AIR EMISSIONS GUIDE FOR AIR FORCE MOBILE SOURCES

METHODS FOR ESTIMATING EMISSIONS OF AIR POLLUTANTS FOR MOBILE SOURCES AT U.S. AIR FORCE INSTALLATIONS

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ACRONYMS (Words formed from the initial letters of a name or parts of a series of words.)

AAFES	Army & Air Force Exchange Service
AFCEC	Air Force Civil Engineer Center
AGE	Aerospace Ground Equipment
ALAPCO	Association of Local Air Pollution Control Officials
AMX	Aircraft Maintenance Squadron
BEE	Bioenvironmental Engineer
BOOS	Burners Out Of Service
CAIR	Clean Air Interstate Rule
CAS	Chemical Abstracts Service
CONUS	Continental United States
DAC	Defense Ammunition Center
EPAct	Energy Policy Act
EPCRA	Emergency Planning and Community Right-to-Know Act
FESOP	Federally Enforceable State Operating Permit
FIRE	Factor Information Retrieval System
HAP	Hazardous Air Pollutant
HAZMAT	Hazardous Materials
HEPA	High Efficiency Particulate Air
HVAC	Heating, Ventilating, and Air Conditioning
ICAO	International Civil Aviation Organization
MAJCOM	Major Command
MEM	Mass of Energetic Material
NAAQS	National Ambient Air Quality Standards
NAICS	North American Industry Classification System
NASA	National Aeronautics and Space Administration
NEPA	National Environmental Policy Act
NESHAP	National Emission Standards for Hazardous Air Pollutants
OCONUS	Outside Continental United States
OTAQ	Office of Transportation and Air Quality
PEMS	Predictive Emission Monitoring System
SAR	Second Assessment Report
SAW	Submerged Arc Welding
SIC	Standard Industrial Classification
SIP	State Implementation Plan
SMAW	Shielded Metal Arc Welding
STAPPA	State and Territorial Air Pollution Program Administrators
USAF	United States Air Force
VIN	Vehicle Identification Number

BREVITY CODES (Shortened form of a frequently used group of words, phrase, or sentence consisting of entirely upper case letters. Each letter is spoken individually.)

AB	Afterburner
AEI	Air Emissions Inventory
AFB	Air Force Base
AFI	Air Force Instruction
AFRL	Air Force Research Laboratory
APU	Auxiliary Power Unit
BSFC	Brake-Specific Fuel Consumption
CAA	Clean Air Act
CE	Civil Engineering
CEMS	Continuous Emission Monitoring System
CEV	Civil Engineering Environmental
CFR	Code of Federal Regulations
CI	Compression Ignition
CNG	Compressed Natural Gas
DLA	Defense Logistics Agency
DOD	Department of Defense
DOE	Department of Energy
EA	Environmental Assessment
EDMS	Emissions and Dispersion Modeling System
EF	Emission Factor
EGBE	Ethylene Glycol Butyl Ether
EIS	Environmental Impact Statement
EPA	Environmental Protection Agency
EPAct	Energy Policy Act
ESTCP	Environmental Security Technology Certification Program
FAA	Federal Aviation Administration
FFV	Flexible Fuel Vehicles
GHG	Greenhouse Gas
GOV	Government Owned Vehicles
GSE	Ground Support Equipment
GVW	Gross Vehicle Weight
HBFC	Hydrobromofluorocarbons
HC	Hydrocarbon
HCFC	Hydrochlorofluorocarbons
HCP	Hard Chrome Plating
HEI	High Explosive Incendiary
HEV	Hybrid Electric Vehicles

HHV	High Heat Value
HMA	Hot Mix Asphalt
HVLP	High Volume Low Pressure
HVOF	High Velocity Oxy-Fuel
IC	Internal Combustion
ICAO	International Civil Aviation Organization
IPCC	Intergovernmental Panel on Climate Change
IRP	Installation Restoration Program
LDF	Liquid Drift Factors
LEL	Lower Explosive Limit
LFB	Low Flyby
LFP	Low Flight Pattern
LGRVM	Vehicle Management Flight Vehicle Maintenance
LNB	Low NOX Burner
LPG	Liquefied Petroleum Gas
LTO	Landing and Takeoff
MEK	Methyl Ethyl Ketone
Mg	Megagram(s) [i.e., metric ton]
mg	Milligram(s)
MIDAS	Munitions Items Disposition Action System
MEK	Methyl Ethyl Ketone
MM	Minutemen Missiles
MMBtu	Million British Thermal Units
Mn	Manganese
MPF	Military Personnel Flight
MPO	Metropolitan Planning Office
MSDS	Material Safety Data Sheet
MSW	Municipal Solid Waste
NACAA	National Association of Clean Air Agencies
NDI	Non-destructive Inspection
NEI	National Emission Inventory
NMHC	Non-Methane Hydrocarbons
NMOC	Non-Methane Organic Compounds
NSCR	Nonselective Catalytic Reduction
NSR	New Source Review
OB/OD	Open Burning/Open Detonation
OBODM	Open Burning/Open Detonation Model
OCA	Off-Site Consequences Analysis
ODS	Ozone Depleting Substances
OIAI	Once In Always In

OLVIMS	On-line Vehicle Interactive Management System
P2	Pollution Prevention
PAH	Polycyclic Aromatic Hydrocarbon
PBT	Persistent Bioaccumulative and Toxic
PEMS	Predictive Emission Monitoring System
PM	Particulate Matter – Aerodynamic diameter unspecified
PM_{10}	Particulate Matter – Aerodynamic diameter < 10 micrometers
$PM_{2.5}$	Particulate Matter – Aerodynamic diameter < 2.5 micrometers
POV	Privately Owned Vehicles
RVP	Reid Vapor Pressure
SCC	Source Classification Code
SI	Spark Ignition
TGO	Touch-and-Go
THC	Total Hydrocarbons
TIM	Time in Mode
TLG	Total Landfill Gas
TNMOC	Total Non-Methane Organic Compounds
T.O.	Technical Order
TOC	Total Organic Compounds
TRI	Toxic Release Inventory
TSD	Treatment, Storage, & Disposal
TSP	Total Suspended Particulate
ULSD	Ultra Low Sulfur Diesel
U.S.	United States
UST	Underground Storage Tanks
VKT	Vehicle Kilometers Traveled
VMIF	Vehicle Maintenance Index File
VMT	Vehicle Miles Traveled
VOC	Volatile Organic Compound

ABBREVIATIONS (Shortened form of a word or phrase)

µg	Microgram(s)
Btu	British Thermal Unit
ºC	Degrees Celsius
CH_4	Methane
CO	Carbon Monoxide
Co	Cobalt
Cr	Chromium
EtO	Ethylene Oxide
ºF	Degrees Fahrenheit
ft.	Foot (Feet)
g/L	Grams per Liter
gal	Gallon(s)
HCl	Hydrochloric Acid
hp	Horse Power
hr	Hour(s)
kW	Kilowatt(s)
lb	Pound(s)
Mg	Megagram(s) [i.e., metric ton]
mg	Milligram(s)
MMBtu	Million British Thermal Units
Mn	Manganese
NH_3	Ammonia
Ni	Nickel
N_2O	Nitrous Oxide
NO_2	Nitrogen Dioxide
NO_X	Nitrogen Oxides
Pb	Lead
ppm	Parts per Million
ppmv	Parts per Million by Volume
psi	Pounds per Square Inch
ºR	Degrees Rankin
scf	Standard Cubic Foot
SO_2	Sulfur Dioxide
SO_X	Sulfur Oxides
tpy	Tons per Year
yr	Year(s)

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1 INTRODUCTION

1.1 Background and Purpose

The Clean Air Act (CAA) established the requirements to quantify and report air pollutant emissions from mobile and stationary sources. The purpose of the CAA is to protect public health by addressing the risks posed by certain air pollutants. The United States Environmental Protection Agency (EPA) has established National Ambient Air Quality Standards (NAAQS) which require facility managers to know at all times if they are in compliance with air regulations. The EPA regulates most mobile sources of air pollution (e.g., automobiles at 40 Code of Federal Regulations (CFR) 85-86, and airplanes at 40 CFR 87, etc.) under Title II of the CAA. Performance standards issued by the EPA limit the emissions of certain pollutants from these sources. Fuel-related requirements under Title II at 40 CFR 79-80 are designed to further reduce emissions from mobile sources.

For an installation, such as an Air Force base, the total air pollutant emissions are determined by conducting an **Air Emissions Inventory (AEI)**. An air emissions inventory is the sum of all air pollutant emissions from each source over a stated period of time, typically one year. Air quality regulations vary from region to region and the local regulatory agency should be consulted prior to conducting an AEI since some local agencies have specific data reporting requirements and/or protocols that the installation must obey. An AEI must be periodically updated as required by federal, state, and local regulations. **Each installation must calculate and record all collected data in the Air Program Information Management System (APIMS).** Installations located in a foreign territory must abide by the requirements of the host government. If there is not a regulatory periodic emission inventory requirement, then APIMS must be updated no less than every three years to accurately reflect the current emissions. Additionally, AEIs must be updated any time there is a change in mission, equipment, and/or operating procedures that result in a substantial change (approximately 5 %) in air emissions.

The purpose of this document is to provide a uniform approach to calculating air pollutant emissions for the most common **mobile sources** found at Air Force installations. This Guide is the Air Force's single authoritative resource for mobile source emission estimating algorithms and emission factors (EFs); no other algorithms or EFs shall be used unless mandated by a legally enforceable regulatory requirement (e.g., permit stipulates) or approved by Air Force Civil Engineering Center/Environmental Quality Technical Support Branch (AFCEC/CZTQ) on a case-by-case basis.

Any questions concerning this document, or requests for additional information pertaining to Air Force air emission inventories, should be directed to the Air Quality Subject Matter Expert;

AFCEC Compliance Technical Support Branch located at, 250 Donald Goodrich Drive; Building #1650 San Antonio, TX 78226.

1.2 Mobile Sources

This document only addresses mobile emission sources typically found on Air Force installations. A mobile source is defined as any type of non-stationary equipment that may emit an air pollutant subject to regulation by the CAA. These mobile sources include aircraft and aircraft support equipment, on-road vehicles, and non-road engines. The description of stationary sources contributing to air emissions and the method for calculating these emissions may be found in the *Air Emissions Guide for Air Force Stationary Sources*. It should be noted that certain districts may classify non-road engines as a stationary source, therefore it is important to consult with the local air quality district for clarification as needed.

1.3 Air Emissions Inventories (AEIs)

Air Quality Compliance and Resource Management, states the following in AFI 32-7040: "Prepare and periodically update an Air Emissions Inventories (AEI) of all installation stationary sources and Air Force owned or operated mobile sources at the frequency required by federal, state and local regulations, via APIMS. If no periodic emission inventory requirements apply, it is recommended that APIMS be updated no less frequently than every three years to accurately reflect current emissions. Overseas installations shall conduct AEIs in accordance with Foreign Governing Standards or Host Nation agreements. Mandatory emissions reports will be provided to Federal, State and local (including Metropolitan Planning Organization or other regional) regulatory agencies as required. Greenhouse Gases (GHG) reporting mandated by Executive Order (E.O.) 13514, Federal Leadership in Environmental, Energy, and Economic Performance, will be accomplished at the SAF/HAF level. GHG reporting mandated by Title 40, Code of Federal Regulations, Part 98, *Mandatory Greenhouse Gas Reporting*, shall be accomplished by the affected installations. Installation AEI data must be stored in APIMS and available for use as needed by Air Force Civil Engineer Center (AFCEC) and higher headquarters."

This document is concerned with "actual emissions" (i.e., from existing sources) and projected emissions (i.e., from projected federal actions). AEIs of these emissions may be required to fulfill a requirement for reporting for a certain period and frequency (e.g., reported for the previous calendar year on an annual basis). AEIs are usually accomplished to meet one or more regulatory requirement(s). The most common regulatory requirements for conducting a mobile source AEI are summarized below.

1.3.1 Title II – Emission Standards for Moving Sources

The EPA regulates most mobile sources of air pollution (e.g., automobiles at 40 CFR 85-86, airplanes at 40 CFR 87, etc.) under Title II of the CAA which sets the standards for motor vehicle and aircraft emissions. Under Title II, the standards are set in order to control emissions that may endanger public health and welfare. Title II goes on to state that for motor vehicles, it is the manufacturer's responsibility to establish and perform tests which evaluate the emissions from the device. All testing results are to be maintained and must be made available to any agent of the enforcement authority when requested. Similarly, Title II of the CAA states that the Secretary of Transportation will work to ensure that all aircraft emissions are in compliance with the established air pollution standards.

1.3.2 General Conformity

Section 176(c) of the CAA prohibits federal activities from taking various actions in nonattainment or maintenance areas unless they first demonstrate conformance with their respective State Implementation Plan (SIP). "A Federal Agency must make a determination that a Federal action conforms to the applicable implementation plan in accordance with the requirements of this Subpart **before the action is taken**" (40 CFR 93.150(b)). A conformity review is a multi-step process used to determine and document whether a proposed action meets the conformity rule. There are two main components to this process: an **applicability analysis** first establishes if a full-scale conformity determination is required and, if it is, a **conformity determination** assesses whether the action conforms to the SIP. The general conformity program requires all federal actions in nonattainment and maintenance areas to comply with the appropriate SIP. An emissions inventory is usually required as part of the conformity determination to identify/quantify air emissions from the proposed federal actions.

1.3.3 Implementation Plans

As specified under Section 110 of the Clean Air Act, all States are required to submit a plan to the EPA which provides for the protection and enhancement of air quality so as to promote public health and welfare. This plan, called a State Implementation Plan (SIP), provides details for implementation, maintenance, and enforcement of the National Ambient Air Quality Standards (NAAQS). For areas in the State that are classified as nonattainment with any NAAQS, the SIP must provide strategies for obtaining attainment. For areas in the State that are already classified as being in attainment, the SIP must provide strategies for maintaining attainment status. All SIPs and SIP revisions must be reviewed and approved by the EPA. If the EPA considers a SIP to be incomplete or inadequate, they may issue their own plan called a Federal Implementation Plan (FIP).

Historically, most control strategies incorporated into implementation plans have targeted stationary sources. However, due to the constant increase in the number of air pollution sources,

the issuance of new ambient air quality standards, and the fact that mobile sources emit a majority of the overall emissions, more control strategies targeting mobile sources are now being incorporated into implementation plans. Since AEIs are typically used to assess the effect of control strategies, an increase in the number of control strategies pertaining to mobile sources will result in an increase in requirements to conduct mobile source AEIs.

1.3.4 National Environmental Policy Act (NEPA)

National Environmental Policy Act (NEPA) requires Federal agencies to evaluate the environmental impacts associated with major actions that they either fund, support, permit, or implement. There are as many as three levels of analysis:

- **Categorical Exclusion Determination** – A proposed action may be categorically excluded from a detailed environmental analysis if the action meets certain criteria which a previous agency has determined to have no significant environmental impact.
- **Environmental Assessment (EA)** – An EA is a proposed action not categorically excluded must be evaluated to determine if undertaking would significantly affect the environment. If no, the agency issues a Finding of No Significant Impact (FONSI). If the EA concludes the action results in a significant environmental impact, an environmental impact statement must be prepared.
- **Environmental Impact Statement (EIS)** – An EIS is a detailed evaluation of the proposed action and its alternatives. A draft EIS is filed with the EPA and the EPA publishes a "Notice of Availability" in the Federal Register. Publication of the "Notice of Availability" begins a 45-day public comment period and mandatory 30-day waiting period before the agency is allowed to decide on the proposed action.

1.3.5 Other Inventory Uses

Complying with environmental regulations is not the only reason air emissions inventories are conducted. An air emissions inventory can be a useful tool in helping industrial facilities implement various environmental programs. The most common programs that may involve mobile source emission inventories are summarized below.

1.3.5.1 Pollution Prevention (P2) Opportunities

An air emissions inventory can be a useful tool in identifying air-related P2 opportunities on military installations. The inventory identifies the types of air pollution sources on base and their accompanying emissions. Due to the large amount of emissions produced from mobile sources, as well as emerging technologies/strategies for reducing mobile source emissions, implementing P2 opportunities for mobile sources is becoming more commonplace.

1.3.5.2 Emissions Trading

Some states have adopted emissions trading programs that apply to mobile sources. These programs are usually applicable to fleet vehicles in nonattainment areas. The emissions trading programs allow entities to generate emission reduction credits by converting to low emission vehicles. The credits may be banked, purchased, sold, or traded to meet clean air mandates for specified air programs. Mobile source AEIs provide important data needed for calculating mobile emission reduction credits.

1.3.5.3 Risk Assessments

In certain cases, it may be necessary to assess the risk(s) that air emissions from a military installation pose to specific public receptors. Data from air emissions inventories can be used in conjunction with approved dispersion models to perform these risk assessments. Due to the large amount of emissions from mobile sources (especially from installations with a high amount of aircraft traffic), as well as the fact that many Air Force installations are located near high population areas, some installations may have a need to conduct risk assessments which include mobile source emissions.

1.3.5.4 Environmental Auditing

An environmental audit is an objective review of a facility's operations and practices to determine if the facility is meeting its environmental requirements. Audits can be designed to verify compliance with environmental requirements, evaluate the effectiveness of environmental management systems already in place. An environmental audit can also assess risks from regulated and unregulated materials and practices. In addition, the audit can be used by management to plan environmental activities for the future. Data from AEIs can be used in the audit process to help identify current and/or potential air pollution problems associated with a facility's operations and practices.

1.4 Emissions Inventory Methodologies

When conducting an AEI, the quantity of regulated pollutants emitted from all emission sources located on an Air Force installation (except those sources that are specifically exempt) must be determined. Several methods can be used to quantify air pollutants from emission sources. Data from source-specific emission tests or continuous emission monitors (CEMs) are usually preferred for estimating a source's emissions. The CEM data provides the best representation of the tested source's emissions. However, source-specific emission tests or continuous emission monitoring of mobile sources at a large installation, such as an Air Force base, may be impractical. Therefore, emission factors and/or mass balance calculations are frequently the best or only method available for estimating emissions, despite their limitations.

An emission factor is a representative value that attempts to relate the quantity of a pollutant released with the activity associated with the release of that pollutant. These factors are usually expressed as the weight of pollutant released per a unit weight, volume, distance, or duration of the activity emitting the pollutant (e.g., pounds of a pollutant emitted per 1,000 pounds of fuel burned). In most cases, these factors are simply averages of all available data of acceptable quality, and are generally assumed to be representative of long-term averages for all processes in the source category (i.e., a population average).

The general equation for emission estimation using an emission factor is:

$$\boldsymbol{E = A \times EF \times N}$$

Equation 1-1

Where,

$\boldsymbol{E}$ = Emissions
$\boldsymbol{A}$ = Activity rate
$\boldsymbol{EF}$ = Emission factor
$\boldsymbol{N}$ = Number of engines/aircraft/equipment

For some sources, a mass balance approach may provide a better, more accurate estimate of emissions than emission tests would. In general, mass balances are appropriate for use in situations where a high percentage of material is lost to the atmosphere (e.g., sulfur in fuel). As the term implies, all the materials going into and coming out of the process must be taken into account to allow an emission estimation to be credible.

1.5 Pollutants

Although there are several types (groups/classes) of federal and state regulated pollutants which may be addressed in an AEI, this document focuses on criteria pollutants, hazardous air pollutants (HAPs), and volatile organic compounds (VOCs). The document also addresses greenhouse gases (GHGs) to a lesser degree.

1.5.1 Criteria Pollutants

In 1971, the EPA established National Ambient Air Quality Standards (NAAQS) for six pollutants which are termed criteria pollutants. These include carbon monoxide, nitrogen dioxide, ozone, sulfur dioxide, lead, and particulate matter. EPA calls these pollutants "criteria" air pollutants because it regulates them by developing human health-based and/or environmentally-based criteria for setting permissible levels. These criteria pollutants are:

Particle Pollution (often referred to as particulate matter):

- PM includes the very fine dust, soot, smoke, and droplets formed from chemical reactions and incomplete burning of fuels.
- The fine particles can get deep into the lungs, causing increased respiratory illnesses and tens of thousands of deaths each year.
- PM is defined as any particle with an equivalent diameter which is less than or equal to 10 microns (**PM_{10}**) and is further subdivided to include a separate standard for particles with an equivalent aerodynamic diameter of less than or equal to 2.5 microns (**$PM_{2.5}$**).

Ground-Level Ozone (O_3):

- O_3 is a primary component of smog that can cause human health problems and damage forests and agricultural crops.
- Repeated exposure to O_3 can make people more susceptible to respiratory infections and lung inflammation.
- Though there is a NAAQS, O_3 is not emitted directly into the air.
- Two types of chemicals that are the main ingredients (precursors) in the presence of sunlight form ground-level O_3 include the following:
    - **Volatile Organic Compounds (VOCs):** Sources include vehicles burning gasoline, petroleum refineries, chemical manufacturing plants, industrial plants, solvents used in paints, and an assortment of consumer and business products.
    - **Nitrogen Oxides (NO_x):** Produced when vehicles and other sources like power plants and industrial boilers burn fuels such as gasoline, coal, or oil. Nitrogen oxides produce the reddish-brown tint in smog.

Carbon Monoxide (CO):

- CO is produced when fossil fuel burns incompletely due to insufficient oxygen.
- Wood/coal/charcoal fires and gasoline engines always produce CO.
- In the United States, particularly in urban areas, the majority of CO air emissions are from mobile sources.
- CO can cause harmful health effects by reducing oxygen delivery to the body's organs (like the heart and brain) and tissues.

Sulfur Dioxide (SO_2):

- SO_2 is a part of a group of highly reactive gases known as “oxides of sulfur”.
- SO_2 is linked to a number of adverse effects on the respiratory system.
- SO_2 emissions are produced from fossil fuel combustion at power plants (73%) and other industrial facilities (20%).
- SO_2 in the ambient air is just one of several oxides of sulfur that contribute to air quality issues.

Nitrogen Dioxide (NO_2):

- NO_2 is a subgroup of nitrogen oxides, and is the most environmentally concerning component and an indicator for the presence of larger group of nitrogen oxides.
- NO_2 forms quickly from vehicle emissions, power plants, and off-road equipment.
- NO_2 contributes to the formation of ground-level O_3, and fine particle pollution.
- NO_2 is linked with a number of adverse effects on the respiratory system.

Lead (Pb):

- Pb is a metal found naturally in the environment as well as in manufactured products.
- Prior to 1980, the major source of Pb was from vehicle exhaust. As a result, the EPA removed Pb from gasoline.
- Pb emissions from vehicles declined by 95% between 1980 and 1999.
- Today, the major sources of Pb are ore and metal processing (e.g. lead smelters).
- Depending on the level of exposure, Pb can adversely affect the nervous system, kidney function, immune system, reproductive and developmental systems and the cardiovascular system.

1.5.2 Hazardous Air Pollutants (HAPs)

According to the EPA (USEPA 2016), "Hazardous air pollutants, also known as toxic air pollutants or air toxics, are those pollutants that are known or suspected to cause cancer or other serious health effects, such as reproductive effects or birth defects, or adverse environmental effects." HAPs include the toxic compounds regulated under Section 112(b) of the CAA. The EPA has been charged with continually analyzing available data on HAPs, and revising the regulated list of HAPs. The EPA has also established procedures for both "listing" and "delisting" HAP compounds. A total of 189 compounds were on the original HAP list, though four compounds have since been removed from this list. These compounds include: hydrogen sulfide in December 1991, caprolactam in June 1996 (61FR30816), ethylene glycol monobutyl ether (EGBE) in November 2004 (69FR69320), and methyl ethyl ketone (MEK) in December 2005 (70FR75047). Changes to the HAPs list are found in 40 CFR Part 63, Subpart C.

1.5.3 Greenhouse Gases (GHGs)

Global climate change is becoming one of the most important and discussed issues of the 21st century. Some GHGs, such as carbon dioxide (CO_2), occur naturally and are emitted to the atmosphere through natural processes as well as human activities. Other GHGs (e.g., fluorinated gases) are created and emitted solely through human activities. The principal GHGs that enter the atmosphere because of human activities are CO_2, methane (CH_4), nitrous oxide (N_2O), and fluorinated gases.

- CO_2 enters the atmosphere through the burning of fossil fuels, (which include oil, natural gas, and coal), solid waste, trees and wood products, and as a result of other chemical reactions (e.g., cement manufacturing). CO_2 is also removed or sequestered from the atmosphere when it is absorbed by plants as part of the biological carbon cycle.
- CH_4 is emitted during the production and transport of coal, natural gas, and oil. CH_4 emissions also result from livestock and other agricultural practices and by the decay of organic waste in municipal solid waste landfills.
- N_2O is emitted during agricultural and industrial activities, as well as during combustion of fossil fuels and solid waste.
- Hydrofluorocarbons, perfluorocarbons, and sulfur hexafluoride are synthetic, powerful GHGs that are emitted from a variety of industrial processes. Fluorinated gases are sometimes used as substitutes for ozone-depleting chemicals (i.e., CFCs, HCFCs, and halons). These gases are typically emitted in smaller quantities, but because they are potent GHGs, they are sometimes referred to as High Global Warming Potential gases ("High GWP gases").

GHGs are assigned a GWP, a measurement of how much heat the gas traps in the atmosphere calculated over a specific time interval, which is typically 100 years. The higher the GWP, the greater the potential for the gas to trap heat, and the more harmful the gas is regarded. CO_2 is used as the baseline gas and is assigned a GWP of 1. Emissions of GHGs may be converted into equivalent CO_2 (CO_2e) by taking the product of each GHG emission factor and its respective GWP. Table A-1 of 40 CFR 98 provides the GWPs for several greenhouse gases and are shown below. The GWP values used to calculate GHG emissions throughout this document are subject to change in the upcoming years due to new data becoming available, but are considered current as of June 6, 2016. The total GHG emissions are calculated by summing all emissions from each gas and are generally derived from the following equation:

$$\boldsymbol{EF_{GHG} = \sum_{i=1}^{n} (EF_i \, x \, GWP_i)}$$

Equation 1-2

Where,

EF_{GHG} = Greenhouse gas emission factor in equivalent CO_2
EF_i = Emission Factor for greenhouse gas species i
GWP_i = Global warming potential for greenhouse gas species i

Table 1-1 Global Warming Potentials

Name	Chemical Formula	Global Warming Potential (100 yr.)
Carbon dioxide	CO_2	1
Methane	CH_4	25
Nitrous oxide	N_2O	298
HFC-23	CHF_3	14,800
HFC-32	CH_2F_2	675
HFC-41	CH_3F	92
HFC-125	C_2HF_5	3,500
HFC-134	$C_2H_2F_4$	1,100
HFC-134a	CH_2FCF_3	1,430
HFC-143	$C_2H_3F_3$	353
HFC-143a	$C_2H_3F_3$	4,470
HFC-152	CH_2FCH_2F	53
HFC-152a	CH_3CHF_2	124
HFC-161	CH_3CH_2F	12
HFC-227ea	C_3HF_7	3,220
HFC-236cb	$CH_2FCF_2CF_3$	1,340
HFC-236ea	CHF_2CHFCF_3	1,370
HFC-236fa	$C_3H_2F_6$	9,810
HFC-245ca	$C_3H_3F_5$	693
HFC-245fa	$CHF_2CH_2CF_3$	1,030
HFC-365mfc	$CH_3CF_2CH_2CF_3$	794
HFC-43-10mee	$CF_3CFHCFHCF_2CF_3$	1,640
Sulfur hexafluoride	SF_6	22,800
Trifluoromethyl sulphur pentafluoride	SF_5CF_3	17,700
Nitrogen trifluoride	NF_3	17,200
PFC-14 (Perfluoromethane)	CF_4	7,390
PFC-116 (Perfluoroethane)	C_2F_6	12,200
PFC-218 (Perfluoropropane)	C_3F_8	8,830
Perfluorocyclopropane	$C\text{-}C_3F_6$	17,340
PFC-3-1-10 (Perfluorobutane)	C_4F_{10}	8,860
PFC-318 (Perfluorocyclobutane)	$C\text{-}C_4F_8$	10,300
PFC-4-1-12 (Perfluoropentane)	C_5F_{12}	9,160
PFC-5-1-14 (Perfluorohexane, FC-72)	C_6F_{14}	9,300
PFC-9-1-18	$C_{10}F_{18}$	7,500
HCFE-235da2 (Isoflurane)	$CHF_2OCHClCF_3$	350

Name	Chemical Formula	Global Warming Potential (100 yr.)
HFE-43-10pccc (H-Galden 1040x, HG-11)	$CHF_2OCF_2OC_2F_4OCHF_2$	1,870
HFE-125	CHF_2OCF_3	14,900
HFE-134 (HG-00)	CHF_2OCHF_2	6,320
HFE-143a	CH_3OCF_3	756
HFE-227ea	$CF_3CHFOCF_3$	1,540
HFE-236ca12 (HG-10)	$CHF_2OCF_2OCHF_2$	2,800
HFE-236ea2 (Desflurane)	$CHF_2OCHFCF_3$	989
HFE-236fa	$CF_3CH_2OCF_3$	487
HFE-245cb2	$CH_3OCF_2CF_3$	708
HFE-245fa1	$CHF_2CH_2OCF_3$	286
HFE-245fa2	$CHF_2OCH_2CF_3$	659
HFE-254cb2	$CH_3OCF_2CHF_2$	359
HFE-263fb2	$CF_3CH_2OCH_3$	11
HFE-329mcc2	$CF_3CF_2OCF_2CHF_2$	919
HFE-338mcf2	$CF_3CF_2OCH_2CF_3$	552
HFE-338pcc13 (HG-01)	$CHF_2OCF_2CF_2OCHF_2$	1,500
HFE-347mcc3 (HFE-7000)	$CH_3OCF_2CF_2CF_3$	575
HFE-347mcf2	$CF_3CF_2OCH_2CHF_2$	374
HFE-347pcf2	$CHF_2CF_2OCH_2CF_3$	580
HFE-356mec3	$CH_3OCF_2CHFCF_3$	101
HFE-356pcc3	$CH_3OCF_2CF_2CHF_2$	110
HFE-356pcf2	$CHF_2CH_2OCF_2CHF_2$	265
HFE-356pcf3	$CHF_2OCH_2CF_2CHF_2$	502
HFE-365mcf3	$CF_3CF_2CH_2OCH_3$	11
HFE-374pc2	$CH_3CH_2OCF_2CHF_2$	557
HFE-449s1 (HFE-7100)	$C_4F_9OCH_3$	297
HFE-569sf2 (HFE-7200)	$C_4F_9OC_2H_5$	59
Sevoflurane (HFE-347mmz1)	$CH_2FOCH(CF_3)_2$	216
HFE-356mmz1	$(CF_3)_2CHOCH_3$	27
HFE-338mmz1	$CHF_2OCH(CF_3)_2$	380
(Octafluorotetramethy-lene) hydroxymethyl group	$X\text{-}(CF_2)_4CH(OH)\text{-}X$	73
HFE-347mmy1	$CH_3OCF(CF_3)_2$	343
Bis(trifluoromethyl)-methanol	$(CF_3)_2CHOH$	195
2,2,3,3,3-pentafluoropropanol	$CF_3CF_2CH_2OH$	42
PFPMIE (HT-70)	$CF_3OCF(CF_3)CF_2OCF_2OCF_3$	10,300

SOURCE: Table A-1 to Subpart A of Part 98 of Title 40 in Code of Federal Regulations

1.6 Document Organization

This document is organized into chapters which are specifically related to facilities or processes typically found at Air Force installations. Chapter topics may or may not correspond directly to source types identified in EPA, State, or local guidance documents, but the intent is to consider sources usually associated with a particular process. This document specifically addresses mobile sources of air emissions. Guidance for addressing stationary or transitory sources of air pollutants may be found in the *Air Emissions Guide for Air Force Stationary Sources* or *Air Emissions Guide for Air Force Transitory Guide*.

1.7 References

USEPA 2000, "Taking Toxics Out of the Air." United States Environmental Protection Agency, Office of Air Quality, Planning and Standards, August 2000

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2 AIRCRAFT FLIGHT OPERATIONS (AOPS)

2.1 Introduction

Emissions from stationed aircraft and transient aircraft operations typically account for the bulk of the mobile source emissions associated with an Air Force base. Emissions from aircraft operations include emissions from aircraft training and flight operations, engine testing, and emissions from each aircraft's associated auxiliary power units (APUs). Aircraft operations result in the release of criteria pollutants, Greenhouse Gases (GHGs), and Hazardous Air Pollutants (HAPs) to the atmosphere.

Aircraft emissions can be classified as being either stationary or mobile in nature depending upon whether the engine is physically attached to the aircraft (mobile), or removed from the aircraft and secured to a stationary device such as a test stand (stationary). Emissions from Air Force aircraft training and flight operations, as well as trim pad and on-wing engine testing, are considered mobile in nature because the engine is secured to a mobile source (the aircraft). Operations in which the engine is removed from the aircraft and secured to a non-mobile device (i.e. in engine test cells or on outdoor test pads) result in emissions that are regarded as stationary. **Calculations of these emissions are described in the Air Emissions Guide for Air Force Stationary Sources**.

Additionally, aircraft are also outfitted with small turbine engines known as APUs that provide auxiliary power to the aircraft while on the ground, and occasionally through takeoff and climb out modes. These APUs are air pollution emission sources and, unless physically removed from an aircraft and operated in a test cell or on an outdoor trim pad, then emissions from the operation of APUs should be treated as mobile sources for inventory purposes.

2.1.1 Landing and Takeoff Cycle (LTO)

The EPA has established formal procedures for calculating exhaust emissions associated with aircraft operations based on a Landing and Takeoff (LTO) cycle (USEPA 1992). Under the EPA procedures, an emissions inventory for aircraft operations focuses on the emissions in the vertical column of air referred to as the "mixing zone" or "inversion layer". Exhaust emissions occurring within this area are calculated for one complete LTO cycle for each aircraft type by applying aircraft engine-specific emission factors. These emission factors are derived from fuel flow rates, the period of time (or time-in-mode, TIM) that each engine operates at a particular power setting during an LTO, and activity based operational data such as the number of aircraft, the number of engines per aircraft, the annual number of sorties or LTOs, etc. Emissions occurring above the mixing zone are typically not considered during the emissions inventory process and is discussed in more detail in the section below.

Each LTO cycle is comprised of five operating modes/power settings: taxi/idle out, takeoff, climb out, approach, and taxi/idle in. The five operating modes and corresponding TIM are described below:

- **Taxi/Idle Out:** The period of time from engine startup to takeoff.
- **Takeoff:** Characterized by full engine thrust, the period of time it takes the aircraft to reach between 500 and 1,000 feet above ground level. This transition height is fairly standard and does not vary much from location to location or among aircraft categories.
- **Climb Out:** The period of time following takeoff that concludes when an aircraft exits the mixing zone and continues on to cruise altitude.
- **Approach:** The period of time from the moment the aircraft enters the mixing zone until the aircraft lands.
- **Taxi/Idle In:** The period of time spent after landing until the aircraft is parked and the engines are turned off.

Due to operational safety considerations, commercial aircraft may sometimes apply engine thrust reversal for 15-20 seconds upon landing as a means of quickly slowing down an aircraft to a safe taxi speed. Thus a sixth operating mode, reverse thrust, may need to be included when estimating emissions for an LTO cycle for commercial aircraft. Military aircraft do not typically employ reverse thrusters for deceleration, but use aerodynamic braking and wheel brakes to slow down. Some military aircraft may, however, employ reverse thrusters as a means of backing up when on the ground. Reverse thrust should only be included in emission calculation procedures as a sixth operating mode if the practice is commonly applied by the aircraft in question. Engine operating conditions for reverse thrust are similar to those occurring during takeoff, thus TIM for reverse thrust should be combined with takeoff mode emission factors and fuel flow as a means of accounting for reverse thrust mode emissions.

The fuel flow rate of each engine power setting is the fuel rate used during emissions sampling and emission factor development. Average power settings of Air Force turbofan engines used on high performance jet aircraft and turboprop engines used on transport and cargo aircraft vary slightly during the takeoff mode. While Air Force jet aircraft typically use 100% of the engine's rated thrust during takeoff, some high-performance aircraft will takeoff using the full afterburner (AB) setting, which introduces fuel at a substantially higher rate. By contrast, turboprop aircraft typically employ a de-rated takeoff procedure that uses less than full power. Commercial and military LTO cycle modes and typical Air Force aircraft engine power settings are presented in Table 2-1.

Table 2-1. Comparison of Commercial and Military LTO Cycle Modes

Engine Type	Commercial LTO Cycle Modes	Military LTO Cycle Modes	Typical Engine Power Setting (%)
Turbofan	Taxi/Idle out	Idle	7
	Takeoff	Military or Afterburner (AB)	100 or 110-150[(1)]
	Climb out	Intermediate	70-85[(1)]
	Approach	Approach	30
	Taxi/Idle in	Idle	7
Turboprop	Taxi/Idle out	Idle	7
	Takeoff	Military	90
	Climb out	Intermediate	70-85[(1)]
	Approach	Approach	30
	Taxi/Idle in	Idle	7

SOURCE: *Airport Air Quality Manual*, International Civil Aviation Organization, 2011, except where noted.

1. Power setting percentage from *Air Emissions Factor Guide to Air Force Mobile Sources*, 2009 which cites Emissions and Dispersion Modeling System (EDMS) as the original source.

Helicopter engines are typically operated at settings that, while similar, reflect operational differences between fixed-wing aircraft and rotorcraft, and are not included in this document. These settings may include ground idle, flight idle, normal, military, and sometimes overspeed power settings. APUs, however, operate either under a no load or a constant load (typically maximum load) power setting.

2.1.2 Touch and Go (TGO) and Low Fly By (LFB) Cycles

Training operations and other contingencies at Air Force installations may dictate the need to conduct aircraft operations that deviate from a standard LTO cycle. For purposes of developing a comprehensive inventory, emissions should also be calculated for these military operations and training procedures. A Touch and Go (TGO) cycle is similar to an LTO cycle, but does not include taxi time. It includes the TIM when an aircraft enters the atmospheric mixing zone, briefly lands, then immediately takes off, and climbs out through the atmospheric mixing zone.

A Low Flyby (LFB) cycle is similar to an LTO and TGO cycle, but less time is spent in the takeoff mode, and the aircraft stays in approach mode below the mixing zone height for a longer period of time. For the purpose of developing a base emission inventory, only that portion of an LFB cycle that occurs within the actual air space of the Air Force base is of concern. If, however, the emission inventory is being created as part of a "regional" inventory development effort by regulators, it

may also be necessary to estimate aircraft emissions that occur outside of a base's air space, under the mixing zone height.

2.2 Mixing Zone Height and Time in Mode (TIM)

Under the EPA procedures, an emissions inventory for aircraft operations focuses on the emissions in the vertical column of air where pollutant chemical reactions occur. This portion of the atmosphere, which begins at the earth's surface and can range from several hundred to several thousand feet in altitude, is commonly referred to as the "mixing zone" or "inversion layer". Because estimating emissions using an LTO approach accounts for exhaust emissions associated with aircraft operations occurring both on the ground and up to the mixing zone height, the choice of a mixing zone height will have a direct impact on total emissions. Mixing zone height is used to adjust the TIM during the approach and climb out modes of an LTO when calculating emissions. Thus a shallow mixing zone height will result in a shorter TIM (and fewer emissions), and a high mixing zone height will result in a longer TIM (and more emissions). While emissions occurring anywhere within this zone will impact ground-level pollutant concentrations, emissions occurring above it will generally not impact concentrations. Because atmospheric stability is a function of temperature, mixing zone height depends on location, hour, and season, and is affected by local topography, time of day, and time of year. Per EPA guidance, a default mixing zone height of 3,000 feet should be used. However, if NO_X emissions are considered an important component of the emission inventory, specific mixing height data should be gathered and applied (Procedures for Emission Inventory Preparation-Volume IV: Mobile Sources). The Federal Aviation Administration (FAA) has adopted this EPA default value in its recommended procedures (FAA 2000). To maximize the accuracy of the inventory through use of specific mixing height data, contact the AFCEC Air Quality Subject Matter Expert to obtain approval and location-specific meteorological data for seasonal or annual average mixing heights. Typical TIM estimates are provided in Table 2-4 for different types of commercial and military aircraft that may be used when base-specific data is unavailable.

2.3 Fuel Flow Rate

It is important to note that EFs are derived for specific fuel flow rates, not power settings, and that actual fuel flow rates used during aircraft operation and testing at different installations may vary from those used to derive EFs. If available, aircraft- and base-specific TIM data and fuel flow rates (using the EF for the closest engine-specific fuel flow rate) should be used to enhance the accuracy of the AEI. Once all necessary operating parameters are identified, total emissions from aggregated aircraft operations may be calculated.

2.3.1 Jet Fuel

Military turbofan and turboprop engines and APUs consume JP-8 fuel, while their commercial counterparts consume a nearly identical fuel known as Jet-A. While the vast majority of aircraft operations involve engines that use either JP-8 or Jet-A fuel, small, piston engine-driven planes that consume aviation grade gasoline, or AVGAS, may periodically operate on an Air Force installation. In addition, recent Air Force and commercial initiatives are expected to result in the increased use of so-called synthetic aviation fuel or "synfuel" over the next several years. These “synfuels” are derived from either coal or natural gas using the Fischer-Tropsch process and burn much cleaner than fuels produced from crude oil. Regardless of fuel type, emissions of concern from aircraft operations and testing include the criteria pollutants (VOC, CO, NO_2, $PM_{2.5}$, PM_{10}, and SO_2), and HAPs that are commonly associated with fuel combustion processes (including, but not limited to: benzene, naphthalene and 1, 3-butadiene).

2.3.2 Synthetic Aviation Fuel

Currently, there are on-going Department of Defense (DoD and Air Force initiatives to reduce dependency on foreign petroleum sources. This includes development of battlefield fuels with essentially no sulfur and reduced aromatic content using Fischer-Tropsch (FT) gasification technology on domestic energy sources such as coal and natural gas. These "synthetic" fuels will increasingly be used to offset conventional JP-8 and diesel fuels in Air Force equipment, particularly aircraft. Testing and certification of 50-50 blends of petroleum- and FT-based JP-8 in B-52s has recently been completed by the Air Force Research Laboratory (AFRL), and data indicates the 50-50 blend reduces SO_2, CO_2, and PM emissions considerably (USAF 2007). When collecting information on aircraft operations, if synthetic fuel blended with petroleum JP-8 was used, the following emission reduction factors should be applied when calculating emissions:

Table 2-2. Fuel Emission Reduction Factors (FERFs) for JP-8/Synthetic Fuel Blends

Pollutant	Reduction Factor (%)
PM	35
SO_2	50
CO_2	1.8

SOURCE: USAF Air Force Alternative Fuels Program, AFRL/WS/06-0078. 22nd Annual UC Symposium on Aviation Noise and Air Quality. March 2007.

2.4 Emission Factors

Air pollutant emission factors for aircraft operations include emissions from the aircraft engines (either fixed wing or rotary) and any APUs used on the airframe. The emission factors have been developed through testing from a variety of sources including the engine manufacturers themselves. Criteria pollutant emission factors EFs for each engine are provided in Table 2-8 while speciated VOC and HAP emission factors are provided in Table 2-9. Similarly, for APUs, criteria pollutants are provided in Table 2-10.

2.5 Emissions Calculation

Emission calculation procedures for different aircraft operations under various operational cycles and mobile testing conditions are described in the following paragraphs. Default data for calculating emissions for specific aircraft engines can be found in Table 2-8. For engine models not in Table 2-8, contact the Air Quality Subject Matter Expert (SME) for assistance in selecting a representative surrogate engine.

2.5.1 Aircraft Emissions

The EFs listed have been determined through testing and may be found in a variety of sources. It is important to note that some sources, such as the Airport Air Quality Manual and International Civil Aviation Organization (ICAO) do not provide PM_{10} and $PM_{2.5}$ EFs directly (ICAO 2011). For those sources, the total PM was calculated and was conservatively assumed to be equal to PM_{10}. A similarly conservative estimate was made for $PM_{2.5}$ by assuming that 90% of the total PM_{10} value is composed of $PM_{2.5}$. These assumptions are noted in the appropriate tables. Additionally, there are several engines for which some emission factor data may have been missing. For these engines, either the EFs from a surrogate were used or the missing data was interpolated. These values are clearly marked in the tables with an (S) for EFs in which a surrogate was used, or a (C) when the values were calculated. The engines used as surrogates are clearly stated in the notes for that engine.

2.5.1.1 Landing and Takeoff Cycle (LTO) Emissions

LTO emissions are calculated based on the type of aircraft, the engine model, the operational mode and TIM for each mode, and the power setting associated with each operational mode. The fuel flow rate associated with each power setting, engine-specific emission factors, the mixing zone height, and the number of LTO cycles conducted during the course of a year are also considered in the LTO emissions calculation. As TIM and fuel flow rate for each power setting varies among aircraft engines and airframes, the calculation procedure will need to be repeated for individual aircraft types.

To calculate LTO emissions using base- and aircraft-specific data, the following data is required: average TIM, the average fuel flow rate associated with each mode (based on engine power setting), the fuel used (if synthetic fuel, apply fuel reduction factors), and the base's mixing zone height. Every effort should be made to use accurate, base-specific data, however, in the absence of available data, default values such as EPA and Air Force established TIM (Table 2-4), fuel flow rates (Table 2-8), and an average mixing zone height of 3,000 feet may be used.

Emissions are calculated using a three step approach that consists of the following steps:
1) Calculating pollutant emissions for each applicable mode of the LTO cycle;
2) Summing emissions from each mode to obtain a LTO cycle value; and
3) Multiplying the LTO emissions by the number of annual LTO cycles to obtain annual emissions.

The following equations are applied to each individual aircraft and pollutant for which emissions are being calculated:

Step 1 - Calculate pollutant emissions for individual LTO cycle modes:

$$E(Pol)_{Mode} = \frac{TIM}{60} \times \frac{FFR}{1000} \times EF(Pol) \times \frac{FERF(Pol)}{100} \times N$$

Equation 2-1

Where,

$E(Pol)_{Mode}$	=	Pollutant emissions for the operational mode per cycle (lb/cycle)
TIM	=	Time spent in each mode per LTO cycle (min/cycle)
60	=	Factor converting minutes into hours (min/hr)
FFR	=	Fuel flow rate during operational mode per aircraft engine (lb/hr)
1000	=	Factor for converting lb to 10^3 lb (lb/10^3 lb)
EF(Pol)	=	Pollutant emission factor (lb/10^3 lb fuel burned)
FERF(Pol)	=	Fuel emission reduction factor (%). In cases where alternative fuel is not used, then a value of 100% must be used.
100	=	Factor to convert percent to a fraction (%)
N	=	Number of engines per aircraft

Step 2 - Calculate the pollutant emissions for a single LTO:

$$E(Pol)_{LTO} = \sum_{i=1}^{n} \left[E(Pol)_{Mode_i} + \cdots + E(Pol)_{Mode_n} \right]$$

Equation 2-2

Where,

$E(Pol)_{LTO}$	=	Emissions of individual pollutant per LTO (lb/cycle)

$\mathbf{E(Pol)_{Mode\ i/n}}$ = Sum of pollutant emissions across operational modes, i.e. approach, idle-in/out, takeoff, and climb out (lb/cycle)

Step 3 – Calculate the total pollutant emissions from the annual operations of a particular aircraft:

$$E(Pol)_{LTO-Total} = E(Pol)_{LTO} \times \mathbf{NC}_{LTO}$$

Equation 2-3

Where,

$\mathbf{E(Pol)_{LTO\text{-}Total}}$ = Annual emissions of pollutant from LTO cycles (lb/yr)
$\mathbf{E(Pol)_{LTO}}$ = Emissions of individual pollutant per LTO (lb/cycle)
$\mathbf{NC_{LTO}}$ = Number of LTO cycles conducted during the year (cycles/yr)

The standard values required to calculate emissions per LTO cycle may be found in the following tables:

- TIM spent in each LTO cycle mode is found in Table 2-4
- Fuel flow rates for each LTO cycle mode and associated engine-specific emission factors are found in Table 2-8 and Table 2-9

2.5.1.2 Touch and Go (TGO) and Low Fly By (LFB) Emissions

TGO and LFB emissions are calculated in essentially the same manner as LTO emissions. Due to the nature of the operational and training requirements for the cycle, however**, the taxi/idle-in and taxi/idle-out modes are excluded**. Also, the TIM may vary from a typical LTO and should be adjusted accordingly whenever possible.

2.5.1.3 Low Flight Pattern (LFP) Emissions

LFP emissions that occur within the airspace of a base are calculated in essentially the same manner as TGO emissions. Due to the nature of the operational and training requirements for the cycle, however, typically less time is spent in the takeoff mode and more time is spent in the approach mode. Some regulatory authorities may also require emissions from LFP operations to be calculated for the period of time when aircraft are operating outside of, but adjacent to, the airspace of the base. In such instances, the average time the aircraft spends in the mixing zone in the additional non-base airspace is used to adjust TIM. When calculating emissions in this manner, one must know both the number of flights per year and the average time each flight operates in the base's airspace. The following equation is used:

$$E(Pol)_{LFP} = \frac{AT}{60} \times NF_{LFP} \times \frac{FFR}{1000} \times EF(Pol) \times N$$

Equation 2-4

Where,

$E(Pol)_{LFP}$ = Annual emissions of pollutant from LFP (lb/yr)
AT = Average time per LFP flight by applicable aircraft within base airspace (min/flight)
60 = Factor converting minutes into hours (min/hr)
NF_{LFP} = Number of LFP flights within base airspace (flight/yr)
FFR = Fuel flow rate per engine (lb/hr)
1000 = Factor for converting lb to 10^3 lb (lb/10^3 lb)
EF(Pol) = Pollutant emission factor (lb/10^3 lb fuel burned)
N = Number of engines per aircraft

The fuel flow rates and engine-specific emission factors required to calculate emissions using Equation 2-4 may be found in Table 2-8 and Table 2-9.

2.5.2 Auxiliary Power Unit Emissions

APU emissions are based on the APU model associated with each aircraft type, EFs, and the length of time the APU was operating during an LTO cycle. The EFs for APUs are presented in units of lb/hr, so the operating time for each APU must be known. When conducting an AEI, one must gather specific information about the APUs used on each aircraft, and the time each APU was in operation for the most accurate emissions calculations possible. In the absence of available data, common aircraft/APU combinations and the typical APU operating times are found in Table 2-5, Table 2-6, and Table 2-7. The following equations and steps are used to calculate the total emissions from an APU:

Step 1 - Calculate pollutant emissions for a single LTO Cycle:

$$E(Pol)_{APU} = OT \times EF(Pol) \times N$$

Equation 2-5

Where,

$E(Pol)_{APU}$ = Emissions for each individual pollutant produced by the APU model installed on each aircraft type for one LTO cycle (lb/cycle)
OT = Operating time per LTO cycle (hr/cycle)
EF(Pol) = APU-specific emission factor for each pollutant (lb/hr)
N = Number of APUs on each aircraft

Step 2 – Calculate the pollutant emissions from annual APU operations:

$$E(Pol)_{APU-Total} = E(Pol)_{APU} \times NC_{LTO}$$

Equation 2-6

Where,

$E(Pol)_{APU-Total}$ = Total annual emissions of each individual pollutant (lb/yr)
$E(Pol)_{APU}$ = Emissions for each individual pollutant produced by the APU model installed on each aircraft type for one LTO cycle (lb/cycle)
NC_{LTO} = Number of LTO cycles conducted during the year (cycles/yr)

2.5.3 Trim Pad and On-Wing Testing

Emissions associated with trim pad and on-wing testing are based on the type of aircraft, engine model, testing times, the power settings and associated fuel flow rate, and engine-specific EFs. Emissions are calculated by multiplying the fuel flow rate at the selected power setting by the amount of time the engine is operated at that power setting, and applying pollutant-specific EFs. After the emissions are calculated for a particular pollutant at each power setting, the values are summed to obtain the total annual emissions for that pollutant. For this method, one must know both the duration of the test at each power setting and the number of tests performed over the calculation period (i.e. over the course of one year). The following equations are used:

Step 1 - Calculate annual operating times:

$$T_{test} = N_{Test} \times \sum \left(\frac{D_{Test}}{60}\right)$$

Equation 2-7

Where,

T_{Test} = Total annual time engine testing occurred at specific power setting (hr/yr)
N_{Test} = Number of tests performed annually (tests/yr)
D_{Test} = Duration of tests at each power setting (min/test)
60 = Factor for converting minutes to hours (min/hr)

Step 2 – Calculate pollutant emissions:

$$E(Pol)_{Setting} = \frac{(FFR \times T_{Test})}{1000} \times EF(Pol)$$

Equation 2-8

Where,

$E(Pol)_{Setting}$ = Emissions of each pollutant at a specific power setting (lb/yr)
FFR = Fuel flow rate per engine (lb/hr)
T_{test} = Total annual time engine testing occurred at specified power setting (hr/yr)
1000 = Factor for converting lb to 10^3 lb (lb/10^3 lb)

EF(Pol) = Emission factor (lb/10^3 lb fuel burned)

The fuel flow rate and engine-specific emission factors required to calculate emissions using Equation 2-8 may be found in Table 2-8 and Table 2-9.

2.5.4 Calculating SO_2 Emissions

SO_2 emissions are created when sulfur in the fuel reacts and combines with oxygen during the combustion process. Fuels with higher sulfur contents will produce higher amounts of SO_2 than low-sulfur fuels. It is generally assumed that during combustion, all sulfur in the fuel reacts to form SO_2 or sulfates. The sulfur content in commercial jet fuel is limited to 0.3 weight percent (wt. %); however, the sulfur content for most in-use fuel is significantly less than this limit. The national average sulfur content for JP-8 is 0.053 wt. %, based on values obtained from Defense Logistics Agency, Defense Energy Support Center, *Petroleum Quality Information System Fuels Data* (1998-2009). **Based on this national weighted-average, a national emission factor was derived at 1.06 lb SO_X per 1,000 lb fuel burned (1.06lb/10^3 lb), which is used as the default value for all aircraft engines within the continental United States.**

For Outside Continental United States (OCONUS) AEIs and NEPA/General Conformity assessments, it may be more appropriate to derive a SO_2 EF specific for the JP-8 at the installation's geographic location. Since the sulfur content depends on the supplier and the geographic location where the fuel is produced, it is possible for one to calculate a more accurate sulfur EF in cases when greater accuracy is needed. In these instances, the national or regional average sulfur content value for the most appropriate geographic area is listed in Table 2-3 may be used. For enhanced accuracy, the sulfur content of the fuel may also be obtained directly from the fuel supplier. With the sulfur content provided, and the assumption that all sulfur in the fuel is converted to SO_2 during the combustion process, the SO_X emission factor may be calculated using the following equation:

$$\mathbf{EF}(\boldsymbol{SO_X}) = \boldsymbol{S} \times \mathbf{20}$$

Equation 2-9

Where,

EF(SO_X) = SO_X emission factor (lb SO_2/10^3 lb fuel burned)

S = Weight percent sulfur content of the fuel

20 = Conversion factor derived by converting the weight percent of sulfur to a weight fraction, converting this into units of lb/1,000 lb, and then multiplying by the ratio of the molecular weight of SO_2 to the molecular weight of sulfur.

Table 2-3. Average Sulfur Content of JP-8

Geographic Region	States or Countries	Weighted-Average Sulfur Content (Weight %)	Emission Factor (lb/10^3 lb fuel)
National Average		**0.053**	**1.06**
1. East Coast U.S.	ME, VT, NH, MA, RI, CT, NY, PA, NJ, DE, MD, VA, WV, NC, SC, GA, FL	0.051	1.02
2. East Central U.S.	ND, SD, MN, IA, NE, WI, MI, OH, KY, TN, IN, IL, MO, KS, OK	0.080	1.60
3. Gulf Coast U.S.	AL, MS, AR, LA, TX, NM, AZ	0.048	0.96
4. West Central U.S.	MT, ID, WY, UT, CO	0.025	0.50
5. West Coast U.S.	WA, OR, CA, NV	0.055	1.10
Middle East	Kuwait, Bahrain, Pakistan, United Arab Emirates	0.090	1.80
European	Europe, Israel, Turkey	0.089	1.78
Pacific	Korea, Japan, HI, AK, Australia, Russia, Singapore	0.078	1.56
Caribbean	Coastal Aruba	0.045	0.90

Source: "Petroleum Quality Information System Fuels Data." Defense Logistics Agency, Defense Energy Support Center, April 2006

2.5.5 Calculating HAP Emissions

There is not an abundance of information available for aircraft engine-specific or APU-specific HAP emissions. This document provides HAP EFs for several engines and APUs in Table 2-9. In instances where determination of a particular HAP is required for an engine or APU not listed in the table, then it is recommended that a thorough review of current data be made to determine

if any new documentation regarding HAPs emissions exists. In the absence of such data, then an appropriate engine or APU should be selected as a surrogate. The method for calculation is the same as outlined above using Equation 2-1 and Equation 2-8.

2.5.6 Lead (Pb) Emissions

Prolonged exposure to high levels of Pb may result in harmful health effects, especially in young children. Though Pb is a criteria pollutant, this document does not provide any Pb EFs for aircraft and APUs since the transition to unleaded aviation fuel.

2.5.7 Greenhouse Gas (GHG) Emissions

Since GHG emissions are becoming increasingly more important, it is becoming more common to record the CO_2, CH_4, and N_2O emissions produced when measuring emissions from mobile and stationary sources. It is also common practice to report GHG emissions in terms of equivalent CO_2 (CO_2e). This document provides a total GHG composite EF consisting of CO_2, CH_4, and N_2O presented in CO_2e for aircraft engines in Table 2-8 and Table 2-10 for APUs. The total GHG emissions may then be calculated using Equation 2-1, Equation 2-5, or Equation 2-8. For more guidance on the calculation of GHG emissions, refer to the Mandatory Reporting Rule Guide.

2.5.8 VOC Speciation

Though VOC emissions have been speciated for some engines, there is very little data available for most aircraft engines likely found at Air Force installations. Whenever the quantity of speciated compounds is required to be calculated, the average percentage of each species within the total VOC may be used as a gross estimate of the emissions of that compound. This section should only be used if an aircraft engine used on an Air Force base does not have any EF data or surrogate EF data listed in Table 2-9. The percentages for VOC emissions are based on the following categories: turbofan, large aircraft turboprop, small aircraft turboprop, and turbojet.

The following equations were used to calculate the weighted percentage of each pollutant based on the total or the average VOCs from those engines which had speciation data. To compute the average VOC percentage, first the average of all reported EFs for each pollutant was calculated (Equation 2-10) for each engine at each mode. Second, a total of the average VOCs was calculated using the average from each pollutant (Equation 2-11). Finally, the average for each pollutant was divided by the average VOC total to derive each pollutants percentage of total VOCs (Equation 2-12).

$$\boldsymbol{EF(Pol)_{Avg.}} = \frac{\boldsymbol{1}}{\boldsymbol{n}} \times \sum_{\boldsymbol{i=1}}^{\boldsymbol{n}} [\boldsymbol{EF(Pol)_i} + \cdots + \boldsymbol{EF(Pol)_n}]$$

Equation 2-10

Where,

$EF(Pol)_{Avg.}$ = Average emission factors for a pollutant at a specified mode/power setting ($lb/10^3$ lb fuel burned)

$EF(Pol)_{i/n}$ = Reported emission factor for the i/n^{th} engine at a specified mode/power setting ($lb/10^3$ lb fuel burned)

n = Number of emission factors calculated at that mode

$$EF(VOC)_{Total} = \sum_{i=1}^{n}\left[EF(Pol_i)_{\text{Avg.}} + \ldots + EF(Pol_n)_{\text{Avg.}}\right]$$

Equation 2-11

Where,

$EF(VOC)_{Total}$ = Sum of the average emission factors for all pollutants classified as VOCs ($lb/10^3$ lb fuel burned)

$EF(Pol_{i/n})_{Avg.}$ = Average emission factor for pollutant i/n classified as a VOC as calculated in Equation 2-10.

$$\mathbf{P(Pol)} = \frac{\mathbf{EF}(Pol)_{Avg.}}{EF(VOC)_{Total}}$$

Equation 2-12

Where,

P(Pol) = Weighted percentage of a given pollutant (%)

Finally, speciated VOCs are calculated by taking the product of the total VOCs and the weighted percentage of the individual VOC as follows:

$$\mathbf{E(Pol)} = \mathbf{E(VOC)} \times \frac{\mathbf{P(Pol)}}{\mathbf{100}}$$

Equation 2-13

Where,

E(Pol) = Emissions of speciated VOC (lb/yr)

100 = Factor for converting percent to a fraction (%)

E(VOC) = Emissions of total VOC (lb/yr)

The percentages of each VOC to total VOC based on engine type (turbofan, large aircraft turboprop, small aircraft turboprop, and turbojet) are provided in Table 2-11, Table 2-12, Table 2-13, and Table 2-14.

2.5.9 International Civil Aviation Organization (ICAO) Emission Factors

The International Civil Aviation Organization (ICAO) is a United Nations specialized agency that was created in 1944, with the goal of encouraging the safe and orderly development of international civil aviation. The organization develops and maintains safety standards, practices, and procedures for a safe and efficient air transport network that supports global, social, and economic priorities. As the need to develop aviation security policies and measures arose in the late 1960s, ICAO developed enhanced, uniform security measures, policies, and guidelines to address any acts of unlawful interference within the aviation system. All security initiatives placed by ICAO rely on the cooperation and commitment among all of the member states.

To make advances in environmental stewardship, ICAO has developed additional standards, policies, and guidance material to specifically address aircraft noise and engine emissions. Most of ICAOs work within the environmental field is undertaken by the ICAO Committee on Aviation Environmental Protection (CAEP), including the collection of aircraft exhaust data from engine manufacturers for engines that have entered production. Many of these engines are used on military aircraft found at Air Force bases, and are often given a military designation to differentiate them from their civilian engine counterparts. Military-sponsored emissions tests have not been conducted on these engines and EFs have not been developed for them. The data collected by CAEP may then be utilized to assist in the calculation of aircraft engine emissions. This document includes EFs that have been developed from various studies as well as those provided by ICAO. This section of this document serves to briefly describe how the ICAO EFs were calculated so they may be used to calculate emissions from aircraft flight operations.

The aircraft exhaust data gathered by CAEP has been standardized per engine based on percent engine thrust. These values are used with the emission data sheets provided by ICAO to calculate aircraft engine emissions. ICAO emissions data sheets provide NO_x and CO emission indices but do not provide VOC or PM emission indices directly. ICAO provides hydrocarbon emission indices which are multiplied by a scaling factor of 1.15 to estimate VOCs. This scaling factor is provided by a combined FAA and EPA report titled *Recommended Best Practice for Quantifying Speciated Organic Gas Emissions from Aircraft Equipped with Turbofan, Turbojet, and Turboprop Engines (May 2009).*

ICAO does not directly provide PM emissions, but describes three types of PM, and outlines a method to calculate each. The first type of PM consists mainly of black carbon and is designated as non-volatile ($EI(PM)_{nvol}$). The second type of PM is designated volatile sulfate ($EI(PM)_{vol\text{-}FSC}$) and is dependent on the sulfur content of the fuel burned in the engine. The last type of PM is designated organic volatiles ($EI(PM)_{vol\text{-}FuelOrganics}$) and results from the incomplete combustion of fuel. The sum of these three values is assumed to equal PM_{10}, and $PM_{2.5}$ is then assumed to equal 90% of the PM_{10} total.

When calculating the non-volatile portion of the PM emissions indices, the first step is to verify that a smoke number (SN), which acts as a surrogate or indicator of plume opacity, has been provided for each mode. If not, the *ICAO Airport Air Quality Manual* may be consulted to estimate those SNs that are missing. Next, calculate the carbon index (CI), which is "a measure of the black carbon mass per standard volume of flow" (ICAO 2011). Depending on the value of the SN, two different equations are used to calculate CI. For those SNs less than or equal to30, Equation 2-14 should be used, while Equation 2-15 should be used for those SNs greater than30.

$$\boldsymbol{CI = 0.06949(SN)^{1.234}}$$

Equation 2-14

$$\boldsymbol{CI = 0.0297(SN)^2 - 1.803(SN) + 31.94}$$

Equation 2-15

Where,

CI = Carbon Index (mg/m^3)
SN = Smoke Number

The volumetric flow rate may then be calculated according to the engine type reported on the ICAO data sheet, or in the database. For engines listed as TF, Q_{Core} is calculated using Equation 2-16. For those listed as MTF, Q_{Mixed} may be calculated using Equation 2-17. The Air-Fuel Ratio (AFR) used in calculations is usually proprietary information, but ICAO has developed average AFR values that may be used, which are provided in the *ICAO Airport Air Quality Manual (ICAO 2011)*.

$$\boldsymbol{Q_{Core} = 0.776(AFR) + 0.877}$$

Equation 2-16

$$\boldsymbol{Q_{Mixed} = 0.7769(AFR)(1 + BPR) + 0.877}$$

Equation 2-17

Where,

Q_{Core} = Volumetric flow rate for TF engine (m^3/kg)
Q_{Mixed} = Volumetric flow rate for MTF engine (m^3/kg)
AFR = Air-fuel ratio as given in ICAO
BPR = Bypass Ratio as provided on ICAO datasheet or in ICAO database

Finally, the emission index (EI) for non-volatile PM ($EI(PM)_{nvol}$) is calculated by multiplying the CI found in either Equation 2-14 or Equation 2-15 by the volumetric flow rate calculated from either Equation 2-16 or Equation 2-17, as shown in Equation 2-18.

$$\boldsymbol{EI(PM)_{nvol} = CI \times Q}$$

Equation 2-18

Where,

$EI(PM)_{nvol}$ = Emission Index for non-volatile PM (mg/kg)
CI = Carbon Index calculated from either Equation 2-14 or Equation 2-15
Q = Volumetric flow rate; either Q_{Core} from Equation 2-16 or Q_{Mixed} from Equation 2-17

The volatile PM sulfate portion of the PM emission index ($EI(PM)_{vol\text{-}FSC}$) is a function of the fuel sulfur content and the fuel sulfur conversion efficiency. If the sulfur content is unknown, a national average value of 0.053 wt.% may be used in the calculations. Similarly, if the fuel sulfur conversion efficiency is unknown, ICAO recommends that a median value of 2.4 wt.% be used. Equation 2-19 may then be employed to determine $EI(PM)_{vol\text{-}FSC}$.

$$EI(PM)_{vol-FSC} = (10)^6 \times \left[\frac{(FSC/100)\times(\varepsilon/100)\times 96}{32}\right]$$

Equation 2-19

Where,

$EI(PM)_{vol\text{-}FSC}$ = Emission index for volatile sulfate PM (mg/kg)
FSC = Fuel sulfur content. **Use 0.053 if unknown (%)**
$(10)^6$ = Factor for converting units to mg/kg
100 = Factor converting percent to a fraction (%)
ε = Fuel sulfur conversion efficiency. **Use 2.4 if unknown (%)**
96 = Molecular weight of sulfate (g/mol)
32 = Molecular weight of sulfur (g/mol)

Finally, the organic volatiles ($EI(PM)_{vol\text{-}FuelOrganics}$) portion of the PM emission indices is calculated using the hydrocarbon (HC) emission indices provided by ICAO. These HC emission indices are multiplied by the ratio of $EI(PM)_{vol\text{-}FuelOrganics}$ to the HC EI of a reference engine. ICAO uses the CFM56-2-C1 as the reference engine for this ratio. The calculation of $EI(PM)_{vol\text{-}FuelOrganics}$ is shown in Equation 2-20.

$$EI(PM)_{vol-FuelOrganics} = \delta \times EI_{HC}$$

Equation 2-20

Where,

$EI(PM)_{vol\text{-}FuelOrganics}$ = Emission index for PM from fuel organics (mg/kg)
δ = Ratio of $EI_{PMvol\text{-}FuelOrganics}$ to EI_{HC} for the CFM56-2-C1 engine
EI_{HC} = Hydrocarbon emission index of the engine

After $EI(PM)_{nvol}$, $EI(PM)_{vol\text{-}FSC}$, and $EI(PM)_{vol\text{-}FuelOrganics}$ are calculated, the emission index for PM_{10} may then be estimated by summing these values and converting into the correct units, as shown in Equation 2-21:

$$\mathbf{EI}(\boldsymbol{PM_{10}}) = \frac{[EI(PM)_{nvol} + EI(PM)_{vol-FSC} + EI(PM)_{vol-FuelOrganics}]}{\mathbf{1000}}$$

Equation 2-21

Where,

$EI(PM_{10})$	=	Emission index for PM_{10} (g/kg)
$EI(PM)_{nvol}$	=	Emission index for non-volatile PM (mg/kg)
$EI(PM)_{vol\text{-}FSC}$	=	Emission index for volatile sulfate PM (mg/kg)
$EI(PM)_{vol\text{-}FuelOrganics}$	=	Emission index for volatile fuel organic PM (mg/kg)
1000	=	Factor to convert units from mg to g (mg/g)

$PM_{2.5}$ may then been determined from PM_{10} by assuming $PM_{2.5}$ is equal to 90% of the PM_{10} value, as shown in Equation 2-22.

$$\mathbf{EI}(\mathbf{PM_{2.5}}) = \mathbf{EI}(\mathbf{PM_{10}}) \times \mathbf{0.90}$$

Equation 2-22

Where,

$EI(PM_{2.5})$	=	Emission index for $PM_{2.5}$ (g/kg)
$EI(PM_{10})$	=	Emission index for PM_{10} (g/kg)
0.90	=	Fraction of total $PM_{2.5}$ to PM_{10}

EFs have been calculated using ICAO data for engines that are most likely to be found at Air Force installations. These have been added to EFs that have already been developed from government-subsidized studies. For any engine whose EF is not listed, if ICAO emissions data is available, the EFs may be calculated as described in this section as needed.

2.6 Information Resources

The Flightline Operations Group and aircraft pilots should be contacted to obtain the information required to calculate emissions from aircraft flying operations (i.e., the number of LTOs, TGOs, LFBs, TIM, etc.). The Aircraft Maintenance Squadron (AMX) should be contacted to obtain the information needed to calculate emissions from on-wing engine testing operations, including the types of engines tested, the number of tests conducted during the year on each engine type, the average time spent at each power setting during a typical test, and the associated fuel flow rate at each power setting. Additionally, the base's Weather Department should be contacted to obtain the average mixing zone height for the base.

2.7 Example Calculations

The following section provides example calculations for aircraft operations.

2.7.1 Problem 1 - Landing and Takeoff Cycle Emissions

Anytown AFB needs to calculate the annual CO and benzene emissions from LTO operations associated with their F-15D aircraft. The following information was obtained from the base:

Aircraft Model: F-15D
Engine Model: F100-PW-220
Number of Engines: 2
Number of Annual LTOs: 2,500

Anytown AFB gathered the TIM data for this aircraft so estimates from Table 2-4 are not needed. This data and the mode specific fuel flow rates and EFs from Table 2-8 for the F100-PW-220 engine are presented in the following table:

LTO Mode	Average TIM (min.)	Typical Power Setting	Average Fuel Flow Rate (lb/hr)	CO Emission Factor (lb/1000 lb_{fuel})
Taxi/Idle-out	30	Idle	1084	35.30
Takeoff	1.0	Military	9679	0.86
Climb out	0.5	Intermediate	5770	0.86
Approach	3.0	Approach	3837	1.92
Taxi/Idle-in	10	Idle	1084	35.30

Step 1 – Calculate CO pollutant emissions for each mode in the LTO cycle. Using Equation 2-1 this is accomplished as follows:

$$E(Pol)_{mode} = \frac{TIM}{60} \times \frac{FFR}{1000} \times EF(Pol) \times N$$

$$\boldsymbol{E(CO)_{Approach}} = \frac{3.0\left(\frac{\cancel{min}}{cycle}\right)}{60\left(\frac{\cancel{min}}{\cancel{hr}}\right)} \times \frac{3837\left(\frac{\cancel{\text{lb fuel}}}{\cancel{hr}}\right)}{1000\left(\frac{\cancel{\text{lb fuel}}}{\cancel{10^3\ lb\ fuel}}\right)} \times 1.92\left(\frac{lb}{\cancel{10^3\ lb\ fuel}}\right) \times 2 = \mathbf{0.74}\ \frac{\boldsymbol{lb}}{\boldsymbol{cycle}}$$

$$\boldsymbol{E(CO)_{Idle-In}} = \frac{10\left(\frac{\cancel{min}}{cycle}\right)}{60\left(\frac{\cancel{min}}{\cancel{hr}}\right)} \times \frac{1084\left(\frac{\cancel{\text{lb fuel}}}{\cancel{hr}}\right)}{1000\left(\frac{\cancel{\text{lb fuel}}}{\cancel{10^3\ lb\ fuel}}\right)} \times 35.30\left(\frac{lb}{\cancel{10^3\ lb\ fuel}}\right) \times 2 = \mathbf{12.76}\ \frac{\boldsymbol{lb}}{\boldsymbol{cycle}}$$

$$\boldsymbol{E(CO)_{Idle-Out}} = \frac{30\left(\frac{\cancel{min}}{cycle}\right)}{60\left(\frac{\cancel{min}}{\cancel{hr}}\right)} \times \frac{1084\left(\frac{\cancel{\text{lb fuel}}}{\cancel{hr}}\right)}{1000\left(\frac{\cancel{\text{lb fuel}}}{\cancel{10^3\ lb\ fuel}}\right)} \times 35.30\ \left(\frac{lb}{\cancel{10^3\ lb\ fuel}}\right) \times 2 = \boldsymbol{38.27\ \frac{lb}{cycle}}$$

$$\boldsymbol{E(CO)_{Takeoff}} = \frac{1.0\left(\frac{\cancel{min}}{cycle}\right)}{60\left(\frac{\cancel{min}}{\cancel{hr}}\right)} \times \frac{9679\left(\frac{\cancel{\text{lb fuel}}}{\cancel{hr}}\right)}{1000\left(\frac{\cancel{\text{lb fuel}}}{\cancel{10^3\ lb\ fuel}}\right)} \times 0.86\ \left(\frac{lb}{\cancel{10^3\ lb\ fuel}}\right) \times 2 = \boldsymbol{0.28\ \frac{lb}{cycle}}$$

$$\boldsymbol{E(CO)_{Climb\ out}} = \frac{0.5\left(\frac{\cancel{min}}{cycle}\right)}{60\left(\frac{\cancel{min}}{\cancel{hr}}\right)} \times \frac{5770\left(\frac{\cancel{\text{lb fuel}}}{\cancel{hr}}\right)}{1000\left(\frac{\cancel{\text{lb fuel}}}{\cancel{10^3\ lb\ fuel}}\right)} \times 0.86\ \left(\frac{lb}{\cancel{10^3\ lb\ fuel}}\right) \times 2 = \boldsymbol{0.08\ \frac{lb}{cycle}}$$

Step 2– Calculate the total CO emissions for a single F-15D LTO. Using Equation 2-2, the total CO emissions is calculated as follows:

$$E(Pol)_{LTO} = \sum_{i=1}^{n}\left[E(Pol)_{Mode_i} + \cdots + E(Pol)_{Mode_n}\right]$$

$$\boldsymbol{E(CO)_{LTO}} = (0.74 + 12.76 + 38.27 + 0.28 + 0.08)\frac{lb}{cycle} = \boldsymbol{52.13\ \frac{lb}{cycle}}$$

Step 3 – Determine the total CO emissions from annual F-15D operations. The total CO emissions is the product of the total emissions per LTO and the total LTO's conducted per year as demonstrated in Equation 2-3:

$$E(Pol)_{Total} = E(Pol)_{LTO} \times NC_{LTO}$$

$$E(CO)_{Total} = 52.13\left(\frac{lb}{\cancel{cycle}}\right) \times 2500\left(\frac{\cancel{cycles}}{yr}\right)$$

$$\boxed{\boldsymbol{E(CO)_{Total} = 130,325\ \frac{lb}{yr}}}$$

Since not all aircraft engines have HAP emission factors, it may be necessary to choose a surrogate engine with similar fuel flow rates. Table 2-9 does not provide the HAP speciation profile for the F100-PW-220 engine. For this example, the F100-PW-200 engine is selected as the surrogate since it: 1) is an engine made by the same manufacturer, 2) is in the same family as the F100-PW-220, 3) has similar fuel flow rates, and 4) is used on the same aircraft.

Step 4 – Record the benzene emission factors for each LTO cycle mode. For idle, approach, intermediate, and military power settings, the emission factors from Table 2-9 are **0.047, 0.000387, 0.000189, and 0.000490 lb/1000 lb fuel** respectively.

Step 5 – Calculate benzene emissions for individual F-15D LTO cycle modes. This is accomplished using the emission factors recorded in step 4 and Equation 2-1:

$$E(Pol)_{mode} = \frac{TIM}{60} \times \frac{FFR}{1000} \times EF(Pol) \times N$$

$$\boldsymbol{E(Benzene)_{Approach}} = \frac{3.0\left(\frac{\cancel{min}}{cycle}\right)}{60\left(\frac{\cancel{min}}{\cancel{hr}}\right)} \times \frac{3837\left(\frac{\cancel{\text{lb fuel}}}{\cancel{hr}}\right)}{1000\left(\frac{\cancel{\text{lb fuel}}}{\cancel{10^3 lb\ fuel}}\right)} \times 0.000387\left(\frac{lb}{\cancel{10^3\ lb\ fuel}}\right) \times 2 = \mathbf{0.00015}\ \frac{\boldsymbol{lb}}{\boldsymbol{cycle}}$$

$$\boldsymbol{E(Benzene)_{Idle-In}} = \frac{10\left(\frac{\cancel{min}}{cycle}\right)}{60\left(\frac{\cancel{min}}{\cancel{hr}}\right)} \times \frac{1084\left(\frac{\cancel{\text{lb fuel}}}{\cancel{hr}}\right)}{1000\left(\frac{\cancel{lb\ fuel}}{\cancel{10^3\ lb\ fuel}}\right)} \times 0.047\left(\frac{lb}{\cancel{10^3\ lb\ fuel}}\right) \times 2 = \mathbf{0.02}\ \frac{\boldsymbol{lb}}{\boldsymbol{cycle}}$$

$$\boldsymbol{E(Benzene)_{Idle-Out}} = \frac{30\left(\frac{\cancel{min}}{cycle}\right)}{60\left(\frac{\cancel{min}}{\cancel{hr}}\right)} \times \frac{1084\left(\frac{\cancel{\text{lb fuel}}}{\cancel{hr}}\right)}{1000\left(\frac{\cancel{lb\ fuel}}{\cancel{10^3\ lb\ fuel}}\right)} \times 0.047\left(\frac{lb}{\cancel{10^3\ lb\ fuel}}\right) \times 2 = \mathbf{0.05}\ \frac{\boldsymbol{lb}}{\boldsymbol{cycle}}$$

$$\boldsymbol{E(Benzene)_{Takeoff}} = \frac{1\left(\frac{\cancel{min}}{cycle}\right)}{60\left(\frac{\cancel{min}}{\cancel{hr}}\right)} \times \frac{9679\left(\frac{\cancel{\text{lb fuel}}}{\cancel{hr}}\right)}{1000\left(\frac{\cancel{lb\ fuel}}{\cancel{10^3\ lb\ fuel}}\right)} \times 0.000490\left(\frac{lb}{\cancel{10^3\ lb\ fuel}}\right) \times 2 = \mathbf{0.00016}\frac{\boldsymbol{lb}}{\boldsymbol{cycle}}$$

$$\boldsymbol{E(Benzene)_{Climb\ out}} = \frac{0.5\left(\frac{\cancel{min}}{cycle}\right)}{60\left(\frac{\cancel{min}}{\cancel{hr}}\right)} \times \frac{5770\left(\frac{\cancel{\text{lb fuel}}}{\cancel{hr}}\right)}{1000\left(\frac{\cancel{lb\ fuel}}{\cancel{10^3\ lb\ fuel}}\right)} \times 0.000189\left(\frac{lb}{\cancel{10^3\ lb\ fuel}}\right) \times 2 = \mathbf{0.000018}\frac{\boldsymbol{lb}}{\boldsymbol{cycle}}$$

Step 5 – Calculate the total benzene pollutant emissions for a single F-15D LTO. This is accomplished using Equation 2-2:

$$E(Pol)_{LTO} = \sum_{i=1}^{n}\left[E(Pol)_{Mode_i} + \cdots + E(Pol)_{Mode_n}\right]$$

$$\boldsymbol{E_{LTO}} = (0.00015 + 0.02 + 0.05 + 0.00016 + 0.000018)\frac{lb}{cycle} = \mathbf{0.07}\ \frac{\boldsymbol{lb}}{\boldsymbol{cycle}}$$

Step 6 – Calculate total benzene pollutant emissions from annual F-15D operations. The total benzene emitted is calculated using Equation 2-3 and the benzene emitted per LTO as calculated in step 5 above:

$$E(Pol)_{Total} = E(Pol)_{LTO} \times NC_{LTO}$$

$$E(Benzene)_{Total} = 0.07 \left(\frac{lb}{\cancel{cycle}}\right) \times 2{,}500 \left(\frac{\cancel{cycle}}{yr}\right)$$

$$\boxed{\boldsymbol{E(Benzene)_{Total} = 175 \ \frac{lb}{yr}}}$$

2.7.2 Problem 2 - Auxiliary Power Unit Emissions

Anytown AFB also needs to calculate the annual NO_X and styrene emissions associated with the operation of the APUs on their aircraft. The following information was obtained:

APU Model	GTCP165-1
# APU per aircraft	1
Power Setting	Constant
Operating Time per LTO	15 minutes
Number of Aircraft	130

Step 1 – Convert the operating time into the correct units. The operating time is provided in minutes, so first convert this to units of hours as follows:

$$\boldsymbol{OT} = 15 \left(\frac{\cancel{min}}{cycle}\right) \times \frac{1}{60} \left(\frac{hr}{\cancel{min}}\right) = \boldsymbol{0.25 \ \frac{hr}{cycle}}$$

Step 2 – Record the NOx emission factor for the GTCP165-1. Table 2-10 lists the NO_X emission factor as **1.22lb/hr**.

Step 3 - Calculate NOx pollutant emissions for a single LTO cycle. Use Equation 2-5 and the emission factor recorded in Step 2 as follows:

$$E(Pol)_{APU} = OT \times EF(Pol) \times N$$

$$\boldsymbol{E(NO_X)_{APU}} = 0.25 \left(\frac{\cancel{hr}}{cycle}\right) \times 1.22 \left(\frac{\text{lb}}{\cancel{\text{hr}}}\right) \times 1 = \boldsymbol{0.305 \frac{lb}{cycle}}$$

Step 4 – Calculate the NOx pollutant emissions from annual APU operations. Use Equation 2-6 and the NO_X emissions per LTO cycle calculated in Step 3 as follows:

$$E(Pol)_{APU-Total} = \ E(Pol)_{APU} \times NC_{LTO}$$

$$E(NO_X)_{APU-Total} = 0.305\left(\frac{lb}{\cancel{cycle}}\right) \times 130\left(\frac{\cancel{cycles}}{yr}\right)$$

$$\boxed{\boldsymbol{E(NO_X)_{APU-Total} = 39.7\,\frac{lb}{yr}}}$$

Step 5 – Record the styrene emission factor and fuel flow rate for the GTCP165-1. Table 2-9 lists these as **0.00224lb/10^3 lb fuel and 273 lb/hr** respectively.

Step 6 – Calculate styrene emissions. Use the emission factor recorded in Step 5 (Note that the APU operates in only one "mode", so use operating time in place of "TIM") and Equation 2-1 as follows:

$$E(Pol)_{Mode} = \frac{TIM}{60} \times \frac{FFR}{1000} \times EF(Pol) \times N$$

$$\boldsymbol{E(Styrene)_{APU}} = \frac{15\left(\frac{\cancel{min}}{cycle}\right)}{60\left(\frac{\cancel{min}}{\cancel{hr}}\right)} \times \frac{273\left(\frac{\cancel{\text{lb fuel}}}{\cancel{hr}}\right)}{1000\left(\frac{\cancel{\text{lb fuel}}}{\cancel{10^3 lb\ fuel}}\right)} \times 0.00224\left(\frac{lb}{\cancel{10^3 lb\ fuel}}\right) \times 1 = \boldsymbol{0.00015\,\frac{lb}{cycle}}$$

Step 7 – Calculate the styrene pollutant emissions from annual APU operations. Using Equation 2-6 and the styrene emissions calculated in Step 6 above, this is accomplished as follows:

$$E(Pol)_{Total} = E(Pol)_{APU} \times NC_{LTO}$$

$$E(Styrene)_{Total} = 0.00015\left(\frac{lb}{\cancel{cycle}}\right) \times 130\left(\frac{\cancel{cycles}}{yr}\right)$$

$$\boxed{\boldsymbol{E(Styrene)_{Total} = 0.02\,\frac{lb}{yr}}}$$

2.7.3 Problem 3 - On-Wing Engine Testing

Anytown AFB performs on-wing evaluations of the F110-GE-100 engines used on their F-16D aircraft. The base must calculate CO and SO_X emissions from on-wing testing operations for a NEPA assessment. The base and the fuel supplier are located in Louisiana and the state wants the SO_X emissions specific for Louisiana sulfur content. According to records obtained from base personnel, 100 on-wing engine tests were conducted during the year. The average operating time for each engine test cycle was approximately the same. The following information was obtained from the base:

Power Setting	Average Fuel Flow Rate (lb/hr)	Average Operating Time per Test (minutes)
Approach	4,209.52	20
Idle	1,147.66	45
Intermediate	6,681.33	15
Military	10,070.45	15
Afterburner	16,532.47	5

Step 1 – Calculate annual operating times. Use Equation 2-7 and the information provided:

$$T_{test} = N_{test} \times \sum \left(\frac{D_{test}}{60}\right)$$

$$\boldsymbol{T_{Test}(Approach)} = 100 \left(\frac{\cancel{test}}{yr}\right) \times 20 \left(\frac{\cancel{min}}{\cancel{test}}\right) \times \frac{1}{60} \left(\frac{hr}{\cancel{min}}\right) = \mathbf{33.33} \ \frac{\boldsymbol{hr}}{\boldsymbol{yr}}$$

$$\boldsymbol{T_{Test}(Idle)} = 100 \left(\frac{\cancel{test}}{yr}\right) \times 45 \left(\frac{\cancel{min}}{\cancel{test}}\right) \times \frac{1}{60} \left(\frac{hr}{\cancel{min}}\right) = \mathbf{75} \ \frac{\boldsymbol{hr}}{\boldsymbol{yr}}$$

$$\boldsymbol{T_{Test}(Intermediate)} = 100 \left(\frac{\cancel{test}}{yr}\right) \times 15 \left(\frac{\cancel{min}}{\cancel{test}}\right) \times \frac{1}{60} \left(\frac{hr}{\cancel{min}}\right) = \mathbf{25} \ \frac{\boldsymbol{hr}}{\boldsymbol{yr}}$$

$$\boldsymbol{T_{Test}(Military)} = 100 \left(\frac{\cancel{test}}{yr}\right) \times 15 \left(\frac{\cancel{min}}{\cancel{test}}\right) \times \frac{1}{60} \left(\frac{hr}{\cancel{min}}\right) = \mathbf{25} \ \frac{\boldsymbol{hr}}{\boldsymbol{yr}}$$

$$\boldsymbol{T_{Test}(Afterburner)} = 100 \left(\frac{\cancel{test}}{yr}\right) \times 5 \left(\frac{\cancel{min}}{\cancel{test}}\right) \times \frac{1}{60} \left(\frac{hr}{\cancel{min}}\right) = \mathbf{8.33} \ \frac{\boldsymbol{hr}}{\boldsymbol{yr}}$$

Step 2 – Record the CO emission factor for each mode for the F110-GE-100. Table 2-8 gives the CO emission factors, in units of lb/1000 lb fuel, as **24.11 for Idle, 5.77 for Approach, 3.47 for Intermediate, 3.38 for Military, and 67.41 for Afterburner**.

Step 3 – Calculate CO emissions. Use the calculated times from Step 1, the fuel flow rates provided above, the emission factors from Step 2, and Equation 2-8:

$$E(Pol)_{Setting} = \frac{(FFR \times T_{Test})}{1000} \times EF(Pol)$$

$$\boldsymbol{E(CO)_{Idle}} = \frac{1147.66 \left(\frac{\cancel{lb\ fuel}}{\cancel{hr}}\right) \times 75 \left(\frac{\cancel{hr}}{yr}\right)}{1000 \left(\frac{\cancel{lb\ fuel}}{\cancel{10^3\ lb\ fuel}}\right)} \times 24.11 \left(\frac{lb}{\cancel{10^3 lb\ fuel}}\right) = \mathbf{2,075.3} \ \frac{\boldsymbol{lb}}{\boldsymbol{yr}}$$

$$\boldsymbol{E(CO)_{Approach}} = \frac{4209.52 \left(\frac{\cancel{lb\ fuel}}{\cancel{hr}}\right) \times 33.33 \left(\frac{\cancel{hr}}{yr}\right)}{1000 \left(\frac{\cancel{lb\ fuel}}{\cancel{10^3\ lb\ fuel}}\right)} \times 5.77 \left(\frac{lb}{\cancel{10^3 lb\ fuel}}\right) = \mathbf{809.6} \ \frac{\boldsymbol{lb}}{\boldsymbol{yr}}$$

$$\boldsymbol{E(CO)_{Intermediate}} = \frac{6681.33\left(\frac{\cancel{lb\ fuel}}{\cancel{hr}}\right) \times 25\left(\frac{\cancel{hr}}{yr}\right)}{1000\left(\frac{\cancel{lb\ fuel}}{\cancel{10^3\ lb\ fuel}}\right)} \times 3.47\left(\frac{lb}{\cancel{10^3 lb\ fuel}}\right) = \mathbf{579.6}\ \frac{\boldsymbol{lb}}{\boldsymbol{yr}}$$

$$\boldsymbol{E(CO)_{Military}} = \frac{10070.45\left(\frac{\cancel{lb\ fuel}}{\cancel{hr}}\right) \times 25\left(\frac{\cancel{hr}}{yr}\right)}{1000\left(\frac{\cancel{lb\ fuel}}{\cancel{10^3\ lb\ fuel}}\right)} \times 3.38\left(\frac{lb}{\cancel{10^3 lb\ fuel}}\right) = \mathbf{851.0}\ \frac{\boldsymbol{lb}}{\boldsymbol{yr}}$$

$$\boldsymbol{E(CO)_{Afterburner}} = \frac{16532.47\left(\frac{\cancel{lb\ fuel}}{\cancel{hr}}\right) \times 8.33\left(\frac{\cancel{hr}}{yr}\right)}{1000\left(\frac{\cancel{lb\ fuel}}{\cancel{10^3\ lb\ fuel}}\right)} \times 67.41\left(\frac{lb}{\cancel{10^3 lb\ fuel}}\right) = \mathbf{9,283.4}\ \frac{\boldsymbol{lb}}{\boldsymbol{yr}}$$

<u>Step 4</u> – Add the CO emissions from each mode for the total CO emissions:

$$E(CO)_{Total} = (2075.3 + 809.6 + 579.6 + 851.0 + 9283.4)\frac{lb}{yr}$$

$$\boxed{\boldsymbol{E(CO)_{Total} = 13,598.9\ \frac{lb}{yr}}}$$

<u>Step 5</u> – Record the SO_X emission factor. Since the state is requesting that the base calculate the SO_X emissions more accurately using the average sulfur content of the fuel from that region, then the SO_X EF from Table 2-3 is used in place of the SO_X emission factor from Table 2-8 which assumes a sulfur content national average. The EF based on the sulfur content of the JP-8 fuel as given in Table 2-3 is **0.96 lb/10^3 lb$_{fuel}$**.

<u>Step 6</u> – Calculate the SO_X emissions for each mode. Use Equation 2-8, the SO_X EF recorded in Step 5, the annual test times calculated in Step 1 above, and the fuel flow rate provided in the table above:

$$E(Pol)_{Setting} = \frac{(FFR \times T_{test})}{1000} \times EF(Pol)$$

$$\boldsymbol{E(SO_X)_{Idle}} = \frac{1147.66\left(\frac{\cancel{lb\ fuel}}{\cancel{hr}}\right) \times 75\left(\frac{\cancel{hr}}{yr}\right)}{1000\left(\frac{\cancel{\text{lb fuel}}}{\cancel{10^3\ lb\ fuel}}\right)} \times 0.96\left(\frac{lb}{\cancel{10^3 lb\ fuel}}\right) = \mathbf{82.6}\ \frac{\boldsymbol{lb}}{\boldsymbol{yr}}$$

$$\boldsymbol{E(SO_X)_{Approach}} = \frac{4209.52\left(\frac{\cancel{lb\ fuel}}{\cancel{hr}}\right) \times 33.33\left(\frac{\cancel{hr}}{yr}\right)}{1000\left(\frac{\cancel{\text{lb fuel}}}{\cancel{10^3\ lb\ fuel}}\right)} \times 0.96\left(\frac{lb}{\cancel{10^3 lb\ fuel}}\right) = \mathbf{134.7}\ \frac{\boldsymbol{lb}}{\boldsymbol{yr}}$$

$$\boldsymbol{E(SO_X)_{Intermediate}} = \frac{6681.33\left(\frac{\cancel{lb\ fuel}}{\cancel{hr}}\right) \times 25\left(\frac{\cancel{hr}}{yr}\right)}{1000\left(\frac{\cancel{\text{lb fuel}}}{\cancel{10^3\ lb\ fuel}}\right)} \times 0.96\left(\frac{lb}{\cancel{10^3 lb\ fuel}}\right) = \mathbf{160.4}\ \frac{\boldsymbol{lb}}{\boldsymbol{yr}}$$

$$\boldsymbol{E(SO_X)_{Military}} = \frac{10070.45\left(\frac{\cancel{lb\ fuel}}{\cancel{hr}}\right) \times 25\left(\frac{\cancel{hr}}{yr}\right)}{1000\left(\frac{\cancel{\text{lb fuel}}}{\cancel{10^3\ lb\ fuel}}\right)} \times 0.96\left(\frac{lb}{\cancel{10^3 lb\ fuel}}\right) = \mathbf{241.7}\ \frac{\boldsymbol{lb}}{\boldsymbol{yr}}$$

$$\boldsymbol{E(SO_X)_{Afterburner}} = \frac{16532.47\left(\frac{\cancel{lb\ fuel}}{\cancel{hr}}\right) \times 8.33\left(\frac{\cancel{hr}}{yr}\right)}{1000\left(\frac{\text{lb fuel}}{\cancel{10^3\ lb\ fuel}}\right)} \times 0.96\left(\frac{lb}{\cancel{10^3 lb\ fuel}}\right) = \boldsymbol{132.2\ \frac{lb}{yr}}$$

<u>Step 7</u> – Sum the SO_X emissions from each mode to calculate the total SO_X emissions:

$$E(SO_X)_{Total} = (82.6 + 134.7 + 160.4 + 241.7 + 132.2)\frac{lb}{yr}$$

$$\boxed{\boldsymbol{E(SO_X)_{Total} = 751.6\frac{lb}{yr}}}$$

Table 2-4. Default Time-in-Mode for Various Aircraft Categories

Aircraft Type	Typical Duration by Mode (Minutes)					
	Taxi/Idle-out	Takeoff	Climb out	Approach	Taxi/Idle-in	Total
Military Aircraft						
Combat:						
USAF	18.50	0.40	0.80	3.50	11.30	34.50
USN	6.50	0.40	0.50	1.60	6.50	15.50
Trainer-Turbine[1]:						
USAF T-38	12.80	0.40	0.90	3.80	6.40	24.30
USAF General	6.80	0.50	1.40	4.00	4.40	17.10
USN	6.50	0.40	0.50	1.60	6.50	15.50
Transport-Turbine[1]:						
USAF General	9.20	0.40	1.20	5.10	6.70	22.60
USN	19.00	0.50	2.50	4.50	7.00	33.50
USAF B-52 and KC-135	32.80	0.70	1.60	5.20	14.90	55.20
Military – Piston	6.50	0.60	5.00	4.60	6.50	23.20
Military – Helicopter	8.00	2.27[(2)]	4.53[(2)]	6.80	7.00	28.60
Civilian Aircraft						
Commercial Carrier:						
Jumbo, Long and Medium range jet	19.00	0.70	2.20	4.00	7.00	32.90
General Aviation:						
Business Jet	6.50	0.40	0.50	1.60	6.50	15.50
Turboprop	19.00	0.50	2.50	4.50	7.00	33.50
Piston	12.00	0.30	5.00	6.00	4.00	27.30

SOURCE (unless otherwise noted): Procedures for Emission Inventory Preparation Volume IV: Mobile Sources, EPA420-R-92-009, December 1992

1. Turbines include both turbofan and turboprop engines.
2. SOURCE: Air Emissions Factor Guide to Air Force Mobile Sources, December 2009. This document cites EDMS as the original source.

"USAF" – United States Air Force.

"USN" – United States Navy.

Table 2-5. Military Airframe/Engine/APU Combinations[1]

Aircraft Model	Time-In-Mode Category[2]	Engine Model(s) (Number of Engines)	APU Model(s) (Number of APUs)	APU Operating Time Per LTO (hrs)[3]	Notes:
A-3A	Combat: USN	J57-P-6B (2)	---	---	4, 9a
A-3B	Combat: USN	J57-P-10 (2)	---	---	9a
A-4	Combat: USN	J52-P-2 (1)	---	---	4, 9d
		J52-P-8 (1)	---	---	4, 9d
		J65-W-2 (1)	---	---	4, 9d
		J65-W-4 (1)	---	---	4, 9d
A-4C	Combat: USN	J65-W-16A (1)	---	---	4, 9a
		J65-W-20 (1)	---	---	9c
A-4E	Combat: USN	J52-P-6A (1)	---	---	4, 9a
		J52-P-8A, -8B (1)	---	---	4, 9a
A-4F	Combat: USN	J52-P-8A , -8B (1)	---	---	4, 9a
A-4L	Combat: USN	J65-W-20 (1)	---	---	9a
A-4M	Combat: USN	J52-P-408 (1)	---	---	9a
A-6A	Combat: USN	J52-P-6A, -6B (2)	---	---	4, 9a, 9c
		J52-P-8A, -8B (2)	---	---	4, 9a
A-6B	Combat: USN	J52-P-6A (2)	---	---	4, 9a
		J52-P-8A (2)	---	---	4, 9a
A-6C	Combat: USN	J52-P-8A (2)	---	---	4, 9a
A-6E	Combat: USN	J52-P-8A, -8B (2)	---	---	4, 9a
A-6F	Combat: USN	F404-GE-400D (2)	---	---	4, 9a
A-7A	Combat: USN	TF30-P-6B (1)	---	---	9c
A-7B, -7C	Combat: USN	TF30-P-8 (1)	---	---	4, 9a
		TF30-P-408 (1)	---	---	4, 9a
A-7D, -7K	Combat: USAF	TF41-A-1 (1)	---	---	9a, 9e
A-7E	Combat: USN	TF41-A-2 (1)	---	---	9a
A-10	Combat: USAF	TF34-GE-100A (2)	---	---	9b
		TF34-GE-400 (2)	---	---	9c
A-10A	Combat: USAF	TF34-GE-100 (2)	GTCP 36-50 (1)	1.00	3, 4, 9a
A-10C	Combat: USAF	TF34-GE-100 (2)	---	---	9f
A-37	Combat: USAF	J69-T-25 (2)	---	---	9c
AC-130A	Transport - Turbine: USAF general	T56-A-1A (4)	---	---	9a
		T56-A-9 (4)	---	---	9a
AC-130H	Transport - Turbine: USAF general	T56-A-15 (4)	GTCP 85-180L (1)	1.00	4, 6, 9a, 10a
AC-130U, -130W	Transport - Turbine: USAF general	T56-A-15 (4)	---	---	9a, 9f
AT-38B	Trainer - Turbine: USAF T-38	J85-GE-5, -5A, -5G, -5J (2)	---	---	4, 9a
AU-24	Combat: USAF	PT6A-27 (1)	---	---	9c
B-1A	Combat: USAF	F101-GE-100 (4)	---	---	9e
B-1B	Combat: USAF	F101-GE-102 (4)	GTCP 165-9 (1)	2.00	3, 4, 9a
B-2A	Combat: USAF	F118-GE-100 (4)	131-3A (2)	4.00	3, 4, 9a
B-52D	Transport - Turbine: USAF B-52	J57-P-19W (8)	---	---	9e
		J57-P/F-43WB (8)	---	---	9e
B-52G	Transport - Turbine: USAF B-52	J57-P-22 (8)	---	---	9c

Table 2-5. Military Airframe/Engine/APU Combinations[1] (continued)

Aircraft Model	Time-In-Mode Category[2]	Engine Model(s) (Number of Engines)	APU Model(s) (Number of APUs)	APU Operating Time Per LTO (hrs)[3]	Notes:
B-52H	Transport - Turbine: USAF B-52	TF33-P-3 (8)	---	---	9c
		TF33-P-5 (8)	---	---	9c
		TF33-P-7 (8)	---	---	9c
		TF33-P-103 (8)	---	---	9f
C-1	General Aviation: Piston	R-1820-82 (2)	---	---	9c
C-1A	General Aviation: Piston	R-1820-82, -82A (2)	---	---	4, 9a
C-2	Transport - Turbine: USN	T56-A-7 (2)	---	---	9c
C-2A	Transport - Turbine: USN	T56-A-8, -8A, -8B (2)	---	---	4, 9a
		T56-A-425 (2)	---	---	4, 9g
C-5A	Transport - Turbine: USAF general	TF39-GE-1, -1A, -1C (4)	GTCP 85-98d (1)	8.00	4, 6, 9a, 9c, 9i, 10a
C-5B, -5C	Transport - Turbine: USAF general	TF39-GE-1C (4)	GTCP 85-98d (1)	8.00	6, 9a, 10a
C-5M	Transport - Turbine: USAF general	CF6-80C2L1F (4)	---	---	4, 9a
		F138-GE-100 (4)	---	---	4, 9a, 13b
C-9	Transport - Turbine: USAF general	JT8D-17 (2)	---	---	8, 9c
C-9A	Transport - Turbine: USAF general	JT8D-9A (2)	GTCP 85-98d (1)	6.00	9a, 10a
C-9B	Transport - Turbine: USN	JT8D-9A (2)	---	---	4, 9a
C-9C	Transport - Turbine: USAF general	JT8D-9A (2)	---	---	4, 9a
C-11A	General Aviation: Business Jet	F113-RR-100 (2)	---	---	9a, 12, 13a
		SPEY Mk511-8 (2)	---	---	4, 9a
C-12	General Aviation: Turboprop	PT6A-27 (2)	---	---	9c
C-12A	General Aviation: Turboprop	PT6A-38 (2)	---	---	9a
		PT6A-41 (2)	---	---	9c
C-12C, -12D, -12L	General Aviation: Turboprop	PT6A-41 (2)	---	---	9a
C-12F, -12R, -12T, -12U	General Aviation: Turboprop	PT6A-42 (2)	---	---	9a, 9f
C-12J	General Aviation: Turboprop	PT6A-65B (2)	---	---	4, 9f
C-12S	General Aviation: Turboprop	PT6A-60A (2)	---	---	4, 9a
C-17A	Transport - Turbine: USAF general	F117-PW-100 (4)	331 250G (1)	0.50	3, 9a
		PW2040 (4)	331 250G (1)	0.50	3, 9a, 13b
C-18B	Transport - Turbine: USAF general	JT3D-7 (4)	T41M-9A (1)	0.50	3, 4, 9a
C-20A	General Aviation: Business Jet	F113-RR-100 (2)	GTCP 36-100 (1)	0.50	3, 9a, 13a
		SPEY Mk511-8 (2)	GTCP 36-100 (1)	0.50	3, 4, 9a
C-20B, -20C, -20D, -20E, -20J	General Aviation: Business Jet	F113-RR-100 (2)	---	---	9a, 12, 13a
		SPEY Mk511-8 (2)	---	---	4, 9a
C-20F, -20G, -20H	General Aviation: Business Jet	TAY Mk611-8 (2)	---	---	9a
C-21A	General Aviation: Business Jet	TFE731-2-2B (2)	---	---	9a
C-22A	Transport - Turbine: USAF general	JT8D-7A (3)	GTCP 85-98ck (1)	1.00	4, 9a, 10a
C-22B	Transport - Turbine: USAF general	JT8D-7 (3)	GTCP 85-98ck (1)	1.00	4, 9a, 10a
C-23A	General Aviation: Turboprop	PT6A-45R (2)	---	---	4, 9a
C-23B, -23C	General Aviation: Turboprop	PT6A-65AR (2)	---	---	4, 9a
C-26A	General Aviation: Turboprop	TPE331-11U (2)	---	---	4, 9a
C-26B	General Aviation: Turboprop	TPE331-12UA-701G (2)	---	---	4, 9a
C-26C	General Aviation: Turboprop	TPE331-12UA-701 (2)	---	---	4, 9a
C-27J	Transport - Turbine: USAF general	AE2100D2 (2)	---	---	4, 9f

Table 2-5. Military Airframe/Engine/APU Combinations[1] (continued)

Aircraft Model	Time-In-Mode Category[2]	Engine Model(s) (Number of Engines)	APU Model(s) (Number of APUs)	APU Operating Time Per LTO (hrs)[3]	Notes:
C-28A	General Aviation: Piston	GTSIO-520-M (2)	---	---	4, 9a
C-32A	Transport - Turbine: USAF general	F117-PW-100 (2)	331-49-7081 (1)	3.00	3, 9a, 12
		PW2040 (2)	331-49-7081 (1)	3.00	3, 9a
C-37A	General Aviation: Business Jet	BR700-710A1-10 (2)	---	---	9f
C-38	General Aviation: Business Jet	TFE731-40R-200G (2)	---	---	4, 9l
C-40A	Transport - Turbine: USN	CFM56-7B24 (2)	---	---	5, 9a
C-40B	Transport - Turbine: USAF general	CFM56-7B27 (2)	131-9 (1)	0.50	3, 4, 9a
		CFM56-7B3 (2)	131-9 (1)	0.50	3, 4, 9a
C-40C	Transport - Turbine: USAF general	CFM56-7B3 (2)	---	---	4, 5, 9a
		CFM56-7B27 (2)	---	---	5, 9a
C-123K	Transport - Turbine: USAF general	J85-GE-17 (2)	---	---	9a
		R-2800-99W (2)	---	---	4, 9a
C-130A, -130D	Transport - Turbine: USAF general	T56-A-9, -9A, -9B (4)	GTCP 85L (1)	1.00	3, 4, 9a
C-130B	Transport - Turbine: USAF general	T56-A-7, -7A (4)	GTCP71/71A (1)	1.00	3, 4, 9a
C-130E	Transport - Turbine: USAF general	T56-A-7, -7A (4)	GTCP71/71A (1)	1.00	3, 4, 9a
C-130F	Transport - Turbine: USN	T56-A-7, -7A (4)	GTCP71/71A (1)	1.00	3, 4, 9a
C-130H	Transport - Turbine: USAF general	T56-A-15 (4)	GTCP 85-180L (1)	1.00	4, 6, 9a, 10a
C-130J	Transport - Turbine: USAF general	T56-A-15 (4)	GTCP 85L (1)	1.00	3, 9a
		AE2100D3 (4)	---	---	4, 9f
C-130T	Transport - Turbine: USN	T56-A-16 (4)	---	---	9a
C-135A	Transport - Turbine: USAF general	J57-P/F-59W (4)	T41M-9A (1)	1.00 to 2.00	3, 4, 9e
			ASHG70-1 (1)	1.00 to 2.00	3, 4, 9e
C-135B, -135C	Transport - Turbine: USAF general	J57-P/F-59W (4)	T41M-9A (1)	1.00 to 2.00	3, 4, 9e
			ASHG70-1 (1)	1.00 to 2.00	3, 4, 9e
		TF33-P-5 (4)	T41M-9A (1)	1.00 to 2.00	3, 4, 9a
			ASHG70-1 (1)	1.00 to 2.00	3, 4, 9a
C-135E	Transport - Turbine: USAF general	TF33-P-102 (4)	T41M-9A (1)	1.00 to 2.00	3, 4, 9a
			ASHG70-1 (1)	1.00 to 2.00	3, 4, 9a
C-137B, -137C	Transport - Turbine: USAF general	JT3D-3B (4)	---	---	9a
C-140A	General Aviation: Business Jet	J60-P-5A, -5B (4)	---	---	9e
C-140B	General Aviation: Business Jet	J60-P-5 (4)	---	---	4, 9f
C-141	Transport - Turbine: USAF general	TF33-P-3 (4)	GTCP 165-1 (1)	3.00	9c, 10b
		TF33-P-5 (4)	GTCP 165-1 (1)	3.00	9c, 10b
C-141A, -141B, -141C	Transport - Turbine: USAF general	TF33-P-7 (4)	GTCP85-106/106A (1)	3.00	3, 4, 9a, 9c
CT-1B	General Aviation: Business Jet	JT15D-5 (2)	---	---	5, 9a
CT-39A	General Aviation: Business Jet	J60-P-3, -3A (2)	---	---	4, 9a
CT-39E, -39G	General Aviation: Business Jet	JT12A-8 (2)	---	---	4, 9a
CT-43A	Transport - Turbine: USAF general	JT8D-9A (2)	---	---	9a
CT-49A	Transport - Turbine: USAF general	JT3D-7 (4)	---	---	4, 5, 9a
CV-22, -22A	Transport - Turbine: USAF general	AE1107C (2)	---	---	7, 9a
		T406-AD-400 (2)	---	---	7, 9a, 13b
DC-130A	Transport - Turbine: USAF general	T56-A-9, -9A (4)	---	---	4, 9a
E-1B	General Aviation: Piston	R-1820-82A (2)	---	---	4, 9a

Table 2-5. Military Airframe/Engine/APU Combinations[1] (continued)

Aircraft Model	Time-In-Mode Category[2]	Engine Model(s) (Number of Engines)	APU Model(s) (Number of APUs)	APU Operating Time Per LTO (hrs)[3]	Notes:
E-2	Transport - Turbine: USN	T56-A-7 (2)	---	---	9c
E-2B	Transport - Turbine: USN	T56-A-8, -8A, -8B (2)	---	---	4, 9a
E-2C	Transport - Turbine: USN	T56-A-422 (2)	---	---	4, 9a
		T56-A-427 (2)	---	---	4, 9m
E-2D	Transport - Turbine: USN	T56-A-427 (2)	---	---	4, 9m
E-3A	Transport - Turbine: USAF general	TF33-P-3 (4)	---	---	5, 9c
		TF33-P-5 (4)	---	---	5, 9c
		TF33-P-7 (4)	---	---	5, 9c
		TF33-P-100A (4)	---	---	4, 5, 9a
E-3B, -3C	Transport - Turbine: USAF general	TF33-P-100A (4)	GTCP 165-1 (1)	2.00	4, 9a, 10a
E-4A	Transport - Turbine: USAF general	F103-GE-100 (4)	---	---	9e
E-4B	Transport - Turbine: USAF general	CF6-50E2 (4)	GTCP 660-4 (1)	2.00	9f, 10a
E-6B	Transport - Turbine: USN	CFM56-2A-2 (4)	---	---	4, 9g
E-8C	Transport - Turbine: USAF general	JT3D-3B (4)	GTCP 85 (1)	2.00	6, 9a, 12
		TF33-PW-102C (4)	GTCP 85 (1)	2.00	4, 6, 9a
EA-3B	Combat: USN	J57-P-10 (2)	---	---	9a
EA-4F	Combat: USN	J52-P-6A, -6B (1)	---	---	4, 9a
		J52-P-8A (1)	---	---	4, 9a
EA-6A	Combat: USN	J52-P-8A, -8B (2)	---	---	4, 9a
EA-6B	Combat: USN	J52-P-8A, -8B (2)	---	---	4, 9a
		J52-P-408 (2)	---	---	4, 9a
EA-7L	Combat: USN	TF41-A-2 (1)	---	---	9a
		TF30-P-408 (1)	---	---	4, 9a
EB-57B	Combat: USAF	J65-W-5, -5B (2)	---	---	4, 9a
EC-18B, -18D	Transport - Turbine: USAF general	JT3D-7 (4)	---	---	4, 9a
EC-24A	Transport - Turbine: USN	JT3D-3B (4)	---	---	9a
EC-130E	Transport - Turbine: USAF general	T56-A-7, -7A (4)	---	---	4, 9a
		T56-A-15 (4)	---	---	9e
EC-130H	Transport - Turbine: USAF general	T56-A-15 (4)	GTCP 85-180L (1)	1.00	9a, 10a
EC-130J, -130SJ	Transport - Turbine: USAF general	AE2100D3 (4)	---	---	4, 9f
EC-130V	Transport - Turbine: USN	T56-A-15 (4)	---	---	5, 9a
EC-135A, -135G, -135L	Transport - Turbine: USAF general	J57-P/F-59W (4)	---	---	9a, 9e
EC-135B	Transport - Turbine: USAF general	TF33-P-5 (4)	---	---	9a
EC-135C, -135J	Transport - Turbine: USAF general	TF33-P-9 (4)	---	---	9a
EC-135E	Transport - Turbine: USAF general	TF33-P-102 (4)	---	---	9a
EC-135H, -135K, -135P	Transport - Turbine: USAF general	J57-P/F-59W (4)	---	---	9a, 12
		TF33-P-102 (4)	---	---	9e
EC-135N	Transport - Turbine: USAF general	J57-P/F-43WB (4)	---	---	9a
EC-135Y	Transport - Turbine: USAF general	J57-P/F-43WB (4)	---	---	9a
		J57-P/F-59W (4)			
EC-137D	Transport - Turbine: USAF general	JT3D-3B (4)	---	---	9a
EF-4J	Combat: USN	J79-GE-8B (2)	---	---	4, 9a
EF-111A	Combat: USAF	TF30-P-109 (2)	---	---	9a

Table 2-5. Military Airframe/Engine/APU Combinations[1] (continued)

Aircraft Model	Time-In-Mode Category[2]	Engine Model(s) (Number of Engines)	APU Model(s) (Number of APUs)	APU Operating Time Per LTO (hrs)[3]	Notes:
EKA-3B	Combat: USN	J57-P-10 (2)	---	---	9a
EP-3B, -3J	Transport - Turbine: USN	T56-A-14 (4)	---	---	9a
ERA-3B	Combat: USN	J57-P-10 (2)	---	---	9a
ES-2D	General Aviation: Piston	R-1820-82A (2)	---	---	4, 9a
F-4	Combat: USN	J79-GE-10 (2)	---	---	4, 9c
F-4B, -4N	Combat: USN	J79-GE-8B, -8C (2)	---	---	4, 9a
F-4C, -4D	Combat: USAF	J79-GE-15 (2)	---	---	9a
F-4E, -4G	Combat: USAF	J79-GE-17 (2)	---	---	9a
F-4J	Combat: USN	J79-GE-8B (2)	---	---	4, 9a
F-4S	Combat: USN	J79-GE-10B (2)	---	---	4, 9a
F-5A, -5B	Combat: USAF	J85-GE-13 (2)	---	---	5, 9c
F-5E, -5F	Combat: USAF	J85-GE-21 (2)	---	---	5, 9a
F-8	Combat: USN	J57-P-22 (1)	---	---	4, 9c
F-8J	Combat: USN	J57-P-420 (1)	---	---	9a
F-14A	Combat: USN	TF30-P-412 (2)	---	---	4, 9a
		TF30-P-414A (2)	---	---	4, 9g
F-14C	Combat: USN	TF30-P-412 (2)	---	---	4, 9a
F-14B, -14D	Combat: USN	F110-GE-400 (2)	---	---	9a
F-15A, -15B	Combat: USAF	F100-PW-100 (2)	---	---	9a
F-15C, -15D	Combat: USAF	F100-PW-100 (2)	---	---	9a
		F100-PW-220 (2)	---	---	9a
		F100-PW-229 (2)	---	---	9f
F-15E	Combat: USAF	F100-PW-220 (2)	---	---	9a
		F100-PW-229 (2)	---	---	9a
F-16	Combat: USAF	F100-PW-100 (1)	T-62T-40-8 (1)	1.00	3, 4, 9c
F-16A, -16B	Combat: USAF	F100-PW-200 (1)	T-62T-40-8 (1)	1.00	3, 4, 9a
		F100-PW-220 (1)	T-62T-40-8 (1)	1.00	3, 4, 9g
F-16C, -16D	Combat: USAF	F100-PW-200 (1)	T-62T-40-8 (1)	1.00	3, 4, 9a
		F100-PW-220 (1)	T-62T-40-8 (1)	1.00	3, 4, 9f
		F100-PW-229 (1)	T-62T-40-8 (1)	1.00	3, 4, 9a
		F110-GE-100 (1)	T-62T-40-8 (1)	1.00	3, 4, 9a
		F110-GE-129 (1)	T-62T-40-8 (1)	1.00	3, 4, 9a
F-16N	Combat: USN	F110-GE-100 (1)	---	---	9a
F-22A, -22B	Combat: USAF	F119-PW-100 (2)	---	---	9a
F-35A	Combat: USAF	F135-PW-100 (1)	---	---	4, 9a
F-35B	Combat: USN	F135-PW-600 (1)	---	---	4, 5, 9n
F-35C	Combat: USN	F135-PW-100 (1)	---	---	4, 9n
F-100	Combat: USAF	J57-P-22 (1)	---	---	4, 9c
F-106A, -106B	Combat: USAF	J75-P-17 (1)	---	---	9a
F-111, -111F	Combat: USAF	TF30-P-100 (2)	---	---	9a, 9c
F-111A	Combat: USAF	TF30-P-3 (2)	---	---	9a
F-111D, -111E	Combat: USAF	TF30-P-3 (2)	---	---	9a
		TF30-P-9 (2)	---	---	9e

Table 2-5. Military Airframe/Engine/APU Combinations[1] (continued)

Aircraft Model	Time-In-Mode Category[2]	Engine Model(s) (Number of Engines)	APU Model(s) (Number of APUs)	APU Operating Time Per LTO (hrs)[3]	Notes:
F-117A	Combat: USAF	F404-GE-F1D2 (2)	3800100-4 (1)	2.00	3, 4, 9h
F/A-18A, -18B	Combat: USN	F404-GE-400 (2)	---	---	9a, 9g
F/A-18C, -18D	Combat: USN	F404-GE-400 (2)	---	---	9a
		F404-GE-402 (2)	---	---	4, 9g
F/A-18E, -18F	Combat: USN	F404-GE-400 (2)	---	---	4, 9g
		F414-GE-400 (2)	---	---	4, 9g
FA-22A	Combat: USAF	F119-PW-100 (2)	---	---	9a
FB-22A	Combat: USAF	F119-PW-100 (2)	---	---	9a
FB-111A	Combat: USAF	TF30-P-7 (2)	---	---	9a
HC-130H	Transport - Turbine: USAF general	T56-A-15 (4)	GTCP 85-180L (1)	1.00	6, 9a, 10a
HC-130J	Transport - Turbine: USAF general	AE2100D3 (4)	---	---	4, 9f
HC-130N, -130P	Transport - Turbine: USN	T56-A-15 (4)	---	---	9a
HV-22A, -22B	Transport - Turbine: USN	AE1107C (2)	---	---	7, 9a, 12
		T406-AD-400 (2)	---	---	7, 9a, 13b
JA-6A	Combat: USN	J52-P-6A, -6B (2)	---	---	4, 9a
		J52-P-8A, -8B (2)	---	---	4, 9a
KA-3B	Combat: USN	J57-P-10 (2)	---	---	9a
KA-6D	Combat: USN	J52-P-6A (2)	---	---	4, 9a
		J52-P-8A (2)	---	---	4, 9a
KC-10, -10A	Transport - Turbine: USAF general	CF6-50C2 (3)	TSCP 700-4B (1)	6.00	9a, 10a
		F103-GE-100 (3)	TSCP 700-4B (1)	6.00	9e, 10a
		F103-GE-101 (3)	TSCP 700-4B (1)	6.00	9o, 10a
KC-46A	Transport - Turbine: USAF general	PW4062 (2)	GTCP 331-200 (1)	0.87	6, 9j, 11
			GTCP 331-200ER (1)	0.87	6, 9j, 11
KC-130F, -130R, -130T	Transport - Turbine: USN	T56-A-16 (4)	---	---	9a
KC-135	Transport - Turbine: USAF KC-135	J57-P-22 (4)	---	---	4, 9c
KC-135A	Transport - Turbine: USAF KC-135	J57-P/F-43WB (4)	---	---	9a
		J57-P/F-59W (4)	---	---	9a
KC-135D, -135Q	Transport - Turbine: USAF KC-135	J57-P/F-59W (4)	---	---	9a, 9e
KC-135E	Transport - Turbine: USAF KC-135	TF33-P-102 (4)	GTCP 85-180L (1)	1.00	4, 6, 9a, 10a
KC-135R, -135T	Transport - Turbine: USAF KC-135	CFM56-2B-1 (4)	T41-M9A	---	9a, 12
		F108-CF-100 (4)	T-62T-40LC-2	---	9a, 13b
KC-767A	Transport - Turbine: USAF general	CF6-80C2B6F (2)	---	---	9k
		CF6-80C2B7F (2)	---	---	9k
		PW4062 (2)	---	---	9k
LC-130F, -130R	Transport - Turbine: USN	T56-A-16 (4)	---	---	9a
LC-130H	Transport - Turbine: USAF general	T56-A-15 (4)	---	---	9a
MC-12W	General Aviation: Turboprop	PT6A-60 (2)	---	---	4, 9f
MC-130E	Transport - Turbine: USAF general	T56-A-7 (4)	---	---	9a
		T56-A-15, -15A (4)	---	---	4, 9a, 9f
MC-130H	Transport - Turbine: USAF general	T56-A-15 (4)	GTCP 85-180L (1)	1.00	6, 9a, 10a

Table 2-5. Military Airframe/Engine/APU Combinations[1] (continued)

Aircraft Model	Time-In-Mode Category[2]	Engine Model(s) (Number of Engines)	APU Model(s) (Number of APUs)	APU Operating Time Per LTO (hrs)[3]	Notes:
MC-130J	Transport - Turbine: USAF general	AE2100D3 (4)	---	---	4, 9f
MC-130P, -130W	Transport - Turbine: USAF general	T56-A-15 (4)	---	---	9a, 9f
MV-22A, -22B	Transport - Turbine: USN	AE1107C (2)	---	---	7, 9a, 12
		T406-AD-400 (2)	---	---	7, 9a, 13b
NA-3B	Combat: USN	J57-P-10 (2)	---	---	9a
NA-4E	Combat: USN	J52-P-6A (1)	---	---	4, 9a
		J52-P-8A, -8B (1)	---	---	4, 9a
NA-4F	Combat: USN	J52-P-8A (1)	---	---	4, 9a
NA-4M	Combat: USN	J52-P-408 (1)	---	---	9a
NA-6A	Combat: USN	J52-P-6A, -6B (2)	---	---	4, 9a
		J52-P-8A, -8B (2)	---	---	4, 9a
NA-6E	Combat: USN	J52-P-8B (2)	---	---	9a
NA-7A	Combat: USN	TF30-P-6 (1)	---	---	4, 9a
NA-7C	Combat: USN	TF30-P-8 (1)	---	---	4, 9a
NA-7E	Combat: USN	TF41-A-2 (1)	---	---	9a
NB-52B	Transport - Turbine: USAF B-52	J57-P-19W (8)	---	---	9a
NC-12B	General Aviation: Turboprop	PT6A-41 (2)	---	---	9a
NC-21A	General Aviation: Business Jet	TFE731-2-2B (2)	---	---	9a
NC-130A	Transport - Turbine: USAF general	T56-A-9, -9A, -9B (4)	---	---	4, 9a
NC-130B, -130E	Transport - Turbine: USAF general	T56-A-7, -7A (4)	---	---	4, 9a
NC-130H	Transport - Turbine: USAF general	T56-A-15 (4)	GTCP 85-180L (1)	1.00	4, 6, 9a, 10a
NC-135A	Transport - Turbine: USAF general	J57-P/F-43WB (4)	---	---	9e
NC-135W	Transport - Turbine: USAF general	TF33-P-5 (4)	---	---	9a
NC-141A	Transport - Turbine: USAF general	TF33-P-7 (4)	GTCP 85-106/106A (1)	3.00	3, 4, 9a
NF-4D	Combat: USAF	J79-GE-15 (2)	---	---	9a
		J79-GE-17 (2)	---	---	9a
NF-16A	Combat: USAF	F100-PW-200 (1)	---	---	9a
NF-16D	Combat: USAF	F100-PW-200 (1)	---	---	9a
		F100-PW-229 (1)	---	---	9a
		F110-GE-100 (1)	---	---	9a
		F110-GE-129 (1)	---	---	9a
NF-106B	Combat: USAF	J75-P-17 (1)	---	---	9e
NF/A-18A, -18B, -18C	Combat: USN	F404-GE-400 (2)	---	---	9a
NKC-135A	Transport - Turbine: USAF KC-135	J57-P/F-43WB (4)	---	---	9a
		J57-P/F-59W (4)	---	---	9a
NKC-135E	Transport - Turbine: USAF KC-135	TF33-P-102 (4)	GTCP 85-180L (1)	2.00	4, 9a, 10a
NP-3C, -3D	Transport - Turbine: USN	T56-A-14 (4)	---	---	9a
NRA-3B	Combat: USN	J57-P-10 (2)	---	---	9a
NT-33A	Trainer - Turbine: USAF General	J33-A-35 (1)	---	---	9a
NT-39A	General Aviation: Business Jet	J60-P-3, -3A (2)	---	---	4, 9a
NTA-4F, -4J	Combat: USN	J52-P-6A (1)	---	---	4, 9a
NUP-3A	Transport - Turbine: USN	T56-A-14 (4)	---	---	9a

Table 2-5. Military Airframe/Engine/APU Combinations[1] (continued)

Aircraft Model	Time-In-Mode Category[2]	Engine Model(s) (Number of Engines)	APU Model(s) (Number of APUs)	APU Operating Time Per LTO (hrs)[3]	Notes:
O-1	General Aviation: Piston	O-470C (1)	---	---	9c
O-2A, -2B	General Aviation: Piston	IO-360-C (1)	---	---	4, 9a, 9c
		IO-360-D (1)	---	---	9c
OA-4M	Combat: USN	J52-P-6A, -6B (1)	---	---	4, 9a
		J52-P-8A (1)	---	---	4, 9a
OA-10A	Combat: USAF	TF34-GE-100 (2)	---	---	9a
OA-37B	Combat: USAF	J85-GE-17A (2)	---	---	9a
OC-135B	Transport - Turbine: USAF general	TF33-P-5 (4)	---	---	9a
OT-47B	General Aviation: Business Jet	JT15D-5D (2)	---	---	4, 9a
OV-10A	General Aviation: Turboprop	T76-G-10A (2)	---	---	4, 8, 9a
		T76-G-12A (2)	---	---	4, 8, 9a
		T76-G-418 (2)	---	---	8, 9a
		T76-G-419 (2)	---	---	8, 9a
P-3B	Transport - Turbine: USN	T56-A-14 (4)	---	---	9a
P-3C	Transport - Turbine: USN	T56-A-7 (4)	---	---	9c
		T56-A-14 (4)	---	---	9a
QF-4B	Combat: USN	J79-GE-8B, -8C (2)	---	---	4, 9a
QF-4E	Combat: USAF	J79-GE-10 (2)	---	---	4, 9a
		J79-GE-17 (2)	---	---	9a
QF-4G	Combat: USAF	J79-GE-15 (2)	---	---	9a
		J79-GE-17 (2)	---	---	9a
QF-106A, -106B	Combat: USAF	J75-P-17 (1)	---	---	9a
QRF-4C	Combat: USAF	J79-GE-10 (2)	---	---	4, 9a
		J79-GE-17 (2)	---	---	9a
QT-33A	Trainer - Turbine: USN	J33-A-35 (1)	---	---	9a
RA-3B	Combat: USN	J57-P-10 (2)	---	---	9a
RA-5C	Combat: USN	J79-GE-8B, -8C (2)	---	---	4, 9a
		J79-GE-10 (2)	---	---	4, 9a
RC-12D, -12G, -12H	General Aviation: Turboprop	PT6A-41 (2)	---	---	9a
RC-135M, -135X	Transport - Turbine: USAF general	TF33-P-5 (4)	---	---	9a, 9e, 9f
RC-135S, -135W	Transport - Turbine: USAF general	TF33-P-5 (4)	---	---	9a
		CFM56-2B-1 (4)	---	---	9f, 12
		F108-CF-201 (4)	---	---	4, 9f, 13b
RC-135T	Transport - Turbine: USAF general	TF33-P-102 (4)	---	---	9e
RC-135U	Transport - Turbine: USAF general	TF33-P-9 (4)	---	---	9a
		CFM56-2B-1 (4)	---	---	9f, 12
		F108-CF-201 (4)	---	---	4, 9f, 13b
RC-135V	Transport - Turbine: USAF general	TF33-P-5 (4)	---	---	9a
		TF33-P-9 (4)	---	---	9e
		CFM56-2B-1 (4)	---	---	9f, 12
		F108-CF-201 (4)	---	---	4, 9f, 13b
RF-4B	Combat: USN	J79-GE-8B, -8C (2)	---	---	4, 9a
RF-4C	Combat: USAF	J79-GE-15 (2)	---	---	9a

Table 2-5. Military Airframe/Engine/APU Combinations[1] (continued)

Aircraft Model	Time-In-Mode Category[2]	Engine Model(s) (Number of Engines)	APU Model(s) (Number of APUs)	APU Operating Time Per LTO (hrs)[3]	Notes:
RF-8G	Combat: USN	J57-P-22 (1)	---	---	4, 9a
RF/A-18A	Combat: USN	F404-GE-400 (2)	---	---	9a
RP-3D	Transport - Turbine: USN	T56-A-14 (4)	---	---	9a
RQ-4	Combat: USAF	AE3007H (1)	---	---	4, 9a
		F137-RR-100 (1)	---	---	4, 9f
RQ-4A	Combat: USAF	AE3007 (1)	---	---	4, 9a
		F137-RR-100 (1)			4, 9f
RQ-4B	Combat: USAF	AE3007H (1)	---	---	4, 9a
RU-21J	General Aviation: Turboprop	PT6A-41 (2)	---	---	9a
S-2, -2G	General Aviation: Piston	R-1820-82 (2)	---	---	9a, 9c
S-2D, -2E	General Aviation: Piston	R-1820-82A (2)	---	---	4, 9a
S-3A	Combat: USN	TF34-GE-400 (2)	---	---	9c
SV-22A	Transport - Turbine: USN	AE1107C (2)	---	---	7, 9a, 12
		T406-AD-400 (2)	---	---	7, 9a, 13b
T-1A	Trainer - Turbine: USAF general	JT15D-5B (2)	---	---	9a
T-2	Trainer - Turbine: USN	J85-GE-5F (2)	---	---	9c
T-6A	Trainer - Turbine: USAF general	PT6A-68 (1)	---	---	8, 9a
T-28	General Aviation: Piston	R-1820-82 (1)	---	---	9c
T-33A	Trainer - Turbine: USAF general	J33-A-35 (1)	---	---	9a
T-34	General Aviation: Piston	O-470C (1)	---	---	9c
T-34C	General Aviation: Piston	PT6A-27 (1)	---	---	9c
T-37, -37B	Trainer - Turbine: USAF general	J69-T-25 (2)	---	---	9a, 9c
T-38	Trainer - Turbine: USAF T-38	J85-GE-5F (2)	---	---	9c
T-38A	Trainer - Turbine: USAF T-38	J85-GE-5, -5A, -5G, -5J, -5M (2)	---	---	4, 9a
T-38C	Trainer - Turbine: USAF T-38	J85-GE-5, -5A, -5G, -5J, -5R (2)	---	---	4, 9a
T-38N	Trainer - Turbine: USAF T-38	J85-GE-5H, -5N (2)	---	---	4, 9a
T-39A, -39D	General Aviation: Business Jet	J60-P-3A (2)	---	---	9a, 9e
T-39B	General Aviation: Business Jet	J60-P-3, -3A (2)	---	---	4,9a
T-41	General Aviation: Piston	IO-360-C (1)	---	---	4, 9c
T-41B	General Aviation: Piston	IO-360-D (1)	---	---	9a
T-41C, -41D	General Aviation: Piston	IO-360-D34 (1)	---	---	4, 9a
T-43A	Transport - Turbine: USAF general	JT8D-9 (2)	---	---	4, 9a
T-44	Trainer - Turbine: USN	PT6A-27 (2)	---	---	9c
T-47A	General Aviation: Business Jet	JT15D-5 (2)	---	---	9a
TA-3B	Combat: USN	J57-P-10 (2)	---	---	9a
TA-4B	Combat: USN	J65-W-20 (1)	---	---	9a
TA-4F	Combat: USN	J52-P-6A, -6B (1)	---	---	4, 9a
		J52-P-8A (1)	---	---	4, 9a
TA-7C	Combat: USN	TF30-P-8 (1)	---	---	4, 9a
TC-18E	Transport - Turbine: USAF general	TF33-P-100A (4)	---	---	4, 9a
TC-18F	Transport - Turbine: USAF general	JT3D-3B (4)	---	---	9a
TC-130H	Transport - Turbine: USAF general	T56-A-15 (4)	---	---	9a
TC-135S, -135W	Transport - Turbine: USAF general	TF33-P-5 (4)	---	---	9a

Table 2-5. Military Airframe/Engine/APU Combinations[1] (continued)

Aircraft Model	Time-In-Mode Category[2]	Engine Model(s) (Number of Engines)	APU Model(s) (Number of APUs)	APU Operating Time Per LTO (hrs)[3]	Notes:
TE-2A, -2C	Transport - Turbine: USN	T56-A-8, -8A, -8B (2)	---	---	4, 9a
TE-8A	Transport - Turbine: USAF general	JT3D-3B (4)	---	---	9a
TF-16N	Combat: USN	F110-GE-100 (1)	---	---	9a
TF-18A	Combat: USN	F404-GE-400 (2)	---	---	9a
TF/A-18A	Combat: USN	F404-GE-400 (2)	---	---	9a
TS-2A	General Aviation: Piston	R-1820-82 (2)	---	---	9a
TU-2S	Combat: USAF	F118-GE-101 (1)	---	---	4, 9f
U-2S	Combat: USAF	F118-GE-101 (1)	---	---	4, 9f
U-21	General Aviation: Turboprop	PT6A-27 (2)	---	---	9c
U-21J	General Aviation: Turboprop	PT6A-41 (2)	---	---	9a
U-28A	General Aviation: Turboprop	PT6A-67B (1)	---	---	9f
UA-3B	Combat: USN	J57-P-10 (2)	---	---	9a
UC-12B	General Aviation: Turboprop	PT6A-41 (2)	---	---	9a
UC-35A, -35C	General Aviation: Business Jet	JT15D-5D (2)	---	---	4, 9a
UC-123K	Transport - Turbine: USAF general	J85-GE-17 (2)	---	---	4, 9a
UP-3B	Transport - Turbine: USN	T56-A-14 (4)	---	---	9a
US-2A, -2B, -2C	General Aviation: Piston	R-1820-82 (2)	---	---	9a
US-2D	General Aviation: Piston	R-1820-82A (2)	---	---	4, 9a
UV-18B	Transport - Turbine: USAF general	PT6A-27 (2)	---	---	9a
UV-20A	General Aviation: Turboprop	PT6A-27 (2)	---	---	9a
VC-25A	Transport - Turbine: USAF general	CF6-80C2B1 (4)	GTCP 660-4 (1)	8.00	6, 9a
VC-137B, -137C	Transport - Turbine: USAF general	JT3D-3B (4)	---	---	9h
VC-140B	General Aviation: Business Jet	J60-P-5A, -5B (4)	---	---	9e
WC-130E	Transport - Turbine: USAF general	T56-A-7 (4)	---	---	9e
		T56-A-15 (4)	---	---	9e
WC-130H	Transport - Turbine: USAF general	T56-A-15 (4)	GTCP 85-180L (1)	1.00	4, 6, 9a, 10a
WC-130J	Transport - Turbine: USAF general	AE2100D3 (4)	---	---	4, 9f
WC-135B, -135W	Transport - Turbine: USAF general	TF33-P-5 (4)	---	---	9a
WC-135C	Transport - Turbine: USAF general	TF33-P-9 (4)	---	---	9a
X-29A	Combat: USAF	F404-GE-400 (1)	---	---	8, 9a
X-31A	Combat: USN	F404-GE-400 (1)	---	---	9a
X-44A	Combat: USAF	F119-PW-100 (2)	---	---	9a
YA-7D	Combat: USAF	TF41-A-1 (1)	---	---	9a
YC-14A	Transport - Turbine: USAF general	CF6-50A (2)	---	---	9a
YE-2C	Transport - Turbine: USN	T56-A-8, -8A, -8B (2)	---	---	4, 9a
YF-4J	Combat: USN	J79-GE-8B (2)	---	---	4, 9a
YF-15A, -15B	Combat: USAF	F100-PW-100 (2)	---	---	9a
YF-16A, -16B	Combat: USAF	F100-PW-200 (1)	---	---	9a
YOV-10D	General Aviation: Turboprop	T76-G-10, -10A (2)	---	---	4, 9a
		T76-G-12, -12A (2)	---	---	4, 9a
YP-3C	Transport - Turbine: USN	T56-A-14 (4)	---	---	9a
YS-2G	General Aviation: Piston	R-1820-82 (2)	---	---	9a

Notes for Table 2-5 follow Table 2-6.

Table 2-6. Military Helicopter/Engine/APU Combinations[1]

Aircraft Model	Time-In-Mode Category[2]	Engine Model(s) (Number of Engines)	APU Model(s) (Number of APUs)	APU Operating Time Per LTO (hrs)[3]	Notes:
AH-1G	Military - Helicopter	T53-L-11D (1)	---	---	9c
		T53-L-13, -13A, -13B (1)	---	---	4, 9a
AH-1J	Military - Helicopter	T400-CP-400 (1)	---	---	9a
AH-64A	Military - Helicopter	T700-GE-700 (2)	---	---	9a
CH-3B	Military - Helicopter	T58-GE-8B (2)	---	---	4, 9a
CH-3E	Military - Helicopter	T58-GE-5 (2)	---	---	9f
CH-46	Military - Helicopter	T58-GE-5 (2)	---	---	9c
CH-46A	Military - Helicopter	T58-GE-8B, -8F (2)	---	---	4, 9a
CH-46E	Military - Helicopter	T58-GE-16 (2)	---	---	9a
CH-53A	Military - Helicopter	T64-GE-6B (2)	---	---	9a
CH-53D	Military - Helicopter	T64-GE-413 (2)	---	---	9a
EH-1H	Military - Helicopter	T53-L-13 (1)	---	---	9a
EH-1X	Military - Helicopter	T53-L-13 (1)	---	---	9a
EH-60A	Military - Helicopter	T700-GE-700 (2)	---	---	9a
HH-1H	Military - Helicopter	T53-L-13 (1)	---	---	9a
HH-1K	Military - Helicopter	T53-L-13, -13A, -13B (1)	---	---	4, 9a
HH-1N	Military - Helicopter	T400-CP-400 (1)	---	---	9g
HH-2D	Military - Helicopter	T58-GE-8B, -8F (2)	---	---	4, 9a
HH-3A	Military - Helicopter	T58-GE-8F (2)	---	---	9a
HH-3E	Military - Helicopter	T58-GE-5 (2)	---	---	9f
HH-3F	Military - Helicopter	T58-GE-8B, -8F (2)	---	---	4, 9a
HH-43	Military - Helicopter	T53-L-11D (1)	---	---	9c
HH-46A	Military - Helicopter	T58-GE-8B, -8F (2)	---	---	4, 9a
HH-52	Military - Helicopter	T58-GE-5 (2)	---	---	9c
HH-52A	Military - Helicopter	T58-GE-8B (2)	---	---	4, 9a
HH-53	Military - Helicopter	T64-GE-6B (2)	---	---	9c
HH-60G	Military - Helicopter	T700-GE-700 (2)	---	---	9f
MH-53J	Military - Helicopter	T64-GE-415 (2)	T-62T-27 (1)	4.00	9a, 10a
MH-53M	Military - Helicopter	T64-GE-100 (2)	---	---	9f
MH-60A	Military - Helicopter	T700-GE-700 (2)	---	---	9a
MH-60G	Military - Helicopter	T700-GE-700 (2)	---	---	9a
NCH-46A	Military - Helicopter	T58-GE-8B, -8F (2)	---	---	4, 9a

Table 2-6. Military Helicopter/Engine/APU Combinations (continued)

Aircraft Model	Time-In-Mode Category[2]	Engine Model(s) (Number of Engines)	APU Model(s) (Number of APUs)	APU Operating Time Per LTO (hrs)[3]	Notes:
NRH-53D	Military - Helicopter	T64-GE-415 (2)	---	---	9a
NSH-3A	Military - Helicopter	T58-GE-8B (2)	---	---	4, 9a
NUH-1E	Military - Helicopter	T53-L-11D (1)	---	---	9a
NUH-1N	Military - Helicopter	T400-CP-400 (1)	---	---	9a
NVH-3A	Military - Helicopter	T58-GE-8F (2)	---	---	9a
OH-6A	Military - Helicopter	T63-A-5A (1)	---	---	9c
OH-58A	Military - Helicopter	T63-A-5A (1)	---	---	9c
RH-53D	Military - Helicopter	T64-GE-415A (2)	---	---	4, 9a
SH-2D	Military - Helicopter	T58-GE-5 (2)	---	---	9c
		T58-GE-8B (2)	---	---	4, 9a
SH-2F	Military - Helicopter	T58-GE-5 (2)	---	---	9c
		T58-GE-8F (2)	---	---	9a
SH-3A	Military - Helicopter	T58-GE-8B (2)	---	---	4, 9a
SH-3G	Military - Helicopter	T58-GE-8B, -8F (2)	---	---	4, 9a
SH-60	Military - Helicopter	T700-GE-700 (2)	---	---	9g
TH-1L	Military - Helicopter	T53-L-13, -13A, -13B (1)	---	---	4, 9a
TH-53A	Military - Helicopter	T64-GE-100 (2)	T-62T-27 (1)	4.00	3, 9a
UH-1E	Military - Helicopter	T53-L-11D (1)	---	---	9a
UH-1H	Military - Helicopter	T53-L-11D (1)	---	---	9c
		T53-L-13 (1)	---	---	9c
UH-1L	Military - Helicopter	T53-L-13, -13A, -13B (1)	---	---	4, 9a
UH-1N	Military - Helicopter	T400-CP-400 (1)	---	---	9f
UH-1V	Military - Helicopter	T53-L-13 (1)	---	---	9a
UH-2C	Military - Helicopter	T58-GE-8B, -8F (2)	---	---	4, 9a
UH-3A	Military - Helicopter	T58-GE-8B (2)	---	---	4, 9a
UH-46A	Military - Helicopter	T58-GE-8B, -8F (2)	---	---	4, 9a
UH-60A	Military - Helicopter	T700-GE-700 (2)	T-62T-40-1 (1)	1.00	3, 4, 9a
UH-60C	Military - Helicopter	T700-GE-700 (2)	---	---	9a
UH-60Q	Military - Helicopter	T700-GE-700 (2)	---	---	9a
YSH-2E	Military - Helicopter	T58-GE-8B, -8F (2)	---	---	4, 9a

Notes for Table 2-5 and Table 2-6 on the following page.

Notes for Table 2-5 and Table 2-6:

1. Note that some Aircraft model/engine/APU combinations may be missing due to unverified sources and/or missing emission factors for either engine(s) and/or APU(s).
2. Time-in-Mode category selected for the aircraft based on that aircraft's expected flight pattern and not based on its mission designation. It is recommended that installation-specific TIM data is used when available.
3. SOURCE: *Flightline Emission Factors-Aircraft/Auxiliary Power Units/Aerospace Ground Support Equipment*, IERA-RS-BR-SR-2005-0001, December 2004. This reference cites survey responses as source of data. APU operating time provided as a guideline. If more accurate and verified APU operating times are available for the installation, those times may be used for emissions calculations.
4. This document does not have emission factors for at least one engine/APU listed for this aircraft.
5. Time-in-Mode category for this aircraft was selected as the recommended category for calculating emissions though this aircraft is actually operated by another military branch.
6. APU operating time an estimate based on similar APUs on similar aircraft.
7. Aircraft may also be operated as a military helicopter. If the aircraft is primarily operated in this mode at the installation, then use the appropriate Time-in-Mode category.
8. This aircraft is operated by multiple military branches.
9. The Airframe/Engine combination source was reported in the following documents:
   a. SOURCE: *Model Designation of Military Aerospace Vehicles*, Department of Defense, May 2004
   b. SOURCE: AF Reserve Website (www.afreserve.com)
   c. SOURCE: *Air Pollutant Emission Factors for Military and Civil Aircraft*, EPA-450/3-78-117, October 1978.
   d. SOURCE: Smithsonian National Air and Space Museum website (www.airandspace.si.edu)
   e. SOURCE: *Aircraft Engine Emissions Estimator*, AFESC, November 1985.
   f. SOURCE: US Air Force fact sheets accessed via official Air Force website (www.af.mil)
   g. SOURCE: US Navy fact sheets accessed via official navy website (www.navy.mil)
   h. SOURCE: National Museum of the Air Force accessed via official website (www.nationalmuseum.af.mil)
   i. SOURCE: GE Aviation website (www.geaviation.com)
   j. SOURCE: *National Environmental Policy ACT (NEPA) Facilitation Report*, April 2012
10. The Airframe/APU combination was reported in the following documents:
   a. SOURCE: *Air Emissions Factor Guide to Air Force Mobile Sources*, AFCEE, 2009
   b. SOURCE: EDMS input from Paine Field
11. APU operating time assumes worst case scenario. The actual operating time may range between 0.23-0.26 if there is gate power or 0.87 if there is no gate power. The value provided assumes no gate power.
12. This engine is not explicitly listed in the source document as the engine in this aircraft. It is listed here, however, because it is an alternate designation of an engine listed in the source document.
13. This is the military designation of a civilian engine listed for the aircraft in the source document. The source for the military designation of the civilian engine is:
   a. SOURCE: *Air Force One*, Robert F. Dorr, 2002.
   b. The Federal Business Opportunities website (www.fbo.gov)

"---" – Indicates either no APU for that aircraft or no data available.

Table 2-7. Commercial Airframe/Engine/APU Combinations[1]

Aircraft Model	Time-In-Mode Category	Engine Model(s) (Number of Engines)	APU Model(s) (Number of APUs)	APU Operating Time Per LTO (hrs)[2] [Without Gate Power]	Notes:
A300 Series	**Commercial Carrier:** Jumbo, long, and medium range jet	CF6-50A, -50C, -50C1, -50C2 (2) CF6-80C2A1, -80C2A3, -80C2A5 (2) JT9D-7R4H1 (2) PW4158 (2)	GTCP 331-250 (1)	0.23 - 0.26 [1.0 - 1.5]	3, 4b, 4c, 5b
A310 Series	**Commercial Carrier:** Jumbo, long, and medium range jet	CF6-80A3, -80C2A2(2) JT9D-7R4D1, -7R4E1 (2) PW4152 (2) PW4156A (2)	GTCP 331-250 (1)	0.23 - 0.26 [1.0 - 1.5]	3, 4b, 4c, 5b
A318 Series	**Commercial Carrier:** Jumbo, long, and medium range jet	CFM56-5B8, -5B9 (2) PW6122A (2) PW6124A (2)	GTCP 36-300 (1)	0.23 - 0.26 [0.87]	3, 4c, 4d, 5b
A319 Series	**Commercial Carrier:** Jumbo, long, and medium range jet	CFM56-5A4, -5A5, -5B5, -5B6, -5B7 (2) V2522-A5 (2) V2524-A5 (2) V2527-A5 (2)	GTCP 36-300 (1)	0.23 - 0.26 [0.87]	3, 4c, 4d, 4e, 5b
A320 Series	**Commercial Carrier:** Jumbo, long, and medium range jet	CFM56-5-A1, -5A3, -5B4, -5B5, -5B6 (2) V2500-A1 (2) V2527-A5 (2)	GTCP 36-300 (1)	0.23 - 0.26 [0.87]	3, 4c, 4d, 4e, 5b
A321 Series	**Commercial Carrier:** Jumbo, long, and medium range jet	CFM56-5B1, -5B2, 5B3 (2) V2533-A5 (2) V2530-A5 (2)	GTCP 36-300 (1)	0.23 - 0.26 [0.87]	3, 4c, 4d, 4e, 5b
A330 Series	**Commercial Carrier:** Jumbo, long, and medium range jet	CF6-80E1, -E1A1, -E1A3, -E1A4 (2) PW4164 (2) PW4168, PW4168A (2) PW4170 (2) Trent 768-60 (2) Trent 772-60 (2)	GTCP 331-250 (1)	0.23 - 0.26 [1.0 - 1.5]	3, 4c, 4d, 4e, 5b
A340 Series	**Commercial Carrier:** Jumbo, long, and medium range jet	CFM56-5C2, -5C2/4, -5C2/F, -5C2/F4, -5C2/G, -5C2/G4, -5C2/P (4) CFM56-5C3/F, -5C3/F4, 5C3/G, -5C3/G4, -5C3/P (4) CFM56-5C4, -5C4/1, -5C4/P, -5C4/1P (4) Trent 553-61, -553A2-61 (4) Trent 556-61, -556A2-61 (4)	---	---	3, 4d, 4e
A380 Series	**Commercial Carrier:** Jumbo, long, and medium range jet	GP7270 (4) Trent 970B-84 (4) Trent 972B-84 (4)	---	---	3, 4b, 4d
ACJ318	**General Aviation:** Business Jet	CFM56-5B9/3 (2)	---	---	4e
ACJ319	**General Aviation:** Business Jet	CFM56-5B7/3 (2)	---	---	4e
ACJ320	**General Aviation:** Business Jet	CFM56-5B4/3 (2)	---	---	4e
ACJ330	**General Aviation:** Business Jet	Trent 772B-60 (2)	---	---	3, 4e
ACJ340	**General Aviation:** Business Jet	Trent 553-61 (4)	---	---	4e
ACJ380	**General Aviation:** Business Jet	Trent 970-84 (4)	---	---	4e
B707 Series	**Commercial Carrier:** Jumbo, long, and medium range jet	JT3D-3, -3B (4) JT3D-7 (4)	GTCP 85 (1)	0.23 - 0.26 [0.87]	3, 4a, 4b, 4f, 5a
B717 Series	**Commercial Carrier:** Jumbo,	BR700-715A1-30, -715C1-30 (2)	---	---	4b
B727 Series	**Commercial Carrier:** Jumbo, long, and medium range jet	JT8D-7, -7A, -7B (3) JT8D-9, -9A (3) JT8D-11 (3) JT8D-15, -15A (3) JT8D-17, -17A, -17AR, -17R (3)	GTCP 85-98 (1)	0.23 - 0.26 [0.87]	3, 4a, 4b, 4f, 5a

Table 2-7. Commercial Airframe/Engine/APU Combinations[1] (continued)

Aircraft Model	Time-In-Mode Category	Engine Model(s) (Number of Engines)	APU Model(s) (Number of APUs)	APU Operating Time Per LTO (hrs)[2] [Without Gate Power]	Notes:
B737 Series	**Commercial Carrier:** Jumbo, long, and medium range jet	CFM56-3-B1, -3B-2, -3C-1 (2) CMF56-7B18/3, -7B20, -7B20/2, -7B20/3, -7B20E (2) CFM56-7B22, -7B22/2, -7B22/3, -7B22E (2) CFM56-7B24, -7B24/2, -7B24/3, -7B24/3B1, -7B24E, -7B24E/B1 (2) CFM56-7B26, -7B26E/B1, -7B26E/B2, -7B26E/B2F, -7B26/2, 7B26/3, -7B26/3F, -7B26E, -7B26E/F (2) CFM56--7B27, -7B27/2, -7B27/3, 7B27/3F, -7B27E, -7B27E/F, -7B27/3B1, -7B27/3B1F, -7B27E/B1, -7B27E/B1F, -7B27/3B3, -7B27E/B3 (2) JT8D-7, -7A, -7B (2) JT8D-9A (2) JT8D-15, -15A (2) JT8D-17, -17A (2)	GTCP 85-129 (1)	0.23 - 0.26 [0.87]	3, 4d, 5c
B747 Series	**Commercial Carrier:** Jumbo, long, and medium range jet	CF6-50E, -50E1, -50E2 (4) CF6-80C2B1, -80C2B1F, -80C2B5F (4) Genx-2B67, -2B67B (4) JT9D-7, -7A, -7F, -7J, 7Q, -7Q3, -7R4G2 (4) JT9D-70A (4) PW4056 (4) RB211-524D4-19, -524D4-39, -524B2-19, -524C2-19, -524G2-19, -524G3-19, -524H2-19 (4) RB211-524G2-T-19, -524G3-T-19, -524H2-T-19 (4)	GTCP 660-4 (1) PW901A (1)	0.23 - 0.26 [1.0 - 1.5]	3, 4b, 4d, 5c
B757 Series	**Commercial Carrier:** Jumbo, long, and medium range jet	RB211-535C-37, -535E4-B-37, -535E4-37, -535E4-C-37 (2) PW2037 (2) PW2040 (2)	GTCP 331-200ER (1)	0.23 - 0.26 [0.87]	3, 4b, 4d, 5c
B767 Series	**Commercial Carrier:** Jumbo, long, and medium range jet	CF6-80A, -80A2, -80C2B2, -80C2B2F, -80C2B4, -80C2B4F, -80C2B6, -80C2B6F, -80C2B7F, -80C2B8F (2) JT9D-7R4D, -7R4E, -7R4E4 (2) PW4056, PW4060, PW4060A, PW4060C, PW4062 (2) RB211-524H36, -524H-T-36 (2)	GTCP 331-200 (1) GTCP 331-200ER (1)	0.23 - 0.26 [0.87]	3, 4b, 4d, 5a, 5c
B777 Series	**Commercial Carrier:** Jumbo, long, and medium range jet	GE90-76B, -77B, -85B,-90B, -94B, -110B1, -110B1L, -115B, -115BL (2) PW4074, -4074D, -4077, -4077D, -4084, -4084D, -4090, -4090, -4090-3, -4098 (2) Trent 875, -877, -884, -884B, -892, -892B, -895 (2)	GTCP 331-500 (1)	0.23 - 0.26 [1.0 - 1.5]	3, 4b, 4d, 4f, 5c
B787 Series	**Commercial Carrier:** Jumbo, long, and medium range jet	Genx-1B64, -1864/P1, -1867, -1867/P1, -1870, -1870/P1, -1870/75/P1 (2) Trent 1000-A, -1000-C, -1000-E (2)	---	---	3, 4b, 4d
BAe 146-100A, -200A	**General Aviation:** Business Jet	ALF 502R-3, -3A, -5 (4)	---	---	3, 4b
BAe 146-300A	**General Aviation:** Business Jet	ALF 502R-3A, -5 (4)	---	---	3, 4b
BAe Avro 146-RJ100A	**General Aviation:** Business Jet	LF507-1F (4)	---	---	4b
BAe Avro 146-RJ70A	**General Aviation:** Business Jet	LF507-1F (4)	---	---	4b
BAe Avro 146-RJ85A	**General Aviation:** Business Jet	LF507-1F (4)	---	---	4b
BD-100-1A10	**General Aviation:** Business Jet	AS907-1-1A (2)	---	---	4b
BD-700-1A10, -1A11	**General Aviation:** Business Jet	BR700-710A2-20 (2)	---	---	4b
Beechcraft 76	**General Aviation:** Turboprop	PT6A-27 (2)	---	---	4a
Beechcraft 99A, -99B, -A99A, -B99	**General Aviation:** Turboprop	PT6A-27 (2)	---	---	4b
BH.125 Series 400A	**General Aviation:** Business Jet	TFE731-3, -3R (2)	---	---	3, 4b
BH.125 Series 600A	**General Aviation:** Business Jet	TFE731-3, -3R (2)	---	---	3, 4b
Cessna 150, -150A, -150B, -150C, -150D, -150E, -150F, -150G, -150H, -150J, -150K, -150L, -150M	**General Aviation:** Piston	O-200-A (1)	---	---	3, 4b
Cessna 172I, -172K, -172L, -172M	**General Aviation:** Piston	O-320-E2D (1)	---	---	3, 4b
Cessna 172N	**General Aviation:** Piston	O-320-H2AD (1)	---	---	3, 4b
Cessna 172P	**General Aviation:** Piston	O-320-D2J (1)	---	---	3, 4b
Cessna 336	**General Aviation:** Piston	IO-360-A (2) TSIO-360-C (2)	---	---	3, 4a, 4b, 4f
Cessna 337, -337A, -337B	**General Aviation:** Piston	IO-360-C, -360-CB, -360-D, -360-DB, -360-G, -360-GB (2)	---	---	3,4b

Table 2-7. Commercial Airframe/Engine/APU Combinations[1] (continued)

Aircraft Model	Time-In-Mode Category	Engine Model(s) (Number of Engines)	APU Model(s) (Number of APUs)	APU Operating Time Per LTO (hrs)[2] [Without Gate Power]	Notes:
Cessna 337C, -337D, -337E, -337F, -337G	**General Aviation:** Piston	IO-360-C, -360-CB, -360-G, -360-GB (2)	---	---	3, 4b
Cessna 337H	**General Aviation:** Piston	IO-360-G, -360-GB (2)	---	---	3, 4b
Cessna Citation I	**General Aviation:** Business Jet	JT15D-1, -1A, -1B (2)	---	---	4a, 4c
Cessna Citation II, -II/S	**General Aviation:** Business Jet	JT15D-4, -4B (2)	---	---	4c
Cessna Citation Ultra	**General Aviation:** Business Jet	JT15D-5D (2)	---	---	3, 4c
Cessna Citation V	**General Aviation:** Business Jet	JT15D-5A (2)	---	---	4c
Cessna M337B	**General Aviation:** Piston	IO-360-D, -360-DB (2)	---	---	3, 4b
Cessna P337H	**General Aviation:** Piston	TSIO-360-C, -360-CB (2)	---	---	3, 4b
Cessna T337B	**General Aviation:** Piston	TSIO-360-A, -360-AB, -360-B, -360-BB (2)	---	---	3, 4b
Cessna T337C, -T337D, -T337E, -T337F	**General Aviation:** Piston	TSIO-360-A, -360-AB (2)	---	---	3, 4b
Cessna T337H	**General Aviation:** Piston	IO-360-G, -360-GB (2) TSIO-360-JB (2)	---	---	3, 4b
Cheyenne III, -IIIA	**General Aviation:** Turboprop	PT6A-41 (2)	---	---	4c
CL-600-1A11	**General Aviation:** Business Jet	ALF 502L, -502L-2 (2)	---	---	3, 4b
CL-600-2A12	**General Aviation:** Business Jet	CF34-3A, -3A2 (2)	---	---	3, 4b
CL-600-2B16	**General Aviation:** Business Jet	CF34-3A, -3A1, -3A2, -3B (2)	---	---	3, 4b
CL-600-2B19	**General Aviation:** Business Jet	CF34-3A1, -3B1 (2)	---	---	3, 4b
CL-600-2C10	**General Aviation:** Business Jet	CF34-8C1, -8C5B1 (2)	---	---	4b
CL-600-2D15	**General Aviation:** Business Jet	CF34-8C5, -8C5A1 (2)	---	---	4b
CL-600-2D24	**General Aviation:** Business Jet	CF34-8C5, -8C5A1 (2)	---	---	4b
CL-600-2E25	**General Aviation:** Business Jet	CF34-8C5, -8C5A1, -8C5A2 (2)	---	---	4b
DC-10 Series	**Commercial Carrier:** Jumbo, long, and medium range jet	CF6-6D, -6D1, -6D1A, -6K, -6K2 (3) CF6-50A, -50C, -50C1, -50C2, -50C2B, -50C2R, -50CA (3) JT9D-20, -20J, -59A (3)	TSCP 700-4B (1)	0.23 - 0.26 [1.0- 1.5]	3, 4a, 4b, 5b
DC-8 Series	**Commercial Carrier:** Jumbo, long, and medium range jet	CFM56-2-C1, -2-C3, -2-C5 (4) JT3D-3, -3B, -7 (4)	---	---	3, 4b
DC-9 Series	**Commercial Carrier:** Jumbo, long, and medium range jet	JT8D-7, -7A, -7B, -9, -9A (2) JT8D-11, -15, 15A, -17, -17A (2) JT8D-209, -217, -217, -217A, -217C, -219 (2)	GTCP 85-98D (1)	0.23 - 0.26 [0.87]	3, 4a, 4b, 5a, 5b
DH.125 Series 1A, -3A, -3A/RA, -400A	**General Aviation:** Business Jet	TFE731-3, -3R (2)	---	---	3, 4b
DHC-6-300, -400	**General Aviation:** Turboprop	PT6A-27 (2)	---	---	4b
F.27 Mark 100, -200, -300, -400, -600, -700	**General Aviation:** Turboprop	SPEY Mk511, -Mk511-7E (2)	---	---	3, 4b
F.28 Mark 0070	**General Aviation:** Business Jet	TAY Mk650-15 (2)	---	---	4b
F.28 Mark 0100	**General Aviation:** Business Jet	TAY Mk620-15 (2) TAY Mk650-15 (2)	---	---	4b
F.28 Mark 1000, -2000	**General Aviation:** Business Jet	SPEY MK555-15 (2)	---	---	3, 4b
F.28 Mark 3000, -4000	**General Aviation:** Business Jet	SPEY Mk555-15H (2)	---	---	3, 4b
Falcon 20	**General Aviation:** Business Jet	CF700-2D (2)	---	---	4a
G-1159, -1159A, -1159B	**General Aviation:** Business Jet	SPEY Mk511-8 (2)	GTCP 36-6 (1)	0.23 - 0.26 [0.87]	3, 4b, 5b
G200	**General Aviation:** Business Jet	PW306A (2)	---	---	4c
G-21	**General Aviation:** Turboprop	PT6A-27 (2)	---	---	4a
G280	**General Aviation:** Business Jet	AS907-2-1G (2)	---	---	4b
GIV	**General Aviation:** Business Jet	TAY Mk611-8 (2)	---	---	4b
GIV-X	**General Aviation:** Business Jet	TAY Mk611-8C (2)	---	---	3, 4b

Table 2-7. Commercial Airframe/Engine/APU Combinations[1] (continued)

Aircraft Model	Time-In-Mode Category	Engine Model(s) (Number of Engines)	APU Model(s) (Number of APUs)	APU Operating Time Per LTO (hrs)[2] [Without Gate Power]	Notes:
GV	**General Aviation:** Business Jet	BR700-710A1-10 (2)	---	---	4b
GVI	**General Aviation:** Business Jet	BR725A1-12 (2)	---	---	4b
GV-SP	**General Aviation:** Business Jet	BR700-710C4-11 (2)	---	---	4b
Hawker 4000	**General Aviation:** Business Jet	PW308A (2)	---	---	4c
Hawker 400A, -400XP	**General Aviation:** Business Jet	JT15D-5, -5R (2)	---	---	3, 4c
HS.125 Series 403B, -600A, -700A, -700B, -F3B, -F3B/RA, -F400B, -F600B	**General Aviation:** Business Jet	TFE731-3, -3R (2)	---	---	3, 4b
JetStar 1329-25	**General Aviation:** Business Jet	TFE731-3-1F (4)	---	---	3, 4b
King Air B200	**General Aviation:** Turboprop	PT6A-41 (2)	---	---	4c
L-1011-385-1	**Commercial Carrier:** Jumbo, long, and medium range jet	RB211-22C-02, -22B-02 (3)	---	---	3, 4b
L-1011-385-1-14	**Commercial Carrier:** Jumbo, long, and medium range jet	RB211-22B-02, -524B-02, -524B4-02, -524B3-02 (3)	---	---	3, 4b
L-1011-385-1-15	**Commercial Carrier:** Jumbo, long, and medium range jet	RB211-22B-02, -22B4D-02, -524B-02, -524B4-02, -524B3-02 (3)	---	---	3, 4b
Learjet 31, -31A	**General Aviation:** Business Jet	TFE731-2-3B (2)	---	---	3, 4b
Learjet 35, -36	**General Aviation:** Business Jet	TFE731-2, -2-2B (2)	---	---	4a
Learjet 35A, -36A	**General Aviation:** Business Jet	TFE731-2-2B (2)	---	---	4a
Learjet 55	**General Aviation:** Business Jet	TFE731-3A-2B1, -3A-2B, -3AR-2B1, -3AR-2B (2)	---	---	3, 4b
Learjet 55B	**General Aviation:** Business Jet	TFE731-3AR-2B1, -3AR-2B (2)	---	---	3, 4b
Learjet 55C	**General Aviation:** Business Jet	TFE731-3AR-3B1, -3AR-3B, -3AR-2B1, -3AR-2B (2)	---	---	3, 4b
MD-10-10F	**Commercial Carrier:** Jumbo, long, and medium range jet	CF6-6D, -6K (3)	TSCP 700-4B (1)	0.23 - 0.26 [1.0 - 1.5]	4b, 5b
MD-10-30F	**Commercial Carrier:** Jumbo, long, and medium range jet	CF6-50C2 (3)	TSCP 700-4B (1)	0.23 - 0.26 [1.0 - 1.5]	4b, 5b
MD-11, -11F	**Commercial Carrier:** Jumbo, long, and medium range jet	CF6-80C2D1F (3) PW4460 (3)	TSCP 700-4 (1)	0.23 - 0.26 [1.0 - 1.5]	4b, 5b
MD-88	**Commercial Carrier:** Jumbo, long, and medium range jet	JT8D-217A, -217C, -219 (2)	---	---	4b
MD-90, -90-30	**Commercial Carrier:** Jumbo, long, and medium range jet	V2525-D5 (2) V2528-D5 (2)	---	---	4b
MU-300, -300-10	**General Aviation:** Business Jet	JT15D-4, -4D (2)	---	---	3, 4b
NA-265-80	**General Aviation:** Business Jet	CF700-2D-2 (2)	---	---	3, 4b
PA-18A	**General Aviation:** Piston	O-320 (1)	---	---	4b
PA-23, -23-160	**General Aviation:** Piston	O-320 (2)	---	---	4b
PA-28-140	**General Aviation:** Piston	O-320-E2A (1)	---	---	3, 4b
PA-28-150	**General Aviation:** Piston	O-320-A2B, -E2A (1)	---	---	3, 4b
PA-28-151	**General Aviation:** Piston	O-320-E3D (1)	---	---	3, 4b
PA-28-160	**General Aviation:** Piston	O-320-B2B, -D2A (1)	---	---	3, 4b
PA-28-161	**General Aviation:** Piston	O-320-D2A, -D3G (1)	---	---	3, 4b
PA-28-201T	**General Aviation:** Piston	TSIO-360-FB (1)	---	---	3, 4b
PA-28R-180	**General Aviation:** Piston	IO-360-B1E (1)	---	---	3, 4b
PA-28R-200	**General Aviation:** Piston	IO-360-C1C, -C1C6 (1)	---	---	3, 4b
PA-28R-201, -28RT-201	**General Aviation:** Piston	IO-360-C1C6 (1)	---	---	3, 4b
PA-28R-201T	**General Aviation:** Piston	TSIO-360-F, -360-FB (1)	---	---	3, 4b
PA-28RT-201T	**General Aviation:** Piston	TSIO-360-FB (1)	---	---	3, 4b
PA-28S-160	**General Aviation:** Piston	O-320-D2A (1)	---	---	3, 4b

Table 2-7. Commercial Airframe/Engine/APU Combinations[1] (continued)

Aircraft Model	Time-In-Mode Category	Engine Model(s) (Number of Engines)	APU Model(s) (Number of APUs)	APU Operating Time Per LTO (hrs)[2] [Without Gate Power]	Notes:
PA-31	**General Aviation:** Piston	TIO-540, -540-A1A, -540-A1B, -540-A2A, -540-A2B, -540-A2C (2)	---	---	3, 4a
PA-31-325	**General Aviation:** Piston	TIO-540-F2BD (2)	---	---	3, 4b
PA-31-350	**General Aviation:** Piston	TIO-540-J2BD, -540-J2B (2)	---	---	3, 4b
PA-32-301T	**General Aviation:** Piston	TIO-540-S1AD (1)	---	---	3, 4b
PA-32-301XTC	**General Aviation:** Piston	TIO-540-AH1A (1)	---	---	3, 4b
PA-32R-301T	**General Aviation:** Piston	TIO-540-S1AD, 540-AH1A (1)	---	---	3, 4b
PA-32RT-300T	**General Aviation:** Piston	TIO-540-S1AD (1)	---	---	3, 4b
PA-36-285	**General Aviation:** Turboprop	6-285-B, -285-BA, -285-C, -285-CA (1)	---	---	3, 4b
PA-42	**General Aviation:** Turboprop	PT6A-41 (2)	---	---	4b
PA-46-350P, -46R-350T	**General Aviation:** Turboprop	TIO-540-AE2A (1)	---	---	3, 4b
SA226-AT	**General Aviation:** Turboprop	TPE331-3U-303G, -3U-304G, -3UW-303G (2)	---	---	3, 4b
SA226-T	**General Aviation:** Turboprop	TPE331-3U-303G, -3U-304G (2)	---	---	3, 4b
SA226-TC	**General Aviation:** Turboprop	TPE331-3U-303G, -3U-304G, -3UW-303G, -3UW-304G (2)	---	---	3, 4b
SC-7	**General Aviation:** Turboprop	TPE331-2-201A (2)	---	---	3, 4a
Super King Air A100-1, -200, -200C, -200CT, -200T, -A200, -A200C, -A200CT, -B200, -B200C, -B200CT, -B200T	**General Aviation:** Turboprop	PT6A-41 (2)	---	---	4b
TU-154-B	**Commercial Carrier:** Jumbo, long, and medium range jet	NK-8-2U (3)	---	---	4g
Twin Commander 685	**General Aviation:** Piston	GTSIO-520-F, -520-K (2)	---	---	3, 4b

1. Note that some Aircraft model/engine/APU combinations may be missing due to unverified sources and/or missing emission factors for either engine(s) and/or APU(s).
2. SOURCE: *Airport Air Quality Manual*, International Civil Aviation Organization, 2011. ICAO provides a range for both narrow body and wide body aircraft. The values given out of the brackets assume gate power while the bracketed values are in instances where there is no gate power.
3. This document does not have emission factors for at least one engine/APU listed for this aircraft.
4. The Aircraft/Engine combination source was reported in one of the following documents:
    a. SOURCE: *Air Pollutant Emission Factors for Military and Civil Aircraft*, EPA-450/3-78-117, October 1978.
    b. SOURCE: The FAA Certificate Data Sheet for the airframe model listed.
    c. SOURCE: Pratt & Whitney website (www.pw.utc.com)
    d. SOURCE: The EASA Certificate Data Sheet for the airframe model listed.
    e. Airbus website (www.airbus.com)
    f. Boeing Website (www.boeing.com)
    g. Tupolev website (www.tupolev.ru/english/)
5. Airframe/APU combination source was reported in one of the following:
    a. SOURCE: EDMS Input from Paine Field
    b. SOURCE: FAA Certificate data sheet for the listed airframe
    c. SOURCE: EASA Certificate data sheet for the listed airframe

Table 2-8. Criteria Pollutants, Ozone Precursors, and Total HAPs

Aircraft Engine	Power Setting	Percent Thrust/hp	Fuel Flow Rate (lb/hr)	Emission Factors (lb/1000lb fuel)							
				NO_X	SO_X[1]	CO	VOC	HAP's	PM_{10}	$PM_{2.5}$	CO_2e[2]
6-285-B	Idle (Taxi)	<40%	72	0.46	1.06	363.70	12.33	---	60.00**(S)**	54.00**(S)**	3233.87
	Approach	40%	84	4.72	1.06	1022.63	18.50	---	47.95**(S)**	43.16**(S)**	3233.87
	Climb out	75-100%	166	5.50	1.06	668.07	9.63	---	40.00**(S)**	36.00**(S)**	3233.87
	Takeoff	100%	153	5.88	1.06	998.04	13.38	---	20.00**(S)**	18.00**(S)**	3233.87
Notes: 3a, 4b (for PM_{10} and $PM_{2.5}$ data at all power settings), 5, 8, 11, 12h											
AE1107C	Idle	---	362	4.15	1.06	8.35	0.10	---	1.58	1.42	3233.87
	Flight Idle	---	663	6.05	1.06	3.47	0.02	---	1.58	1.42	3233.87
	Intermediate	---	948	7.87	1.06	1.82	0.02	---	1.58	1.42	3233.87
	Max Continuous	---	2507	18.03	1.06	0.29	0.01	---	1.58	1.42	3233.87
Notes: 3f (This is the commercial designation of the T406-AD-400 engine), 8, 12d											
AE3007A	Idle (Taxi)	7%	389	3.83	1.06	17.35	2.89	---	0.05	0.05	3233.87
	Approach	30%	929	7.79	1.06	3.28	0.74	---	0.07	0.07	3233.87
	Climb out	85%	2500	17.47	1.06	0.92	0.33	---	0.06	0.05	3233.87
	Takeoff	100%	2992	20.54	1.06	0.75	0.29	---	0.08	0.07	3233.87
Notes: 3b, 5, 6, 8, 10, 12e											
ALF 502L-2	Idle (Taxi)	7%	379	3.38	1.06	45.63	7.65	---	0.10	0.09	3233.87
	Approach	30%	930	6.47	1.06	3.97	0.21	---	0.11	0.10	3233.87
	Climb out	85%	2568	12.03	1.06	0.30	0.03	---	0.10	0.09	3233.87
	Takeoff	100%	3174	13.43	1.06	0.40	0.02	---	0.07	0.07	3233.87
Notes: 3b, 5, 6, 8, 10, 12h											
ALF 502R-3	Idle (Taxi)	7%	343	3.30	1.06	44.67	7.49	---	0.09	0.08	3233.87
	Approach	30%	815	6.15	1.06	8.43	0.33	---	0.09	0.08	3233.87
	Climb out	85%	2286	9.94	1.06	0.50	0.06	---	0.10	0.09	3233.87
	Takeoff	100%	2759	11.20	1.06	0.43	0.06	---	0.10	0.09	3233.87
Notes: 3b, 5, 6, 8, 10, 12h											
ALF 502R-5	Idle (Taxi)	7%	324	3.78	1.06	40.93	6.20	---	0.09	0.08	3233.87
	Approach	30%	821	6.60	1.06	7.10	0.25	---	0.09	0.08	3233.87
	Climb out	85%	2345	10.56	1.06	0.25	0.06	---	0.11	0.10	3233.87
	Takeoff	100%	2842	13.35	1.06	0.30	0.07	---	0.11	0.10	3233.87
Notes: 3b, 5, 6, 8, 10, 12h											
AS907-1-1A	Idle (Taxi)	7%	381	3.91	1.06	33.24	1.45	---	0.10	0.09	3233.87
	Approach	30%	825	8.81	1.06	6.28	0.14	---	0.06	0.05	3233.87
	Climb out	85%	2286	16.17	1.06	0.63	0.07	---	0.31	0.28	3233.87
	Takeoff	100%	2854	17.90	1.06	0.56	0.06	---	0.36	0.33	3233.87
Notes: 3b, 5, 6, 8, 10, 12a											
AS907-2-1G	Idle (Taxi)	7%	389	3.91	1.06	29.28	1.08	---	0.08	0.07	3233.87
	Approach	30%	849	8.74	1.06	6.29	0.13	---	0.06	0.05	3233.87
	Climb out	85%	2444	16.39	1.06	0.61	0.07	---	0.31	0.28	3233.87
	Takeoff	100%	2952	18.29	1.06	0.54	0.07	---	0.36	0.33	3233.87
Notes: 3b, 5, 6, 8, 10, 12a											

Table 2-8. Criteria Pollutants, Ozone Precursors, and Total HAPs (cont.)

Aircraft Engine	Power Setting	Percent Thrust/hp	Fuel Flow Rate (lb/hr)	Emission Factors (lb/1000lb fuel)							
				NO_X	SO_X[1]	CO	VOC	HAP's	PM_{10}	$PM_{2.5}$	CO_2e[2]
BR700-710A1-10	Idle (Taxi)	7%	706	4.00	1.06	26.09	2.28	---	0.05	0.05	3233.87
	Approach	30%	1746	8.20	1.06	4.24	0.05	---	0.04	0.04	3233.87
	Climb out	85%	4667	13.93	1.06	0.66	0.03	---	0.25	0.22	3233.87
	Takeoff	100%	5611	17.07	1.06	0.52	0.00	---	0.28	0.26	3233.87
Notes: 3b, 5, 6, 8, 10, 12h											
BR700-710A2-20	Idle (Taxi)	7%	706	4.67	1.06	28.00	1.29	---	0.06	0.05	3233.87
	Approach	30%	1698	7.67	1.06	4.81	0.06	---	0.05	0.04	3233.87
	Climb out	85%	4722	15.03	1.06	0.93	0.02	---	0.34	0.31	3233.87
	Takeoff	100%	5667	18.73	1.06	1.04	0.02	---	0.37	0.33	3233.87
Notes: 3b, 5, 6, 8, 10, 12h											
BR700-710C4-11	Idle (Taxi)	7%	659	4.50	1.06	31.57	2.63	---	0.06	0.06	3233.87
	Approach	30%	1706	7.71	1.06	4.92	0.06	---	0.05	0.04	3233.87
	Climb out	85%	4897	15.43	1.06	0.92	0.02	---	0.35	0.32	3233.87
	Takeoff	100%	5929	19.52	1.06	1.04	0.02	---	0.37	0.33	3233.87
Notes: 3b, 5, 6, 8, 10, 12h											
BR700-715A1-30	Idle (Taxi)	7%	762	5.37	1.06	16.27	0.24	---	0.07	0.06	3233.87
	Approach	30%	1944	11.19	1.06	3.76	0.01	---	0.06	0.06	3233.87
	Climb out	85%	5476	18.65	1.06	0.75	0.02	---	0.09	0.08	3233.87
	Takeoff	100%	6635	23.97	1.06	0.78	0.00	---	0.10	0.09	3233.87
Notes: 3b, 5, 6, 8, 10, 12h											
BR700-715C1-30	Idle (Taxi)	7%	802	5.72	1.06	14.86	0.16	---	0.07	0.06	3233.87
	Approach	30%	2167	11.55	1.06	3.06	0.00	---	0.07	0.06	3233.87
	Climb out	85%	6341	22.41	1.06	0.78	0.00	---	0.10	0.09	3233.87
	Takeoff	100%	7778	31.39	1.06	0.75	0.00	---	0.11	0.10	3233.87
Notes: 3b, 5, 6, 8, 10, 12h											
BR725A1-12	Idle (Taxi)	7%	675	3.38	1.06	41.88	3.45	---	0.06	0.05	3233.87
	Approach	30%	1754	7.81	1.06	5.93	0.00	---	0.04	0.03	3233.87
	Climb out	85%	5159	13.32	1.06	0.32	0.00	---	0.13	0.12	3233.87
	Takeoff	100%	6262	16.92	1.06	0.40	0.00	---	0.11	0.10	3233.87
Notes: 3b, 5, 6, 8, 10, 12h											
CF6-6D	Idle (Taxi)	7%	1371	4.50	1.06	54.20	24.15	---	0.20	0.18	3233.87
	Approach	30%	3841	11.40	1.06	6.50	0.81	---	0.10	0.09	3233.87
	Climb out	85%	11357	32.60	1.06	0.50	0.35	---	0.07	0.06	3233.87
	Takeoff	100%	13778	40.00	1.06	0.50	0.35	---	0.09	0.08	3233.87
Notes: 3b, 5, 6, 8, 10, 12a											
CF6-6D1A	Idle (Taxi)	7%	1397	4.60	1.06	52.00	22.89	---	0.19	0.17	3233.87
	Approach	30%	3921	11.80	1.06	5.50	0.69	---	0.09	0.08	3233.87
	Climb out	85%	11921	33.90	1.06	0.50	0.35	---	0.07	0.06	3233.87
	Takeoff	100%	14381	41.60	1.06	0.50	0.35	---	0.09	0.08	3233.87
Notes: 3b, 5, 6, 8, 10, 12a											

Table 2-8. Criteria Pollutants, Ozone Precursors, and Total HAPs (cont.)

Aircraft Engine	Power Setting	Percent Thrust/hp	Fuel Flow Rate (lb/hr)	Emission Factors (lb/1000lb fuel)							
				NO_X	SO_X[1]	CO	VOC	HAP's	PM_{10}	$PM_{2.5}$	CO_2e[2]
CF6-6K	Idle (Taxi)	7%	1371	4.50	1.06	54.20	24.15	---	0.20	0.18	3233.87
	Approach	30%	3841	11.40	1.06	6.50	0.81	---	0.10	0.09	3233.87
	Climb out	85%	11357	32.60	1.06	0.50	0.35	---	0.07	0.06	3233.87
	Takeoff	100%	13778	40.00	1.06	0.50	0.35	---	0.09	0.08	3233.87
Notes: 3b, 5, 6, 8, 10, 12a											
CF6-6K2	Idle (Taxi)	7%	1397	4.60	1.06	52.00	22.89	---	0.19	0.17	3233.87
	Approach	30%	3921	11.80	1.06	5.50	0.69	---	0.09	0.08	3233.87
	Climb out	85%	11921	33.90	1.06	0.50	0.35	---	0.07	0.06	3233.87
	Takeoff	100%	14381	41.60	1.06	0.50	0.35	---	0.09	0.08	3233.87
Notes: 3b, 5, 6, 8, 10, 12a											
CF6-50A	Idle (Taxi)	7%	1294	3.40	1.06	24.04	3.13	---	0.06	0.06	3233.87
	Approach	30%	4960	9.72	1.06	4.35	0.36	---	0.06	0.06	3233.87
	Climb out	85%	14183	23.27	1.06	0.49	0.16	---	0.11	0.10	3233.87
	Takeoff	100%	17206	27.17	1.06	0.43	0.17	---	0.11	0.10	3233.87
Notes: 3b, 5, 6, 8, 10, 12a											
CF6-50C	Idle (Taxi)	7%	1683	3.50	1.06	62.30	26.45	---	0.22	0.20	3233.87
	Approach	30%	5103	9.40	1.06	5.20	1.15	---	0.11	0.10	3233.87
	Climb out	85%	15199	29.00	1.06	0.50	0.81	---	0.10	0.09	3233.87
	Takeoff	100%	18881	35.00	1.06	0.50	0.69	---	0.12	0.11	3233.87
Notes: 3b, 5, 6, 8, 10, 12a											
CF6-50C1, -50C2	Idle (Taxi)	7%	1706	3.60	1.06	61.80	25.07	---	0.21	0.19	3233.87
	Approach	30%	5238	9.50	1.06	4.30	1.15	---	0.11	0.10	3233.87
	Climb out	85%	15675	29.70	1.06	0.50	0.81	---	0.10	0.09	3233.87
	Takeoff	100%	19738	36.30	1.06	0.50	0.69	---	0.12	0.11	3233.87
Notes: 3b (CF6-50C2 is the commercial designation of the F103-GE-101 engine), 5, 6, 8, 10, 12a											
CF6-50C2B	Idle (Taxi)	7%	1294	3.40	1.06	24.04	3.13	---	0.06	0.06	3233.87
	Approach	30%	5294	10.49	1.06	3.42	0.30	---	0.06	0.05	3233.87
	Climb out	85%	15849	26.34	1.06	0.44	0.17	---	0.11	0.10	3233.87
	Takeoff	100%	19127	29.59	1.06	0.46	0.15	---	0.10	0.09	3233.87
Notes: 3b, 5, 6, 8, 10, 12a											
CF6-50C2R	Idle (Taxi)	7%	1683	3.50	1.06	62.30	26.45	---	0.22	0.20	3233.87
	Approach	30%	5103	9.40	1.06	5.20	1.15	---	0.11	0.10	3233.87
	Climb out	85%	15199	29.00	1.06	0.50	0.81	---	0.10	0.09	3233.87
	Takeoff	100%	18881	35.00	1.06	0.50	0.69	---	0.12	0.11	3233.87
Notes: 3b, 5, 6, 8, 10, 12a											
CF6-50CA	Idle (Taxi)	7%	1294	3.40	1.06	24.04	3.13	---	0.06	0.06	3233.87
	Approach	30%	5087	10.09	1.06	3.99	0.33	---	0.06	0.06	3233.87
	Climb out	85%	14881	24.30	1.06	0.46	0.16	---	0.11	0.10	3233.87
	Takeoff	100%	18103	28.03	1.06	0.44	0.16	---	0.10	0.09	3233.87
Notes: 3b, 5, 6, 8, 10, 12a											

Table 2-8. Criteria Pollutants, Ozone Precursors, and Total HAPs (cont.)

Aircraft Engine	Power Setting	Percent Thrust/hp	Fuel Flow Rate (lb/hr)	Emission Factors (lb/1000lb fuel)							
				NO_X	SO_X[1]	CO	VOC	HAP's	PM_{10}	$PM_{2.5}$	CO_2e[2]
CF6-50E, -50E1	Idle (Taxi)	7%	1294	3.40	1.06	24.04	3.13	---	0.06	0.06	3233.87
	Approach	30%	5262	10.16	1.06	3.71	0.32	---	0.06	0.06	3233.87
	Climb out	85%	15397	25.50	1.06	0.45	0.17	---	0.11	0.10	3233.87
	Takeoff	100%	18738	28.97	1.06	0.45	0.16	---	0.10	0.09	3233.87
Notes: 3b, 5, 6, 8, 10, 12a											
CF6-50E2	Idle (Taxi)	7%	1294	3.40	1.06	24.04	3.13	---	0.06	0.06	3233.87
	Approach	30%	5262	10.16	1.06	3.71	0.32	---	0.06	0.06	3233.87
	Climb out	85%	15397	25.50	1.06	0.45	0.17	---	0.11	0.10	3233.87
	Takeoff	100%	18738	28.97	1.06	0.45	0.16	---	0.10	0.09	3233.87
Notes: 3b (This is the commercial designation of the F103-GE-100 engine), 5, 6, 8, 10, 12a											
CF6-80A	Idle (Taxi)	7%	1190	3.40	1.06	28.20	7.23	---	0.09	0.08	3233.87
	Approach	30%	4881	10.30	1.06	3.10	0.54	---	0.08	0.07	3233.87
	Climb out	85%	14246	25.60	1.06	1.10	0.33	---	0.11	0.10	3233.87
	Takeoff	100%	17024	29.80	1.06	1.00	0.33	---	0.12	0.11	3233.87
Notes: 3b, 5, 6, 8, 10, 12a											
CF6-80A2, -80A3	Idle (Taxi)	7%	1190	3.40	1.06	28.20	7.22	---	0.09	0.08	3233.87
	Approach	30%	5087	10.80	1.06	2.80	0.52	---	0.07	0.07	3233.87
	Climb out	85%	14960	26.60	1.06	1.10	0.43	---	0.11	0.10	3233.87
	Takeoff	100%	17889	29.60	1.06	1.00	0.35	---	0.13	0.11	3233.87
Notes: 3b, 5, 6, 8, 10, 12a											
CF6-80C2A1	Idle (Taxi)	7%	1579	3.99	1.06	42.24	10.57	---	0.12	0.11	3233.87
	Approach	30%	5048	9.76	1.06	2.19	0.23	---	0.06	0.06	3233.87
	Climb out	85%	15500	24.85	1.06	0.54	0.10	---	0.06	0.06	3233.87
	Takeoff	100%	19048	32.22	1.06	0.56	0.09	---	0.08	0.07	3233.87
Notes: 3b, 5, 6, 8, 10, 12a											
CF6-80C2A2	Idle (Taxi)	7%	1500	3.95	1.06	46.01	12.05	---	0.13	0.11	3233.87
	Approach	30%	4603	9.44	1.06	2.94	0.26	---	0.06	0.06	3233.87
	Climb out	85%	13849	20.69	1.06	0.55	0.12	---	0.06	0.06	3233.87
	Takeoff	100%	16802	27.93	1.06	0.57	0.09	---	0.07	0.07	3233.87
Notes: 3b, 5, 6, 8, 10, 12a											
CF6-80C2A3	Idle (Taxi)	7%	1603	3.92	1.06	41.51	10.28	---	0.12	0.10	3233.87
	Approach	30%	5151	9.93	1.06	2.07	0.22	---	0.06	0.06	3233.87
	Climb out	85%	15897	25.46	1.06	0.56	0.09	---	0.07	0.06	3233.87
	Takeoff	100%	19500	34.50	1.06	0.58	0.07	---	0.08	0.07	3233.87
Notes: 3b, 5, 6, 8, 10, 12a											
CF6-80C2A5	Idle (Taxi)	7%	1643	3.79	1.06	41.65	10.34	---	0.12	0.10	3233.87
	Approach	30%	5452	9.11	1.06	1.93	0.23	---	0.06	0.06	3233.87
	Climb out	85%	16524	22.86	1.06	0.52	0.09	---	0.07	0.06	3233.87
	Takeoff	100%	20484	34.38	1.06	0.52	0.08	---	0.08	0.07	3233.87
Notes: 3b, 5, 6, 8, 10, 12a											

Table 2-8. Criteria Pollutants, Ozone Precursors, and Total HAPs (cont.)

Aircraft Engine	Power Setting	Percent Thrust/hp	Fuel Flow Rate (lb/hr)	Emission Factors (lb/1000lb fuel)							
				NO_X	SO_X[1]	CO	VOC	HAP's	PM_{10}	$PM_{2.5}$	CO_2e[2]
CF6-80C2A5F	Idle (Taxi)	7%	1746	4.90	1.06	16.96	1.36	---	0.05	0.04	3233.87
	Approach	30%	5484	12.64	1.06	1.92	0.13	---	0.04	0.04	3233.87
	Climb out	85%	16714	21.27	1.06	0.04	0.05	---	0.06	0.06	3233.87
	Takeoff	100%	20873	28.11	1.06	0.05	0.06	---	0.07	0.07	3233.87
Notes: 3b, 5, 6, 8, 10, 12a											
CF6-80C2B1	Idle (Taxi)	7%	1556	3.73	1.06	43.22	10.88	---	0.12	0.11	3233.87
	Approach	30%	4889	8.83	1.06	2.37	0.24	---	0.06	0.06	3233.87
	Climb out	85%	14865	21.26	1.06	0.55	0.10	---	0.06	0.06	3233.87
	Takeoff	100%	18135	28.11	1.06	0.58	0.09	---	0.08	0.07	3233.87
Notes: 3b, 5, 6, 8, 10, 12a											
CF6-80C2B1F	Idle (Taxi)	7%	1579	4.73	1.06	19.23	1.77	---	0.05	0.04	3233.87
	Approach	30%	5159	12.47	1.06	2.13	0.13	---	0.04	0.04	3233.87
	Climb out	85%	15738	19.72	1.06	0.04	0.06	---	0.06	0.05	3233.87
	Takeoff	100%	19222	24.94	1.06	0.04	0.06	---	0.07	0.06	3233.87
Notes: 3b, 5, 6, 8, 10, 12a											
CF6-80C2B2	Idle (Taxi)	7%	1508	4.45	1.06	22.41	2.27	---	0.05	0.05	3233.87
	Approach	30%	4643	11.79	1.06	2.61	0.14	---	0.04	0.04	3233.87
	Climb out	85%	13937	18.25	1.06	0.05	0.06	---	0.05	0.05	3233.87
	Takeoff	100%	16857	22.02	1.06	0.04	0.06	---	0.06	0.06	3233.87
Notes: 3b, 5, 6, 8, 10, 12a											
CF6-80C2B2F	Idle (Taxi)	7%	1492	4.52	1.06	21.56	2.14	---	0.05	0.04	3233.87
	Approach	30%	4706	11.80	1.06	2.64	0.14	---	0.04	0.04	3233.87
	Climb out	85%	14103	18.09	1.06	0.06	0.06	---	0.05	0.05	3233.87
	Takeoff	100%	17048	21.55	1.06	0.04	0.06	---	0.07	0.06	3233.87
Notes: 3b, 5, 6, 8, 10, 12a											
CF6-80C2B4	Idle (Taxi)	7%	1595	4.68	1.06	19.76	1.83	---	0.05	0.04	3233.87
	Approach	30%	5087	12.37	1.06	2.12	0.14	---	0.04	0.04	3233.87
	Climb out	85%	15595	20.17	1.06	0.04	0.06	---	0.06	0.05	3233.87
	Takeoff	100%	19119	25.93	1.06	0.05	0.06	---	0.07	0.06	3233.87
Notes: 3b, 5, 6, 8, 10, 12a											
CF6-80C2B4F	Idle (Taxi)	7%	1579	4.73	1.06	19.23	1.77	---	0.05	0.04	3233.87
	Approach	30%	5159	12.47	1.06	2.13	0.13	---	0.04	0.04	3233.87
	Climb out	85%	15738	19.72	1.06	0.04	0.06	---	0.06	0.05	3233.87
	Takeoff	100%	19302	25.08	1.06	0.04	0.06	---	0.07	0.06	3233.87
Notes: 3b, 5, 6, 8, 10, 12a											
CF6-80C2B5F	Idle (Taxi)	7%	1635	4.91	1.06	17.45	1.51	---	0.05	0.04	3233.87
	Approach	30%	5532	12.74	1.06	1.83	0.13	---	0.04	0.04	3233.87
	Climb out	85%	17159	21.76	1.06	0.04	0.06	---	0.06	0.06	3233.87
	Takeoff	100%	21310	28.58	1.06	0.05	0.06	---	0.07	0.07	3233.87
Notes: 3b, 5, 6, 8, 10, 12a											

Table 2-8. Criteria Pollutants, Ozone Precursors, and Total HAPs (cont.)

Aircraft Engine	Power Setting	Percent Thrust/hp	Fuel Flow Rate (lb/hr)	Emission Factors (lb/1000lb fuel)							
				NO_X	SO_X[1]	CO	VOC	HAP's	PM_{10}	$PM_{2.5}$	CO_2e[2]
CF6-80C2B6	Idle (Taxi)	7%	1627	4.76	1.06	18.89	1.70	---	0.05	0.04	3233.87
	Approach	30%	5333	12.53	1.06	1.91	0.13	---	0.04	0.04	3233.87
	Climb out	85%	16635	21.69	1.06	0.04	0.06	---	0.06	0.06	3233.87
	Takeoff	100%	20476	28.57	1.06	0.06	0.05	---	0.07	0.06	3233.87
Notes: 3b, 5, 6, 8, 10, 12a											
CF6-80C2B6F	Idle (Taxi)	7%	1611	4.81	1.06	18.42	1.64	---	0.05	0.04	3233.87
	Approach	30%	5413	12.63	1.06	1.93	0.13	---	0.04	0.04	3233.87
	Climb out	85%	16699	21.05	1.06	0.04	0.06	---	0.06	0.06	3233.87
	Takeoff	100%	20587	27.38	1.06	0.05	0.06	---	0.07	0.06	3233.87
Notes: 3b, 5, 6, 8, 10, 12a											
CF6-80C2B7F	Idle (Taxi)	7%	1611	4.81	1.06	18.42	1.64	---	0.05	0.04	3233.87
	Approach	30%	5413	12.63	1.06	1.93	0.13	---	0.04	0.04	3233.87
	Climb out	85%	16699	21.05	1.06	0.04	0.06	---	0.06	0.06	3233.87
	Takeoff	100%	20587	27.38	1.06	0.05	0.06	---	0.07	0.06	3233.87
Notes: 3b, 5, 6, 8, 10, 12a											
CF6-80C2B8F	Idle (Taxi)	7%	1627	4.59	1.06	16.69	1.31	---	0.05	0.04	3233.87
	Approach	30%	5437	12.42	1.06	1.69	0.10	---	0.04	0.04	3233.87
	Climb out	85%	16714	20.84	1.06	0.02	0.05	---	0.06	0.05	3233.87
	Takeoff	100%	20500	26.85	1.06	0.03	0.05	---	0.06	0.06	3233.87
Notes: 3b, 5, 6, 8, 10, 12a											
CF6-80C2D1F	Idle (Taxi)	7%	1556	3.80	1.06	41.78	10.38	---	0.12	0.11	3233.87
	Approach	30%	5214	9.16	1.06	1.94	0.23	---	0.06	0.06	3233.87
	Climb out	85%	16389	24.02	1.06	0.52	0.09	---	0.07	0.06	3233.87
	Takeoff	100%	20603	32.65	1.06	0.52	0.08	---	0.08	0.07	3233.87
Notes: 3b, 5, 6, 8, 10, 12a											
CF6-80E1A2	Idle (Taxi)	7%	1810	4.53	1.06	42.67	10.78	---	0.10	0.09	3233.87
	Approach	30%	5746	9.91	1.06	1.61	0.16	---	0.05	0.04	3233.87
	Climb out	85%	17818	28.02	1.06	0.34	0.08	---	0.08	0.07	3233.87
	Takeoff	100%	21960	39.29	1.06	0.38	0.06	---	0.09	0.08	3233.87
Notes: 3b, 5, 6, 8, 10, 12a											
CF6-80E1A3	Idle (Taxi)	7%	1802	4.69	1.06	37.02	10.96	---	0.10	0.09	3233.87
	Approach	30%	5992	10.29	1.06	1.23	0.21	---	0.05	0.04	3233.87
	Climb out	85%	18945	31.74	1.06	0.31	0.08	---	0.08	0.08	3233.87
	Takeoff	100%	23722	45.63	1.06	0.34	0.08	---	0.09	0.08	3233.87
Notes: 3b, 5, 6, 8, 10, 12a											
CF6-80E1A4	Idle (Taxi)	7%	1802	4.62	1.06	38.09	11.90	---	0.10	0.09	3233.87
	Approach	30%	5905	10.13	1.06	1.33	0.21	---	0.05	0.04	3233.87
	Climb out	85%	18548	30.30	1.06	0.30	0.08	---	0.08	0.07	3233.87
	Takeoff	100%	23048	43.15	1.06	0.34	0.07	---	0.09	0.08	3233.87
Notes: 3b, 5, 6, 8, 10, 12a											

Table 2-8. Criteria Pollutants, Ozone Precursors, and Total HAPs (cont.)

Aircraft Engine	Power Setting	Percent Thrust/hp	Fuel Flow Rate (lb/hr)	Emission Factors (lb/1000lb fuel)							
				NO_X	SO_X[1]	CO	VOC	HAP's	PM_{10}	$PM_{2.5}$	CO_2e[2]
CF34-3A, -3A1	Idle (Taxi)	7%	394	3.82	1.06	42.60	4.54	---	0.09	0.08	3233.87
	Approach	30%	944	6.86	1.06	1.90	0.15	---	0.06	0.06	3233.87
	Climb out	85%	2653	10.14	1.06	0.00	0.07	---	0.09	0.08	3233.87
	Takeoff	100%	3230	11.61	1.06	0.00	0.07	---	0.16	0.14	3233.87
Notes: 3b, 5, 6, 8, 10, 12d											
CF34-3B	Idle (Taxi)	7%	388	3.72	1.06	47.59	5.39	---	0.09	0.08	3233.87
	Approach	30%	921	6.63	1.06	1.88	0.15	---	0.06	0.06	3233.87
	Climb out	85%	2610	9.68	1.06	0.00	0.06	---	0.09	0.08	3233.87
	Takeoff	100%	3167	11.28	1.06	0.00	0.07	---	0.13	0.12	3233.87
Notes: 3b, 5, 6, 8, 10, 12a											
CF34-8C1	Idle (Taxi)	7%	548	4.31	1.06	24.92	0.09	---	0.04	0.03	3233.87
	Approach	30%	1334	11.10	1.06	2.91	0.07	---	0.04	0.04	3233.87
	Climb out	85%	3921	12.82	1.06	0.50	0.02	---	0.04	0.04	3233.87
	Takeoff	100%	4795	14.67	1.06	0.41	0.02	---	0.06	0.05	3233.87
Notes: 3b, 5, 6, 8, 10, 12a											
CF34-8C5	Idle (Taxi)	7%	510	4.60	1.06	18.25	0.15	---	0.04	0.04	3233.87
	Approach	30%	1423	10.75	1.06	4.24	0.07	---	0.04	0.04	3233.87
	Climb out	85%	4204	12.60	1.06	0.57	0.02	---	0.05	0.04	3233.87
	Takeoff	100%	5144	14.69	1.06	0.64	0.02	---	0.07	0.07	3233.87
Notes: 3b, 5, 6, 8, 10, 12a											
CF34-8C5A1	Idle (Taxi)	7%	516	4.65	1.06	17.85	0.15	---	0.04	0.04	3233.87
	Approach	30%	1452	10.87	1.06	4.17	0.07	---	0.04	0.04	3233.87
	Climb out	85%	4310	12.82	1.06	0.57	0.02	---	0.05	0.04	3233.87
	Takeoff	100%	5278	15.09	1.06	0.66	0.02	---	0.08	0.07	3233.87
Notes: 3b, 5, 6, 8, 10, 12a											
CF34-8C5A2	Idle (Taxi)	7%	524	4.70	1.06	17.30	0.15	---	0.04	0.04	3233.87
	Approach	30%	1492	11.06	1.06	4.05	0.07	---	0.04	0.04	3233.87
	Climb out	85%	4468	13.15	1.06	0.57	0.02	---	0.05	0.05	3233.87
	Takeoff	100%	5484	15.81	1.06	0.71	0.02	---	0.10	0.09	3233.87
Notes: 3b, 5, 6, 8, 10, 12a											
CF34-8C5B1	Idle (Taxi)	7%	500	4.50	1.06	19.52	0.18	---	0.04	0.04	3233.87
	Approach	30%	1357	10.42	1.06	4.44	0.08	---	0.04	0.04	3233.87
	Climb out	85%	3944	12.03	1.06	0.58	0.03	---	0.04	0.04	3233.87
	Takeoff	100%	4810	13.89	1.06	0.60	0.02	---	0.06	0.05	3233.87
Notes: 3b, 5, 6, 8, 10, 12a											
CF700-2D	Idle (Taxi)	<30%	460	0.89	1.06	155.00	20.70	---	0.00**(S)**	0.00**(S)**	3233.87
	Approach	30%	919	1.80	1.06	62.00	1.61	---	0.01**(S)**	0.01**(S)**	3233.87
	Climb out	90 - 100%	2322	4.30	1.06	11.34	0.11	---	0.01**(S)**	0.01**(S)**	3233.87
	Takeoff	>100%	2607	5.60	1.06	9.98	0.11	---	0.02**(S)**	0.02**(S)**	3233.87
Notes: 3a, 4c (for PM_{10} and $PM_{2.5}$ at all power settings), 5, 11, 12h											

Table 2-8. Criteria Pollutants, Ozone Precursors, and Total HAPs (cont.)

Aircraft Engine	Power Setting	Percent Thrust/hp	Fuel Flow Rate (lb/hr)	Emission Factors (lb/1000lb fuel)							
				NO_X	SO_X[1]	CO	VOC	HAP's	PM_{10}	$PM_{2.5}$	CO_2e[2]
CFM56-2A Series	Idle (Taxi)	7%	1032	4.30	1.06	23.50	1.30	---	0.06	0.05	3233.87
	Approach	30%	2524	8.70	1.06	3.40	0.09	---	0.06	0.05	3233.87
	Climb out	70%	7230	17.30	1.06	0.90	0.05	---	0.06	0.05	3233.87
	Takeoff	100%	8841	20.40	1.06	0.90	0.05	---	0.07	0.07	3233.87
Notes: 3b, 5, 6, 8, 10, 12a											
CFM56-2B-1	Idle (Taxi)	9%	1136	3.88	1.06	23.65	0.19	0.208	2.07	0.16	3233.87
	Approach	30%	2547	5.73	1.06	8.57	0.06	0.084	1.55	0.76	3233.87
	Intermediate	70%	5650	11.04	1.06	2.32	0.03	0.069	0.65	0.36	3233.87
	Military	78%	6458	12.05	1.06	0.36	0.03	0.018	1.59	1.02	3233.87
Notes: 3c (this is the commercial designation of the F108-CF-100 engine), 10, 12e											
CFM56-2-C5	Idle (Taxi)	7%	1016	4.00	1.06	30.70	2.10	---	0.06	0.06	3233.87
	Approach	30%	2468	8.20	1.06	4.20	0.09	---	0.06	0.05	3233.87
	Climb out	85%	6500	16.00	1.06	0.90	0.06	---	0.05	0.05	3233.87
	Takeoff	100%	7818	18.50	1.06	0.90	0.05	---	0.07	0.06	3233.87
Notes: 3b, 5, 6, 8, 10, 12a											
CFM56-3-B1	Idle (Taxi)	7%	905	3.90	1.06	34.40	2.62	---	0.07	0.06	3233.87
	Approach	30%	2302	8.30	1.06	3.80	0.09	---	0.06	0.05	3233.87
	Climb out	85%	6286	15.50	1.06	0.95	0.06	---	0.05	0.05	3233.87
	Takeoff	100%	7508	17.70	1.06	0.90	0.05	---	0.06	0.05	3233.87
Notes: 3b, 5, 6, 8, 10, 12a											
CFM56-3B-2	Idle (Taxi)	7%	944	4.10	1.06	30.10	2.01	---	0.06	0.06	3233.87
	Approach	30%	2492	8.70	1.06	3.40	0.08	---	0.06	0.05	3233.87
	Climb out	85%	6968	16.70	1.06	0.90	0.05	---	0.05	0.05	3233.87
	Takeoff	100%	8381	19.40	1.06	0.90	0.04	---	0.06	0.06	3233.87
Notes: 3b, 5, 6, 8, 10, 12a											
CFM56-3C-1	Idle (Taxi)	7%	984	4.30	1.06	26.80	1.63	---	0.06	0.06	3233.87
	Approach	30%	2667	9.10	1.06	3.10	0.08	---	0.06	0.05	3233.87
	Climb out	85%	7571	17.80	1.06	0.90	0.05	---	0.06	0.05	3233.87
	Takeoff	100%	9159	20.70	1.06	0.90	0.03	---	0.07	0.07	3233.87
Notes: 3b, 5, 6, 8, 10, 12a											
CFM56-5-A1	Idle (Taxi)	7%	802	4.00	1.06	17.60	1.61	---	0.06	0.06	3233.87
	Approach	30%	2310	8.00	1.06	2.50	0.46	---	0.09	0.08	3233.87
	Climb out	85%	6841	19.60	1.06	0.90	0.26	---	0.13	0.12	3233.87
	Takeoff	100%	8341	24.60	1.06	0.90	0.26	---	0.14	0.13	3233.87
Notes: 3b, 5, 6, 8, 10, 12a											
CFM56-5A3	Idle (Taxi)	7%	829	4.10	1.06	16.20	1.50	---	0.07	0.06	3233.87
	Approach	30%	2437	8.30	1.06	2.40	0.35	---	0.09	0.08	3233.87
	Climb out	85%	7341	21.10	1.06	0.90	0.23	---	0.13	0.12	3233.87
	Takeoff	100%	8976	26.40	1.06	0.90	0.23	---	0.14	0.13	3233.87
Notes: 3b, 5, 6, 8, 10, 12a											

Table 2-8. Criteria Pollutants, Ozone Precursors, and Total HAPs (cont.)

Aircraft Engine	Power Setting	Percent Thrust/hp	Fuel Flow Rate (lb/hr)	Emission Factors (lb/1000lb fuel)							
				NO_X	SO_X[1]	CO	VOC	HAP's	PM_{10}	$PM_{2.5}$	CO_2e[2]
CFM56-5A4	Idle (Taxi)	7%	754	4.04	1.06	20.30	2.01	---	0.07	0.06	3233.87
	Approach	30%	2071	8.51	1.06	3.10	0.58	---	0.09	0.08	3233.87
	Climb out	85%	5873	19.11	1.06	1.10	0.26	---	0.11	0.10	3233.87
	Takeoff	100%	7119	22.64	1.06	1.10	0.26	---	0.13	0.12	3233.87
Notes: 3b, 5, 6, 8, 10, 12a											
CFM56-5A5	Idle (Taxi)	7%	778	4.29	1.06	18.50	1.76	---	0.06	0.06	3233.87
	Approach	30%	2190	8.94	1.06	2.80	0.52	---	0.09	0.08	3233.87
	Climb out	85%	6341	19.98	1.06	1.10	0.26	---	0.12	0.11	3233.87
	Takeoff	100%	7714	24.79	1.06	1.10	0.26	---	0.13	0.12	3233.87
Notes: 3b, 5, 6, 8, 10, 12a											
CFM56-5B1	Idle (Taxi)	7%	929	4.60	1.06	28.40	3.69	---	0.06	0.05	3233.87
	Approach	30%	2889	10.80	1.06	1.57	0.14	---	0.04	0.04	3233.87
	Climb out	85%	8833	27.20	1.06	0.50	0.12	---	0.10	0.09	3233.87
	Takeoff	100%	10786	35.10	1.06	0.50	0.12	---	0.09	0.08	3233.87
Notes: 3b, 5, 6, 8, 10, 12a											
CFM56-5B2	Idle (Taxi)	7%	944	4.70	1.06	27.40	3.50	---	0.06	0.05	3233.87
	Approach	30%	2984	11.00	1.06	1.40	0.14	---	0.04	0.04	3233.87
	Climb out	85%	9191	28.50	1.06	0.50	0.12	---	0.09	0.09	3233.87
	Takeoff	100%	11318	37.80	1.06	0.50	0.12	---	0.08	0.07	3233.87
Notes: 3b, 5, 6, 8, 10, 12a											
CFM56-5B4	Idle (Taxi)	7%	849	4.30	1.06	31.90	4.45	---	0.06	0.06	3233.87
	Approach	30%	2587	10.00	1.06	2.33	0.15	---	0.05	0.04	3233.87
	Climb out	85%	7627	23.30	1.06	0.50	0.12	---	0.10	0.09	3233.87
	Takeoff	100%	9254	28.70	1.06	0.50	0.12	---	0.09	0.08	3233.87
Notes: 3b, 5, 6, 8, 10, 12a											
CFM56-5B4/3	Idle (Taxi)	7%	810	4.22	1.06	32.07	2.21	---	0.06	0.06	3233.87
	Approach	30%	2508	8.85	1.06	3.24	0.06	---	0.05	0.05	3233.87
	Climb out	85%	7452	17.23	1.06	0.16	0.02	---	0.09	0.08	3233.87
	Takeoff	100%	9064	21.57	1.06	0.25	0.02	---	0.10	0.09	3233.87
Notes: 3b, 5, 6, 8, 10, 12a											
CFM56-5B7/3	Idle (Taxi)	7%	810	4.22	1.06	32.07	2.21	---	0.06	0.06	3233.87
	Approach	30%	2508	8.85	1.06	3.24	0.06	---	0.05	0.05	3233.87
	Climb out	85%	7452	17.23	1.06	0.16	0.02	---	0.09	0.08	3233.87
	Takeoff	100%	9064	21.57	1.06	0.25	0.02	---	0.10	0.09	3233.87
Notes: 3b, 5, 6, 8, 10, 12a											
CFM56-5B9/3	Idle (Taxi)	7%	754	3.92	1.06	38.80	3.46	---	0.07	0.06	3233.87
	Approach	30%	2206	8.26	1.06	4.42	0.08	---	0.05	0.05	3233.87
	Climb out	85%	6294	14.76	1.06	0.17	0.03	---	0.08	0.07	3233.87
	Takeoff	100%	7587	17.54	1.06	0.16	0.02	---	0.09	0.08	3233.87
Notes: 3b, 5, 6, 8, 10, 12a											

Table 2-8. Criteria Pollutants, Ozone Precursors, and Total HAPs (cont.)

Aircraft Engine	Power Setting	Percent Thrust/hp	Fuel Flow Rate (lb/hr)	Emission Factors (lb/1000lb fuel)							
				NO_X	SO_X[1]	CO	VOC	HAP's	PM_{10}	$PM_{2.5}$	CO_2e[2]
CFM56-5C2	Idle (Taxi)	7%	933	4.19	1.06	34.00	6.53	---	0.12	0.11	3233.87
	Approach	30%	2824	10.00	1.06	1.75	0.09	---	0.08	0.07	3233.87
	Climb out	85%	8540	25.80	1.06	0.80	0.01	---	0.34	0.31	3233.87
	Takeoff	100%	10381	32.60	1.06	0.93	0.01	---	0.41	0.37	3233.87
Notes: 3b, 5, 6, 8, 10, 12a											
CFM56-5C2/P	Idle (Taxi)	7%	865	3.90	1.06	35.10	6.67	---	0.12	0.11	3233.87
	Approach	30%	2714	9.30	1.06	2.10	0.00	---	0.07	0.07	3233.87
	Climb out	85%	8214	23.80	1.06	0.70	0.00	---	0.34	0.30	3233.87
	Takeoff	100%	9937	29.70	1.06	0.80	0.00	---	0.39	0.35	3233.87
Notes: 3b, 5, 6, 8, 10, 12a											
CFM56-5C3/P	Idle (Taxi)	7%	889	4.00	1.06	33.40	6.21	---	0.12	0.11	3233.87
	Approach	30%	2817	9.60	1.06	1.90	0.00	---	0.07	0.07	3233.87
	Climb out	85%	8611	25.10	1.06	0.70	0.00	---	0.36	0.32	3233.87
	Takeoff	100%	10445	31.60	1.06	0.80	0.00	---	0.42	0.38	3233.87
Notes: 3b, 5, 6, 8, 10, 12a											
CFM56-5C4	Idle (Taxi)	7%	984	4.28	1.06	30.93	5.75	---	0.12	0.11	3233.87
	Approach	30%	3064	10.67	1.06	1.40	0.07	---	0.08	0.07	3233.87
	Climb out	85%	9484	29.05	1.06	0.85	0.01	---	0.39	0.35	3233.87
	Takeoff	100%	11556	37.67	1.06	1.00	0.01	---	0.46	0.42	3233.87
Notes: 3b, 5, 6, 8, 10, 12a											
CFM56-5C4/P	Idle (Taxi)	7%	913	4.10	1.06	31.60	5.75	---	0.12	0.11	3233.87
	Approach	30%	2937	9.90	1.06	1.60	0.00	---	0.07	0.07	3233.87
	Climb out	85%	9071	26.70	1.06	0.70	0.00	---	0.38	0.34	3233.87
	Takeoff	100%	11072	34.10	1.06	0.80	0.00	---	0.44	0.39	3233.87
Notes: 3b, 5, 6, 8, 10, 12a											
CFM56-7B18/3	Idle (Taxi)	7%	730	3.65	1.06	46.64	5.19	---	0.08	0.07	3233.87
	Approach	30%	2032	7.78	1.06	5.54	0.09	---	0.05	0.05	3233.87
	Climb out	85%	5571	13.00	1.06	0.28	0.03	---	0.07	0.06	3233.87
	Takeoff	100%	6683	14.81	1.06	0.17	0.03	---	0.07	0.07	3233.87
Notes: 3b, 5, 6, 8, 10, 12a											
CFM56-7B20	Idle (Taxi)	7%	794	4.30	1.06	25.90	3.57	---	0.06	0.05	3233.87
	Approach	30%	2175	9.50	1.06	3.20	0.12	---	0.04	0.04	3233.87
	Climb out	85%	6040	17.40	1.06	0.50	0.12	---	0.08	0.07	3233.87
	Takeoff	100%	7246	20.50	1.06	0.60	0.12	---	0.10	0.09	3233.87
Notes: 3b, 5, 6, 8, 10, 12a											
CFM56-7B20/2	Idle (Taxi)	7%	810	3.75	1.06	49.71	9.33	---	0.09	0.08	3233.87
	Approach	30%	2206	9.39	1.06	11.37	0.41	---	0.07	0.06	3233.87
	Climb out	85%	5984	10.81	1.06	11.38	0.26	---	0.06	0.05	3233.87
	Takeoff	100%	7167	13.25	1.06	4.26	0.08	---	0.05	0.04	3233.87
Notes: 3b, 5, 6, 8, 10, 12a											

Table 2-8. Criteria Pollutants, Ozone Precursors, and Total HAPs (cont.)

Aircraft Engine	Power Setting	Percent Thrust/hp	Fuel Flow Rate (lb/hr)	Emission Factors (lb/1000lb fuel)							
				NO_X	SO_X[1]	CO	VOC	HAP's	PM_{10}	$PM_{2.5}$	CO_2e[2]
CFM56-7B20/3	Idle (Taxi)	7%	746	3.77	1.06	43.31	4.42	---	0.08	0.07	3233.87
	Approach	30%	2127	7.98	1.06	5.03	0.09	---	0.05	0.05	3233.87
	Climb out	85%	5921	13.53	1.06	0.23	0.03	---	0.07	0.06	3233.87
	Takeoff	100%	7111	15.61	1.06	0.15	0.03	---	0.08	0.07	3233.87
Notes: 3b, 5, 6, 8, 10, 12a											
CFM56-7B20E	Idle (Taxi)	7%	794	3.80	1.06	43.30	4.37	---	0.08	0.07	3233.87
	Approach	30%	2381	8.00	1.06	5.00	0.12	---	0.06	0.05	3233.87
	Climb out	85%	5556	13.50	1.06	0.20	0.00	---	0.07	0.06	3233.87
	Takeoff	100%	7143	15.60	1.06	0.20	0.00	---	0.07	0.07	3233.87
Notes: 3b, 5, 6, 8, 10, 12a											
CFM56-7B22	Idle (Taxi)	7%	833	4.50	1.06	22.80	2.88	---	0.05	0.05	3233.87
	Approach	30%	2365	10.00	1.06	2.50	0.12	---	0.04	0.04	3233.87
	Climb out	85%	6698	19.00	1.06	0.60	0.12	---	0.10	0.09	3233.87
	Takeoff	100%	8103	23.10	1.06	0.50	0.12	---	0.10	0.09	3233.87
Notes: 3b, 5, 6, 8, 10, 12a											
CFM56-7B22/2	Idle (Taxi)	7%	833	3.94	1.06	45.35	8.35	---	0.09	0.08	3233.87
	Approach	30%	2405	6.37	1.06	30.87	6.97	---	0.38	0.34	3233.87
	Climb out	85%	6643	12.16	1.06	6.58	0.12	---	0.05	0.04	3233.87
	Takeoff	100%	8000	15.08	1.06	2.18	0.07	---	0.05	0.04	3233.87
Notes: 3b, 5, 6, 8, 10, 12a											
CFM56-7B22/3	Idle (Taxi)	7%	786	3.95	1.06	37.90	3.25	---	0.07	0.06	3233.87
	Approach	30%	2310	8.35	1.06	4.18	0.08	---	0.05	0.05	3233.87
	Climb out	85%	6603	14.67	1.06	0.17	0.03	---	0.08	0.07	3233.87
	Takeoff	100%	7968	17.40	1.06	0.16	0.02	---	0.08	0.07	3233.87
Notes: 3b, 5, 6, 8, 10, 12a											
CFM56-7B22E	Idle (Taxi)	7%	794	4.00	1.06	37.90	3.22	---	0.07	0.06	3233.87
	Approach	30%	2381	8.40	1.06	4.20	0.12	---	0.06	0.05	3233.87
	Climb out	85%	6349	14.70	1.06	0.20	0.00	---	0.07	0.07	3233.87
	Takeoff	100%	7937	17.40	1.06	0.20	0.00	---	0.08	0.07	3233.87
Notes: 3b, 5, 6, 8, 10, 12a											
CFM56-7B24	Idle (Taxi)	7%	865	4.40	1.06	22.00	2.76	---	0.05	0.05	3233.87
	Approach	30%	2508	10.10	1.06	2.20	0.12	---	0.04	0.04	3233.87
	Climb out	85%	7222	20.50	1.06	0.60	0.12	---	0.10	0.09	3233.87
	Takeoff	100%	8754	25.30	1.06	0.40	0.12	---	0.11	0.10	3233.87
Notes: 3b, 5, 6, 8, 10, 12a											
CFM56-7B24/2	Idle (Taxi)	7%	865	4.08	1.06	42.72	7.53	---	0.08	0.07	3233.87
	Approach	30%	2484	6.72	1.06	30.32	6.91	---	0.38	0.34	3233.87
	Climb out	85%	7159	13.23	1.06	4.30	0.08	---	0.05	0.04	3233.87
	Takeoff	100%	8643	16.63	1.06	1.38	0.06	---	0.05	0.04	3233.87
Notes: 3b, 5, 6, 8, 10, 12a											

Table 2-8. Criteria Pollutants, Ozone Precursors, and Total HAPs (cont.)

Aircraft Engine	Power Setting	Percent Thrust/hp	Fuel Flow Rate (lb/hr)	Emission Factors (lb/1000lb fuel)							
				NO_X	SO_X[1]	CO	VOC	HAP's	PM_{10}	$PM_{2.5}$	CO_2e[2]
CFM56-7B24/3	Idle (Taxi)	7%	817	4.09	1.06	34.71	2.65	---	0.07	0.06	3233.87
	Approach	30%	2444	8.60	1.06	3.68	0.07	---	0.05	0.05	3233.87
	Climb out	85%	7103	15.60	1.06	0.15	0.03	---	0.08	0.07	3233.87
	Takeoff	100%	8619	18.93	1.06	0.18	0.02	---	0.09	0.08	3233.87
Notes: 3b, 5, 6, 8, 10, 12a											
CFM56-7B24E	Idle (Taxi)	7%	794	4.10	1.06	34.70	2.65	---	0.07	0.06	3233.87
	Approach	30%	2381	8.60	1.06	3.70	0.12	---	0.06	0.05	3233.87
	Climb out	85%	7143	15.60	1.06	0.20	0.00	---	0.08	0.07	3233.87
	Takeoff	100%	8730	18.90	1.06	0.20	0.00	---	0.09	0.08	3233.87
Notes: 3b, 5, 6, 8, 10, 12a											
CFM56-7B24E/B1	Idle (Taxi)	7%	794	4.10	1.06	34.70	2.65	---	0.07	0.06	3233.87
	Approach	30%	2381	8.60	1.06	3.70	0.12	---	0.06	0.05	3233.87
	Climb out	85%	7143	15.60	1.06	0.20	0.00	---	0.08	0.07	3233.87
	Takeoff	100%	8730	18.90	1.06	0.20	0.00	---	0.09	0.08	3233.87
Notes: 3b, 5, 6, 8, 10, 12a											
CFM56-7B26	Idle (Taxi)	7%	897	4.70	1.06	18.80	2.19	---	0.05	0.04	3233.87
	Approach	30%	2683	10.80	1.06	1.60	0.12	---	0.04	0.04	3233.87
	Climb out	85%	7929	22.50	1.06	0.60	0.12	---	0.11	0.09	3233.87
	Takeoff	100%	9691	28.80	1.06	0.20	0.12	---	0.12	0.11	3233.87
Notes: 3b, 5, 6, 8, 10, 12a											
CFM56-7B26/2	Idle (Taxi)	7%	897	4.27	1.06	39.93	6.76	---	0.08	0.07	3233.87
	Approach	30%	2651	7.26	1.06	26.07	5.44	---	0.31	0.28	3233.87
	Climb out	85%	7849	14.77	1.06	2.51	0.07	---	0.04	0.04	3233.87
	Takeoff	100%	9548	19.20	1.06	0.77	0.03	---	0.04	0.04	3233.87
Notes: 3b, 5, 6, 8, 10, 12a											
CFM56-7B26/3	Idle (Taxi)	7%	857	4.27	1.06	30.94	2.01	---	0.06	0.06	3233.87
	Approach	30%	2627	8.93	1.06	3.07	0.06	---	0.05	0.05	3233.87
	Climb out	85%	7825	17.08	1.06	0.16	0.02	---	0.09	0.08	3233.87
	Takeoff	100%	9627	21.79	1.06	0.25	0.02	---	0.10	0.09	3233.87
Notes: 3b, 5, 6, 8, 10, 12a											
CFM56-7B26E, -7B26E/B1, -7B26E/B2, -7B26E/B2F, -7B26E/F	Idle (Taxi)	7%	794	4.30	1.06	30.90	2.07	---	0.06	0.06	3233.87
	Approach	30%	2381	8.90	1.06	3.10	0.12	---	0.06	0.05	3233.87
	Climb out	85%	7937	17.10	1.06	0.20	0.00	---	0.09	0.08	3233.87
	Takeoff	100%	9524	21.80	1.06	0.20	0.00	---	0.10	0.09	3233.87
Notes: 3b, 5, 6, 8, 10, 12a											
CFM56-7B27	Idle (Taxi)	7%	921	4.80	1.06	17.90	1.96	---	0.05	0.04	3233.87
	Approach	30%	2770	11.00	1.06	1.40	0.12	---	0.04	0.04	3233.87
	Climb out	85%	8278	23.70	1.06	0.50	0.12	---	0.11	0.10	3233.87
	Takeoff	100%	10191	30.90	1.06	0.20	0.12	---	0.12	0.11	3233.87
Notes: 3b, 5, 6, 8, 10, 12a											

Table 2-8. Criteria Pollutants, Ozone Precursors, and Total HAPs (cont.)

Aircraft Engine	Power Setting	Percent Thrust/hp	Fuel Flow Rate (lb/hr)	Emission Factors (lb/1000lb fuel)							
				NO_X	SO_X[1]	CO	VOC	HAP's	PM_{10}	$PM_{2.5}$	CO_2e[2]
CFM56-7B27/2	Idle (Taxi)	7%	913	4.36	1.06	38.73	6.39	---	0.08	0.07	3233.87
	Approach	30%	2786	7.53	1.06	24.28	4.84	---	0.28	0.25	3233.87
	Climb out	85%	8198	15.59	1.06	1.97	0.07	---	0.04	0.04	3233.87
	Takeoff	100%	10040	20.81	1.06	0.54	0.06	---	0.05	0.04	3233.87
Notes: 3b, 5, 6, 8, 10, 12a											
CFM56-7B27/3	Idle (Taxi)	7%	873	4.36	1.06	29.39	1.77	---	0.06	0.06	3233.87
	Approach	30%	2722	9.09	1.06	2.82	0.06	---	0.05	0.05	3233.87
	Climb out	85%	8183	17.89	1.06	0.17	0.02	---	0.10	0.09	3233.87
	Takeoff	100%	10262	23.94	1.06	0.31	0.03	---	0.10	0.09	3233.87
Notes: 3b, 5, 6, 8, 10, 12a											
CFM56-7B27E, -7B27E/B1, -7B27E/B1F, -7B27E/B3, -7B27E/F	Idle (Taxi)	7%	794	4.40	1.06	29.40	1.73	---	0.06	0.06	3233.87
	Approach	30%	2381	9.10	1.06	2.80	0.12	---	0.06	0.05	3233.87
	Climb out	85%	7937	17.90	1.06	0.20	0.00	---	0.09	0.08	3233.87
	Takeoff	100%	10318	23.90	1.06	0.30	0.00	---	0.10	0.09	3233.87
Notes: 3b, 5, 6, 8, 10, 12a											
CT7-5	Idle (Taxi)	7%	131	2.20	1.06	35.33	3.78	---	0.18	0.16	3233.87
	Approach	30%	364	6.88	1.06	5.29	1.42	---	0.37	0.33	3233.87
	Climb out	70%	756	13.17	1.06	2.59	0.95	---	0.57	0.51	3233.87
	Takeoff	100%	809	13.77	1.06	2.59	0.95	---	0.69	0.62	3233.87
Notes: 3m, 11, 12h											
F100-PW-100	Idle (Taxi)	3%	1127	4.64	1.06	49.58	3.79	1.538	3.13	2.82	3233.87
	Approach	13%	2765	12.52	1.06	3.99	1.06	0.853	1.57	1.41	3233.87
	Intermediate	45%	7685	27.09	1.06	0.72	0.14	0.044	0.72	0.65	3233.87
	Military	100%	10996	35.01	1.06	0.70	0.12	0.067	1.24	1.12	3233.87
	Afterburner-1	134%	54007	6.62	1.06	9.57	0.13	0.026	0.87	0.78	3233.87
Notes: 3n, 8, 10, 12e											
F100-PW-200	Idle (Taxi)	3%	1006	6.21	1.06	24.06	2.05	1.294	2.49	2.24	3233.87
	Approach	13%	3251	17.93	1.06	1.22	0.05	0.003	2.37	2.13	3233.87
	Intermediate	45%	5651	26.55	1.06	0.38	0.07	0.018	1.58	1.42	3233.87
	Military	100%	8888	34.32	1.06	0.56	0.11	0.026	1.58	1.42	3233.87
	Afterburner-5	134%	40123	6.63	1.06	10.42	0.69	0.046	3.04	2.74	3233.87
Notes: 3e, 8, 10, 12e											
F100-PW-220	Idle (Taxi)	---	1084	4.61	1.06	35.30	7.94	---	2.06	1.85	3233.87
	Approach	---	3837	12.53	1.06	1.92	5.12	---	2.63	2.37	3233.87
	Intermediate	---	5770	22.18	1.06	0.86	2.89	---	2.06	1.85	3233.87
	Military	---	9679	29.32	1.06	0.86	1.79	---	1.33	1.20	3233.87
	Afterburner-5	---	41682	8.37	1.06	11.99	1.53	---	1.15	1.04	3233.87
Notes: 3f, 8, 12e											
F100-PW-229	Idle (Taxi)	5%	1087	3.80	1.06	10.17	0.45	---	2.06**(S)**	1.85**(S)**	3233.87
	Approach	21%	3098	15.08	1.06	1.17	0.24	---	2.63**(S)**	2.37**(S)**	3233.87
	Intermediate	49%	5838	17.54	1.06	0.15	0.35	---	2.06**(S)**	1.85**(S)**	3233.87
	Military	86%	11490	29.29	1.06	0.33	0.31	---	1.33**(S)**	1.20**(S)**	3233.87
	Afterburner-1	102%	20793	14.30	1.06	21.51	5.26	---	1.15**(S)**	1.04**(S)**	3233.87
Notes: 3c, 4d ($PM_{2.5}$ and PM_{10} data at all power settings), 5, 8, 10, 12e											

Table 2-8. Criteria Pollutants, Ozone Precursors, and Total HAPs (cont.)

Aircraft Engine	Power Setting	Percent Thrust/hp	Fuel Flow Rate (lb/hr)	Emission Factors (lb/1000lb fuel)							
				NO_X	SO_X[1]	CO	VOC	HAP's	PM_{10}	$PM_{2.5}$	CO_2e[2]
F101-GE-100	Idle (Taxi)	---	476	7.30	1.06	120.10	28.98	---	0.09	0.08	3233.87
	Approach	---	4533**(S)**	9.16**(S)**	1.06	1.03**(S)**	0.02**(S)**	---	4.21**(S)**	3.74**(S)**	3233.87
	Intermediate	---	6557**(S)**	13.15**(S)**	1.06	0.85**(S)**	0.04**(S)**	---	1.35**(S)**	0.72**(S)**	3233.87
	Military	---	10000	2.30	1.06	7.60	0.46	---	0.03	0.03	3233.87
	Afterburner	---	66747	4.60	1.06	16.70	0.12	---	0.05	0.05	3233.87
Notes: 3g, 4e (all emission factors and fuel flow rates for Approach and Intermediate Power settings), 5, 8, 12h											
F101-GE-102	Idle (Taxi)	5%	1117	4.10	1.06	24.46	0.16	0.127	2.18	0.96	3233.87
	Approach	47%	4533	9.16	1.06	1.03	0.02	0.009	4.21	3.74	3233.87
	Intermediate	66%	6557	13.15	1.06	0.85	0.04	0.009	1.35	0.72	3233.87
	Military	77%	7828	12.83	1.06	0.83	0.12	0.014	1.68	1.20	3233.87
	Afterburner-1	106%	15314	16.92	1.06	43.49	1.46	0.969	2.87	2.40	3233.87
Notes: 3c, 10, 12e											
F103-GE-100	Idle (Taxi)	7%	1294	3.40	1.06	24.04	3.13	---	0.06	0.06	3233.87
	Approach	30%	5262	10.16	1.06	3.71	0.32	---	0.06	0.06	3233.87
	Climb out	85%	15397	25.50	1.06	0.45	0.17	---	0.11	0.10	3233.87
	Takeoff	100%	18738	28.97	1.06	0.45	0.16	---	0.10	0.09	3233.87
Notes: 3b (This is the military designation of the CF6-50E2 engine), 5, 6, 8, 10, 12a											
F103-GE-101	Idle (Taxi)	7%	1706	3.60	1.06	61.80	25.07	---	0.21	0.19	3233.87
	Approach	30%	5238	9.50	1.06	4.30	1.15	---	0.11	0.10	3233.87
	Climb out	85%	15675	29.70	1.06	0.50	0.81	---	0.10	0.09	3233.87
	Takeoff	100%	19738	36.30	1.06	0.50	0.69	---	0.12	0.11	3233.87
Notes: 3b (this is the military designation of the CF6-50C2 engine), 5, 6, 8, 10, 12a											
F108-CF-100, -201	Idle (Taxi)	9%	1136	3.88	1.06	23.65	0.19	0.125	2.07	0.16	3233.87
	Approach	30%	2547	5.73	1.06	8.57	0.06	0.027	1.55	0.76	3233.87
	Intermediate	70%	5650	11.04	1.06	2.32	0.03	0.008	0.65	0.36	3233.87
	Military	78%	6458	12.05	1.06	0.36	0.03	0.009	1.59	1.02	3233.87
Notes: 3c (F108-CF-100 is the military designation of the CFM56-2B-1 engine, this engine used as a surrogate at all settings for F108-CF-201 engine), 10, 12e											
F110-GE-100	Idle (Taxi)	3%	1111	3.77	1.06	24.11	0.22	0.164	2.60	1.12	3233.87
	Approach	44%	5080	9.78	1.06	5.77	0.03	0.015	1.37	0.91	3233.87
	Intermediate	66%	7332	16.92	1.06	3.47	0.05	0.025	0.58	0.41	3233.87
	Military	100%	11358	29.00	1.06	3.38	0.04	0.019	0.14	0.00	3233.87
	Afterburner-1	113%	18088	14.26	1.06	67.41	1.21	0.697	3.35	2.98	3233.87
Notes: 3c, 10, 12e											
F110-GE-129	Idle (Taxi)	4%	961	2.62	1.06	45.04	4.90	---	2.60**(S)**	1.12**(S)**	3233.87
	Approach	45%	4832	13.42	1.06	1.93	0.03**(S)**	---	1.37**(S)**	0.91**(S)**	3233.87
	Intermediate	65%	6939	17.82	1.06	1.53	0.05**(S)**	---	0.58**(S)**	0.41**(S)**	3233.87
	Military	76%	8611	20.34	1.06	1.17	0.93	---	0.14**(S)**	0.00**(S)**	3233.87
	Afterburner-1	99%	15564	7.09	1.06	63.28	53.46	---	3.35**(S)**	2.98**(S)**	3233.87
Notes: 3c, 4g (for VOC data for Approach and Intermediate settings and PM_{10} and $PM_{2.5}$ for all power settings), 5, 10, 12e											
F110-GE-400	Idle (Taxi)	7%	1287	2.76	1.06	16.57	3.48	---	0.02	0.02	3233.87
	Approach	30%	5809	12.41	1.06	0.96	0.44	---	0.02	0.02	3233.87
	Climb out	70%	11868	58.57	1.06	0.84	0.38	---	0.26	0.23	3233.87
	Takeoff	100%	11833	28.47	1.06	0.84	0.38	---	0.31	0.28	3233.87
Notes: 3m, 11, 12h											

Table 2-8. Criteria Pollutants, Ozone Precursors, and Total HAPs (cont.)

Aircraft Engine	Power Setting	Percent Thrust/hp	Fuel Flow Rate (lb/hr)	Emission Factors (lb/1000lb fuel)							
				NO_X	SO_X[1]	CO	VOC	HAP's	PM_{10}	$PM_{2.5}$	CO_2e[2]
F113-RR-100	Idle (Taxi)	7%	1008	3.60	1.06	31.77	4.24	---	0.16	0.15	3233.87
	Approach	30%	2206	7.20	1.06	2.65	0.21	---	0.22	0.20	3233.87
	Climb out	85%	5762	17.30	1.06	0.63	0.14	---	0.24	0.22	3233.87
	Takeoff	100%	7071	22.70	1.06	0.12	0.10	---	0.23	0.21	3233.87
Notes: 3b (This is the military designation of the SPEY Mk511 engine), 5, 6, 8, 10, 12h											
F117-PW-100	Idle (Taxi)	4%	978	3.76	1.06	22.70	0.37	0.291	10.67	8.75	3233.87
	Approach	31%	4645	15.49	1.06	0.51	0.05	0.019	5.53	5.10	3233.87
	Intermediate	68%	10408	32.72	1.06	0.32	0.04	0.012	2.31	1.42	3233.87
	Takeoff	---	13905**(S)**	35.04**(S)**	1.06	0.32**(S)**	0.01**(S)**	0.013**(C)**	0.06**(S)**	0.05**(S)**	3233.87
Notes: 3c (this is the military designation of the PW2040 engine), 4a (HAPs at Takeoff setting only), 4h (All remaining Emission Factors at Takeoff setting), 10, 12e											
F118-GE-100	Idle (Taxi)	---	1097	4.30	1.06	20.98	0.29	0.234	1.25	1.03	3233.87
	Approach	---	3773	11.09	1.06	2.02	0.05	0.017	4.70	2.32	3233.87
	Intermediate	---	6350	18.01	1.06	0.85	0.03	0.013	3.05	2.72	3233.87
	Military	---	10887	33.12	1.06	0.65	0.03	0.007	1.64	1.48	3233.87
Notes: 3c, 10, 12e											
F119-PW-100	Idle (Taxi)	10%	1377	3.01	1.06	48.15	1.67	1.492	2.42	1.76	3233.87
	Approach	20%	2740	6.59	1.06	7.92	0.05	0.047	1.96	1.73	3233.87
	Intermediate	70%	10110	12.40	1.06	2.14	0.03	0.030	1.40	1.09	3233.87
	Military	100%	18612	19.81	1.06	0.75	0.01	0.010	1.12	0.97	3233.87
	Afterburner	150%	50170	7.37	1.06	16.10	0.00**(C)**	0.002**(C)**	0.85**(C)**	0.75**(C)**	3233.87
Notes: 3d, 4a (VOC, HAP, PM_{10}, and $PM_{2.5}$ Emission factors for afterburner setting only), 10, 12e											
F135-PW-100	Proprietary Information. Contact Air Quality Subject Matter Expert for More Information regarding this engine's Emission Factors										
F402-RR-406A	Idle (Taxi)	7%	1251	1.80	1.06	106.08	18.75	---	0.49	0.44	3233.87
	Approach	30%	3735	4.99	1.06	21.46	1.05	---	0.30	0.27	3233.87
	Intermediate	70%	7125	9.48	1.06	8.35	0.43	---	0.30	0.27	3233.87
	Military	100%	8094	10.78	1.06	6.93	0.43	---	0.32	0.29	3233.87
Notes: 3m, 11, 12h											
F402-RR-408	Idle (Taxi)	7%	1449	2.20	1.06	39.72	2.41	---	0.16	0.14	3233.87
	Approach	30%	3974	5.02	1.06	16.57	0.46	---	0.19	0.17	3233.87
	Intermediate	70%	7290	7.55	1.06	9.79	0.20	---	0.02	0.02	3233.87
	Military	100%	8494	8.38	1.06	8.58	0.20	---	0.21	0.19	3233.87
Notes: 3m, 11, 12h											
F404-GE-400, -F1D2	Idle (Taxi)	6%	685	1.70	1.06	110.18	3.39	2.798	4.47	3.10	3233.87
	Approach	38%	3111	7.86	1.06	2.02	0.04	0.022	1.46	0.87	3233.87
	Intermediate	79%	6464	17.03	1.06	1.54	0.07	0.026	1.57	0.90	3233.87
	Military	91%	7739	25.83	1.06	1.48	0.02	0.012	1.61	0.89	3233.87
	Afterburner-3	114%	15851	5.43	1.06	50.31	1.85	1.099	3.57	3.21	3233.87
Notes: 3c, 10, 12e, 13											

Table 2-8. Criteria Pollutants, Ozone Precursors, and Total HAPs (cont.)

Aircraft Engine	Power Setting	Percent Thrust/hp	Fuel Flow Rate (lb/hr)	Emission Factors (lb/1000lb fuel)							
				NO_X	SO_X[1]	CO	VOC	HAP's	PM_{10}	$PM_{2.5}$	CO_2e[2]
GE90-110B1	Idle (Taxi)	7%	2937	5.11	1.06	40.59	5.23	---	0.07	0.06	3233.87
	Approach	30%	8571	15.78	1.06	2.29	0.07	---	0.05	0.04	3233.87
	Climb out	85%	27540	33.85	1.06	0.07	0.03	---	0.05	0.04	3233.87
	Takeoff	100%	34286	44.44	1.06	0.07	0.03	---	0.05	0.05	3233.87
Notes: 3b, 5, 6, 8, 10, 12a											
GE90-115B	Idle (Taxi)	7%	3016	5.19	1.06	39.11	4.88	---	0.07	0.06	3233.87
	Approach	30%	8968	16.50	1.06	1.98	0.07	---	0.05	0.04	3233.87
	Climb out	85%	29127	35.98	1.06	0.07	0.03	---	0.05	0.04	3233.87
	Takeoff	100%	37222	50.34	1.06	0.08	0.05	---	0.06	0.05	3233.87
Notes: 3b, 5, 6, 8, 10, 12a											
GE90-76B	Idle (Taxi)	7%	2048	5.10	1.06	34.12	3.69	---	0.07	0.06	3233.87
	Approach	30%	5857	13.76	1.06	2.77	0.08	---	0.05	0.04	3233.87
	Climb out	85%	18103	32.43	1.06	0.32	0.03	---	0.04	0.04	3233.87
	Takeoff	100%	22191	40.25	1.06	0.31	0.03	---	0.04	0.04	3233.87
Notes: 3b, 5, 6, 8, 10, 12a											
GE90-77B	Idle (Taxi)	7%	2064	5.12	1.06	33.81	3.63	---	0.07	0.06	3233.87
	Approach	30%	5913	13.87	1.06	2.71	0.08	---	0.05	0.04	3233.87
	Climb out	85%	18326	32.78	1.06	0.32	0.03	---	0.04	0.04	3233.87
	Takeoff	100%	22460	40.83	1.06	0.31	0.03	---	0.04	0.04	3233.87
Notes: 3b, 5, 6, 8, 10, 12a											
GE90-85B	Idle (Taxi)	7%	2151	5.33	1.06	31.34	3.22	---	0.06	0.06	3233.87
	Approach	30%	6381	14.77	1.06	2.16	0.07	---	0.05	0.04	3233.87
	Climb out	85%	20262	36.35	1.06	0.31	0.03	---	0.04	0.04	3233.87
	Takeoff	100%	24849	45.54	1.06	0.30	0.05	---	0.05	0.04	3233.87
Notes: 3b, 5, 6, 8, 10, 12a											
GE90-90B	Idle (Taxi)	7%	2222	5.48	1.06	29.89	2.98	---	0.06	0.05	3233.87
	Approach	30%	6762	15.44	1.06	1.88	0.07	---	0.05	0.04	3233.87
	Climb out	85%	21706	39.07	1.06	0.31	0.03	---	0.04	0.04	3233.87
	Takeoff	100%	26826	49.21	1.06	0.30	0.05	---	0.05	0.05	3233.87
Notes: 3b, 5, 6, 8, 10, 12a											
GE90-94B	Idle (Taxi)	7%	2254	5.55	1.06	29.23	2.86	---	0.06	0.05	3233.87
	Approach	30%	6952	15.81	1.06	1.74	0.07	---	0.05	0.04	3233.87
	Climb out	85%	22468	40.63	1.06	0.31	0.03	---	0.04	0.04	3233.87
	Takeoff	100%	27881	51.33	1.06	0.30	0.05	---	0.05	0.05	3233.87
Notes: 3b, 5, 6, 8, 10, 12a											
GEnx-1B64	Idle (Taxi)	7%	1579	4.24	1.06	21.62	0.93	---	0.04	0.04	3233.87
	Approach	30%	4794	9.03	1.06	2.99	0.07	---	0.08	0.07	3233.87
	Climb out	85%	14770	14.61	1.06	0.38	0.02	---	0.04	0.04	3233.87
	Takeoff	100%	17976	24.82	1.06	0.18	0.02	---	0.04	0.04	3233.87
Notes: 3b, 5, 6, 8, 10, 12a											

Table 2-8. Criteria Pollutants, Ozone Precursors, and Total HAPs (cont.)

Aircraft Engine	Power Setting	Percent Thrust/hp	Fuel Flow Rate (lb/hr)	Emission Factors (lb/1000lb fuel)							
				NO_X	SO_X[1]	CO	VOC	HAP's	PM_{10}	$PM_{2.5}$	CO_2e[2]
GEnx-1B67	Idle (Taxi)	7%	1611	4.30	1.06	20.70	0.83	---	0.04	0.04	3233.87
	Approach	30%	4960	9.29	1.06	2.76	0.07	---	0.08	0.07	3233.87
	Climb out	85%	15397	16.26	1.06	0.30	0.02	---	0.04	0.04	3233.87
	Takeoff	100%	18794	28.56	1.06	0.17	0.02	---	0.04	0.04	3233.87
Notes: 3b, 5, 6, 8, 10, 12a											
GEnx-1B70	Idle (Taxi)	7%	1651	4.37	1.06	19.68	0.72	---	0.04	0.04	3233.87
	Approach	30%	5159	9.63	1.06	2.49	0.07	---	0.08	0.07	3233.87
	Climb out	85%	16167	18.48	1.06	0.24	0.02	---	0.04	0.04	3233.87
	Takeoff	100%	19794	34.06	1.06	0.17	0.02	---	0.04	0.04	3233.87
Notes: 3b, 5, 6, 8, 10, 12a											
GEnx-2B67	Idle (Taxi)	7%	1714	4.43	1.06	18.95	0.66	---	0.04	0.04	3233.87
	Approach	30%	5564	9.58	1.06	2.53	0.07	---	0.08	0.07	3233.87
	Climb out	85%	15968	17.94	1.06	0.28	0.02	---	0.04	0.04	3233.87
	Takeoff	100%	19453	31.20	1.06	0.17	0.02	---	0.04	0.04	3233.87
Notes: 3b, 5, 6, 8, 10, 12a											
GP7270	Idle (Taxi)	7%	1857	5.24	1.06	33.58	4.65	---	0.09	0.08	3233.87
	Approach	30%	5643	12.90	1.06	1.27	0.08	---	0.05	0.05	3233.87
	Climb out	85%	17214	31.37	1.06	0.09	0.03	---	0.06	0.05	3233.87
	Takeoff	100%	20929	41.73	1.06	0.11	0.03	---	0.06	0.05	3233.87
Notes: 3b, 5, 6, 8, 10, 12a											
GTSIO-520-H	Idle (Taxi)	<40%	22	0.88	1.06	720.50	47.31	---	60.00**(S)**	54.00**(S)**	3233.87
	Pattern	40%	102	7.70	1.06	697.40	7.52	---	47.95**(S)**	43.16**(S)**	3233.87
	Climb out	75%	145	9.76	1.06	728.75	7.04	---	40.00**(S)**	36.00**(S)**	3233.87
	Takeoff	100%	256	1.03	1.06	1045.66	11.66	---	20.00**(S)**	18.00**(S)**	3233.87
Notes: 3h, 4b (for PM_{10} and $PM_{2.5}$ at all power settings), 5, 9, 12h											
IO-360-B	Idle (Taxi)	5-10%	8	1.16	1.06	897.40	56.58	---	60.00**(S)**	54.00**(S)**	3233.87
	Approach	30%	37	10.16	1.06	691.26	11.15	---	47.95**(S)**	43.16**(S)**	3233.87
	Climb out	75%	72	4.59	1.06	983.26	9.38	---	40.00**(S)**	36.00**(S)**	3233.87
	Takeoff	100%	103	1.99	1.06	1199.03	11.50	---	20.00**(S)**	18.00**(S)**	3233.87
Notes: 3a, 4b (for PM_{10} and $PM_{2.5}$ at all power settings), 5, 11, 12h											
IO-360-D	Idle (Taxi)	---	30	1.10	1.06	848.00	166.75	---	60.00	54.00	3233.87
	Approach	---	50	4.00	1.06	912.45	54.17	---	47.95	43.16	3233.87
	Intermediate	---	70	6.60	1.06	972.00	20.01	---	40.00	36.00	3233.87
	Military	---	90	5.80	1.06	1030.00	25.88	---	20.00	18.00	3233.87
Notes: 3g, 5, 12h											
J33-A-35	Idle (Taxi)	---	1190	1.50	1.06	127.00	22.43	---	0.73	0.66	3233.87
	Approach	---	1984	1.90	1.06	84.60	7.48	---	0.57	0.51	3233.87
	Intermediate	---	4762	2.70	1.06	49.10	1.50	---	0.02	0.02	3233.87
	Military	---	5556	3.60	1.06	31.30	0.58	---	0.02	0.02	3233.87
Notes: 3g, 5, 7, 8, 12h											

Table 2-8. Criteria Pollutants, Ozone Precursors, and Total HAPs (cont.)

Aircraft Engine	Power Setting	Percent Thrust/hp	Fuel Flow Rate (lb/hr)	Emission Factors (lb/1000lb fuel)							
				NO_X	SO_X[1]	CO	VOC	HAP's	PM_{10}	$PM_{2.5}$	CO_2e[2]
J52-P-6B	Idle (Taxi)	<35%	714	2.07	1.06	86.37	27.46	---	19.94	17.95	3233.87
	3000lb Thrust	35% **(C)**	2301	3.91	1.06	16.57	0.94	---	0.18**(S)**	0.16**(S)**	3233.87
	75% Thrust	75%	3977	5.84	1.06	6.00	0.75	---	0.18**(S)**	0.16**(S)**	3233.87
	Military	>75%	6328	9.00	1.06	3.01	0.38	---	7.75	6.98	3233.87
Notes: 3i, 4i (for PM_{10} and $PM_{2.5}$ at 3000lb and 75% thrust power settings only), 5, 7, 8, 11 (percent thrust for 3000lb setting assumes maximum thrust of 8500lb for this engine),											
J52-P-8B	Idle (Taxi)	<32%	680	1.79	1.06	63.78	48.53	---	0.18**(S)**	0.16**(S)**	3233.87
	3000lb Thrust	32% **(C)**	2300	6.34	1.06	10.54	1.98	---	0.18**(S)**	0.16**(S)**	3233.87
	75% Thrust	75%	4320	10.10	1.06	3.00	0.67	---	0.13**(S)**	0.12**(S)**	3233.87
	Military	>75%	7370	13.05	1.06	0.71	1.07	---	0.13**(S)**	0.12**(S)**	3233.87
Notes: 3i, 4i (for PM_{10} and $PM_{2.5}$ at all power settings), 5, 11 (percent thrust for 3000lb setting assumes maximum thrust of 9300lb for this engine), 12h											
J52-P-408	Idle (Taxi)	7%	1466	2.79	1.06	50.10	3.62	---	0.18	0.16	3233.87
	Approach	30%	3325	7.25	1.06	16.07	0.29	---	0.18	0.16	3233.87
	Intermediate	70%	6502	7.53	1.06	7.70	0.03	---	0.13	0.12	3233.87
	Military	100%	6483	7.53	1.06	7.70	0.03	---	0.13	0.12	3233.87
Notes: 3m, 5, 11, 12h											
J57-P-10	Idle (Taxi)	<75%	1100	1.87	1.06	80.52	111.09	---	0.16**(S)**	0.14**(S)**	3233.87
	75% Thrust	75%	5670	7.40	1.06	3.21	0.87	---	0.93**(S)**	0.84**(S)**	3233.87
	Normal Rated	76-99%	7250	9.00	1.06	1.79	1.15	---	1.92**(S)**	1.73**(S)**	3233.87
	Military	100%	8370	10.37	1.06	1.16	0.99	---	1.72**(S)**	1.55**(S)**	3233.87
Notes: 3i, 4j (for PM_{10} and $PM_{2.5}$ at all power settings), 5, 11 (assumes 100% thrust at Military setting), 12h											
J57-P-19W	Idle (Taxi)	---	952	2.20	1.06	79.00	88.55	---	0.16	0.14	3233.87
	Approach	---	3333	5.80	1.06	7.90	1.61	---	0.93	0.84	3233.87
	Intermediate	---	6508	9.50	1.06	2.40	0.23	---	1.92	1.73	3233.87
	Military	---	7460	11.00	1.06	1.90	0.12	---	1.72	1.55	3233.87
Notes: 3g, 5, 7, 8, 12h											
J57-P-420	Idle (Taxi)	<30%	1322	1.53	1.06	80.74	87.93	---	0.16**(S)**	0.14**(S)**	3233.87
	30% Thrust	30%	3413	4.45	1.06	14.83	5.22	---	0.93**(S)**	0.84**(S)**	3233.87
	75% Thrust	75%	5767	6.99	1.06	4.32	1.25	---	1.92**(S)**	1.73**(S)**	3233.87
	Intermediate	75-100%	10570	12.97	1.06	0.34	0.56	---	1.72**(S)**	1.55**(S)**	3233.87
	Afterburner	>100%	39721	5.16	1.06	14.20	2.92	---	3.10**(C)**	2.80**(C)**	3233.87
Notes: 3i, 4a (for PM_{10} and $PM_{2.5}$ at Afterburner setting), 4j (for PM_{10} and $PM_{2.5}$ at all other settings), 5, 11, 12h											
J57-P/F-43WB	Idle (Taxi)	---	952	2.20	1.06	78.00	86.25	---	0.14	0.13	3233.87
	Approach	---	1825	4.45	1.06	16.85	6.33	---	0.41	0.37	3233.87
	Intermediate	---	6667	9.90	1.06	2.30	0.12	---	1.23	1.11	3233.87
	Military	---	7778	11.00	1.06	1.50	0.12	---	1.74	1.57	3233.87
Notes: 3g, 5, 7, 8, 12h											
J57-P/F-59W	Idle (Taxi)	---	1270	2.40	1.06	65.00	60.84	---	0.13	0.12	3233.87
	Approach	---	1825	3.30	1.06	32.50	16.33	---	0.22	0.20	3233.87
	Intermediate	---	3889	6.10	1.06	8.90	1.27	---	0.60	0.54	3233.87
	Military	---	7937	11.30	1.06	2.40	0.23	---	0.84	0.76	3233.87
Notes: 3g, 5, 7, 8, 12h											

Table 2-8. Criteria Pollutants, Ozone Precursors, and Total HAPs (cont.)

Aircraft Engine	Power Setting	Percent Thrust/hp	Fuel Flow Rate (lb/hr)	Emission Factors (lb/1000lb fuel)							
				NO_X	SO_X[1]	CO	VOC	HAP's	PM_{10}	$PM_{2.5}$	CO_2e[2]
J60-P-3A	Idle (Taxi)	---	556	1.50	1.06	70.00	10.58	---	0.02	0.02	3233.87
	Approach	---	556	1.70	1.06	50.50	6.44	---	0.02	0.02	3233.87
	Intermediate	---	1429	4.00	1.06	5.80	0.23	---	0.23	0.21	3233.87
	Military	---	3413	4.60	1.06	4.00	0.12	---	0.17	0.15	3233.87
Notes: 3g, 5, 7, 8, 12h											
J60-P-5A, -5B	Idle (Taxi)	---	476	1.50	1.06	70.00	10.58	---	0.02	0.02	3233.87
	Approach	---	556	1.70	1.06	50.50	6.44	---	0.02	0.02	3233.87
	Intermediate	---	1429	4.00	1.06	5.80	0.23	---	0.23	0.21	3233.87
	Military	---	2460	4.60	1.06	4.00	0.12	---	0.17	0.15	3233.87
Notes: 3g, 5, 7, 8, 12h											
J65-W-5F	Idle (Taxi)	---	1320	2.46	1.06	47.16	11.25	---	0.18**(S)**	0.16**(S)**	3233.87
	7450 rpm	---	4370	7.30	1.06	12.61	1.09	---	0.18**(S)**	0.16**(S)**	3233.87
	8000 rpm	---	5970	5.71	1.06	7.39	0.83	---	0.13**(S)**	0.12**(S)**	3233.87
	8300 rpm	---	7040	5.15	1.06	4.57	0.38	---	0.13**(S)**	0.12**(S)**	3233.87
	Military	---	6946	5.23	1.06	5.31	0.70	---	0.13**(S)**	0.12**(S)**	3233.87
Notes: 3i, 4i (PM_{10} and $PM_{2.5}$ at all power settings), 5, 12h											
J65-W-20	Idle (Taxi)	---	1333	2.78	1.06	50.19	4.31	---	0.18**(S)**	0.16**(S)**	3233.87
	75% rpm	---	2346	4.82	1.06	21.82	1.57	---	0.18**(S)**	0.16**(S)**	3233.87
	85% rpm	---	3260	7.27	1.06	16.13	0.32	---	0.18**(S)**	0.16**(S)**	3233.87
	90% rpm	---	3951	7.97	1.06	14.30	0.15	---	0.18**(S)**	0.16**(S)**	3233.87
	Intermediate (Mil)	---	6421	7.55	1.06	7.72	0.04	---	0.13**(S)**	0.12**(S)**	3233.87
Notes: 3a, 4i (PM_{10} and $PM_{2.5}$ at all power settings), 5, 12h											
J69-T-25	Idle (Taxi)	4%	167	0.80	1.06	160.08	2.33	1.712	3.15	1.47	3233.87
	Approach	30%	568**(C)**	1.71**(C)**	1.06	56.03**(C)**	0.14**(C)**	0.233**(C)**	1.52**(C)**	0.58**(C)**	3233.87
	Intermediate	63%	872	2.92	1.06	38.27	0.06	0.038	0.94	0.39	3233.87
	Military	84%	1085	4.53	1.06	32.86	0.03	0.015	0.67	0.38	3233.87
Notes: 3c, 4a (for all values for approach power setting only), 7, 8, 10, 12e											
J75-P-17	Idle (Taxi)	---	1700	1.29	1.06	76.18	65.41	---	0.47	0.42	3233.87
	Approach	---	11300	11.90	1.06	1.40	0.11	---	0.10	0.09	3233.87
	Intermediate	---	12386**(C)**	9.79**(C)**	1.06	0.94**(C)**	0.20**(C)**	---	0.64**(C)**	0.58**(C)**	3233.87
	Military	---	13200	8.20	1.06	0.60	0.26	---	1.05	0.95	3233.87
	Afterburner	---	53700	4.10	1.06	12.00	0.14	---	1.73**(C)**	1.57**(C)**	3233.87
Notes: 3a, 4a (for PM_{10} and $PM_{2.5}$ at Afterburner setting only), 5, 7, 8, 11 (assumes military setting has maximum percent thrust of 100%), 12h											
J79-GE-8D	Idle (Taxi)	7%	1325	2.36	1.06	55.59	16.14	---	0.44	0.40	3233.87
	75% rpm	30%	1550	2.97	1.06	30.55	4.20	---	0.90	0.81	3233.87
	87% rpm	70%	8310	8.44	1.06	2.56	0.12	---	0.15	0.14	3233.87
	Military	100%	9544	10.42	1.06	2.56	0.12	---	0.18	0.16	3233.87
	Afterburner	110-150%	34647	4.71	1.06	8.14	0.19	---	0.56	0.50	3233.87
Notes: 3m, 5, 11, 12h											
J79-GE-10D	Idle (Taxi)	7%	1375	1.33	1.06	111.18	37.37	---	0.88	0.79	3233.87
	Approach	30%	3490	4.22	1.06	20.00	2.80	---	0.63	0.57	3233.87
	Intermediate	70%	7674	8.24	1.06	4.69	1.34	---	0.72	0.65	3233.87
	Military	100%	10097	10.24	1.06	2.83	1.34	---	0.72	0.65	3233.87
	Afterburner	110-150%	35339	4.50	1.06	8.63	1.01	---	0.37	0.33	3233.87
Notes: 3m, 5, 11, 12h											

Table 2-8. Criteria Pollutants, Ozone Precursors, and Total HAPs (cont.)

Aircraft Engine	Power Setting	Percent Thrust/hp	Fuel Flow Rate (lb/hr)	Emission Factors (lb/1000lb fuel)							
				NO_X	SO_X[1]	CO	VOC	HAP's	PM_{10}	$PM_{2.5}$	CO_2e[2]
J79-GE-15	Idle (Taxi)	---	1111	2.50	1.06	57.00	13.80	---	0.50	0.45	3233.87
	Approach	---	3492	4.80	1.06	9.40	1.27	---	1.80	1.62	3233.87
	Intermediate	---	5397	5.60	1.06	4.60	0.35	---	2.80	2.52	3233.87
	Military	---	8889	8.90	1.06	2.20	0.23	---	2.20	1.98	3233.87
	Afterburner	---	32223	9.10	1.06	4.00	0.01	---	0.15	0.14	3233.87
Notes: 3g, 5, 7, 8, 12h											
J79-GE-17	Idle (Taxi)	---	1032	2.70	1.06	66.00	26.57	---	0.18	0.16	3233.87
	Approach	---	3492	4.50	1.06	15.40	0.58	---	0.51	0.46	3233.87
	Intermediate	---	6984	5.80	1.06	7.80	0.12	---	0.72	0.65	3233.87
	Military	---	9841	10.60	1.06	5.20	0.12	---	0.92	0.83	3233.87
	Afterburner	---	34921	8.10	1.06	4.00	0.01	---	0.15	0.14	3233.87
Notes: 3g, 5, 7, 8, 12h											
J85-GE-5A	Idle (Taxi)	4%	434	1.34	1.06	250.22	2.00	1.306	4.70	4.02	3233.87
	Approach	13%**(C)**	875**(C)**	1.45**(C)**	1.06	115.08**(C)**	1.31**(C)**	0.851**(C)**	2.42**(C)**	0.81**(C)**	3233.87
	Intermediate	15%	950	1.47	1.06	104.02	0.92	0.811	1.79	0.69	3233.87
	Military	88%	2740	2.64	1.06	32.91	0.12	0.094	1.13	0.04	3233.87
	Afterburner-1	116%	8138	1.98	1.06	13.46	0.05	0.038	0.25	0.09	3233.87
Notes: 3c, 10, 12e											
J85-GE-5F	Idle (Taxi)	---	524	1.34	1.06	178.05	34.46	---	4.70**(S)**	4.02**(S)**	3233.87
	75% rpm	---	798	2.13	1.06	78.20	2.59	---	3.01**(C)**	1.84**(C)**	3233.87
	85% rpm	---	1098	2.73	1.06	58.01	1.36	---	2.15**(C)**	1.20**(C)**	3233.87
	Intermediate	---	1297	2.31	1.06	43.02	3.99	---	1.79**(S)**	0.69**(S)**	3233.87
	Afterburner	---	8470	2.60	1.06	29.00	0.92	---	0.25**(S)**	0.09**(S)**	3233.87
Notes: 3a, 4a (for PM_{10} and $PM_{2.5}$ at 75% rpm and 85% rpm power settings), 4l (PM_{10} and $PM_{2.5}$ for remaining power settings), 5, 12h											
J85-GE-5H	Idle (Taxi)	---	434	1.14	1.06	211.97	39.12	---	4.70	4.02	3233.87
	Approach	---	875**(C)**	1.64**(C)**	1.06	148.04**(C)**	6.56**(C)**	---	2.42**(C)**	0.81**(C)**	3233.87
	Intermediate	---	950	1.74	1.06	123.43	6.51	---	1.79	0.69	3233.87
	Military	---	2740	2.92	1.06	36.40	0.67	---	1.13	0.04	3233.87
	Afterburner	---	8138	2.09	1.06	14.19	2.63	---	0.25	0.09	3233.87
Notes: 3j, 7, 10, 12h											
J85-GE-5M	Idle (Taxi)	---	525	0.79	1.06	191.41	4.01	3.111	7.02	4.90	3233.87
	Approach	---	703**(C)**	1.09**(C)**	1.06	110.79**(C)**	1.50**(C)**	1.12**(C)**	8.83**(C)**	6.52**(C)**	3233.87
	Intermediate	---	1045	1.81	1.06	48.90	0.54	0.450	12.30	9.63	3233.87
	Military	---	2550	1.65	1.06	25.35	0.04	0.032	4.25	2.43	3233.87
	Afterburner	---	7695	1.21	1.06	10.19	0.05**(S)**	0.045**(S)**	0.25**(S)**	0.09**(S)**	3233.87
Notes: 3j, 4l (for VOC, HAPs, PM_{10} and $PM_{2.5}$ at Afterburner power setting only), 10, 12f											
J85-GE-5R	Idle (Taxi)	---	520	1.08	1.06	177.45	16.80	---	4.70**(S)**	4.02**(S)**	3233.87
	Approach	---	689**(C)**	0.91**(C)**	1.06	119.23**(C)**	7.96**(C)**	---	2.42**(S)**	0.81**(S)**	3233.87
	Intermediate	---	1030	0.70	1.06	65.07	2.78	---	1.79**(S)**	0.69**(S)**	3233.87
	Military	---	2220	1.92	1.06	30.99	0.75	---	1.13**(S)**	0.04**(S)**	3233.87
	Afterburner	---	7695	6.23	1.06	53.43	6.97	---	0.25**(S)**	0.09**(S)**	3233.87
Notes: 3j, 4l (PM_{10} and $PM_{2.5}$ at all power settings), 5, 10, 12f											
J85-GE-13	Idle (Taxi)	---	556	1.30	1.06	178.00	34.50	---	0.00	0.00	3233.87
	Approach	---	1230	2.05	1.06	58.30	5.69	---	0.01	0.01	3233.87
	Intermediate	---	2222	2.30	1.06	43.00	4.03	---	0.01	0.01	3233.87
	Military	---	2778	2.60	1.06	29.00	0.92	---	0.02	0.02	3233.87
	Afterburner	---	8968	2.00	1.06	26.00	0.08	---	0.01	0.01	3233.87
Notes: 3g, 5, 7, 8, 9, 12h											

Table 2-8. Criteria Pollutants, Ozone Precursors, and Total HAPs (cont.)

Aircraft Engine	Power Setting	Percent Thrust/hp	Fuel Flow Rate (lb/hr)	Emission Factors (lb/1000lb fuel)							
				NO_X	SO_X[1]	CO	VOC	HAP's	PM_{10}	$PM_{2.5}$	CO_2e[2]
J85-GE-17A	Idle (Taxi)	---	556	1.30	1.06	178.00	34.50	---	0.00**(S)**	0.00**(S)**	3233.87
	Approach	---	1230	2.05	1.06	58.30	5.69	---	0.01**(S)**	0.01**(S)**	3233.87
	Intermediate	---	2222	2.30	1.06	43.00	4.03	---	0.01**(S)**	0.01**(S)**	3233.87
	Military	---	3810	2.60	1.06	29.00	0.92	---	0.02**(S)**	0.02**(S)**	3233.87
Notes: 3g, 4c (PM_{10} and $PM_{2.5}$ for all power settings), 5, 7, 8, 10, 12h											
J85-GE-21	Idle (Taxi)	---	400	1.25	1.06	159.00	27.89	---	0.00**(S)**	0.00**(S)**	3233.87
	75% rpm	---	700	2.00	1.06	92.14	14.29	---	0.01**(S)**	0.01**(S)**	3233.87
	85% rpm	---	1200	2.92	1.06	46.17	2.97	---	0.01**(S)**	0.01**(S)**	3233.87
	Intermediate (Military)	---	3200	5.00	1.06	21.56	0.29	---	0.02**(S)**	0.02**(S)**	3233.87
	Afterburner	---	10650	5.60	1.06	36.40	0.12	---	0.01**(S)**	0.01**(S)**	3233.87
Notes: 3a, 4c (PM_{10} and $PM_{2.5}$ at all power settings), 5, 7, 8, 12h											
JT3D-3B	Idle (Taxi)	7%	1071	2.50	1.06	98.00	128.80	---	0.16**(S)**	0.14**(S)**	3233.87
	Approach	30%	2746	4.80	1.06	24.50	4.60	---	0.93**(S)**	0.84**(S)**	3233.87
	Climb out	85%	7397	9.90	1.06	2.80	2.30	---	1.92**(S)**	1.73**(S)**	3233.87
	Takeoff	100%	9318	12.10	1.06	1.50	4.60	---	1.72**(S)**	1.55**(S)**	3233.87
Notes: 3b, 4j (for PM_{10} and $PM_{2.5}$ at all power settings), 5, 6, 8, 10, 12a											
JT3D-7 Series	Idle (Taxi)	7%	1016	2.20	1.06	138.99	141.45	---	0.16**(S)**	0.14**(S)**	3233.87
	Approach	30%	3087	5.30	1.06	19.50	2.42	---	0.93**(S)**	0.84**(S)**	3233.87
	Climb out	85%	8191	9.59	1.06	1.90	0.46	---	1.92**(S)**	1.73**(S)**	3233.87
	Takeoff	100%	9952	12.69	1.06	0.89	0.58	---	1.72**(S)**	1.55**(S)**	3233.87
Notes: 3b, 4j (for PM_{10} and $PM_{2.5}$ at all power settings), 5, 6, 8, 10, 12a											
JT8D-7 Series	Idle (Taxi)	7%	1025	2.70	1.06	35.50	12.19	---	0.23	0.20	3233.87
	Approach	30%	2271	5.50	1.06	10.50	1.84	---	0.22	0.20	3233.87
	Climb out	85%	6439	13.50	1.06	2.00	0.58	---	0.31	0.28	3233.87
	Takeoff	100%	7851	17.10	1.06	1.50	0.46	---	0.32	0.28	3233.87
Notes: 3b, 5, 6, 8, 10, 12a											
JT8D-9 Series	Idle (Taxi)	7%	1050	2.90	1.06	14.14	3.59	---	0.10	0.09	3233.87
	Approach	30%	2363	6.00	1.06	2.14	0.69	---	0.11	0.10	3233.87
	Climb out	85%	6709	14.50	1.06	1.11	0.21	---	0.14	0.12	3233.87
	Takeoff	100%	8254	19.30	1.06	1.04	0.17	---	0.14	0.13	3233.87
Notes: 3b, 5, 6, 8, 10, 12a											
JT8D-9A	Idle (Taxi)	7%	1155	2.89	1.06	14.11	2.95	---	0.21	0.19	3233.87
	Approach	30%	2409	5.99	1.06	2.14	0.57	---	0.25	0.23	3233.87
	Intermediate	70%	6794	14.47	1.06	1.07	0.16	---	0.27	0.24	3233.87
	Military	100%	8334	19.26	1.06	1.07	0.16	---	0.27	0.24	3233.87
Notes: 3m, 11, 12h											
JT8D-11	Idle (Taxi)	7%	1155	2.75	1.06	35.00	11.50	---	0.13**(S)**	0.11**(S)**	3233.87
	Approach	30%	2650	5.80	1.06	9.40	1.61	---	0.13**(S)**	0.12**(S)**	3233.87
	Climb out	85%	7251	14.60	1.06	1.90	0.52	---	0.21**(S)**	0.19**(S)**	3233.87
	Takeoff	100%	8897	18.90	1.06	1.20	0.46	---	0.22**(S)**	0.19**(S)**	3233.87
Notes: 3b, 4m (for PM_{10} and $PM_{2.5}$ at all power settings), 5, 6, 8, 10, 12a											

Table 2-8. Criteria Pollutants, Ozone Precursors, and Total HAPs (cont.)

Aircraft Engine	Power Setting	Percent Thrust/hp	Fuel Flow Rate (lb/hr)	Emission Factors (lb/1000lb fuel)							
				NO_X	SO_X[1]	CO	VOC	HAP's	PM_{10}	$PM_{2.5}$	CO_2e[2]
JT8D-15	Idle (Taxi)	7%	1172	3.20	1.06	11.00	1.68	---	0.13	0.11	3233.87
	Approach	30%	2700	6.90	1.06	2.77	0.63	---	0.13	0.12	3233.87
	Climb out	85%	7500	15.10	1.06	1.15	0.32	---	0.21	0.19	3233.87
	Takeoff	100%	9349	19.40	1.06	1.03	0.28	---	0.22	0.19	3233.87
Notes: 3b, 5, 6, 8, 10, 12a											
JT8D-15A	Idle (Taxi)	7%	1089	3.10	1.06	12.93	2.14	---	0.13	0.12	3233.87
	Approach	30%	2476	6.60	1.06	2.90	0.75	---	0.14	0.12	3233.87
	Climb out	85%	7107	13.90	1.06	1.20	0.38	---	0.22	0.19	3233.87
	Takeoff	100%	8849	18.10	1.06	1.08	0.29	---	0.22	0.20	3233.87
Notes: 3b, 5, 6, 8, 10, 12a											
JT8D-17	Idle (Taxi)	7%	1170	3.20	1.06	10.46	1.44	---	0.13	0.12	3233.87
	Approach	30%	2810	8.00	1.06	2.67	0.60	---	0.13	0.12	3233.87
	Climb out	85%	7913	15.70	1.06	1.10	0.31	---	0.22	0.20	3233.87
	Takeoff	100%	9881	20.60	1.06	0.95	0.25	---	0.22	0.20	3233.87
Notes: 3b, 5, 6, 8, 10, 12a											
JT8D-17A	Idle (Taxi)	7%	1112	3.20	1.06	12.46	7.59	---	0.17	0.15	3233.87
	Approach	30%	2622	6.70	1.06	2.88	0.74	---	0.14	0.13	3233.87
	Climb out	85%	7416	14.30	1.06	1.16	0.35	---	0.22	0.20	3233.87
	Takeoff	100%	9310	19.10	1.06	1.07	0.29	---	0.23	0.21	3233.87
Notes: 3b, 5, 6, 8, 10, 12a											
JT8D-17AR	Idle (Taxi)	7%	1172	3.20	1.06	10.70	1.53	---	0.15	0.13	3233.87
	Approach	30%	2837	8.00	1.06	2.68	0.63	---	0.15	0.13	3233.87
	Climb out	85%	8310	16.00	1.06	1.08	0.31	---	0.25	0.22	3233.87
	Takeoff	100%	10833	24.50	1.06	0.93	0.24	---	0.25	0.23	3233.87
Notes: 3b, 5, 6, 8, 10, 12a											
JT8D-17R	Idle (Taxi)	7%	1230	3.30	1.06	9.43	1.09	---	0.14	0.13	3233.87
	Approach	30%	2980	8.40	1.06	2.54	0.61	---	0.15	0.13	3233.87
	Climb out	85%	8754	17.60	1.06	1.03	0.31	---	0.25	0.22	3233.87
	Takeoff	100%	11246	25.30	1.06	0.95	0.24	---	0.25	0.23	3233.87
Notes: 3b, 5, 6, 8, 10, 12a											
JT8D-209	Idle (Taxi)	7%	1034	3.50	1.06	14.10	4.63	---	0.13	0.12	3233.87
	Approach	30%	2851	8.80	1.06	4.37	1.94	---	0.19	0.17	3233.87
	Climb out	85%	7800	19.00	1.06	1.40	0.58	---	0.21	0.19	3233.87
	Takeoff	100%	9452	22.80	1.06	1.03	0.40	---	0.21	0.19	3233.87
Notes: 3b, 5, 6, 8, 10, 12a											
JT8D-217	Idle (Taxi)	7%	1089	4.57	1.06	15.31	0.00	---	0.07	0.06	3233.87
	Approach	30%	3042	7.66	1.06	3.54	0.00	---	0.06	0.06	3233.87
	Climb out	85%	8556	13.54	1.06	0.47	0.00	---	0.10	0.09	3233.87
	Takeoff	100%	10476	17.54	1.06	0.42	0.00	---	0.10	0.09	3233.87
Notes: 3b, 5, 6, 8, 10, 12a											

Table 2-8. Criteria Pollutants, Ozone Precursors, and Total HAPs (cont.)

Aircraft Engine	Power Setting	Percent Thrust/hp	Fuel Flow Rate (lb/hr)	Emission Factors (lb/1000lb fuel)							
				NO_X	SO_X[1]	CO	VOC	HAP's	PM_{10}	$PM_{2.5}$	CO_2e[2]
JT8D-217A	Idle (Taxi)	7%	1089	4.57	1.06	15.31	0.00	---	0.07	0.06	3233.87
	Approach	30%	3042	7.66	1.06	3.54	0.00	---	0.06	0.06	3233.87
	Climb out	85%	8556	13.54	1.06	0.47	0.00	---	0.10	0.09	3233.87
	Takeoff	100%	10476	17.54	1.06	0.42	0.00	---	0.10	0.09	3233.87
Notes: 3b, 5, 6, 8, 10, 12a											
JT8D-217C	Idle (Taxi)	7%	1087	4.05	1.06	17.89	0.00	---	0.04	0.03	3233.87
	Approach	30%	2881	7.65	1.06	3.79	0.00	---	0.06	0.05	3233.87
	Climb out	85%	8294	13.02	1.06	0.49	0.00	---	0.08	0.07	3233.87
	Takeoff	100%	10175	16.49	1.06	0.42	0.00	---	0.10	0.09	3233.87
Notes: 3b, 5, 6, 8, 10, 12a											
JT8D-219	Idle (Taxi)	7%	1067	3.60	1.06	12.63	4.00	---	0.15	0.14	3233.87
	Approach	30%	3029	9.13	1.06	4.07	1.83	---	0.20	0.18	3233.87
	Climb out	85%	8611	20.80	1.06	1.20	0.48	---	0.25	0.22	3233.87
	Takeoff	100%	10746	27.00	1.06	0.73	0.31	---	0.25	0.22	3233.87
Notes: 3b, 5, 6, 8, 10, 12a											
JT9D-7	Idle (Taxi)	7%	1667	3.10	1.06	84.10	41.98	---	0.27	0.24	3233.87
	Approach	30%	4833	7.60	1.06	7.80	1.50	---	0.13	0.11	3233.87
	Climb out	85%	14000	27.70	1.06	0.00	0.12	---	0.09	0.08	3233.87
	Takeoff	100%	16532	37.90	1.06	0.00	0.12	---	0.10	0.09	3233.87
Notes: 3b, 5, 6, 8, 10, 12a											
JT9D-7A	Idle (Taxi)	7%	1675	3.10	1.06	83.60	41.52	---	0.26	0.24	3233.87
	Approach	30%	4913	7.60	1.06	7.60	1.50	---	0.13	0.11	3233.87
	Climb out	85%	14199	28.50	1.06	0.00	0.12	---	0.09	0.08	3233.87
	Takeoff	100%	16659	38.70	1.06	0.00	0.12	---	0.10	0.09	3233.87
Notes: 3b, 5, 6, 8, 10, 12a											
JT9D-7F	Idle (Taxi)	7%	1841	3.20	1.06	68.60	29.79	---	0.24	0.21	3233.87
	Approach	30%	4952	9.10	1.06	5.80	0.69	---	0.10	0.09	3233.87
	Climb out	85%	14119	31.50	1.06	0.90	0.00	---	0.11	0.10	3233.87
	Takeoff	100%	17151	41.70	1.06	0.90	0.00	---	0.11	0.10	3233.87
Notes: 3b, 5, 6, 8, 10, 12a											
JT9D-7J	Idle (Taxi)	7%	1889	3.30	1.06	66.70	28.18	---	0.24**(S)**	0.21**(S)**	3233.87
	Approach	30%	5389	9.40	1.06	5.50	0.58	---	0.10**(S)**	0.09**(S)**	3233.87
	Climb out	85%	15095	34.90	1.06	0.90	0.00	---	0.11**(S)**	0.10**(S)**	3233.87
	Takeoff	100%	18373	44.90	1.06	0.90	0.00	---	0.11**(S)**	0.10**(S)**	3233.87
Notes: 3b, 4n (PM_{10} and $PM_{2.5}$ at all power settings), 5, 6, 8, 10, 12a											
JT9D-7Q	Idle (Taxi)	7%	1881	3.00	1.06	53.00	13.80	---	0.24**(S)**	0.21**(S)**	3233.87
	Approach	30%	5400	7.80	1.06	1.70	0.35	---	0.10**(S)**	0.09**(S)**	3233.87
	Climb out	85%	15870	25.60	1.06	0.20	0.23	---	0.11**(S)**	0.10**(S)**	3233.87
	Takeoff	100%	19380	31.60	1.06	0.20	0.23	---	0.11**(S)**	0.10**(S)**	3233.87
Notes: 3b, 4n (PM_{10} and $PM_{2.5}$ at all power settings), 5, 6, 8, 10, 12a											

Table 2-8. Criteria Pollutants, Ozone Precursors, and Total HAPs (cont.)

Aircraft Engine	Power Setting	Percent Thrust/hp	Fuel Flow Rate (lb/hr)	Emission Factors (lb/1000lb fuel)							
				NO_X	SO_X[1]	CO	VOC	HAP's	PM_{10}	$PM_{2.5}$	CO_2e[2]
JT9D-7R4D, -7R4D1	Idle (Taxi)	7%	1630	4.10	1.06	8.84	1.44	---	0.05	0.05	3233.87
	Approach	30%	5233	9.80	1.06	1.36	0.15	---	0.05	0.05	3233.87
	Climb out	85%	13318	30.00	1.06	0.48	0.14	---	0.06	0.06	3233.87
	Takeoff	100%	16310	38.50	1.06	0.51	0.17	---	0.07	0.06	3233.87
Notes: 3b, 5, 6, 8, 10, 12a											
JT9D-7R4E, -7R4E1	Idle (Taxi)	7%	1754	4.10	1.06	8.27	1.28	---	0.05	0.05	3233.87
	Approach	30%	5182	10.40	1.06	1.23	0.15	---	0.05	0.05	3233.87
	Climb out	85%	13683	34.20	1.06	0.53	0.15	---	0.07	0.06	3233.87
	Takeoff	100%	16810	41.60	1.06	0.57	0.18	---	0.07	0.07	3233.87
Notes: 3b, 5, 6, 8, 10, 12a											
JT9D-7R4E4	Idle (Taxi)	7%	1750	3.50	1.06	16.00	3.85	---	0.07	0.06	3233.87
	Approach	30%	5079	8.50	1.06	1.46	0.25	---	0.06	0.05	3233.87
	Climb out	85%	14516	29.70	1.06	0.67	0.15	---	0.06	0.06	3233.87
	Takeoff	100%	17603	36.90	1.06	0.67	0.17	---	0.07	0.06	3233.87
Notes: 3b, 5, 6, 8, 10, 12a											
JT9D-7R4G2	Idle (Taxi)	7%	1777	3.80	1.06	11.82	1.78	---	0.06	0.06	3233.87
	Approach	30%	5230	8.80	1.06	1.40	0.21	---	0.06	0.05	3233.87
	Climb out	85%	14921	29.50	1.06	0.63	0.16	---	0.08	0.07	3233.87
	Takeoff	100%	19278	41.30	1.06	0.74	0.17	---	0.08	0.07	3233.87
Notes: 3b, 5, 6, 8, 10, 12a											
JT9D-7R4H1	Idle (Taxi)	7%	1948	3.80	1.06	11.63	1.70	---	0.06	0.06	3233.87
	Approach	30%	5736	8.90	1.06	1.39	0.21	---	0.06	0.05	3233.87
	Climb out	85%	15865	30.00	1.06	0.63	0.16	---	0.08	0.07	3233.87
	Takeoff	100%	19937	45.20	1.06	0.74	0.17	---	0.09	0.08	3233.87
Notes: 3b, 5, 6, 8, 10, 12a											
JT9D-20	Idle (Taxi)	7%	1675	3.10	1.06	83.60	41.52	---	0.26	0.24	3233.87
	Approach	30%	4913	7.60	1.06	7.60	1.50	---	0.13	0.11	3233.87
	Climb out	85%	14199	28.50	1.06	0.00	0.12	---	0.09	0.08	3233.87
	Takeoff	100%	16659	38.70	1.06	0.00	0.12	---	0.10	0.09	3233.87
Notes: 3b, 5, 6, 8, 10, 12h											
JT9D-20J	Idle (Taxi)	7%	1889	3.30	1.06	66.70	28.18	---	0.26**(S)**	0.24**(S)**	3233.87
	Approach	30%	5389	9.40	1.06	5.50	0.58	---	0.13**(S)**	0.11**(S)**	3233.87
	Climb out	85%	15095	34.90	1.06	0.90	0.00	---	0.09**(S)**	0.08**(S)**	3233.87
	Takeoff	100%	18373	44.90	1.06	0.90	0.00	---	0.10**(S)**	0.09**(S)**	3233.87
Notes: 3b, 4o (PM_{10} and $PM_{2.5}$ at all power settings), 5, 6, 8, 10, 12a											
JT9D-59A, -70A	Idle (Taxi)	7%	1881	3.00	1.06	53.00	13.80	---	0.26**(S)**	0.24**(S)**	3233.87
	Approach	30%	5400	7.80	1.06	1.70	0.35	---	0.13**(S)**	0.11**(S)**	3233.87
	Climb out	85%	15870	25.60	1.06	0.20	0.23	---	0.09**(S)**	0.08**(S)**	3233.87
	Takeoff	100%	19380	31.60	1.06	0.20	0.23	---	0.10**(S)**	0.09**(S)**	3233.87
Notes: 3b, 4o (PM_{10} and $PM_{2.5}$ at all power settings), 5, 6, 8, 10, 12a											

Table 2-8. Criteria Pollutants, Ozone Precursors, and Total HAPs (cont.)

Aircraft Engine	Power Setting	Percent Thrust/hp	Fuel Flow Rate (lb/hr)	Emission Factors (lb/1000lb fuel)							
				NO_X	SO_X[1]	CO	VOC	HAP's	PM_{10}	$PM_{2.5}$	CO_2e[2]
JT15D-1 Series	Idle (Taxi)	7%	183	1.75	1.06	132.00	58.08	---	0.39	0.35	3233.87
	Approach	30%	405	3.44	1.06	40.50	5.09	---	0.32	0.28	3233.87
	Climb out	85%	984	6.77	1.06	3.50	0.01	---	0.11	0.10	3233.87
	Takeoff	100%	1175	7.60	1.06	2.65	0.01	---	0.11	0.10	3233.87
Notes: 3b, 5, 6, 8, 10, 12b											
JT15D-5, -5A, -5B	Idle (Taxi)	7%	235	1.66	1.06	119.20	136.97	---	0.82	0.74	3233.87
	Approach	30%	524	4.93	1.06	38.60	13.46	---	0.73	0.66	3233.87
	Climb out	85%	1371	10.08	1.06	1.15	1.50	---	0.23	0.20	3233.87
	Takeoff	100%	1630	11.13	1.06	0.00	0.00	---	0.13	0.12	3233.87
Notes: 3b, 5, 6, 8, 10, 12b											
LF507-1F	Idle (Taxi)	7%	360	3.28	1.06	37.83	5.43	---	0.13	0.12	3233.87
	Approach	30%	860	6.39	1.06	4.43	0.14	---	0.09	0.08	3233.87
	Climb out	85%	2350	12.02	1.06	0.30	0.01	---	0.09	0.08	3233.87
	Takeoff	100%	2840	14.52	1.06	0.20	0.01	---	0.08	0.08	3233.87
Notes: 3b, 5, 6, 8, 10, 12b											
NK-8-2U	Idle (Taxi)	7%	1905	2.70	1.06	116.00	119.37	---	2.60**(S)**	1.12**(S)**	3233.87
	Approach	30%	4603	5.40	1.06	21.00	5.75	---	1.37**(S)**	0.91**(S)**	3233.87
	Climb out	85%	9286	12.90	1.06	6.00	0.63	---	0.58**(S)**	0.41**(S)**	3233.87
	Takeoff	100%	13889	13.90	1.06	5.50	0.52	---	0.14**(S)**	0.00**(S)**	3233.87
Notes: 3b, 4g (PM_{10} and $PM_{2.5}$ at all power settings), 5, 6, 8, 10, 12h											
O-200	Idle (Taxi)	<40%	8	1.58	1.06	644.42	33.36	---	60.00**(S)**	54.00**(S)**	3233.87
	Approach	40%	26	1.14	1.06	1187.84	38.20	---	47.95**(S)**	43.16**(S)**	3233.87
	Climb out	75-100%	45	4.87	1.06	974.10	23.93	---	40.00**(S)**	36.00**(S)**	3233.87
	Takeoff	100%	45	4.87	1.06	974.10	23.93	---	20.00**(S)**	18.00**(S)**	3233.87
Notes: 3a, 4b (PM_{10} and $PM_{2.5}$ at all power settings), 5, 11, 12h											
O-320	Idle (Taxi)	<40%	9	0.52	1.06	1077.00	42.46	---	60.00**(S)**	54.00**(S)**	3233.87
	Approach	40%	47	0.95	1.06	1221.51	22.13	---	47.95**(S)**	43.16**(S)**	3233.87
	Climb out	75-100%	67	3.97	1.06	989.51	14.24	---	40.00**(S)**	36.00**(S)**	3233.87
	Takeoff	100%	89	2.19	1.06	1077.44	13.55	---	20.00**(S)**	18.00**(S)**	3233.87
Notes: 3a, 4b (PM_{10} and $PM_{2.5}$ at all power settings), 5, 11, 12h											
O-470C	Idle (Taxi)	5-10%	15	1.32	1.06	741.72	220.86	---	60.00**(S)**	54.00**(S)**	3233.87
	Approach	30%	86	9.35	1.06	691.59	10.75	---	47.95**(S)**	43.16**(S)**	3233.87
	Intermediate	70%**(C)**	112**(C)**	4.44**(C)**	1.06	956.61**(C)**	5.49**(C)**	---	40.00**(S)**	36.00**(S)**	3233.87
	Military	100%	131	0.76	1.06	1155.37	3.50	---	20.00**(S)**	18.00**(S)**	3233.87
Notes: 3a, 4b (PM_{10} and $PM_{2.5}$ at all power settings), 5, 11, 12h											
PT6A-27	Idle (Taxi)	<30%	115	2.43	1.06	64.00	57.70	---	0.50**(S)**	0.45**(S)**	3233.87
	Approach	30%	215	8.37	1.06	23.26	2.51	---	0.10**(S)**	0.09**(S)**	3233.87
	Climb out	90%	400	7.00	1.06	1.20	0.00	---	0.25**(S)**	0.23**(S)**	3233.87
	Takeoff	100%	425	7.81	1.06	1.01	0.00	---	0.24**(S)**	0.22**(S)**	3233.87
Notes: 3a, 4p (PM_{10} and $PM_{2.5}$ at all power settings), 5, 11, 12h											

Table 2-8. Criteria Pollutants, Ozone Precursors, and Total HAPs (cont.)

Aircraft Engine	Power Setting	Percent Thrust/hp	Fuel Flow Rate (lb/hr)	Emission Factors (lb/1000lb fuel)							
				NO_X	SO_X[1]	CO	VOC	HAP's	PM_{10}	$PM_{2.5}$	CO_2e[2]
PT6A-38	Idle (Taxi)	7%	103	2.09	1.06	82.44	2.09	---	0.50	0.45	3233.87
	Approach	30%	275	4.79	1.06	7.29	0.00	---	0.10	0.09	3233.87
	Climb out	70%	450	6.69	1.06	2.17	0.00	---	0.25	0.23	3233.87
	Takeoff	90%	489	7.08	1.06	2.05	0.00	---	0.24	0.22	3233.87
Notes: 3m, 11, 12h											
PT6A-41	Idle (Taxi)	<30%	147	1.97	1.06	115.31	116.88	---	0.50**(S)**	0.45**(S)**	3233.87
	Approach	30%	273	4.65	1.06	34.80	26.12	---	0.10**(S)**	0.09**(S)**	3233.87
	Climb out	90%	473	7.57	1.06	6.49	2.33	---	0.25**(S)**	0.23**(S)**	3233.87
	Takeoff	100%	510	7.98	1.06	5.10	2.01	---	0.24**(S)**	0.22**(S)**	3233.87
Notes: 3a, 4p (PM_{10} and $PM_{2.5}$ for all power settings), 5, 11, 12h											
PT6A-42	Idle (Taxi)	7%	103	2.16	1.06	76.55	16.61	---	0.45	0.41	3233.87
	Approach	30%	275	4.89	1.06	6.89	0.00	---	0.10	0.09	3233.87
	Intermediate	70%	466	6.88	1.06	1.95	0.00	---	0.24	0.22	3233.87
	Military	90%	513	7.28	1.06	1.95	0.00	---	0.23	0.21	3233.87
Notes: 3m, 11, 12h											
PT6A-65	Idle (Taxi)	7%	131	1.89	1.06	166.43	53.66	---	1.23	1.11	3233.87
	Approach	30%	340	4.59	1.06	20.86	3.31	---	0.74	0.67	3233.87
	Intermediate	70%	571	6.69	1.06	6.72	0.72	---	0.29	0.26	3233.87
	Military	90%	633	7.08	1.06	5.36	0.53	---	0.26	0.23	3233.87
Notes: 3m, 11, 12h											
PT6A-67B	Idle (Taxi)	7%	143	1.83	1.06	183.80	61.52	---	1.38	1.24	3233.87
	Approach	30%	364	4.59	1.06	20.96	3.24	---	0.72	0.65	3233.87
	Intermediate	70%	619	6.59	1.06	6.12	0.61	---	0.32	0.29	3233.87
	Military	90%	681	6.98	1.06	5.73	0.45	---	0.25	0.23	3233.87
Notes: 3m, 11, 12h											
PT6A-67D	Idle (Taxi)	7%	149	1.83	1.06	177.91	57.94	---	1.31	1.18	3233.87
	Approach	30%	372	4.69	1.06	19.76	2.93	---	0.66	0.59	3233.87
	Intermediate	70%	643	6.69	1.06	5.35	0.50	---	0.28	0.25	3233.87
	Military	90%	713	7.18	1.06	5.09	0.35	---	0.24	0.22	3233.87
Notes: 3m, 11, 12h											
PT6A-68	Ground Idle	2%	156	1.77	1.06	117.85	7.89	6.571	3.95	2.16	3233.87
	Flight Idle	3%	180	1.95	1.06	94.99	1.33	7.546	4.18	1.96	3233.87
	Descend	19%	328	5.03	1.06	33.69	3.29	3.208	4.15	1.23	3233.87
	Approach	46%	449	4.73	1.06	10.91	0.71	0.697	3.34	0.70	3233.87
	Max. Continuous	88%	612	8.18	1.06	3.88	0.20	0.104	4.30	0.61	3233.87
Notes: 3k, 10, 11 (percent hp calculated assuming maximum hp of 1250 per manufacturer's stated specifications), 12f											
PW306A	Idle (Taxi)	7%	335	4.26	1.06	36.35	5.01	---	0.07	0.06	3233.87
	Approach	30%	773	11.87	1.06	7.11	0.00	---	0.04	0.03	3233.87
	Climb out	85%	2096	19.26	1.06	2.51	0.00	---	0.05	0.04	3233.87
	Takeoff	100%	2517	20.08	1.06	2.27	0.00	---	0.08	0.07	3233.87
Notes: 3b, 5, 6, 8, 10, 12a											

Table 2-8. Criteria Pollutants, Ozone Precursors, and Total HAPs (cont.)

Aircraft Engine	Power Setting	Percent Thrust/hp	Fuel Flow Rate (lb/hr)	Emission Factors (lb/1000lb fuel)							
				NO_X	SO_X[1]	CO	VOC	HAP's	PM_{10}	$PM_{2.5}$	CO_2e[2]
PW308A	Idle (Taxi)	7%	353	3.65	1.06	38.21	7.61	---	0.14	0.12	3233.87
	Approach	30%	980	8.03	1.06	4.08	0.02	---	0.11	0.10	3233.87
	Climb out	85%	2374	14.06	1.06	1.06	0.00	---	0.44	0.39	3233.87
	Takeoff	100%	2860	16.74	1.06	0.83	0.00	---	0.39	0.35	3233.87
Notes: 3b, 5, 6, 8, 10, 12a											
PW2037	Idle (Taxi)	7%	1206	4.10	1.06	22.36	2.21	---	0.06	0.05	3233.87
	Approach	30%	3635	9.77	1.06	1.95	0.13	---	0.06	0.06	3233.87
	Climb out	85%	10373	23.96	1.06	0.34	0.02	---	0.09	0.08	3233.87
	Takeoff	100%	12468	29.41	1.06	0.33	0.02	---	0.06	0.06	3233.87
Notes: 3b, 5, 6, 8, 10, 12a											
PW2040	Idle (Taxi)	4%	978	3.76	1.06	22.70	0.37	0.311	10.67	8.75	3233.87
	Approach	31%	4645	15.49	1.06	0.51	0.05	0.033	5.53	5.10	3233.87
	Intermediate	68%	10408	32.72	1.06	0.32	0.04	0.026	2.31	1.42	3233.87
	Takeoff	100%	13905	35.04	1.06	0.32	0.01	---	0.06	0.05	3233.87
Notes: 3b (for Takeoff excluding HAPs and GHG), 3c (this is the commercial designation of theF117-PW-100 engine), 4a (HAPs at Takeoff setting only), 10, 12e											
PW2041	Idle (Taxi)	7%	1388	4.49	1.06	23.05	2.13	---	0.15	0.14	3233.87
	Approach	30%	4184	10.98	1.06	2.49	0.15	---	0.13	0.12	3233.87
	Climb out	70%	12345	28.94	1.06	0.20	0.03	---	0.12	0.11	3233.87
	Takeoff	100%	15362	36.92	1.06	0.20	0.03	---	0.12	0.11	3233.87
Notes: 3m, 11, 12h											
PW4056	Idle (Taxi)	7%	1651	4.80	1.06	21.86	2.21	---	0.07	0.06	3233.87
	Approach	30%	5222	11.60	1.06	2.00	0.15	---	0.06	0.05	3233.87
	Climb out	85%	15318	22.90	1.06	0.57	0.01	---	0.07	0.06	3233.87
	Takeoff	100%	18587	28.10	1.06	0.44	0.07	---	0.08	0.07	3233.87
Notes: 3b, 5, 6, 8, 10, 12a											
PW4060	Idle (Taxi)	7%	1690	4.90	1.06	20.32	1.91	---	0.07	0.06	3233.87
	Approach	30%	5579	12.00	1.06	1.78	0.16	---	0.06	0.05	3233.87
	Climb out	85%	16548	24.70	1.06	0.51	0.03	---	0.07	0.07	3233.87
	Takeoff	100%	21008	32.80	1.06	0.37	0.12	---	0.08	0.08	3233.87
Notes: 3b, 5, 6, 8, 10, 12a											
PW4062	Idle (Taxi)	7%	1667	3.78	1.06	42.61	12.49	---	0.11	0.10	3233.87
	Approach	30%	5698	12.17	1.06	1.93	0.10	---	0.05	0.04	3233.87
	Climb out	85%	16865	25.98	1.06	0.50	0.08	---	0.07	0.06	3233.87
	Takeoff	100%	21627	34.36	1.06	0.61	0.09	---	0.08	0.07	3233.87
Notes: 3b, 5, 6, 8, 10, 12a											
PW4074	Idle (Taxi)	7%	1810	4.20	1.06	21.00	3.68	---	0.06	0.05	3233.87
	Approach	30%	6310	11.00	1.06	0.40	0.23	---	0.05	0.05	3233.87
	Climb out	85%	18794	31.50	1.06	0.10	0.12	---	0.05	0.05	3233.87
	Takeoff	100%	23008	38.10	1.06	0.10	0.12	---	0.07	0.07	3233.87
Notes: 3b, 5, 6, 8, 10, 12a											

Table 2-8. Criteria Pollutants, Ozone Precursors, and Total HAPs (cont.)

Aircraft Engine	Power Setting	Percent Thrust/hp	Fuel Flow Rate (lb/hr)	Emission Factors (lb/1000lb fuel)							
				NO_X	SO_X[1]	CO	VOC	HAP's	PM_{10}	$PM_{2.5}$	CO_2e[2]
PW4074D	Idle (Taxi)	7%	2421	3.80	1.06	26.34	3.59	---	0.06	0.05	3233.87
	Approach	30%	6897	11.35	1.06	0.96	0.05	---	0.04	0.04	3233.87
	Climb out	85%	19611	32.71	1.06	0.35	0.02	---	0.05	0.04	3233.87
	Takeoff	100%	24143	42.46	1.06	0.30	0.02	---	0.06	0.05	3233.87
Notes: 3b, 5, 6, 8, 10, 12a											
PW4077	Idle (Taxi)	7%	1841	4.20	1.06	20.20	3.45	---	0.06	0.05	3233.87
	Approach	30%	6476	11.30	1.06	0.40	0.23	---	0.05	0.05	3233.87
	Climb out	85%	19460	32.50	1.06	0.10	0.12	---	0.06	0.05	3233.87
	Takeoff	100%	23960	39.80	1.06	0.10	0.12	---	0.08	0.07	3233.87
Notes: 3b, 5, 6, 8, 10, 12a											
PW4077D	Idle (Taxi)	7%	2460	3.81	1.06	24.80	3.24	---	0.06	0.05	3233.87
	Approach	30%	7079	11.63	1.06	0.86	0.05	---	0.04	0.04	3233.87
	Climb out	85%	20333	34.05	1.06	0.34	0.02	---	0.05	0.04	3233.87
	Takeoff	100%	25175	44.68	1.06	0.29	0.02	---	0.06	0.05	3233.87
Notes: 3b, 5, 6, 8, 10, 12a											
PW4084	Idle (Taxi)	7%	1921	4.40	1.06	18.73	3.11	---	0.05	0.05	3233.87
	Approach	30%	6944	12.00	1.06	0.40	0.23	---	0.05	0.05	3233.87
	Climb out	85%	21341	35.50	1.06	0.10	0.12	---	0.07	0.06	3233.87
	Takeoff	100%	27072	45.00	1.06	0.10	0.12	---	0.09	0.09	3233.87
Notes: 3b, 5, 6, 8, 10, 12a											
PW4084D	Idle (Taxi)	7%	2556	3.99	1.06	21.12	2.48	---	0.05	0.05	3233.87
	Approach	30%	7571	12.27	1.06	0.66	0.05	---	0.04	0.04	3233.87
	Climb out	85%	22294	37.78	1.06	0.32	0.02	---	0.05	0.05	3233.87
	Takeoff	100%	28230	51.39	1.06	0.28	0.02	---	0.07	0.06	3233.87
Notes: 3b, 5, 6, 8, 10, 12a											
PW4090	Idle (Taxi)	7%	2683	4.48	1.06	11.94	0.79	---	0.04	0.04	3233.87
	Approach	30%	7770	12.74	1.06	0.55	0.05	---	0.04	0.04	3233.87
	Climb out	85%	23778	41.17	1.06	0.31	0.02	---	0.06	0.05	3233.87
	Takeoff	100%	31159	57.52	1.06	0.27	0.02	---	0.09	0.08	3233.87
Notes: 3b, 5, 6, 8, 10, 12a											
PW4098	Idle (Taxi)	7%	2548	7.78	1.06	6.48	0.00	---	0.04	0.03	3233.87
	Approach	30%	8532	14.89	1.06	0.70	0.00	---	0.05	0.05	3233.87
	Climb out	85%	25754	36.45	1.06	0.21	0.00	---	0.07	0.07	3233.87
	Takeoff	100%	32841	51.29	1.06	0.16	0.00	---	0.06	0.06	3233.87
Notes: 3b, 5, 6, 8, 10, 12a											
PW4152	Idle (Taxi)	7%	1405	4.90	1.06	12.76	0.85	---	0.07	0.07	3233.87
	Approach	30%	4706	11.10	1.06	1.09	0.17	---	0.07	0.06	3233.87
	Climb out	85%	14167	22.70	1.06	0.17	0.18	---	0.11	0.10	3233.87
	Takeoff	100%	17278	26.90	1.06	0.12	0.15	---	0.11	0.10	3233.87
Notes: 3b, 5, 6, 8, 10, 12a											

Table 2-8. Criteria Pollutants, Ozone Precursors, and Total HAPs (cont.)

Aircraft Engine	Power Setting	Percent Thrust/hp	Fuel Flow Rate (lb/hr)	Emission Factors (lb/1000lb fuel)							
				NO_X	SO_X[1]	CO	VOC	HAP's	PM_{10}	$PM_{2.5}$	CO_2e[2]
PW4156	Idle (Taxi)	7%	1492	5.00	1.06	11.60	0.76	---	0.08	0.07	3233.87
	Approach	30%	5135	11.60	1.06	0.90	0.29	---	0.08	0.07	3233.87
	Climb out	70%	15722	24.60	1.06	0.14	0.20	---	0.12	0.11	3233.87
	Takeoff	100%	19437	32.50	1.06	0.08	0.13	---	0.12	0.11	3233.87
Notes: 3b, 5, 6, 8, 10, 12a											
PW4158	Idle (Taxi)	7%	1675	4.80	1.06	20.99	2.05	---	0.07	0.06	3233.87
	Approach	30%	5413	11.80	1.06	1.88	0.16	---	0.06	0.05	3233.87
	Climb out	85%	15905	23.70	1.06	0.54	0.02	---	0.07	0.07	3233.87
	Takeoff	100%	19691	30.20	1.06	0.40	0.10	---	0.08	0.07	3233.87
Notes: 3b, 5, 6, 8, 10, 12a											
PW4164	Idle (Taxi)	7%	1667	4.03	1.06	26.67	5.13	---	0.07	0.06	3233.87
	Approach	30%	5984	14.10	1.06	1.86	0.18	---	0.05	0.04	3233.87
	Climb out	85%	17294	31.66	1.06	0.79	0.05	---	0.05	0.04	3233.87
	Takeoff	100%	20841	38.57	1.06	0.69	0.03	---	0.05	0.05	3233.87
Notes: 3b, 5, 6, 8, 10, 12a											
PW4164-1D	Idle (Taxi)	7%	1929	3.79	1.06	17.13	1.66	---	0.05	0.04	3233.87
	Approach	30%	6151	12.10	1.06	1.55	0.07	---	0.04	0.04	3233.87
	Climb out	85%	17770	20.97	1.06	0.17	0.00	---	0.06	0.05	3233.87
	Takeoff	100%	21595	26.31	1.06	0.16	0.00	---	0.06	0.05	3233.87
Notes: 3b, 5, 6, 8, 10, 12a											
PW4168	Idle (Taxi)	7%	1984	5.20	1.06	15.90	0.23	---	0.04	0.04	3233.87
	Approach	30%	6421	12.10	1.06	2.40	0.00	---	0.04	0.04	3233.87
	Climb out	85%	18754	20.20	1.06	0.20	0.00	---	0.09	0.08	3233.87
	Takeoff	100%	22889	26.90	1.06	0.10	0.00	---	0.10	0.09	3233.87
Notes: 3b, 5, 6, 8, 10, 12a											
PW4168A	Idle (Taxi)	7%	1984	5.20	1.06	15.90	0.23	---	0.04	0.04	3233.87
	Approach	30%	6421	12.10	1.06	2.40	0.00	---	0.04	0.04	3233.87
	Climb out	85%	18754	20.20	1.06	0.20	0.00	---	0.09	0.08	3233.87
	Takeoff	100%	22889	26.90	1.06	0.10	0.00	---	0.10	0.09	3233.87
Notes: 3b, 5, 6, 8, 10, 12a											
PW4168-1D, -4168A-1D	Idle (Taxi)	7%	2000	4.08	1.06	14.78	1.09	---	0.04	0.04	3233.87
	Approach	30%	6492	12.39	1.06	1.26	0.06	---	0.04	0.04	3233.87
	Climb out	85%	19032	22.31	1.06	0.18	0.00	---	0.06	0.06	3233.87
	Takeoff	100%	23310	30.15	1.06	0.17	0.00	---	0.06	0.05	3233.87
Notes: 3b, 5, 6, 8, 10, 12a											
PW4170	Idle (Taxi)	7%	2024	4.18	1.06	14.04	0.95	---	0.04	0.04	3233.87
	Approach	30%	6611	12.49	1.06	1.17	0.06	---	0.04	0.04	3233.87
	Climb out	85%	19445	22.84	1.06	0.18	0.00	---	0.06	0.06	3233.87
	Takeoff	100%	23960	31.40	1.06	0.18	0.00	---	0.06	0.05	3233.87
Notes: 3b, 5, 6, 8, 10, 12a											

Table 2-8. Criteria Pollutants, Ozone Precursors, and Total HAPs (cont.)

Aircraft Engine	Power Setting	Percent Thrust/hp	Fuel Flow Rate (lb/hr)	Emission Factors (lb/1000lb fuel)							
				NO_X	SO_X[1]	CO	VOC	HAP's	PM_{10}	$PM_{2.5}$	CO_2e[2]
PW4460	Idle (Taxi)	7%	1690	4.90	1.06	20.32	1.91	---	0.07	0.06	3233.87
	Approach	30%	5579	12.00	1.06	1.78	0.16	---	0.06	0.05	3233.87
	Climb out	85%	16548	24.70	1.06	0.51	0.03	---	0.07	0.07	3233.87
	Takeoff	100%	21008	32.80	1.06	0.37	0.12	---	0.08	0.08	3233.87
Notes: 3b, 5, 6, 8, 10, 12a											
PW6122A	Idle (Taxi)	7%	865	3.08	1.06	24.68	0.01	---	0.10	0.09	3233.87
	Approach	30%	2413	5.95	1.06	3.99	0.00	---	0.07	0.07	3233.87
	Climb out	85%	6825	13.40	1.06	0.72	0.00	---	0.14	0.12	3233.87
	Takeoff	100%	8310	17.04	1.06	0.74	0.00	---	0.13	0.12	3233.87
Notes: 3b, 5, 6, 8, 10, 12a											
PW6124A	Idle (Taxi)	7%	905	3.58	1.06	25.19	0.00	---	0.09	0.08	3233.87
	Approach	30%	2579	6.88	1.06	3.69	0.00	---	0.07	0.07	3233.87
	Climb out	85%	7452	15.85	1.06	0.81	0.00	---	0.15	0.13	3233.87
	Takeoff	100%	9278	21.03	1.06	0.68	0.00	---	0.15	0.13	3233.87
Notes: 3b, 5, 6, 8, 10, 12a											
R-1820-82	Idle (Taxi)	---	89	0.00	1.06	474.16	173.15	---	60.00**(S)**	54.00**(S)**	3233.87
	Approach	---	323	6.50	1.06	384.83	6.41	---	47.95**(S)**	43.16**(S)**	3233.87
	Climb out	---	862	2.09	1.06	435.03	55.77	---	40.00**(S)**	36.00**(S)**	3233.87
	Takeoff	---	1166	1.72	1.06	531.73	108.89	---	20.00**(S)**	18.00**(S)**	3233.87
Notes: 3a, 4b (for PM_{10} and $PM_{2.5}$ at all power settings), 5, 12h											
RB211-22B	Idle (Taxi)	7%	2198	2.70	1.06	93.17	75.18	---	0.47	0.42	3233.87
	Approach	30%	4389	8.05	1.06	26.38	8.89	---	0.53	0.48	3233.87
	Climb out	85%	12238	25.63	1.06	4.14	0.45	---	0.13	0.12	3233.87
	Takeoff	100%	14810	34.32	1.06	2.48	0.41	---	0.15	0.13	3233.87
Notes: 3b, 5, 6, 8, 10, 12h											
RB211-524B Series	Idle (Taxi)	7%	1905	4.20	1.06	12.39	2.24	---	0.05	0.05	3233.87
	Approach	30%	5000	9.80	1.06	1.56	0.81	---	0.09	0.08	3233.87
	Climb out	85%	14206	38.20	1.06	0.33	0.30	---	0.10	0.09	3233.87
	Takeoff	100%	17540	52.30	1.06	0.70	0.45	---	0.14	0.12	3233.87
Notes: 3b, 5, 6, 8, 10, 12h											
RB211-524C2	Idle (Taxi)	7%	2381	3.37	1.06	81.00	62.33	---	0.38	0.34	3233.87
	Approach	30%	5873	10.40	1.06	18.90	5.08	---	0.30	0.27	3233.87
	Climb out	85%	16032	32.30	1.06	1.63	0.25	---	0.11	0.10	3233.87
	Takeoff	100%	19683	41.90	1.06	0.66	0.00	---	0.11	0.10	3233.87
Notes: 3b, 5, 6, 8, 10, 12h											
RB211-524D4	Idle (Taxi)	7%	2381	4.11	1.06	73.80	53.43	---	0.33	0.30	3233.87
	Approach	30%	5873	9.65	1.06	16.90	5.52	---	0.32	0.29	3233.87
	Climb out	85%	15952	41.00	1.06	1.18	0.48	---	0.11	0.10	3233.87
	Takeoff	100%	19921	56.90	1.06	0.51	0.00	---	0.09	0.08	3233.87
Notes: 3b, 5, 6, 8, 10, 12h											

Table 2-8. Criteria Pollutants, Ozone Precursors, and Total HAPs (cont.)

Aircraft Engine	Power Setting	Percent Thrust/hp	Fuel Flow Rate (lb/hr)	Emission Factors (lb/1000lb fuel)							
				NO_X	SO_X[1]	CO	VOC	HAP's	PM_{10}	$PM_{2.5}$	CO_2e[2]
RB211-524G	Idle (Taxi)	7%	2064	4.63	1.06	13.74	1.02	---	0.05	0.04	3233.87
	Approach	30%	5556	9.56	1.06	1.01	0.43	---	0.11	0.10	3233.87
	Climb out	85%	16508	40.54	1.06	0.43	0.31	---	0.13	0.12	3233.87
	Takeoff	100%	20794	58.71	1.06	0.59	0.45	---	0.13	0.12	3233.87
Notes: 3b, 5, 6, 8, 10, 12h											
RB211-524G-T	Idle (Taxi)	7%	2064	4.00	1.06	28.82	4.54	---	0.08	0.07	3233.87
	Approach	30%	5873	9.68	1.06	1.17	0.00	---	0.09	0.08	3233.87
	Climb out	85%	16667	21.80	1.06	0.14	0.03	---	0.15	0.14	3233.87
	Takeoff	100%	20794	28.43	1.06	0.16	0.00	---	0.14	0.12	3233.87
Notes: 3b, 5, 6, 8, 10, 12h											
RB211-524H	Idle (Taxi)	7%	2064	4.78	1.06	11.75	0.85	---	0.05	0.04	3233.87
	Approach	30%	5635	10.26	1.06	0.99	0.41	---	0.11	0.10	3233.87
	Climb out	85%	17222	46.31	1.06	0.38	0.38	---	0.13	0.12	3233.87
	Takeoff	100%	21667	65.84	1.06	0.87	0.39	---	0.13	0.11	3233.87
Notes: 3b, 5, 6, 8, 10, 12h											
RB211-524H-T	Idle (Taxi)	7%	2064	4.16	1.06	26.17	3.81	---	0.07	0.06	3233.87
	Approach	30%	6111	9.91	1.06	1.05	0.00	---	0.09	0.08	3233.87
	Climb out	85%	17619	23.19	1.06	0.14	0.02	---	0.15	0.14	3233.87
	Takeoff	100%	22302	31.19	1.06	0.18	0.00	---	0.14	0.12	3233.87
Notes: 3b, 5, 6, 8, 10, 12h											
RB211-535C	Idle (Taxi)	7%	1587	3.44	1.06	18.79	1.66	---	0.06	0.05	3233.87
	Approach	30%	4286	6.37	1.06	0.48	0.51	---	0.09	0.08	3233.87
	Climb out	85%	11667	24.89	1.06	0.27	0.16	---	0.08	0.07	3233.87
	Takeoff	100%	14286	33.71	1.06	0.70	0.29	---	0.10	0.09	3233.87
Notes: 3b, 5, 6, 8, 10, 12h											
RB211-535E4	Idle (Taxi)	7%	1429	3.46	1.06	13.31	0.43	---	0.05	0.05	3233.87
	Approach	30%	4127	6.78	1.06	1.14	0.05	---	0.06	0.06	3233.87
	Climb out	85%	11984	32.06	1.06	0.50	0.01	---	0.07	0.06	3233.87
	Takeoff	100%	14762	44.88	1.06	0.77	0.00	---	0.06	0.06	3233.87
Notes: 3b, 5, 6, 8, 10, 12h											
Spey Mk511	Idle (Taxi)	7%	1008	3.60	1.06	31.77	4.24	---	0.16	0.15	3233.87
	Approach	30%	2206	7.20	1.06	2.65	0.21	---	0.22	0.20	3233.87
	Climb out	85%	5762	17.30	1.06	0.63	0.14	---	0.24	0.22	3233.87
	Takeoff	100%	7071	22.70	1.06	0.12	0.10	---	0.23	0.21	3233.87
Notes: 3b (this is the commercial designation of the F113-RR-100 engine), 5, 6, 8, 10, 12h											
Spey Mk555	Idle (Taxi)	7%	762	3.70	1.06	29.30	2.14	---	0.18	0.16	3233.87
	Approach	30%	1754	6.80	1.06	3.70	0.33	---	0.35	0.32	3233.87
	Climb out	85%	4698	16.50	1.06	0.70	0.17	---	0.35	0.31	3233.87
	Takeoff	100%	5833	21.90	1.06	0.30	0.33	---	0.32	0.28	3233.87
Notes: 3b, 5, 6, 8, 10, 12h											

Table 2-8. Criteria Pollutants, Ozone Precursors, and Total HAPs (cont.)

Aircraft Engine	Power Setting	Percent Thrust/hp	Fuel Flow Rate (lb/hr)	Emission Factors (lb/1000lb fuel)							
				NO_X	SO_X[1]	CO	VOC	HAP's	PM_{10}	$PM_{2.5}$	CO_2e[2]
T53-L-11D	Ground Idle	---	145	1.58	1.06	31.51	66.80	---	1.44**(S)**	1.30**(S)**	3233.87
	Flight Idle	---	222	2.53	1.06	37.79	15.61	---	2.95**(S)**	2.66**(S)**	3233.87
	Normal Rated	---	645	6.43	1.06	6.83	0.66	---	0.31**(S)**	0.28**(S)**	3233.87
	Military	---	685	6.34	1.06	3.34	0.30	---	0.36**(S)**	0.32**(S)**	3233.87
	Takeoff	---	690	7.75	1.06	3.85	0.31	---	0.36**(S)**	0.32**(S)**	3233.87
Notes: 3i, 4q (for PM_{10} and $PM_{2.5}$ for all power settings), 5, 12h											
T53-L-13	Idle (Taxi)	7%	160	1.58	1.06	31.45	64.28	---	1.44	1.30	3233.87
	Approach	30%	227	2.52	1.06	37.71	15.02	---	2.95	2.66	3233.87
	Climb out	70%	694	6.33	1.06	3.59	0.30	---	0.31	0.28	3233.87
	Takeoff	90%	696	7.73	1.06	3.59	0.30	---	0.36	0.32	3233.87
Notes: 3m, 11, 12h											
T56 Series I	Idle (Taxi)	7%	829	7.33	1.06	5.73	0.86	---	0.12	0.11	3233.87
	Approach	30%	1036	7.12	1.06	4.70	0.61	---	0.22	0.20	3233.87
	Intermediate	70%	1824	9.61	1.06	2.84	0.31	---	0.28	0.25	3233.87
	Military	90%	2059	9.87	1.06	2.82	0.31	---	0.28	0.25	3233.87
Notes: 3m, 11, 12h											
T56 Series III	Idle (Taxi)	7%	986	6.05	1.06	6.50	0.90	---	0.12	0.11	3233.87
	Approach	30%	1262	9.10	1.06	2.79	0.44	---	0.19	0.17	3233.87
	Intermediate	70%	2210	12.19	1.06	1.47	0.26	---	0.24	0.22	3233.87
	Military	90%	2476	12.76	1.06	1.47	0.26	---	0.26	0.23	3233.87
Notes: 3m, 11, 12h											
T56-A-7	Idle (Taxi)	5%	724	7.58	1.06	5.06	0.08	0.062	3.64	1.88	3233.87
	Approach	15%	880	7.54	1.06	3.89	0.06	0.043	3.85	2.18	3233.87
	Intermediate	61%	1742	9.15	1.06	1.94	0.02	0.013	1.46	0.56	3233.87
	Military	90%	2262	12.46	1.06	2.30	0.01	0.003	1.22	0.33	3233.87
Notes: 3c, 10, 12e											
T56-A-9	Idle	7%	794	3.90	1.06	32.00	24.15	---	0.83	0.75	3233.87
	Approach	30%	1423(**C**)	4.40	1.06	22.20	14.26	---	0.97	0.87	3233.87
	Intermediate	70%	1825	9.20	1.06	2.40	0.58	---	0.51	0.46	3233.87
	Military	100%	1905	9.30	1.06	2.10	0.46	---	0.50	0.45	3233.87
Notes: 3g, 5, 12d											
T56-A-14	Idle (Taxi)	5%	324	3.72	1.06	30.39	15.85	---	0.43	0.39	3233.87
	Approach	15%	839	6.79	1.06	3.49	0.92	---	0.28	0.25	3233.87
	Intermediate	61%	1409	10.30	1.06	1.07	0.04	---	0.17	0.15	3233.87
	Military	90%	1563	12.05	1.06	0.95	0.04	---	0.16	0.14	3233.87
Notes: 3m, 12h											
T56-A-15	Idle (Taxi)	7%	794	3.90	1.06	32.00	24.15	---	0.83	0.75	3233.87
	Approach	30%	1423(**C**)	4.40	1.06	22.20	14.26	---	0.97	0.87	3233.87
	Intermediate	70%	1825	9.20	1.06	2.40	0.58	---	0.51	0.46	3233.87
	Military	90%	2302	9.30	1.06	2.10	0.46	---	0.50	0.45	3233.87
Notes: 3g, 5, 8, 12h											

Table 2-8. Criteria Pollutants, Ozone Precursors, and Total HAPs (cont.)

Aircraft Engine	Power Setting	Percent Thrust/hp	Fuel Flow Rate (lb/hr)	Emission Factors (lb/1000lb fuel)							
				NO_X	SO_X[1]	CO	VOC	HAP's	PM_{10}	$PM_{2.5}$	CO_2e[2]
T56-A-16	Ground Idle	---	756	6.35	1.06	5.65	1.40	---	0.83**(S)**	0.75**(S)**	3233.87
	Flight Idle	---	836	6.52	1.06	4.54	1.09	---	0.97**(S)**	0.87**(S)**	3233.87
	75%	---	1996	9.93	1.06	0.42	0.20	---	0.51**(S)**	0.46**(S)**	3233.87
	100%	---	2136	10.29	1.06	0.68	0.14	---	0.50**(S)**	0.45**(S)**	3233.87
	Military	---	2219	10.45	1.06	0.65	0.16	---	0.50**(S)**	0.45**(S)**	3233.87
Notes: 3i, 4r (for PM_{10} and $PM_{2.5}$ for all power settings), 5, 12h											
T58-GE-5	Idle	---	133	1.50	1.06	169.17	111.54	---	0.75	0.68	3233.87
	Normal Cruise	---	757	6.34	1.06	7.66	1.82	---	0.79	0.71	3233.87
	Intermediate (Military)	---	821	6.70	1.06	6.82	3.78	---	0.97	0.88	3233.87
	Power Takeoff	---	886	7.22	1.06	5.64	0.91	---	0.90	0.81	3233.87
Notes: 3a, 5, 12d											
T58-GE-8F	Idle	---	132	1.43	1.06	178.44	149.98	---	0.75**(S)**	0.68**(S)**	3233.87
	Approach	---	581	4.47	1.06	17.28	1.29	---	0.79**(S)**	0.71**(S)**	3233.87
	Cruise	---	627	4.68	1.06	14.13	0.92	---	0.79**(S)**	0.71**(S)**	3233.87
	Max Continuous	---	685	4.90	1.06	12.96	0.84	---	0.79**(S)**	0.71**(S)**	3233.87
	Takeoff	---	786	5.47	1.06	9.03	0.46	---	0.97**(S)**	0.88**(S)**	3233.87
Notes: 3i, 4o (PM_{10} and $PM_{2.5}$ at all power settings), 5, 12h											
T58-GE-16	Ground Idle	---	150	3.03	1.06	139.73	47.05	---	0.75**(S)**	0.68**(S)**	3233.87
	60% Normal	---	656	7.88	1.06	14.56	0.44	---	0.79**(S)**	0.71**(S)**	3233.87
	75% Normal	---	779	9.47	1.06	10.89	0.72	---	0.79**(S)**	0.71**(S)**	3233.87
	90% Normal	---	890	10.07	1.06	9.10	0.96	---	0.90**(S)**	0.81**(S)**	3233.87
	Military	---	1020	11.60	1.06	7.73	1.52	---	0.90**(S)**	0.81**(S)**	3233.87
Notes: 3i, 4o (PM_{10} and $PM_{2.5}$ at all power settings), 5, 12d											
T63-A-5A	Ground Idle	---	61	1.42	1.06	79.15	23.35	---	0.83**(S)**	0.75**(S)**	3233.87
	Flight Idle	---	70	1.89	1.06	61.83	12.02	---	0.83**(S)**	0.75**(S)**	3233.87
	30%	---	105	2.90	1.06	38.59	3.76	---	0.97**(S)**	0.87**(S)**	3233.87
	60%	---	157	4.11	1.06	20.79	0.78	---	0.51**(S)**	0.46**(S)**	3233.87
	Military	---	215	5.07	1.06	7.54	0.09	---	0.50**(S)**	0.45**(S)**	3233.87
Notes: 3i, 4r (PM_{10} and $PM_{2.5}$ at all power settings), 5, 12h											
T64-GE-6B	Idle	---	337	3.86	1.06	48.66	15.01	---	0.30	0.27	3233.87
	75% hp	---	1039	8.95	1.06	4.72	0.89	---	0.58	0.52	3233.87
	Normal Rated	---	1257	10.42	1.06	2.86	0.82	---	0.72	0.64	3233.87
	Intermediate (Military)	---	1390	11.15	1.06	2.30	0.74	---	0.79	0.71	3233.87
Notes: 3a, 4t (PM_{10} and $PM_{2.5}$ at all power settings), 5, 12h											
T64-GE-100	Ground Idle	2%	298	1.11	1.06	76.46	1.26	0.744	2.36	2.14	3233.87
	75% Normal	34%	941	6.85	1.06	7.85	0.05	0.033	1.97	0.45	3233.87
	Normal	81%	1698	9.46	1.06	2.21	0.01	0.004	1.61	0.88	3233.87
	Military	90%	1848	11.30	1.06	2.17	0.01	0.007	0.92	0.09	3233.87
Notes: 3c, 5, 12e											
T64-GE-413	Idle	---	260	2.62	1.06	51.83	19.87	---	2.36**(S)**	2.14**(S)**	3233.87
	75% hp	---	1287	8.54	1.06	1.94	0.40	---	1.97**(S)**	0.45**(S)**	3233.87
	Normal Rated	---	1511	9.65	1.06	1.20	0.38	---	1.61**(S)**	0.88**(S)**	3233.87
	Intermediate	---	1661	10.92	1.06	0.67	0.39	---	1.61**(S)**	0.88**(S)**	3233.87
	Maximum	---	1721	11.42	1.06	0.49	0.31	---	1.61**(S)**	0.88**(S)**	3233.87
Notes: 3i, 4t (PM_{10} and $PM_{2.5}$ at all power settings), 5, 12h											

Table 2-8. Criteria Pollutants, Ozone Precursors, and Total HAPs (cont.)

Aircraft Engine	Power Setting	Percent Thrust/hp	Fuel Flow Rate (lb/hr)	Emission Factors (lb/1000lb fuel)							
				NO_X	SO_X[1]	CO	VOC	HAP's	PM_{10}	$PM_{2.5}$	CO_2e[2]
T64-GE-415	Idle	---	269	2.12	1.06	74.33	28.00	---	2.36**(S)**	2.14**(S)**	3233.87
	75%	---	1493	8.09	1.06	2.10	0.15	---	1.61**(S)**	0.88**(S)**	3233.87
	Normal Rated	---	1730	9.29	1.06	1.50	0.09	---	1.61**(S)**	0.88**(S)**	3233.87
	Military	---	1916	9.99	1.06	1.29	0.32	---	0.92**(S)**	0.09**(S)**	3233.87
	Max. Rated	---	2005	10.83	1.06	1.47	0.22	---	0.92**(S)**	0.09**(S)**	3233.87
Notes: 3i, 4t (PM_{10} and $PM_{2.5}$ at all power settings), 5, 12h											
T76-G-10	Idle (Taxi)	---	238	7.40	1.06	23.80	8.51	---	0.38	0.34	3233.87
	Approach	---	476	8.50	1.06	17.20	0.92	---	0.50	0.45	3233.87
	Intermediate	---	794	9.90	1.06	5.90	0.12	---	0.63	0.57	3233.87
	Military	---	873	10.30	1.06	2.30	0.12	---	0.71	0.64	3233.87
Notes: 3g, 5, 7, 8, 12h											
T76-G-12	Idle (Taxi)	---	397	7.40	1.06	23.80	8.51	---	0.38	0.34	3233.87
	Approach	---	476	8.50	1.06	17.20	0.92	---	0.50	0.45	3233.87
	Intermediate	---	794	9.90	1.06	5.90	0.12	---	0.63	0.57	3233.87
	Military	---	857**(C)**	10.30	1.06	2.30	0.12	---	0.71	0.64	3233.87
Notes: 3g, 5, 7, 8, 12h											
T76-G-418	Idle (Taxi)	---	238	7.40	1.06	23.80	8.51	---	0.38	0.34	3233.87
	Approach	---	476	8.50	1.06	17.20	0.92	---	0.50	0.45	3233.87
	Intermediate	---	794	9.90	1.06	5.90	0.12	---	0.63	0.57	3233.87
	Military	---	873	10.30	1.06	2.30	0.12	---	0.71	0.64	3233.87
Notes: 3g, 5, 7, 8, 12h											
T76-G-419	Idle (Taxi)	---	397	7.40	1.06	23.80	8.51	---	0.38	0.34	3233.87
	Approach	---	476	8.50	1.06	17.20	0.92	---	0.50	0.45	3233.87
	Intermediate	---	794	9.90	1.06	5.90	0.12	---	0.63	0.57	3233.87
	Military	---	857**(C)**	10.30	1.06	2.30	0.12	---	0.71	0.64	3233.87
Notes: 3g, 5, 7, 8, 12h											
T400-CP-400	Ground Idle	---	136	2.21	1.06	27.94	10.99	---	0.44	0.40	3233.87
	Flight Idle	---	141	2.84	1.06	29.08	8.97	---	0.41**(C)**	0.37**(C)**	3233.87
	Cruise	---	279	4.66	1.06	1.79	0.00	---	0.36	0.32	3233.87
	Intermediate (Military)	---	406	5.91	1.06	0.00	0.00	---	0.25	0.22	3233.87
	Maximum	---	1069	11.51	1.06	0.00	0.22	---	0.28	0.25	3233.87
Notes: 3a, 4a (for PM_{10} and $PM_{2.5}$ at Flight Idle power setting only), 5, 12h											
T406-AD-400	Idle	---	362	4.15	1.06	8.35	0.10	---	1.58	1.42	3233.87
	Flight Idle	---	663	6.05	1.06	3.47	0.02	---	1.58	1.42	3233.87
	Intermediate	---	948	7.87	1.06	1.82	0.02	---	1.58	1.42	3233.87
	Max Continuous	---	2507	18.03	1.06	0.29	0.01	---	1.58	1.42	3233.87
Notes: 3f (this is the military designation of the AE1107C engine), 8, 12d											
T700-GE-401, -401C	Idle	---	432	5.36	1.06	10.46	0.54	---	0.12	0.11	3233.87
	Approach	---	348	5.36	1.06	10.46	0.54	---	0.21	0.19	3233.87
	Climb out	---	443	5.60	1.06	10.11	0.53	---	0.46	0.41	3233.87
	Takeoff	---	442	5.59	1.06	10.15	0.53	---	0.53	0.48	3233.87
Notes: 3m, 12h											

Table 2-8. Criteria Pollutants, Ozone Precursors, and Total HAPs (cont.)

Aircraft Engine	Power Setting	Percent Thrust/hp	Fuel Flow Rate (lb/hr)	Emission Factors (lb/1000lb fuel)							
				NO_X	SO_X[1]	CO	VOC	HAP's	PM_{10}	$PM_{2.5}$	CO_2e[2]
T700-GE-700	Ground Idle	4%	134	3.36	1.06	46.24	0.50	0.334	1.48	0.98	3233.87
	Flight Idle	56%	469	10.95	1.06	5.12	0.02	0.007	1.26	0.07	3233.87
	Flight Max	82%	626	11.87	1.06	3.51	0.01	0.003	2.22	0.93	3233.87
	Overspeed	100%	725	11.43	1.06	2.81	0.01	0.007	2.61	1.21	3233.87
Notes: 3c, 10, 12e											
TAY Mk611-8, -Mk620-15	Idle (Taxi)	7%	873	2.50	1.06	24.10	3.91	---	0.16	0.15	3233.87
	Approach	30%	1825	5.70	1.06	3.90	1.04	---	0.52	0.47	3233.87
	Climb out	85%	5000	16.80	1.06	0.80	0.35	---	0.48	0.43	3233.87
	Takeoff	100%	6032	21.10	1.06	0.70	0.92	---	0.56	0.50	3233.87
Notes: 3b, 5, 6, 8, 10, 12h											
TAY Mk650-15	Idle (Taxi)	7%	944	1.70	1.06	33.77	3.78	---	0.06	0.06	3233.87
	Approach	30%	2016	4.55	1.06	6.54	1.01	---	0.14	0.12	3233.87
	Climb out	85%	5675	16.47	1.06	2.01	0.47	---	0.41	0.37	3233.87
	Takeoff	100%	6937	19.81	1.06	1.74	0.43	---	0.42	0.38	3233.87
Notes: 3b, 5, 6, 8, 10, 12h											
TF30-P-3	Idle (Taxi)	---	873	2.30	1.06	72.00	71.30	---	0.01	0.01	3233.87
	Approach	---	2064	4.80	1.06	9.20	2.42	---	0.05	0.05	3233.87
	Intermediate	---	4921	9.40	1.06	1.30	0.12	---	0.45	0.41	3233.87
	Military	---	6191	12.00	1.06	0.80	0.03	---	0.40	0.36	3233.87
	Afterburner	---	38413	3.10	1.06	4.06	0.01	---	0.15	0.14	3233.87
Notes: 3g, 5, 7, 8, 12h											
TF30-P-6B	Idle (Taxi)	<75%	689	1.31	1.06	68.21	21.53	---	0.02**(S)**	0.02**(S)**	3233.87
	75% Thrust	75%	3550	6.68	1.06	6.31	3.40	---	0.12**(S)**	0.11**(S)**	3233.87
	Normal Rated	75-99%	4700	8.06	1.06	5.55	1.61	---	0.44**(S)**	0.40**(S)**	3233.87
	Intermediate (Military)	100%	6835	12.04	1.06	3.09	1.16	---	0.35**(S)**	0.32**(S)**	3233.87
Notes: 3a, 4u (for PM_{10} and $PM_{2.5}$ at all power settings), 5, 11 (assumes 100% thrust at Intermediate setting), 12h											
TF30-P-7	Idle (Taxi)	---	952	3.00	1.06	53.00	34.50	---	0.02	0.02	3233.87
	Approach	---	2064	6.10	1.06	11.50	3.68	---	0.12	0.11	3233.87
	Intermediate	---	5714	14.00	1.06	1.20	0.23	---	0.44	0.40	3233.87
	Military	---	7222	20.00	1.06	0.80	0.12	---	0.35	0.32	3233.87
	Afterburner	---	38413	3.10	1.06	4.00	0.01	---	0.15	0.14	3233.87
Notes: 3g, 5, 7, 8, 12h											
TF30-P-9	Idle (Taxi)	---	952	3.00	1.06	53.00	34.50	---	0.02	0.02	3233.87
	Approach	---	2064	6.10	1.06	11.50	3.68	---	0.12	0.11	3233.87
	Intermediate	---	5714	14.00	1.06	1.20	0.23	---	0.44	0.40	3233.87
	Military	---	8730	20.00	1.06	0.80	0.12	---	0.35	0.32	3233.87
	Afterburner	---	54525	3.10	1.06	4.00	0.01	---	0.15	0.14	3233.87
Notes: 3g, 5, 12h											
TF30-P-100	Idle (Taxi)	---	1260	2.86	1.06	47.62	21.72	---	26.27	23.64	3233.87
	Approach	---	4562**(C)**	10.95**(C)**	1.06	1.70**(C)**	0.41**(C)**	---	24.88**(C)**	22.39**(C)**	3233.87
	Intermediate	---	6650	20.00	1.06	0.71	0.12	---	24.00	21.60	3233.87
	Military	---	7120	28.01	1.06	0.70	0.11	---	8.34	7.51	3233.87
	Afterburner	---	42850	4.47	1.06	24.80	2.30	---	5.36	4.82	3233.87
Notes: 3a, 5, 11 (assumes 100% thrust at Takeoff power setting), 12h											

Table 2-8. Criteria Pollutants, Ozone Precursors, and Total HAPs (cont.)

Aircraft Engine	Power Setting	Percent Thrust/hp	Fuel Flow Rate (lb/hr)	Emission Factors (lb/1000lb fuel)							
				NO_X	SO_X[1]	CO	VOC	HAP's	PM_{10}	$PM_{2.5}$	CO_2e[2]
TF30-P-103	Idle (Taxi)	<30%	827	4.00	1.06	100.00	88.44	---	0.51	0.46	3233.87
	30%	30%	2003	7.00	1.06	36.20	12.54	---	0.82	0.74	3233.87
	75%	75%	4119	15.10	1.06	5.50	0.36	---	0.20	0.18	3233.87
	100%	100%	5541	20.10	1.06	2.10	0.10	---	16.34	14.70	3233.87
	Afterburner-1	>100%	14292	11.20	1.06	77.20	32.20	---	35.69**(C)**	31.84**(C)**	3233.87
Notes: 3o, 4a (PM_{10} and $PM_{2.5}$ at afterburner setting only), 5, 6, 8, 10, 12c											
TF30-P-109	Idle (Taxi)	5%	761	2.93	1.06	48.49	7.44	3.242	1.24	1.11	3233.87
	Approach	23%	1727	6.19	1.06	20.73	2.35	1.279	1.52	1.37	3233.87
	Intermediate	47%	2921	9.58	1.06	5.17	0.80	0.072	1.64	1.47	3233.87
	Military	99%	6263	23.63	1.06	0.71	0.87	0.023	0.92	0.82	3233.87
	Afterburner-5	>99%	38460	4.89	1.06	6.19	2.50	0.034	0.51	0.46	3233.87
Notes: 3l, 8, 12e											
TF30-P-412A	Idle (Taxi)	---	999	2.40	1.06	68.17	44.20	---	26.53	23.87	3233.87
	75% rpm	---	1448	3.66	1.06	38.60	11.12	---	24.03	21.63	3233.87
	90% rpm	---	3597	9.62	1.06	6.34	0.19	---	15.01	13.51	3233.87
	Intermediate (Military)	---	7394	16.66	1.06	2.12	0.11	---	8.34	7.51	3233.87
	Afterburner	---	40000	6.75	1.06	15.00	1.15	---	17.33	15.60	3233.87
Notes: 3a, 5, 12h											
TF33-P-3, -P-5	Idle (Taxi)	<30%	846	1.77	1.06	88.53	105.76	---	5.20	4.68	3233.87
	Approach	30%	3797	7.30	1.06	9.01	4.36	---	13.98	12.59	3233.87
	Climb out	85%	7323	9.00	1.06	1.80	0.46	---	14.00	12.60	3233.87
	Takeoff	100%	9979	11.00	1.06	1.30	0.35	---	8.00	7.20	3233.87
Notes: 3a, 5, 8, 11, 12h											
TF33-P-7	Idle (Taxi)	4%	1093	0.78	1.06	134.96	5.32	4.640	6.13	3.80	3233.87
	Approach	45%	4884	7.12	1.06	9.67	0.24	0.190	3.68	1.46	3233.87
	Intermediate	58%	6356	8.10	1.06	4.16	0.06	0.041	5.28	1.72	3233.87
	Military	73%	8264	10.29	1.06	1.49	0.02	0.011	3.58	1.23	3233.87
Notes: 3c, 5, 12e											
TF33-P-9	Idle (Taxi)	---	1120	1.39	1.06	95.06	90.91	---	4.98	4.48	3233.87
	Approach	---	4140	6.37	1.06	5.24	1.37	---	3.55	3.20	3233.87
	Intermediate	---	8960	7.88	1.06	2.11	1.50	---	3.15	2.84	3233.87
	Military	---	9630	12.08	1.06	0.00	0.55	---	3.67	3.30	3233.87
Notes: 3f, 5, 8, 12d											
TF33-P-100	Idle (Taxi)	---	1108	1.50	1.06	136.96	131.16	---	6.13	5.52	3233.87
	Approach	---	2794	6.22	1.06	14.60	3.62	---	5.46	4.91	3233.87
	Intermediate	---	8069	8.47	1.06	2.96	0.39	---	5.29	4.76	3233.87
	Military	---	10856	11.49	1.06	1.19	0.25	---	2.93	2.64	3233.87
Notes: 3f, 8, 12h											
TF33-P-102	Idle (Taxi)	5%	1114	1.39	1.06	95.02	3.42	2.610	4.96	4.06	3233.87
	Approach	49%	4737	6.37	1.06	5.24	0.11	0.087	3.55	1.66	3233.87
	Intermediate	59%	5782	7.88	1.06	2.11	0.06	0.032	3.15	1.42	3233.87
	Military	75%	7561	12.08	1.06	0.00	0.02	0.003	2.52	1.02	3233.87
Notes: 3c, 5, 12e											

Table 2-8. Criteria Pollutants, Ozone Precursors, and Total HAPs (cont.)

Aircraft Engine	Power Setting	Percent Thrust/hp	Fuel Flow Rate (lb/hr)	Emission Factors (lb/1000lb fuel)							
				NO_X	SO_X[1]	CO	VOC	HAP's	PM_{10}	$PM_{2.5}$	CO_2e[2]
TF33-P-102A	Idle (Taxi)	7%	1065	1.80	1.06	117.03	106.96	---	4.98	4.48	3233.87
	Approach	30%	3912	5.84	1.06	12.37	1.74	---	3.55	3.20	3233.87
	Intermediate	70%	6985	8.74	1.06	2.01	0.95	---	3.15	2.84	3233.87
	Military	100%	8756	12.39	1.06	0.45	0.53	---	3.67	3.30	3233.87
Notes: 3f, 8, 11, 12h											
TF33-P-103	Idle (Taxi)	---	900	1.39	1.06	95.06	90.91	---	4.98	4.48	3233.87
	Approach	---	3800	6.37	1.06	5.24	1.37	---	3.55	3.20	3233.87
	Intermediate	---	6240	7.88	1.06	2.11	1.50	---	3.15	2.84	3233.87
	Military	---	7440	12.08	1.06	0.00	0.55	---	3.67	3.30	3233.87
Notes: 3f, 5, 8, 12d											
TF34-GE-100	Idle (Taxi)	---	390	2.10	1.06	106.70	39.45	---	8.13**(S)**	3.60**(S)**	3233.87
	Approach	---	920	5.70	1.06	16.30	2.19	---	6.21**(S)**	2.12**(S)**	3233.87
	Intermediate	---	460	2.60	1.06	78.00	23.35	---	8.93**(S)**	6.95**(S)**	3233.87
	Military	---	2710	10.70	1.06	2.20	0.12	---	2.66**(S)**	1.68**(S)**	3233.87
Notes: 3g, 4v (PM_{10} and $PM_{2.5}$ at all power settings), 5, 12h											
TF34-GE-100A	Idle (Taxi)	7%	498	0.32	1.06	65.62	2.24	2.030	8.13	3.60	3233.87
	Approach	28%	933	3.09	1.06	27.92	1.44	1.340	6.21	2.12	3233.87
	Intermediate	46%	1512	5.61	1.06	8.88	0.13	0.087	8.93	6.95	3233.87
	Military	78%	2628	9.11	1.06	3.94	0.07	0.040	2.66	1.68	3233.87
Notes: 3c, 10, 12e											
TF34-GE-400	Idle (Taxi)	10%**(C)**	458	1.69	1.06	90.98	17.24	---	8.13**(S)**	3.60**(S)**	3233.87
	Approach	30%**(C)**	1201**(C)**	2.98**(C)**	1.06	72.08**(C)**	13.51**(C)**	---	6.21**(S)**	2.12**(S)**	3233.87
	Intermediate	70%**(C)**	2686**(C)**	5.57**(C)**	1.06	34.29**(C)**	6.05**(C)**	---	2.66**(S)**	1.68**(S)**	3233.87
	Military	100%**(C)**	3800	7.51	1.06	5.95	0.45	---	2.66**(S)**	1.68**(S)**	3233.87
Notes: 3i, 4v (PM_{10} and $PM_{2.5}$ at all power settings), 5, 12h											
TF39-GE-1C	Idle (Taxi)	7%	1448	3.37	1.06	58.43	3.44	2.590	2.80	2.49	3233.87
	Approach	76%	10477	24.91	1.06	0.77	0.03	0.014	1.20	0.44	3233.87
	Intermediate	87%	12541	28.16	1.06	1.53	0.03	0.010	0.89	0.37	3233.87
	Military	94%	13862	32.66	1.06	1.29	0.03	0.014	1.18	0.77	3233.87
Notes: 3c, 10, 12e											
TF41-A-1	Idle (Taxi)	---	1032	1.50	1.06	119.00	105.80	---	0.15	0.14	3233.87
	Approach	---	3492	6.80	1.06	10.20	2.53	---	0.36	0.32	3233.87
	Intermediate	---	5873	12.00	1.06	3.70	0.46	---	0.52	0.47	3233.87
	Military	---	8413	21.00	1.06	1.80	0.23	---	0.67	0.60	3233.87
Notes: 3g, 5, 12h											
TF41-A-2	Idle (Taxi)	<30%	1047	4.00	1.06	176.00	114.54	---	0.65	0.59	3233.87
	30%	30%	2704	8.90	1.06	45.00	11.62	---	0.73	0.66	3233.87
	75%	75%	5810	23.80	1.06	4.70	0.10	---	16.94	15.25	3233.87
	100%	100%	8086	32.90	1.06	3.20	0.09	---	28.60	25.74	3233.87
Notes: 3o, 5, 6, 8, 10, 12c											

Table 2-8. Criteria Pollutants, Ozone Precursors, and Total HAPs (cont.)

Aircraft Engine	Power Setting	Percent Thrust/hp	Fuel Flow Rate (lb/hr)	Emission Factors (lb/1000lb fuel)							
				NO_X	SO_X[1]	CO	VOC	HAP's	PM_{10}	$PM_{2.5}$	CO_2e[2]
TFE731-2, -2A	Idle (Taxi)	---	206	3.50	1.06	47.80	8.54	---	0.13**(S)**	0.12**(S)**	3233.87
	Approach	---	571	6.90	1.06	15.56	1.41	---	0.13**(S)**	0.12**(S)**	3233.87
	Intermediate	---	1476	16.08	1.06	1.62	0.07	---	0.09**(S)**	0.08**(S)**	3233.87
	Military	---	1786	19.15	1.06	1.13	0.06	---	0.09**(S)**	0.08**(S)**	3233.87
Notes: 3f, 4w (PM_{10} and $PM_{2.5}$ at all power settings), 12h											
TFE731-2-2B	Idle (Taxi)	7%	190	2.82	1.06	58.60	23.05	---	0.13**(S)**	0.12**(S)**	3233.87
	Approach	30%	532	5.90	1.06	22.38	4.90	---	0.09**(S)**	0.08**(S)**	3233.87
	Climb out	85%	1373	13.08	1.06	2.03	0.15	---	0.09**(S)**	0.08**(S)**	3233.87
	Takeoff	100%	1627	15.25	1.06	1.39	0.13	---	0.08**(S)**	0.08**(S)**	3233.87
Notes: 3b, 4w (PM_{10} and $PM_{2.5}$ for all power settings), 5, 6, 8, 10, 12h											
TFE731-3	Idle (Taxi)	7%	206	3.72	1.06	47.70	10.40	---	0.13**(S)**	0.12**(S)**	3233.87
	Approach	30%	571	6.92	1.06	15.56	1.62	---	0.09**(S)**	0.08**(S)**	3233.87
	Climb out	85%	1476	16.02	1.06	1.62	0.08	---	0.09**(S)**	0.08**(S)**	3233.87
	Takeoff	100%	1786	19.15	1.06	1.13	0.07	---	0.08**(S)**	0.08**(S)**	3233.87
Notes: 3b, 4w (PM_{10} and $PM_{2.5}$ for all power settings), 5, 6, 8, 10, 12h											
TIO-540-J2B2	Idle (Taxi)	<40%	25	0.39	1.06	1293.70	78.29	---	60.00**(S)**	54.00**(S)**	3233.87
	Approach	40%	99	1.39	1.06	1261.57	15.39	---	47.95**(S)**	43.16**(S)**	3233.87
	Climb out	75-100%	205	0.24	1.06	1470.90	19.12	---	40.00**(S)**	36.00**(S)**	3233.87
	Takeoff	100%	260	0.36	1.06	1442.05	14.21	---	20.00**(S)**	18.00**(S)**	3233.87
Notes: 3a, 4b (PM_{10} and $PM_{2.5}$ at all power settings), 5, 11, 12h											
TPE331-2	Idle (Taxi)	<30%	105	2.57	1.06	64.10	104.92	---	2.68**(S)**	2.41**(S)**	3233.87
	Approach	30%	220	8.27	1.06	16.59	3.08	---	2.40**(S)**	2.16**(S)**	3233.87
	Climb out	90%	372	9.92	1.06	1.37	0.46	---	1.47**(S)**	1.32**(S)**	3233.87
	Takeoff	100%	405	10.22	1.06	0.94	0.45	---	1.75**(S)**	1.57**(S)**	3233.87
Notes: 3a, 4y (PM_{10} and $PM_{2.5}$ at all power settings), 5, 11, 12h											
TPE331-3	Idle (Taxi)	<30%	112	2.86	1.06	61.52	90.97	---	2.68	2.41	3233.87
	Approach	30%	250	9.92	1.06	6.96	0.74	---	2.40	2.16	3233.87
	Climb out	90%	409	11.86	1.06	0.98	0.17	---	1.47	1.32	3233.87
	Takeoff	100%	458	12.36	1.06	0.76	0.13	---	1.75	1.57	3233.87
Notes: 3a, 5, 11, 12h											
Trent 553-61	Idle (Taxi)	7%	1825	5.96	1.06	10.50	0.16	---	0.04	0.04	3233.87
	Approach	30%	4762	11.37	1.06	0.66	0.05	---	0.05	0.05	3233.87
	Climb out	85%	13730	30.98	1.06	0.44	0.01	---	0.06	0.05	3233.87
	Takeoff	100%	16746	40.55	1.06	0.18	0.02	---	0.06	0.05	3233.87
Notes: 3b, 5, 6, 8, 10, 12h											
Trent 556-61	Idle (Taxi)	7%	1825	6.09	1.06	9.96	0.15	---	0.04	0.04	3233.87
	Approach	30%	4921	11.68	1.06	0.54	0.05	---	0.05	0.05	3233.87
	Climb out	85%	14524	33.25	1.06	0.38	0.01	---	0.06	0.05	3233.87
	Takeoff	100%	17778	44.77	1.06	0.17	0.02	---	0.06	0.05	3233.87
Notes: 3b, 5, 6, 8, 10, 12h											

Table 2-8. Criteria Pollutants, Ozone Precursors, and Total HAPs (cont.)

Aircraft Engine	Power Setting	Percent Thrust/hp	Fuel Flow Rate (lb/hr)	Emission Factors (lb/1000lb fuel)							
				NO_X	SO_X[1]	CO	VOC	HAP's	PM_{10}	$PM_{2.5}$	CO_2e[2]
Trent 768	Idle (Taxi)	7%	2143	4.52	1.06	20.22	2.17	---	0.05	0.05	3233.87
	Approach	30%	6429	10.01	1.06	1.02	0.01	---	0.06	0.05	3233.87
	Climb out	85%	19286	24.66	1.06	0.15	0.01	---	0.08	0.07	3233.87
	Takeoff	100%	26572	31.25	1.06	0.18	0.00	---	0.07	0.06	3233.87
Notes: 3b, 5, 6, 8, 10, 12h											
Trent 772	Idle (Taxi)	7%	2222	4.71	1.06	17.94	1.68	---	0.05	0.05	3233.87
	Approach	30%	6746	10.30	1.06	0.89	0.01	---	0.06	0.05	3233.87
	Climb out	85%	20476	26.44	1.06	0.16	0.00	---	0.08	0.07	3233.87
	Takeoff	100%	25397	34.38	1.06	0.20	0.00	---	0.07	0.06	3233.87
Notes: 3b, 5, 6, 8, 10, 12h											
Trent 875	Idle (Taxi)	7%	2222	4.64	1.06	19.66	2.05	---	0.05	0.05	3233.87
	Approach	30%	6984	10.43	1.06	0.86	0.00	---	0.05	0.05	3233.87
	Climb out	85%	20397	26.55	1.06	0.16	0.00	---	0.06	0.05	3233.87
	Takeoff	100%	24603	33.32	1.06	0.19	0.00	---	0.06	0.05	3233.87
Notes: 3b, 5, 6, 8, 10, 12h											
Trent 877	Idle (Taxi)	7%	2222	4.75	1.06	18.42	1.78	---	0.05	0.05	3233.87
	Approach	30%	7143	10.59	1.06	0.80	0.00	---	0.05	0.05	3233.87
	Climb out	85%	21111	27.59	1.06	0.16	0.00	---	0.06	0.05	3233.87
	Takeoff	100%	25476	34.76	1.06	0.20	0.00	---	0.05	0.05	3233.87
Notes: 3b, 5, 6, 8, 10, 12h											
Trent 884	Idle (Taxi)	7%	2460	5.04	1.06	15.19	1.15	---	0.05	0.04	3233.87
	Approach	30%	7698	11.07	1.06	0.65	0.00	---	0.05	0.05	3233.87
	Climb out	85%	22937	30.63	1.06	0.18	0.00	---	0.06	0.05	3233.87
	Takeoff	100%	28254	40.05	1.06	0.24	0.00	---	0.05	0.05	3233.87
Notes: 3b, 5, 6, 8, 10, 12h											
Trent 892	Idle (Taxi)	7%	2381	5.33	1.06	13.07	0.81	---	0.05	0.04	3233.87
	Approach	30%	7937	11.58	1.06	0.57	0.00	---	0.05	0.05	3233.87
	Climb out	85%	24603	33.30	1.06	0.20	0.00	---	0.06	0.05	3233.87
	Takeoff	100%	31032	45.70	1.06	0.28	0.01	---	0.05	0.05	3233.87
Notes: 3b, 5, 6, 8, 10, 12h											
Trent 895	Idle (Taxi)	7%	2619	5.11	1.06	14.71	1.02	---	0.05	0.04	3233.87
	Approach	30%	8333	11.39	1.06	0.54	0.00	---	0.05	0.05	3233.87
	Climb out	85%	25318	34.29	1.06	0.19	0.00	---	0.06	0.05	3233.87
	Takeoff	100%	31984	47.79	1.06	0.27	0.02	---	0.05	0.05	3233.87
Notes: 3b, 5, 6, 8, 10, 12h											
Trent 970-84	Idle (Taxi)	7%	2381	5.10	1.06	15.10	0.23	---	0.04	0.04	3233.87
	Approach	30%	5556	11.40	1.06	1.40	0.00	---	0.05	0.05	3233.87
	Climb out	85%	17460	29.10	1.06	0.20	0.00	---	0.06	0.05	3233.87
	Takeoff	100%	20638	37.20	1.06	0.40	0.00	---	0.05	0.05	3233.87
Notes: 3b, 5, 6, 8, 10, 12h											

Table 2-8. Criteria Pollutants, Ozone Precursors, and Total HAPs (cont.)

Aircraft Engine	Power Setting	Percent Thrust/hp	Fuel Flow Rate (lb/hr)	Emission Factors (lb/1000lb fuel)							
				NO_X	SO_X[1]	CO	VOC	HAP's	PM_{10}	$PM_{2.5}$	CO_2e[2]
Trent 972-84	Idle (Taxi)	7%	2143	5.00	1.06	15.94	0.28	---	0.04	0.04	3233.87
	Approach	30%	5952	11.80	1.06	1.40	0.00	---	0.05	0.05	3233.87
	Climb out	85%	17699	29.60	1.06	0.30	0.00	---	0.06	0.05	3233.87
	Takeoff	100%	21349	38.80	1.06	0.40	0.00	---	0.05	0.05	3233.87
Notes: 3b, 5, 6, 8, 10, 12h											
Trent 1000-A	Idle (Taxi)	7%	1881	5.40	1.06	8.73	0.07	---	0.04	0.04	3233.87
	Approach	30%	4960	13.29	1.06	0.77	0.00	---	0.06	0.05	3233.87
	Climb out	85%	14897	35.87	1.06	0.45	0.00	---	0.05	0.05	3233.87
	Takeoff	100%	18111	46.67	1.06	0.53	0.00	---	0.05	0.04	3233.87
Notes: 3b, 5, 6, 8, 10, 12h											
Trent 1000-C	Idle (Taxi)	7%	1952	5.66	1.06	7.66	0.05	---	0.04	0.04	3233.87
	Approach	30%	5302	13.86	1.06	0.68	0.00	---	0.06	0.05	3233.87
	Climb out	85%	16254	40.33	1.06	0.48	0.00	---	0.05	0.05	3233.87
	Takeoff	100%	19905	53.54	1.06	0.51	0.00	---	0.05	0.04	3233.87
Notes: 3b, 5, 6, 8, 10, 12h											
Trent 1000-E	Idle (Taxi)	7%	1762	5.06	1.06	10.63	0.10	---	0.04	0.04	3233.87
	Approach	30%	4524	12.54	1.06	0.92	0.00	---	0.05	0.05	3233.87
	Climb out	85%	13167	30.55	1.06	0.43	0.00	---	0.06	0.05	3233.87
	Takeoff	100%	15929	39.17	1.06	0.47	0.00	---	0.05	0.05	3233.87
Notes: 3b, 5, 6, 8, 10, 12h											
TSIO-360-C	Idle (Taxi)	7%	12	1.91	1.06	592.17	159.00	---	60.00**(S)**	54.00**(S)**	3233.87
	Approach	30%	61	3.77	1.06	995.08	13.01	---	47.95**(S)**	43.16**(S)**	3233.87
	Climb out	85%	100	4.32	1.06	960.80	10.98	---	40.00**(S)**	36.00**(S)**	3233.87
	Takeoff	100%	133	2.71	1.06	1081.95	10.55	---	20.00**(S)**	18.00**(S)**	3233.87
Notes: 3a, 4b (PM_{10} and $PM_{2.5}$ at all power settings), 5, 10, 12h											
V2500-A1	Idle (Taxi)	7%	984	5.91	1.06	7.76	0.25	---	0.13**(S)**	0.12**(S)**	3233.87
	Approach	30%	2651	13.45	1.06	0.77	0.17	---	0.20**(S)**	0.18**(S)**	3233.87
	Climb out	85%	7333	30.82	1.06	0.55	0.13	---	0.20**(S)**	0.18**(S)**	3233.87
	Takeoff	100%	8833	37.13	1.06	0.55	0.12	---	0.14**(S)**	0.13**(S)**	3233.87
Notes: 3b, 4x (PM_{10} and $PM_{2.5}$ at all power settings), 5, 6, 8, 10, 12a											
V2522-A5	Taxi (Idle)	7%	937	4.50	1.06	13.42	0.12	---	0.15	0.13	3233.87
	Approach	30%	2468	8.70	1.06	2.60	0.07	---	0.19	0.17	3233.87
	Climb out	85%	6484	20.80	1.06	0.67	0.05	---	0.24	0.21	3233.87
	Takeoff	100%	7706	24.50	1.06	0.57	0.05	---	0.16	0.14	3233.87
Notes: 3b, 5, 6, 8, 10, 12a											
V2524-A5	Idle (Taxi)	7%	976	4.70	1.06	12.64	0.12	---	0.15	0.13	3233.87
	Approach	30%	2603	9.00	1.06	2.37	0.07	---	0.19	0.18	3233.87
	Climb out	85%	6889	22.00	1.06	0.63	0.05	---	0.22	0.20	3233.87
	Takeoff	100%	8270	26.20	1.06	0.54	0.05	---	0.15	0.14	3233.87
Notes: 3b, 5, 6, 8, 10, 12a											

Table 2-8. Criteria Pollutants, Ozone Precursors, and Total HAPs (cont.)

Aircraft Engine	Power Setting	Percent Thrust/hp	Fuel Flow Rate (lb/hr)	Emission Factors (lb/1000lb fuel)							
				NO_X	SO_X[1]	CO	VOC	HAP's	PM_{10}	$PM_{2.5}$	CO_2e[2]
V2525-D5	Taxi (Idle)	7%	1016	4.70	1.06	12.43	0.12	---	0.15	0.13	3233.87
	Approach	30%	2532	8.90	1.06	2.44	0.07	---	0.20	0.18	3233.87
	Climb out	85%	6984	22.30	1.06	0.62	0.05	---	0.23	0.20	3233.87
	Takeoff	100%	8357	26.50	1.06	0.53	0.05	---	0.15	0.14	3233.87
Notes: 3b, 5, 6, 8, 10, 12a											
V2527-A5	Idle (Taxi)	7%	1018	4.70	1.06	12.43	0.12	---	0.15	0.13	3233.87
	Approach	30%	2538	8.90	1.06	2.44	0.07	---	0.20	0.18	3233.87
	Climb out	85%	7001	22.30	1.06	0.62	0.05	---	0.23	0.20	3233.87
	Takeoff	100%	8378	26.50	1.06	0.53	0.05	---	0.15	0.14	3233.87
Notes: 3b, 5, 6, 8, 10, 12a											
V2528-D5	Taxi (Idle)	7%	1063	4.90	1.06	11.53	0.12	---	0.13	0.12	3233.87
	Approach	30%	2802	9.60	1.06	2.03	0.07	---	0.20	0.18	3233.87
	Climb out	85%	7905	25.10	1.06	0.56	0.05	---	0.20	0.18	3233.87
	Takeoff	100%	9595	30.50	1.06	0.47	0.05	---	0.14	0.13	3233.87
Notes: 3b, 5, 6, 8, 10, 12a											
V2530-A5	Idle (Taxi)	7%	1095	5.00	1.06	10.95	0.12	---	0.13	0.12	3233.87
	Approach	30%	2992	10.10	1.06	1.81	0.06	---	0.20	0.18	3233.87
	Climb out	85%	8548	27.10	1.06	0.52	0.05	---	0.19	0.17	3233.87
	Takeoff	100%	10564	33.80	1.06	0.45	0.05	---	0.14	0.13	3233.87
Notes: 3b, 5, 6, 8, 10, 12a											
V2533-A5	Taxi (Idle)	7%	1082	5.24	1.06	9.32	0.12	---	0.13	0.12	3233.87
	Approach	30%	3096	10.83	1.06	1.65	0.06	---	0.21	0.19	3233.87
	Climb out	85%	9085	28.67	1.06	0.52	0.05	---	0.18	0.17	3233.87
	Takeoff	100%	11318	36.48	1.06	0.46	0.05	---	0.13	0.12	3233.87
Notes: 3b, 5, 6, 8, 10, 12a											

Notes for Table 2-8 on the following page.

Notes for Table 2-8:

1. The Emission Factors for Sulfur assume JP-8 used as the fuel. The value is a national average for sulfur in JP-8.
2. The Greenhouse gas (GHG) emission factors are the total of CO_2, CH_4, and N_2O with individual emission factors of 9.75kg/gal, 0.405g/gal, and 0.081 g/gal respectively. CH_4 and N_2O were converted to equivalent CO_2 (CO_2e) using a global warming potential (GWP) value of 25 for CH_4 and 298 for N_2O. These were added to the CO_2 and are presented as the GHG emission factors in units of lb/1000lb fuel. JP-8 with a density of 6.67lb/gal was used for unit conversion.
3. The Emission factors were found in the following sources:
   a. SOURCE: *Air Pollutant Emission Factors for Military and Civil Aircraft*, EPA-450/3-78-117, October 1978.
   b. SOURCE: *Airport Air Quality Manual*, International Civil Aviation Organization, 2011.
   c. SOURCE: *Aircraft Engine and Auxiliary Power Unit Emissions* Volumes I-III, March 1999, IERA-RS-BR-TR-1999-0006.
   d. SOURCE: *Aircraft Engine and Auxiliary Power Unit Emissions Testing Final Report Addendum F119-PW-100* June 2002, IERA-RS-BR-SR-2002-0006.
   e. SOURCE: *Engine and Hush House Emissions from a F100-PW-200 Jet Engine Tested at Kelly AFB*, TX Final Volume I February 1997.
   f. SOURCE: Air Emissions Inventory Guidance Document for Mobile Sources at Air Force Installations January 2002, IERA-RS-BR-SR-2001-0010.
   g. SOURCE: *Aircraft Engine Emissions Estimator*, AFESC, September 1985.
   h. SOURCE: *Collection and Assessment of Aircraft Emissions*, US EPA, October 1971.
   i. SOURCE: *Summary Tables of Gaseous and Particulate Emissions from Aircraft Engines*, Aircraft Environmental Support Office.
   j. SOURCE: *Clean Air Act Emission Testing of the T-38C Aircraft Engines* September 2002, IERA-RS-BR-SR-2003-001.
   k. SOURCE: *PT6A-68 Emissions Measurement Program Summary, September 2002*, IERA-RS-BR-SR-2003-0003.
   l. SOURCE: *Engine and Hush House Emissions from a TF30-P-109 Jet Engine Tested at Canon AFB*, NM Final Volume I June 1996.
   m. SOURCE: *Air Emissions Factor Guide to Air Force Mobile Sources*, December 2009.
   n. SOURCE: *Engine and Hush House Emissions from a F100-PW-100 Jet Tested at Langley Air Force Base, VA*, November 1996.
   o. SOURCE: *Aircraft Emissions Characterization: TF41-A2, TF30-P-103, and TF30-P109 Engines*, December 1987.
4. Surrogate data was used for this engine. The surrogate data was found in the following sources:
   a. Data was calculated using values provided in the source document.
   b. IO-360-D
   c. J85-GE-13
   d. F100-PW-220
   e. F101-GE-102
   f. F103-GE-100
   g. F110-GE-100
   h. PW2040
   i. J52-P-408
   j. J57-P-19W
   k. J85-GE-5A
   l. PT6A-38
   m. T53-L-13
   n. T56-A-15
   o. T58-GE-5
   p. T64-GE-100
   q. TF30-P-7
   r. TF34-GE-100A
   s. LF507-1F
5. Source Document provided emission factors for total hydrocarbons (THC) or non-methane total organic gas (NMTOG). These values converted to volatile organic compounds (VOC's) using the following equations: VOC=1.15*THC or VOC=NMOG*0.99 based on the document Recommended Best Practice for Quantifying Speciated Organic Gas Emissions from Aircraft Equipped with Turbofan, Turbojet, and Turboprop Engines.
6. PM data calculated using smoke numbers and the ICAO method. The PM calculated was assumed to be PM_{10}.

7. PM reported in the source document was assumed to be PM_{10}.
8. $PM_{2.5}$ calculated at 90% of PM_{10}.
9. For at least one setting, the emission factors reported are an average of values provided in the source document.
10. Emission factors calculated and validated 6/1/2012.
11. Percent thrust is an estimate based on tables provided in the source document.
12. Fuel used for emissions testing:
    a. Jet A
    b. Jet A-1
    c. JP-4
    d. JP-5
    e. JP-8
    f. JP-8+100
    g. Unknown, but probably Jet A
    h. No data on fuel used in tests
13. F404-GE-F1D2 is a non-afterburning version of the F404-GE-400 and has the same emissions (without the afterburning setting) as the F400-GE-400 engine.

"(**S**)" – Indicates that this emission factor is from a recommended surrogate engine. See note 4 for details.
"(**C**)" – Indicates this value was calculated using data provided by the source document.
"---" Indicates No Data Available

Table 2-9. VOC and HAP Emission Factors for Select Engines

F100-PW-100

Power Setting			Idle	Approach	Intermediate	Military	Afterburner-5
Fuel Flowrate (lb/hr)[1]			1127	2765	7685	10996	54007
Percent Thrust/hp[1]			3%	13%	45%	100%	134%
Compound Name	**CAS Number**	**HAP**	**Emission Factors (lb/1000lb fuel burned)**				
Acetaldehyde	75-07-0	X	2.35E-01	1.50E-01	1.00E-02	1.00E-02	1.00E-02
Acrolein	107-02-8	X	1.11E-01	6.00E-02	ND	ND	ND
Benzaldehyde	100-52-7		---	---	---	---	---
Benzene	71-43-2	X	4.50E-02	2.45E-03	5.25E-04	5.01E-04	2.85E-04
1,3-Butadiene	106-99-0	X	2.93E-02	ND	ND	ND	ND
2-Butanone (MEK)	78-93-3		9.00E-03	2.00E-02	0.00E+00	0.00E+00	0.00E+00
Crotonaldehyde	4170-30-3		3.40E-02	2.00E-02	ND	ND	ND
Ethylbenzene	100-41-4	X	5.93E-03	4.44E-04	ND	3.99E-04	8.38E-05
Formaldehyde	50-00-0	X	8.61E-01	6.10E-01	2.00E-02	1.00E-02	1.00E-02
Hexanal	66-25-1		2.50E-02	3.00E-02	3.00E-02	1.00E-02	0.00E+00
Naphthalene	91-20-3	X	9.50E-02	7.49E-04	4.91E-04	3.43E-04	5.40E-04
Phenol	108-95-2	X	3.99E-02	ND	ND	ND	3.38E-03
Propanal	123-38-6	X	3.90E-02	2.00E-02	1.00E-02	4.00E-02	0.00E+00
Styrene	100-42-5	X	4.09E-03	ND	ND	ND	ND
Toluene	108-88-3	X	2.20E-02	1.73E-03	9.55E-04	9.24E-04	2.98E-04
m,p-Xylene	1330-20-7	X	4.09E-02	6.15E-03	1.61E-03	3.59E-03	7.58E-04
o-Xylene	95-47-6	X	1.01E-02	1.20E-03	3.09E-04	9.60E-04	1.84E-04

Notes for F100-PW-100

1. Data obtained from Engine and Hush House Emissions from F100-PW-100 Jet Engine Tested at Langley Air Force Base, VA Volumes I-III, November 1996

"X" Indicates that compound is a HAP

"---" Indicates No Data Available

ND – Compound not detected at the detection limit. Compound may be present at a value less than the detection limit

Table 2-9. VOC and HAP Emission Factors for Select Engines (cont.)

F100-PW-200

Power Setting			Idle	Approach	Intermediate	Military	Afterburner-5
Fuel Flowrate (lb/hr)[1]			1006	3251	5651	8888	40123
Percent Thrust/hp[1]			3%	13%	45%	100%	134%
Compound Name	**CAS Number**	**HAP**	**Emission Factors (lb/1000lb fuel burned)**				
Acetaldehyde	75-07-0	X	2.41E-01	ND	7.00E-03	1.30E-02	1.60E-02
Acrolein	107-02-8	X	8.40E-02	ND	ND	ND	ND
Benzaldehyde	100-52-7		ND	ND	ND	ND	ND
Benzene	71-43-2	X	4.70E-02	3.87E-04	1.89E-04	4.90E-04	1.82E-04
1,3-Butadiene	106-99-0	X	1.04E-02	ND	ND	ND	ND
2-Butanone (MEK)	78-93-3		4.00E-02	ND	7.00E-03	6.00E-03	8.00E-03
Crotonaldehyde	4170-30-3		3.20E-02	ND	ND	ND	ND
Ethylbenzene	100-41-4	X	2.99E-03	1.93E-04	2.70E-04	3.44E-04	4.01E-05
Formaldehyde	50-00-0	X	7.77E-01	ND	ND	2.00E-03	2.00E-02
Hexanal	66-25-1		ND	ND	ND	ND	ND
Naphthalene	91-20-3	X	3.42E-02	2.13E-04	3.96E-04	4.01E-04	4.12E-04
Phenol	108-95-2	X	1.35E-02	ND	ND	2.68E-04	1.04E-03
Propanal	123-38-6	X	4.90E-02	ND	8.00E-03	6.00E-03	7.00E-03
Styrene	100-42-5	X	5.02E-04	ND	2.78E-04	ND	ND
Toluene	108-88-3	X	1.65E-02	7.62E-04	4.34E-04	1.08E-03	8.75E-04
m,p-Xylene	1330-20-7	X	1.47E-02	1.40E-03	1.43E-03	2.11E-03	2.59E-04
o-Xylene	95-47-6	X	3.61E-03	2.81E-04	3.51E-04	4.73E-04	5.80E-05

Notes for F100-PW-200 Engine:

1. Data obtained from Engine and Hush House Emissions from F100-PW-200 Jet Engine Tested at Kelly Air Force Base, TX Volumes I-III, February 1997

"X" Indicates that compound is a HAP

ND - Compound not detected at the detection limit. Compound may be present at a value less than the detection limit.

Table 2-9. VOC and HAP Emission Factors for Select Engines (cont.)

F101-GE-102

Power Setting			Idle	Approach	Intermediate	Military	Afterburner-1
Fuel Flowrate (lb/hr)[1]			1117	4533	6557	7828	15314
Percent Thrust/hp[1]			5%	47%	66%	77%	106%
Compound Name	**CAS Number**	**HAP**	**Emission Factors (lb/1000lb fuel burned)**				
Acetaldehyde	75-07-0	X	ND	ND	ND	ND	1.77E-02
Acrolein	107-02-8	X	ND	ND	ND	ND	8.23E-02
Benzaldehyde	100-52-7		ND	ND	ND	1.93E-03	4.98E-02
Benzene	71-43-2	X	1.18E-02	7.89E-04	1.32E-03	5.48E-03	2.28E-01
1,3-Butadiene	106-99-0	X	---	---	---	---	---
2-Butanone (MEK)	78-93-3		2.18E-03	ND	ND	ND	3.30E-02
Crotonaldehyde	4170-30-3		ND	ND	ND	ND	3.59E-02
Ethylbenzene	100-41-4	X	ND	ND	ND	ND	8.60E-02
Formaldehyde	50-00-0	X	1.04E-01	5.12E-03	4.64E-03	4.43E-03	3.89E-02
Hexanal	66-25-1		ND	ND	ND	ND	1.80E-02
Naphthalene	91-20-3	X	1.79E-03	AA	ND	ND	1.27E-01
Phenol	108-95-2	X	2.29E-03	1.22E-03	ND	ND	2.71E-02
Propanal	123-38-6	X	---	---	---	---	---
Styrene	100-42-5	X	1.08E-03	ND	3.36E-04	ND	1.21E-02
Toluene	108-88-3	X	5.55E-03	1.50E-03	1.69E-03	1.29E-03	1.26E-01
m,p-Xylene	1330-20-7	X	9.22E-04	4.34E-04	6.65E-04	2.45E-03	1.55E-01
o-Xylene	95-47-6	X	ND	ND	ND	ND	6.90E-02

Notes for F101-GE-102 Engine:

1. Data obtained from Aircraft Engine and APU Emissions Testing Volumes I-III March 1999, IERA-RS-BR-TR-1999-0006

"X" Indicates that compound is a HAP

"—" Indicates No Data Available

ND - Compound not detected at the detection limit. Compound may be present at a value less than the detection limit.

AA - Compound detected was less than the Ambient Air concentration resulting in a negative emission factor when the Ambient Air Concentration was removed.

Table 2-9. VOC and HAP Emission Factors for Select Engines (cont.)

F108-CF-100

Power Setting			Idle	Approach	Intermediate	Military	---
Fuel Flowrate (lb/hr)[1]			1136	2547	5650	6458	---
Percent Thrust/hp[1]			9%	30%	70%	78%	---
Compound Name	**CAS Number**	**HAP**	**Emission Factors (lb/1000lb fuel burned)**				
Acetaldehyde	75-07-0	X	AA	ND	ND	ND	---
Acrolein	107-02-8	X	ND	ND	ND	ND	---
Benzaldehyde	100-52-7		ND	ND	ND	4.09E-03	---
Benzene	71-43-2	X	1.39E-02	3.39E-03	8.30E-04	5.10E-04	---
1,3-Butadiene	106-99-0	X	---	---	---	---	---
2-Butanone (MEK)	78-93-3		5.35E-03	ND	ND	ND	---
Crotonaldehyde	4170-30-3		ND	ND	ND	ND	---
Ethylbenzene	100-41-4	X	6.84E-04	5.53E-04	ND	ND	---
Formaldehyde	50-00-0	X	9.51E-02	1.50E-02	5.58E-03	7.01E-03	---
Hexanal	66-25-1		ND	9.66E-03	ND	ND	---
Naphthalene	91-20-3	X	2.90E-03	AA	ND	ND	---
Phenol	108-95-2	X	ND	ND	ND	ND	---
Propanal	123-38-6	X	---	---	---	---	---
Styrene	100-42-5	X	1.48E-03	ND	ND	ND	---
Toluene	108-88-3	X	8.97E-03	6.23E-03	1.42E-03	1.11E-03	---
m,p-Xylene	1330-20-7	X	1.65E-03	1.61E-03	5.42E-04	3.36E-04	---
o-Xylene	95-47-6	X	ND	ND	ND	ND	---

Notes for F108-CF-100 Engine

1. Data obtained from Aircraft Engine and APU Emissions Testing Volumes I-III March 1999, IERA-RS-BR-TR-1999-0006

"X" Indicates that compound is a HAP

"—" Indicates No Data Available

ND - Compound not detected at the detection limit. Compound may be present at a value less than the detection limit.

AA - Compound detected was less than the Ambient Air concentration resulting in a negative emission factor when the Ambient Air Concentration was removed.

Table 2-9. VOC and HAP Emission Factors for Select Engines (cont.)

F110-GE-100

Power Setting			Idle	Approach	Intermediate	Military	Afterburner-1
Fuel Flowrate (lb/hr)[1]			1111	5080	7332	11358	18088
Percent Thrust/hp[1]			3%	44%	66%	100%	113%
Compound Name	**CAS Number**	**HAP**	**Emission Factors (lb/1000lb fuel burned)**				
Acetaldehyde	75-07-0	X	6.62E-03	ND	1.65E-04	1.44E-04	1.24E-02
Acrolein	107-02-8	X	ND	ND	ND	ND	3.90E-02
Benzaldehyde	100-52-7		3.48E-02	ND	4.26E-03	3.06E-03	7.13E-02
Benzene	71-43-2	X	2.93E-02	1.77E-03	1.59E-03	1.61E-03	1.88E-01
1,3-Butadiene	106-99-0	X	---	---	---	---	---
2-Butanone (MEK)	78-93-3		2.44E-03	ND	ND	4.55E-04	2.02E-02
Crotonaldehyde	4170-30-3		ND	ND	ND	ND	6.08E-02
Ethylbenzene	100-41-4	X	2.00E-03	3.93E-04	3.68E-04	1.69E-04	4.47E-02
Formaldehyde	50-00-0	X	1.01E-01	1.00E-02	1.94E-02	1.53E-02	1.53E-02
Hexanal	66-25-1		ND	ND	ND	ND	1.14E-02
Naphthalene	91-20-3	X	3.31E-03	AA	AA	3.31E-04	9.73E-02
Phenol	108-95-2	X	2.95E-03	ND	ND	ND	6.63E-02
Propanal	123-38-6	X	---	---	---	---	---
Styrene	100-42-5	X	3.69E-03	2.98E-04	4.91E-04	2.65E-04	5.71E-03
Toluene	108-88-3	X	1.10E-02	1.34E-03	1.90E-03	7.41E-04	1.40E-01
m,p-Xylene	1330-20-7	X	2.84E-03	8.26E-04	9.70E-04	3.38E-04	6.05E-02
o-Xylene	95-47-6	X	1.38E-03	2.98E-04	ND	1.69E-04	2.84E-02

Notes for F110-GE-100 Engine:

1. Data obtained from Aircraft Engine and APU Emissions Testing Volumes I-III March 1999, IERA-RS-BR-TR-1999-0006

"X" Indicates that compound is a HAP

"—" Indicates No Data Available

ND - Compound not detected at the detection limit. Compound may be present at a value less than the detection limit.

AA - Compound detected was less than the Ambient Air concentration resulting in a negative emission factor when the Ambient Air Concentration was removed.

Table 2-9. VOC and HAP Emission Factors for Select Engines (cont.)

F117-PW-100

Power Setting			Idle	Approach	Intermediate	---	---
Fuel Flowrate (lb/hr)[1]			978	4645	10408	---	---
Percent Thrust/hp[1]			4%	31%	68%	---	---
Compound Name	**CAS Number**	**HAP**	**Emission Factors (lb/1000lb fuel burned)**				
Acetaldehyde	75-07-0	X	1.20E-02	ND	ND	---	---
Acrolein	107-02-8	X	ND	ND	ND	---	---
Benzaldehyde	100-52-7		ND	3.16E-03	3.68E-03	---	---
Benzene	71-43-2	X	2.25E-02	8.90E-04	6.25E-04	---	---
1,3-Butadiene	106-99-0	X	---	---	---	---	---
2-Butanone (MEK)	78-93-3		ND	ND	ND	---	---
Crotonaldehyde	4170-30-3		1.20E-02	ND	ND	---	---
Ethylbenzene	100-41-4	X	2.82E-03	ND	ND	---	---
Formaldehyde	50-00-0	X	2.36E-01	1.65E-02	9.50E-03	---	---
Hexanal	66-25-1		ND	ND	ND	---	---
Naphthalene	91-20-3	X	2.39E-03	ND	ND	---	---
Phenol	108-95-2	X	3.79E-03	ND	ND	---	---
Propanal	123-38-6	X	---	---	---	---	---
Styrene	100-42-5	X	1.55E-03	ND	ND	---	---
Toluene	108-88-3	X	6.68E-03	1.41E-03	1.12E-03	---	---
m,p-Xylene	1330-20-7	X	2.29E-03	6.21E-04	5.47E-04	---	---
o-Xylene	95-47-6	X	9.80E-04	ND	ND	---	---

Notes for F117-PW-100 Engine:

1. Data obtained from Aircraft Engine and APU Emissions Testing Volumes I-III March 1999, IERA-RS-BR-TR-1999-0006

"X" Indicates that compound is a HAP

"—" Indicates No Data Available

ND - Compound not detected at the detection limit. Compound may be present at a value less than the detection limit.

AA - Compound detected was less than the Ambient Air concentration resulting in a negative emission factor when the Ambient Air Concentration was removed.

Table 2-9. VOC and HAP Emission Factors for Select Engines (cont.)

F118-GE-100

Power Setting			Idle	Approach	Intermediate	Military	---
Fuel Flowrate (lb/hr)[1]			1097	3773	6350	10887	---
Percent Thrust/hp[1]			---	---	---	---	---
Compound Name	**CAS Number**	**HAP**	**Emission Factors (lb/1000lb fuel burned)**				
Acetaldehyde	75-07-0	X	7.86E-03	ND	ND	ND	---
Acrolein	107-02-8	X	ND	ND	ND	ND	---
Benzaldehyde	100-52-7		6.59E-03	1.59E-03	1.65E-03	1.94E-03	---
Benzene	71-43-2	X	2.70E-02	8.58E-04	3.71E-04	3.38E-04	---
1,3-Butadiene	106-99-0	X	---	---	---	---	---
2-Butanone (MEK)	78-93-3		3.01E-03	ND	ND	ND	---
Crotonaldehyde	4170-30-3		ND	ND	ND	ND	---
Ethylbenzene	100-41-4	X	1.23E-03	3.72E-04	ND	ND	---
Formaldehyde	50-00-0	X	1.80E-01	1.22E-02	1.17E-02	6.55E-03	---
Hexanal	66-25-1		ND	ND	ND	ND	---
Naphthalene	91-20-3	X	AA	ND	ND	ND	---
Phenol	108-95-2	X	1.20E-03	ND	ND	ND	---
Propanal	123-38-6	X	---	---	---	---	---
Styrene	100-42-5	X	2.25E-03	ND	ND	ND	---
Toluene	108-88-3	X	9.88E-03	1.35E-03	2.98E-04	3.85E-04	---
m,p-Xylene	1330-20-7	X	3.82E-03	1.47E-03	2.87E-04	2.05E-04	---
o-Xylene	95-47-6	X	1.43E-03	4.98E-04	ND	ND	---

Notes for F118-GE-100 Engine:

1. Data obtained from Aircraft Engine and APU Emissions Testing Volumes I-III March 1999, IERA-RS-BR-TR-1999-0006

"X" Indicates that compound is a HAP

"—" Indicates No Data Available

ND - Compound not detected at the detection limit. Compound may be present at a value less than the detection limit.

AA - Compound detected was less than the Ambient Air concentration resulting in a negative emission factor when the Ambient Air Concentration was removed.

Table 2-9. VOC and HAP Emission Factors for Select Engines (cont.)

F119-PW-100

Power Setting			Idle	Approach	Intermediate	Military	Afterburner
Fuel Flowrate (lb/hr)[1]			1377	2740	10110	18612	50170
Percent Thrust/hp[1]			10%	20%	70%	100%	150%
Compound Name	**CAS Number**	**HAP**	**Emission Factors (lb/1000lb fuel burned)**				
Acetaldehyde	75-07-0	X	1.11E-01	6.75E-03	2.61E-03	8.33E-04	---
Acrolein	107-02-8	X	3.60E-02	ND	ND	ND	---
Benzaldehyde	100-52-7		4.15E-02	ND	ND	ND	---
Benzene	71-43-2	X	1.06E-01	3.33E-03	6.86E-04	4.88E-04	---
1,3-Butadiene	106-99-0	X	4.99E-02	ND	4.27E-04	ND	---
2-Butanone (MEK)	78-93-3		3.33E-02	ND	ND	ND	---
Crotonaldehyde	4170-30-3		2.66E-02	ND	ND	ND	---
Ethylbenzene	100-41-4	X	1.64E-02	2.55E-04	4.99E-04	1.34E-04	---
Formaldehyde	50-00-0	X	9.95E-01	3.56E-02	2.44E-02	7.58E-03	---
Hexanal	66-25-1		ND	ND	ND	ND	---
Naphthalene	91-20-3	X	---	---	---	---	---
Phenol	108-95-2	X	---	---	---	---	---
Propanal	123-38-6	X	1.60E-02	ND	9.78E-04	4.10E-04	---
Styrene	100-42-5	X	3.12E-02	2.55E-04	ND	ND	---
Toluene	108-88-3	X	6.37E-02	2.68E-04	AA	AA	---
m,p-Xylene	1330-20-7	X	3.92E-02	5.60E-04	AA	2.57E-04	---
o-Xylene	95-47-6	X	2.79E-02	3.21E-04	4.89E-04	1.20E-04	---

Notes for F119-PW-100 Engine:

1. Data obtained from Aircraft Engine and Auxiliary Power Unit Emissions Testing Final Report Addendum F119-PW-100 June 2002, IERA-RS-BR-SR-2002-0006

"X" Indicates that compound is a HAP

"—" Indicates No Data Available

ND - Compound not detected at the detection limit. Compound may be present at a value less than the detection limit.

AA - Compound detected was less than the Ambient Air concentration resulting in a negative emission factor when the Ambient Air Concentration was removed.

Table 2-9. VOC and HAP Emission Factors for Select Engines (cont.)

F404-GE-400, -F1D2

Power Setting			Idle	Approach	Intermediate	Military	Afterburner-3
Fuel Flowrate (lb/hr)[1]			685	3111	6464	7739	15851
Percent Thrust/hp[1]			6%	38%	79%	91%	114%
Compound Name	**CAS Number**	**HAP**	**Emission Factors (lb/1000lb fuel burned)**				
Acetaldehyde	75-07-0	X	5.69E-02	ND	ND	ND	3.38E-02
Acrolein	107-02-8	X	1.71E-01	ND	ND	ND	1.44E-01
Benzaldehyde	100-52-7		1.31E-01	ND	1.70E-03	ND	1.32E-01
Benzene	71-43-2	X	5.12E-01	7.56E-04	6.45E-04	7.38E-04	3.70E-01
1,3-Butadiene	106-99-0	X	---	---	---	---	---
2-Butanone (MEK)	78-93-3		2.31E-02	ND	ND	ND	2.74E-02
Crotonaldehyde	4170-30-3		9.14E-02	ND	ND	ND	8.45E-02
Ethylbenzene	100-41-4	X	7.48E-02	4.84E-04	3.53E-04	ND	4.86E-02
Formaldehyde	50-00-0	X	1.14E+00	1.67E-02	2.17E-02	9.02E-03	3.74E-02
Hexanal	66-25-1		ND	ND	ND	ND	1.26E-02
Naphthalene	91-20-3	X	1.31E-01	3.10E-04	7.04E-05	1.03E-04	7.32E-02
Phenol	108-95-2	X	1.15E-01	ND	ND	ND	6.69E-02
Propanal	123-38-6	X	---	---	---	---	---
Styrene	100-42-5	X	8.66E-02	ND	ND	ND	4.90E-03
Toluene	108-88-3	X	2.60E-01	8.73E-04	1.07E-03	6.61E-04	1.78E-01
m,p-Xylene	1330-20-7	X	1.68E-01	1.76E-03	1.38E-03	7.45E-04	9.29E-02
o-Xylene	95-47-6	X	8.07E-02	8.75E-04	5.90E-04	2.65E-04	4.86E-02

Notes for F404-GE-400, -F1D2 Engines:

1. Data obtained from Aircraft Engine and APU Emissions Testing Volumes I-III March 1999, IERA-RS-BR-TR-1999-0006

"X" Indicates that compound is a HAP

"—" Indicates No Data Available

ND - Compound not detected at the detection limit. Compound may be present at a value less than the detection limit.

AA - Compound detected was less than the Ambient Air concentration resulting in a negative emission factor when the Ambient Air Concentration was removed.

The F404-GE-F1D2 is a non-afterburning version of the F404-GE-400 and has the same emissions (without the afterburner setting) as the F404-GE-400.

Table 2-9. VOC and HAP Emission Factors for Select Engines (cont.)

GTCP85-180

Power Setting			**Constant**	**---**	**---**	**---**	**---**
Fuel Flowrate (lb/hr)[1]			270	---	---	---	---
Compound Name	**CAS Number**	**HAP**	**Emission Factors (lb/1000lb fuel burned)**				
Acetaldehyde	75-07-0	X	2.09E-03	---	---	---	---
Acrolein	107-02-8	X	3.04E-04	---	---	---	---
Benzaldehyde	100-52-7		ND	---	---	---	---
Benzene	71-43-2	X	1.50E-02	---	---	---	---
1,3-Butadiene	106-99-0	X	---	---	---	---	---
2-Butanone (MEK)	78-93-3		9.96E-04	---	---	---	---
Crotonaldehyde	4170-30-3		5.25E-04	---	---	---	---
Ethylbenzene	100-41-4	X	1.20E-04	---	---	---	---
Formaldehyde	50-00-0	X	2.03E-02	---	---	---	---
Hexanal	66-25-1		ND	---	---	---	---
Naphthalene	91-20-3	X	AA	---	---	---	---
Phenol	108-95-2	X	1.44E-04	---	---	---	---
Propanal	123-38-6	X	---	---	---	---	---
Styrene	100-42-5	X	1.91E-04	---	---	---	---
Toluene	108-88-3	X	2.94E-03	---	---	---	---
m,p-Xylene	1330-20-7	X	2.32E-03	---	---	---	---
o-Xylene	95-47-6	X	3.27E-04	---	---	---	---

Notes for GTCP85-180 Engine:

1. Data obtained from Aircraft Engine and APU Emissions Testing Volumes I-III March 1999, IERA-RS-BR-TR-1999-0006

"X" Indicates that compound is a HAP

"—" Indicates No Data Available

ND - Compound not detected at the detection limit. Compound may be present at a value less than the detection limit.

AA - Compound detected was less than the Ambient Air concentration resulting in a negative emission factor when the Ambient Air Concentration was removed.

Table 2-9. VOC and HAP Emission Factors for Select Engines (cont.)

GTCP165-1

		Power Setting	**Constant**	**---**	**---**	**---**	**---**
		Fuel Flowrate (lb/hr)[1]	273	---	---	---	---
Compound Name	**CAS Number**	**HAP**	**Emission Factors (lb/1000lb fuel burned)**				
Acetaldehyde	75-07-0	X	5.61E-03	---	---	---	---
Acrolein	107-02-8	X	1.21E-02	---	---	---	---
Benzaldehyde	100-52-7		1.26E-02	---	---	---	---
Benzene	71-43-2	X	3.79E-02	---	---	---	---
1,3-Butadiene	106-99-0	X	---	---	---	---	---
2-Butanone (MEK)	78-93-3		2.77E-03	---	---	---	---
Crotonaldehyde	4170-30-3		5.83E-03	---	---	---	---
Ethylbenzene	100-41-4	X	8.63E-04	---	---	---	---
Formaldehyde	50-00-0	X	1.88E-02	---	---	---	---
Hexanal	66-25-1		ND	---	---	---	---
Naphthalene	91-20-3	X	5.54E-03	---	---	---	---
Phenol	108-95-2	X	4.48E-03	---	---	---	---
Propanal	123-38-6	X	--	---	---	---	---
Styrene	100-42-5	X	2.24E-03	---	---	---	---
Toluene	108-88-3	X	1.87E-02	---	---	---	---
m,p-Xylene	1330-20-7	X	4.84E-03	---	---	---	---
o-Xylene	95-47-6	X	1.17E-03	---	---	---	---

Notes for GTCP165-1 Engine:

1. Data obtained from Aircraft Engine and APU Emissions Testing Volumes I-III March 1999, IERA-RS-BR-TR-1999-0006

"X" Indicates that compound is a HAP

"—" Indicates No Data Available

ND - Compound not detected at the detection limit. Compound may be present at a value less than the detection limit.

AA - Compound detected was less than the Ambient Air concentration resulting in a negative emission factor when the Ambient Air Concentration was removed.

Table 2-9. VOC and HAP Emission Factors for Select Engines (cont.)

J69-T-25

Power Setting			Idle	Intermediate	Military	---	---
Fuel Flowrate (lb/hr)[1]			167	872	1085	---	---
Percent Thrust/hp[1]			4%	63%	84%	---	---
Compound Name	**CAS Number**	**HAP**	**Emission Factors (lb/1000lb fuel burned)**				
Acetaldehyde	75-07-0	X	9.76E-02	2.12E-03	ND	---	---
Acrolein	107-02-8	X	1.96E-01	ND	ND	---	---
Benzaldehyde	100-52-7		1.04E-01	ND	ND	---	---
Benzene	71-43-2	X	1.89E-01	3.47E-03	1.86E-03	---	---
1,3-Butadiene	106-99-0	X	---	---	---	---	---
2-Butanone (MEK)	78-93-3		2.41E-02	8.70E-04	8.79E-04	---	---
Crotonaldehyde	4170-30-3		1.22E-01	ND	ND	---	---
Ethylbenzene	100-41-4	X	2.03E-02	ND	ND	---	---
Formaldehyde	50-00-0	X	9.16E-01	2.72E-02	1.16E-02	---	---
Hexanal	66-25-1		ND	ND	ND	---	---
Naphthalene	91-20-3	X	3.54E-02	3.41E-04	2.22E-04	---	---
Phenol	108-95-2	X	2.85E-02	9.86E-04	ND	---	---
Propanal	123-38-6	X	---	---	---	---	---
Styrene	100-42-5	X	2.72E-02	ND	ND	---	---
Toluene	108-88-3	X	1.12E-01	1.56E-03	8.29E-04	---	---
m,p-Xylene	1330-20-7	X	6.45E-02	2.13E-03	4.94E-04	---	---
o-Xylene	95-47-6	X	2.51E-02	6.62E-04	ND	---	---

Notes for J69-T-25 Engine:

1. Data obtained from Aircraft Engine and APU Emissions Testing Volumes I-III March 1999, IERA-RS-BR-TR-1999-0006

"X" Indicates that compound is a HAP

"—" Indicates No Data Available

ND - Compound not detected at the detection limit. Compound may be present at a value less than the detection limit.

AA - Compound detected was less than the Ambient Air concentration resulting in a negative emission factor when the Ambient Air Concentration was removed.

Table 2-9. VOC and HAP Emission Factors for Select Engines (cont.)

J85-GE-5A

Power Setting			Idle	Intermediate	Military	Afterburner-1	---
Fuel Flowrate (lb/hr)[1]			434	950	2740	8138	---
Percent Thrust/hp[1]			4%	15%	88%	116%	---
Compound Name	**CAS Number**	**HAP**	**Emission Factors (lb/1000lb fuel burned)**				
Acetaldehyde	75-07-0	X	1.18E-01	ND	ND	ND	---
Acrolein	107-02-8	X	2.70E-01	ND	ND	ND	---
Benzaldehyde	100-52-7		1.10E-01	ND	ND	ND	---
Benzene	71-43-2	X	1.48E-01	1.34E-01	1.14E-02	6.84E-03	---
1,3-Butadiene	106-99-0	X	---	---	---	---	---
2-Butanone (MEK)	78-93-3		2.88E-02	9.09E-03	ND	3.27E-04	---
Crotonaldehyde	4170-30-3		1.34E-01	ND	ND	ND	---
Ethylbenzene	100-41-4	X	3.06E-02	8.80E-03	3.75E-04	5.24E-04	---
Formaldehyde	50-00-0	X	2.26E-01	5.45E-01	7.37E-02	2.40E-02	---
Hexanal	66-25-1		ND	ND	ND	ND	---
Naphthalene	91-20-3	X	9.65E-02	1.28E-02	1.27E-03	8.16E-04	---
Phenol	108-95-2	X	7.17E-02	1.24E-02	1.52E-03	9.39E-04	---
Propanal	123-38-6	X	---	---	---	---	---
Styrene	100-42-5	X	4.17E-02	1.29E-02	5.02E-04	2.85E-04	---
Toluene	108-88-3	X	1.67E-01	4.91E-02	3.23E-03	1.74E-03	---
m,p-Xylene	1330-20-7	X	9.89E-02	2.55E-02	1.29E-03	1.88E-03	---
o-Xylene	95-47-6	X	3.85E-02	1.07E-02	4.90E-04	9.04E-04	---

Notes for J85-GE-5A Engine:

1. Data obtained from Aircraft Engine and APU Emissions Testing Volumes I-III March 1999, IERA-RS-BR-TR-1999-0006

"X" Indicates that compound is a HAP

"—" Indicates No Data Available

ND - Compound not detected at the detection limit. Compound may be present at a value less than the detection limit.

AA - Compound detected was less than the Ambient Air concentration resulting in a negative emission factor when the Ambient Air Concentration was removed.

Table 2-9. VOC and HAP Emission Factors for Select Engines (cont.)

J85-GE-5M

Power Setting			Idle	Intermediate	Military	Afterburner	---
Fuel Flowrate (lb/hr)[1]			525	1045	2550	7695	---
Percent Thrust/hp[1]			---	---	---	---	---
Compound Name	**CAS Number**	**HAP**	**Emission Factors (lb/1000lb fuel burned)**				
Acetaldehyde	75-07-0	X	2.44E-01	1.91E-02	1.57E-03	---	---
Acrolein	107-02-8	X	3.14E-01	1.24E-02	1.18E-03	---	---
Benzaldehyde	100-52-7		7.81E-02	1.24E-02	1.18E-03	---	---
Benzene	71-43-2	X	3.05E-02	2.34E-02	2.56E-03	---	---
1,3-Butadiene	106-99-0	X	1.20E-02	6.02E-03	ND	---	---
2-Butanone (MEK)	78-93-3		3.94E-02	6.77E-03	9.29E-04	---	---
Crotonaldehyde	4170-30-3		1.18E-01	1.24E-02	1.18E-03	---	---
Ethylbenzene	100-41-4	X	7.36E-03	2.38E-03	8.21E-05	---	---
Formaldehyde	50-00-0	X	2.27E+00	3.48E-01	2.39E-02	---	---
Hexanal	66-25-1		7.81E-02	1.24E-02	1.18E-03	---	---
Naphthalene	91-20-3	X	8.29E-02	ND	ND	---	---
Phenol	108-95-2	X	---	---	---	---	---
Propanal	123-38-6	X	7.81E-02	1.24E-02	1.18E-03	---	---
Styrene	100-42-5	X	7.88E-03	2.44E-03	1.08E-04	---	---
Toluene	108-88-3	X	2.76E-02	1.14E-02	9.14E-04	---	---
m,p-Xylene	1330-20-7	X	2.44E-02	7.63E-03	4.33E-04	---	---
o-Xylene	95-47-6	X	1.59E-02	4.83E-03	2.33E-04	---	---

Notes for J85-GE-5M Engine:

1. Data obtained from Clean Air Act Emissions Testing of the T-38C Aircraft Engines September 2002, IERA-RS-BR-SR-2003-0001

"X" Indicates that compound is a HAP

"—" Indicates No Data Available

ND - Compound not detected at the detection limit. Compound may be present at a value less than the detection limit.

AA - Compound detected was less than the Ambient Air concentration resulting in a negative emission factor when the Ambient Air Concentration was removed.

Table 2-9. VOC and HAP Emission Factors for Select Engines (cont.)

PT6A-68

Power Setting			Ground Idle	Flight Idle	Descend	Approach	Max. Continuous
Fuel Flowrate (lb/hr)[1]			156	180	328	449	612
Percent Thrust/hp[1]			2%	3%	19%	46%	88%
Compound Name	**CAS Number**	**HAP**	**Emission Factors (lb/1000lb fuel burned)**				
Acetaldehyde	75-07-0	X	2.99E-01	3.47E-01	8.78E-02	1.04E-02	2.17E-03
Acrolein	107-02-8	X	7.16E-01	6.00E-01	5.06E-02	ND	ND
Benzaldehyde	100-52-7		2.34E-02	1.73E-01	4.45E-02	8.01E-03	ND
Benzene	71-43-2	X	1.67E-01	5.22E-01	8.49E-02	1.04E-02	8.63E-04
1,3-Butadiene	106-99-0	X	1.49E-01	2.67E-01	1.10E-02	ND	ND
2-Butanone (MEK)	78-93-3		1.32E-02	ND	2.65E-03	ND	ND
Crotonaldehyde	4170-30-3		2.08E-01	1.73E-01	ND	ND	ND
Ethylbenzene	100-41-4	X	4.76E-02	4.94E-02	2.52E-03	2.09E-04	1.07E-04
Formaldehyde	50-00-0	X	4.81E+00	5.27E+00	2.93E+00	6.73E-01	2.21E-02
Hexanal	66-25-1		1.56E-01	ND	ND	ND	ND
Naphthalene	91-20-3	X	ND	1.16E-02	ND	ND	7.68E-02
Phenol	108-95-2	X	---	---	---	---	---
Propanal	123-38-6	X	---	---	---	---	---
Styrene	100-42-5	X	4.68E-02	3.80E-02	8.05E-03	ND	ND
Toluene	108-88-3	X	1.65E-01	2.42E-01	2.46E-02	2.37E-03	5.18E-04
m,p-Xylene	1330-20-7	X	1.13E-01	1.31E-01	6.03E-03	6.01E-04	1.29E-03
o-Xylene	95-47-6	X	5.98E-02	6.60E-02	2.92E-03	2.59E-04	1.54E-04

Notes for PT6A-68 Engine:

1. Data obtained from PT6A-68 Emissions Measurement Program Summary September 2002, IERA-RS-BR-SR-2003-0003

"X" Indicates that compound is a HAP

"—" Indicates No Data Available

ND - Compound not detected at the detection limit. Compound may be present at a value less than the detection limit.

AA - Compound detected was less than the Ambient Air concentration resulting in a negative emission factor when the Ambient Air Concentration was removed.

Table 2-9. VOC and HAP Emission Factors for Select Engines (cont.)

T56-A-7

Power Setting			Idle	Approach	Intermediate	Military	---
Fuel Flowrate (lb/hr)[1]			724	880	1742	2262	---
Percent Thrust/hp[1]			5%	15%	61%	90%	---
Compound Name	**CAS Number**	**HAP**	**Emission Factors (lb/1000lb fuel burned)**				
Acetaldehyde	75-07-0	X	1.04E-02	AA	5.43E-04	1.64E-04	---
Acrolein	107-02-8	X	ND	ND	ND	ND	---
Benzaldehyde	100-52-7		1.13E-03	8.76E-04	4.67E-04	ND	---
Benzene	71-43-2	X	4.77E-03	4.45E-03	1.34E-03	7.84E-04	---
1,3-Butadiene	106-99-0	X	---	---	---	---	---
2-Butanone (MEK)	78-93-3		4.63E-04	3.62E-04	ND	1.75E-04	---
Crotonaldehyde	4170-30-3		ND	ND	ND	ND	---
Ethylbenzene	100-41-4	X	ND	4.06E-04	2.07E-04	1.80E-04	---
Formaldehyde	50-00-0	X	4.10E-02	3.34E-02	9.30E-03	3.81E-04	---
Hexanal	66-25-1		ND	ND	ND	ND	---
Naphthalene	91-20-3	X	1.16E-03	1.03E-03	1.77E-04	1.34E-04	---
Phenol	108-95-2	X	ND	ND	ND	ND	---
Propanal	123-38-6	X	---	---	---	---	---
Styrene	100-42-5	X	7.09E-04	3.67E-04	ND	ND	---
Toluene	108-88-3	X	2.71E-03	2.29E-03	9.61E-04	2.53E-05	---
m,p-Xylene	1330-20-7	X	6.70E-04	7.31E-04	4.14E-04	6.26E-04	---
o-Xylene	95-47-6	X	6.56E-04	3.23E-04	1.68E-04	2.48E-04	---

Notes for T56-A-7 Engine:

1. Data obtained from *Aircraft Engine and APU Emissions Testing Volumes I-III* March 1999, IERA-RS-BR-TR-1999-0006

"X" Indicates that compound is a HAP

"—" Indicates No Data Available

ND - Compound not detected at the detection limit. Compound may be present at a value less than the detection limit.

AA - Compound detected was less than the Ambient Air concentration resulting in a negative emission factor when the Ambient Air Concentration was removed.

Table 2-9. VOC and HAP Emission Factors for Select Engines (cont.)

T64-GE-100

Power Setting			Ground Idle	75% Normal	Normal	Military	---
Fuel Flowrate (lb/hr)[1]			298	941	1698	1848	---
Percent Thrust/hp[1]			2%	34%	81%	90%	---
Compound Name	**CAS Number**	**HAP**	**Emission Factors (lb/1000lb fuel burned)**				
Acetaldehyde	75-07-0	X	5.07E-02	1.20E-03	ND	ND	---
Acrolein	107-02-8	X	1.14E-01	1.37E-03	ND	ND	---
Benzaldehyde	100-52-7		5.91E-02	1.86E-03	ND	ND	---
Benzene	71-43-2	X	2.16E-01	1.26E-02	4.00E-03	3.88E-03	---
1,3-Butadiene	106-99-0	X	---	---	---	---	---
2-Butanone (MEK)	78-93-3		2.96E-02	2.33E-04	ND	ND	---
Crotonaldehyde	4170-30-3		5.07E-02	1.01E-03	ND	ND	---
Ethylbenzene	100-41-4	X	2.24E-02	3.07E-04	ND	ND	---
Formaldehyde	50-00-0	X	7.15E-02	1.17E-02	3.18E-04	1.83E-04	---
Hexanal	66-25-1		1.81E-02	3.83E-05	ND	ND	---
Naphthalene	91-20-3	X	5.44E-02	1.52E-03	4.96E-06	2.50E-03	---
Phenol	108-95-2	X	8.26E-03	ND	ND	ND	---
Propanal	123-38-6	X	---	---	---	---	---
Styrene	100-42-5	X	4.11E-02	5.12E-04	ND	ND	---
Toluene	108-88-3	X	1.02E-01	2.88E-03	1.33E-04	1.27E-04	---
m,p-Xylene	1330-20-7	X	4.38E-02	6.83E-04	ND	ND	---
o-Xylene	95-47-6	X	2.07E-02	2.85E-04	ND	ND	---

Notes for T64-GE-100 Engine:

1. Data obtained from Aircraft Engine and APU Emissions Testing Volumes I-III March 1999, IERA-RS-BR-TR-1999-0006

"X" Indicates that compound is a HAP

"—" Indicates No Data Available

ND - Compound not detected at the detection limit. Compound may be present at a value less than the detection limit.

AA - Compound detected was less than the Ambient Air concentration resulting in a negative emission factor when the Ambient Air Concentration was removed.

Table 2-9. VOC and HAP Emission Factors for Select Engines (cont.)

T700-GE-700

Power Setting			Ground Idle	Flight Idle	Flight Max	Overspeed	---
Fuel Flowrate (lb/hr)[1]			134	469	626	725	---
Percent Thrust/hp[1]			4%	56%	82%	100%	---
Compound Name	**CAS Number**	**HAP**	**Emission Factors (lb/1000lb fuel burned)**				
Acetaldehyde	75-07-0	X	1.81E-02	3.03E-04	2.00E-04	ND	---
Acrolein	107-02-8	X	7.23E-03	9.68E-05	1.10E-05	ND	---
Benzaldehyde	100-52-7		ND	9.00E-04	4.15E-04	ND	---
Benzene	71-43-2	X	4.87E-02	2.97E-04	3.12E-04	3.00E-04	---
1,3-Butadiene	106-99-0	X	---	---	---	---	---
2-Butanone (MEK)	78-93-3		2.00E-03	3.26E-04	ND	ND	---
Crotonaldehyde	4170-30-3		9.93E-03	ND	ND	ND	---
Ethylbenzene	100-41-4	X	2.25E-03	2.57E-04	ND	1.99E-04	---
Formaldehyde	50-00-0	X	2.19E-01	4.09E-03	2.09E-03	4.81E-03	---
Hexanal	66-25-1		ND	ND	ND	ND	---
Naphthalene	91-20-3	X	7.33E-03	1.56E-04	6.73E-05	2.91E-05	---
Phenol	108-95-2	X	6.24E-03	ND	ND	ND	---
Propanal	123-38-6	X	---	---	---	---	---
Styrene	100-42-5	X	5.16E-03	ND	ND	ND	---
Toluene	108-88-3	X	1.28E-02	1.24E-03	AA	2.92E-04	---
m,p-Xylene	1330-20-7	X	4.35E-03	3.17E-04	3.23E-04	8.36E-04	---
o-Xylene	95-47-6	X	2.80E-03	2.52E-04	1.85E-04	4.05E-04	---

Notes for T700-GE-700 Engine:

1. Data obtained from *Aircraft Engine and APU Emissions Testing Volumes I-III* March 1999, IERA-RS-BR-TR-1999-0006

"X" Indicates that compound is a HAP

"—" Indicates No Data Available

ND - Compound not detected at the detection limit. Compound may be present at a value less than the detection limit.

AA - Compound detected was less than the Ambient Air concentration resulting in a negative emission factor when the Ambient Air Concentration was removed.

Table 2-9. VOC and HAP Emission Factors for Select Engines (cont.)

TF30-P-109

Power Setting			Idle	Approach	Intermediate	Military	Afterburner
Fuel Flowrate (lb/hr)[1]			761	1727	2921	6263	38460
Percent Thrust/hp[1]			5%	23%	47%	99%	---
Compound Name	**CAS Number**	**HAP**	**Emission Factors (lb/1000lb fuel burned)**				
Acetaldehyde	75-07-0	X	4.45E-01	2.45E-01	9.59E-03	1.53E-02	6.73E-03
Acrolein	107-02-8	X	3.42E-02	2.26E-02	ND	ND	ND
Benzaldehyde	100-52-7		1.84E-02	6.95E-03	ND	ND	ND
Benzene	71-43-2	X	1.94E-01	5.47E-02	4.38E-03	3.75E-04	6.84E-04
1,3-Butadiene	106-99-0	X	8.34E-02	3.02E-02	ND	ND	ND
2-Butanone (MEK)	78-93-3		1.97E-02	6.95E-03	1.16E-02	4.15E-03	2.44E-03
Crotonaldehyde	4170-30-3		6.18E-02	3.53E-02	ND	ND	ND
Ethylbenzene	100-41-4	X	4.38E-02	5.32E-03	5.61E-04	3.64E-04	6.29E-05
Formaldehyde	50-00-0	X	1.81E+00	7.96E-01	4.72E-02	3.35E-03	2.44E-02
Hexanal	66-25-1		8.02E-02	2.00E-01	2.08E-01	1.16E-01	4.46E-02
Naphthalene	91-20-3	X	1.13E-01	2.36E-02	3.59E-03	8.99E-04	8.48E-04
Phenol	108-95-2	X	7.12E-02	1.82E-02	1.68E-03	9.01E-05	7.44E-04
Propanal	123-38-6	X	5.52E-02	2.61E-02	ND	ND	ND
Styrene	100-42-5	X	2.96E-02	1.33E-02	3.94E-04	ND	ND
Toluene	108-88-3	X	1.62E-01	2.60E-02	2.11E-03	8.64E-04	2.76E-04
m,p-Xylene	1330-20-7	X	1.60E-01	1.52E-02	2.15E-03	1.46E-03	2.17E-04
o-Xylene	95-47-6	X	3.50E-02	3.77E-03	4.69E-04	3.07E-04	5.10E-05

Notes for TF30-P-109 Engine:

1. Data obtained from Engine and Hush House Emissions from a TF30-P109 Jet Engine Tested at Cannon Air Force Base, NM

"—" Indicates No Data Available

"X" Indicates that compound is a HAP

ND - Compound not detected at the detection limit. Compound may be present at a value less than the detection limit.

AA - Compound detected was less than the Ambient Air concentration resulting in a negative emission factor when the Ambient Air Concentration was removed.

Table 2-9. VOC and HAP Emission Factors for Select Engines (cont.)

TF33-P-7/7A

Power Setting			Idle	Approach	Intermediate	Military	---
Fuel Flowrate (lb/hr)[1]			1093	4884	6356	8264	---
Percent Thrust/hp[1]			4%	45%	58%	73%	---
Compound Name	**CAS Number**	**HAP**	**Emission Factors (lb/1000lb fuel burned)**				
Acetaldehyde	75-07-0	X	ND	8.72E-03	ND	ND	---
Acrolein	107-02-8	X	ND	ND	ND	ND	---
Benzaldehyde	100-52-7		ND	ND	ND	ND	---
Benzene	71-43-2	X	5.23E-01	2.84E-02	6.49E-03	1.47E-03	---
1,3-Butadiene	106-99-0	X	---	---	---	---	---
2-Butanone (MEK)	78-93-3		1.89E-02	7.11E-03	ND	ND	---
Crotonaldehyde	4170-30-3		ND	ND	ND	ND	---
Ethylbenzene	100-41-4	X	2.00E-01	2.04E-03	5.11E-04	3.88E-04	---
Formaldehyde	50-00-0	X	2.31E+00	1.26E-01	2.80E-02	5.28E-03	---
Hexanal	66-25-1		ND	ND	ND	ND	---
Naphthalene	91-20-3	X	3.71E-01	3.13E-03	3.54E-04	AA	---
Phenol	108-95-2	X	1.67E-01	3.54E-03	1.28E-03	ND	---
Propanal	123-38-6	X	---	---	---	---	---
Styrene	100-42-5	X	2.42E-01	3.43E-03	7.46E-04	ND	---
Toluene	108-88-3	X	3.73E-01	1.01E-02	2.54E-03	2.27E-03	---
m,p-Xylene	1330-20-7	X	3.35E-01	3.40E-03	1.04E-03	1.21E-03	---
o-Xylene	95-47-6	X	1.27E-01	1.42E-03	3.05E-04	4.31E-04	---

Notes for TF33-P-7/7A Engine:

1. Data obtained from *Aircraft Engine and APU Emissions Testing Volumes I-III March 1999,* IERA-RS-BR-TR-1999-0006

"X" Indicates that compound is a HAP

"---" Indicates No Data Available

ND – Compound not detected at the detection limit. Compound may be present at a value less than the detection limit

AA – Compound detected was less than the ambient air concentration resulting in a negative emission factor when the ambient air concentration was removed

Table 2-9. VOC and HAP Emission Factors for Select Engines (cont.)

TF33-P-102

Power Setting			Idle	Approach	Intermediate	Military	---
Fuel Flowrate (lb/hr)[1]			1114	4737	5782	7561	---
Percent Thrust/hp[1]			5%	49%	59%	75%	---
Compound Name	**CAS Number**	**HAP**	**Emission Factors (lb/1000lb fuel burned)**				
Acetaldehyde	75-07-0	X	ND	ND	ND	ND	---
Acrolein	107-02-8	X	ND	ND	ND	ND	---
Benzaldehyde	100-52-7		ND	ND	ND	ND	---
Benzene	71-43-2	X	7.09E-01	1.14E-02	4.05E-03	9.53E-04	---
1,3-Butadiene	106-99-0	X	---	---	---	---	---
2-Butanone (MEK)	78-93-3		3.64E-02	1.59E-03	7.45E-04	ND	---
Crotonaldehyde	4170-30-3		ND	ND	ND	ND	---
Ethylbenzene	100-41-4	X	8.63E-02	8.23E-04	4.79E-04	ND	---
Formaldehyde	50-00-0	X	9.43E-01	6.65E-02	2.27E-02	ND	---
Hexanal	66-25-1		ND	ND	ND	ND	---
Naphthalene	91-20-3	X	2.15E-01	1.10E-03	7.35E-04	1.30E-04	---
Phenol	108-95-2	X	8.41E-02	1.76E-03	ND	ND	---
Propanal	123-38-6	X	---	---	---	---	---
Styrene	100-42-5	X	1.09E-01	1.18E-03	4.38E-04	ND	---
Toluene	108-88-3	X	2.65E-01	2.28E-03	2.65E-03	9.50E-04	---
m,p-Xylene	1330-20-7	X	1.37E-01	2.40E-03	1.04E-03	8.35E-04	---
o-Xylene	95-47-6	X	6.09E-02	AA	ND	2.46E-04	---

Notes for TF33-P-102 Engine:

1. Data obtained from Aircraft Engine and APU Emissions Testing Volumes I-III March 1999, IERA-RS-BR-TR-1999-0006

"X" Indicates that compound is a HAP

"---" Indicates No Data Available

ND – Compound not detected at the detection limit. Compound may be present at a value less than the detection limit

AA – Compound detected was less than the ambient air concentration resulting in a negative emission factor when the ambient air concentration was removed

Table 2-9. VOC and HAP Emission Factors for Select Engines (cont.)

TF34-GE-100A

Power Setting			Idle	Approach	Intermediate	Military	---
Fuel Flowrate (lb/hr)[1]			498	933	1512	2628	---
Percent Thrust/hp[1]			7%	28%	46%	78%	---
Compound Name	**CAS Number**	**HAP**	**Emission Factors (lb/1000lb fuel burned)**				
Acetaldehyde	75-07-0	X	1.27E-01	3.08E-02	ND	ND	---
Acrolein	107-02-8	X	6.10E-02	1.36E-02	5.42E-03	2.96E-03	---
Benzaldehyde	100-52-7		5.10E-02	2.03E-02	7.80E-03	5.94E-03	---
Benzene	71-43-2	X	2.81E-01	6.37E-02	9.57E-03	4.27E-03	---
1,3-Butadiene	106-99-0	X	---	---	---	---	---
2-Butanone (MEK)	78-93-3		1.50E-02	5.94E-03	ND	ND	---
Crotonaldehyde	4170-30-3		5.10E-02	ND	ND	ND	---
Ethylbenzene	100-41-4	X	2.62E-02	3.50E-03	ND	6.82E-04	---
Formaldehyde	50-00-0	X	1.22E+00	5.31E-01	6.61E-02	2.82E-02	---
Hexanal	66-25-1		ND	ND	ND	ND	---
Naphthalene	91-20-3	X	4.48E-02	8.51E-03	1.59E-03	3.20E-05	---
Phenol	108-95-2	X	2.73E-02	6.61E-01	ND	ND	---
Propanal	123-38-6	X	---	---	---	---	---
Styrene	100-42-5	X	4.41E-02	6.72E-03	ND	ND	---
Toluene	108-88-3	X	1.12E-01	1.40E-02	3.21E-03	1.34E-04	---
m,p-Xylene	1330-20-7	X	5.50E-02	7.95E-03	1.52E-03	2.41E-03	---
o-Xylene	95-47-6	X	2.67E-02	3.65E-03	ND	7.35E-04	---

Notes for TF34-GE-100A Engine:

1. Data obtained from *Aircraft Engine and APU Emissions Testing Volumes I-III March 1999,* IERA-RS-BR-TR-1999-0006

"X" Indicates that compound is a HAP

"---" Indicates No Data Available

ND – Compound not detected at the detection limit. Compound may be present at a value less than the detection limit

AA – Compound detected was less than the ambient air concentration resulting in a negative emission factor when the ambient air concentration was removed

Table 2-9. VOC and HAP Emission Factors for Select Engines (cont.)

TF39-GE-1C

Power Setting			Idle	Approach	Intermediate	Military	---
Fuel Flowrate (lb/hr)[1]			1448	10477	12541	13862	---
Percent Thrust/hp[1]			7%	76%	87%	94%	---
Compound Name	**CAS Number**	**HAP**	**Emission Factors (lb/1000lb fuel burned)**				
Acetaldehyde	75-07-0	X	2.12E-01	3.16E-03	2.61E-04	6.17E-04	---
Acrolein	107-02-8	X	2.06E-01	ND	ND	ND	---
Benzaldehyde	100-52-7		1.42E-01	1.15E-03	1.88E-03	1.70E-03	---
Benzene	71-43-2	X	3.58E-01	1.56E-03	1.41E-03	2.16E-03	---
1,3-Butadiene	106-99-0	X	---	---	---	---	---
2-Butanone (MEK)	78-93-3		2.59E-02	ND	1.16E-03	2.46E-04	---
Crotonaldehyde	4170-30-3		8.77E-02	ND	ND	ND	---
Ethylbenzene	100-41-4	X	2.01E-02	ND	4.99E-04	AA	---
Formaldehyde	50-00-0	X	1.42E+00	8.15E-03	4.90E-03	1.05E-02	---
Hexanal	66-25-1		ND	ND	ND	ND	---
Naphthalene	91-20-3	X	9.74E-02	AA	AA	AA	---
Phenol	108-95-2	X	4.38E-02	ND	ND	ND	---
Propanal	123-38-6	X	---	---	---	---	---
Styrene	100-42-5	X	4.49E-02	ND	ND	6.94E-04	---
Toluene	108-88-3	X	1.28E-01	AA	AA	AA	---
m,p-Xylene	1330-20-7	X	3.81E-02	AA	1.90E-03	AA	---
o-Xylene	95-47-6	X	2.00E-02	9.26E-04	6.83E-04	AA	---

Notes for TF39-GE-1C Engine:

1. Data obtained from *Aircraft Engine and APU Emissions Testing Volumes I-III March 1999,* IERA-RS-BR-TR-1999-0006

"X" Indicates that compound is a HAP

"---" Indicates No Data Available

ND – Compound not detected at the detection limit. Compound may be present at a value less than the detection limit

AA – Compound detected was less than the ambient air concentration resulting in a negative emission factor when the ambient air concentration was removed

Table 2-10. Criteria Pollutant and Ozone Precursor Emission Factors for APUs[1]

APU Model	Manufacturer	Fuel Flow Rate (lb/hr)	Emission Factors in lb/hr of Operation						
			NO_X	CO	VOC	SO_X[2]	PM_{10}	$PM_{2.5}$	CO_2e[3]
GTC 85-72 (200 hp)[4]	Honeywell Inc.	210.00	0.81	3.11	0.03	0.22	---	---	674.49
GTCP 30-300	Honeywell Inc.	282.20	2.85	---	0.06	0.30	---	---	---
GTCP 36-6	Honeywell Inc.	150.00	0.87	1.41	0.06	---	---	---	---
GTCP 36-300 (80 hp)	Honeywell Inc.	282.20	2.85	0.58[(6)]	0.06	0.30	---	---	---
GTCP 85 (200 hp)	Honeywell Inc.	235.28	1.12	---	0.24	0.25	---	---	---
GTCP 85-98ck (200 hp)	Honeywell Inc.	235.28	1.12	4.23[(6)]	0.24	0.25	---	---	---
GTCP 85-98d	Honeywell Inc.	297.00	1.78	1.64	0.04	---	---	---	---
GTCP 85-129 (200 hp)	Honeywell Inc.	235.28	1.12	4.23[(6)]	0.24	0.25	---	---	---
GTCP 85-129ck (200 hp)	Honeywell Inc.	235.28	1.12	4.23[(6)]	0.24	0.25	---	---	---
GTCP 85-180[7]	Honeywell Inc.	270.30	1.28	2.05	0.01	0.29	0.05	0.01	906.25
GTCP 95-2 (300 hp)[4]	Honeywell Inc.	293.00	1.65	0.94	0.11	0.31	---	---	948.89
GTCP 100-544 (400 hp)[4]	Honeywell Inc.	413.00	2.46	2.43	0.07	0.44	---	---	1337.86
GTCP 165-1[7]	Honeywell Inc.	272.60	1.22	3.76	0.49	0.29	0.13	0.04	910.75
GTCP 331-200/250 (143 hp)	Honeywell Inc.	267.92	2.55	---	0.12	0.28	---	---	---
GTCP 331-200ER (143 hp)	Honeywell Inc.	267.92	2.55	1.11[(6)]	0.12	0.28	---	---	---
GTCP 331-500 (143 hp)	Honeywell Inc.	536.00	7.86	0.05[(6)]	0.07	0.57	---	---	---
GTCP 660-4 (300 hp)	Honeywell Inc.	862.92	4.60	7.46[(6)]	0.24	0.91	---	---	---
PW901A	Pratt & Whitney	862.92	2.72	14.48[(6)]	1.29	0.91	---	---	---
ST-6[8]	United Technologies Corporation	440.00	3.92	0.02	0.01	0.47	---	---	---
T-62T-27 (100 hp)[4]	United Technologies Corporation	102.00	0.40	4.36	0.79	0.11	---	---	344.76
T-62T-47C1[6]	United Technologies Corporation	235.28	1.01	9.46	0.04	0.25	---	---	---
TSCP 700 (142 hp)	Honeywell Inc.	323.68	2.77	---	0.08	0.34	---	---	---
TSCP 700-4B (142 hp)	Honeywell Inc.	323.68	2.77	0.48[(6)]	0.08	0.34	---	---	---
WR27-1[4]	Williams International	140.00	0.65	0.79	0.03	0.15	---	---	444.77

1. SOURCE (unless otherwise stated): Technical Data to Support FAA's Advisory Circular on Reducing Emissions from Commercial Aviation memorandum. This document states the original source as Proposed Federal Implementation Plan for California, Docket No. A-94-09 memorandum
2. SO_X Emission factors assume that JP-8, with an average wt. % of 0.053 Sulfur, is used to power the APU.
3. Greenhouse Gas (GHG) emission factors are presented in equivalent CO_2 (CO_2e). Original source document provided emission factors for CO_2 and CH_4. CH_4 emissions were then multiplied by the global warming potential (GWP) which is stated as 25 per Table A-1 to Subpart A of 40 CFR 98.
4. SOURCE: Summary Tables of Gaseous and Particulate Emissions from Aircraft Engines, June 1990.
5. SOURCE: Air Pollutant Emission Factors for Military and Civil Aircraft.
6. SOURCE: Technical Data to Support FAA's Advisory Circular on Reducing Emissions from Commercial Aviation memorandum. This document states the original source as United Air Lines' APU Emissions Database (note: data for LAX 1991)
7. SOURCE: Aircraft Engine and Auxiliary Power Unit Emissions Testing Volume I -III, March 1999
8. SOURCE: Technical Data to Support FAA's Advisory Circular on Reducing Emissions from Commercial Aviation memorandum. This document states the original source as AIA Exhaust Emissions Data Sheet letter

"---" Indicates No Data Available

Table 2-11. VOC Weight Fractions for Turbofan Engines

Compound Name	CAS Number	HAP	Power Setting				
			Idle	Approach	Intermediate	Military	Afterburner-1
Acenaphthene	83-32-9	X	ND	ND	ND	ND	ND
Acenaphthylene	208-96-8	X	0.25%	ND	ND	ND	ND
Acetaldehyde	75-07-0	X	3.85%	5.65%	1.85%	2.28%	1.84%
Acrolein	107-02-8	X	2.55%	2.09%	0.50%	0.27%	5.45%
Anthracene	120-12-7	X	ND	ND	ND	ND	ND
Benzaldehyde	100-52-7		1.68%	0.80%	2.10%	1.89%	6.50%
Benz(a)anthracene	56-55-3	X	ND	ND	ND	ND	ND
Benzene	71-43-2	X	10.24%	3.39%	2.62%	1.76%	16.12%
Benzenemethanol	100-51-6		0.25%	ND	ND	ND	0.58%
Benzo(b)fluoranthene	205-99-2	X	ND	ND	ND	ND	ND
Benzo(k)fluoranthene	207-08-9	X	ND	ND	ND	ND	ND
Benzo(g,h,i)perylene	191-24-2	X	ND	ND	ND	ND	ND
Benzo(a)pyrene	50-32-8	X	ND	ND	ND	ND	ND
Benzoic Acid	65-85-0		4.26%	3.92%	11.41%	8.18%	6.06%
Bromodichloromethane	75-27-4		0.08%	ND	0.03%	0.02%	0.10%
Bromoform	75-25-2	X	0.07%	ND	0.03%	0.02%	0.07%
Bromomethane	74-83-9	X	0.10%	0.19%	1.75%	7.29%	3.13%
4-Bromophenyl-phenyl Ether	101-55-3		ND	ND	ND	ND	ND
1,3-Butadiene	106-99-0	X	1.48%	ND	0.17%	ND	ND
2-Butanone (MEK)	78-93-3		0.82%	0.98%	0.82%	0.62%	1.82%
Butyl benzyl phthalate	85-68-7		0.01%	0.01%	0.11%	0.03%	0.01%
Carbon Disulfide	75-15-0	X	0.08%	0.01%	0.35%	0.23%	0.10%
Carbon Tetrachloride	56-23-5	X	0.07%	0.14%	0.34%	0.20%	0.06%
4-Chloroaniline	106-47-8		ND	ND	ND	ND	ND
Chlorobenzene	108-90-7	X	0.07%	ND	0.05%	0.03%	0.07%
Chlorodibromomethane	124-48-1		0.08%	ND	0.03%	0.02%	0.10%
Chloroethane	75-00-3	X	0.08%	ND	0.03%	0.02%	0.10%
bis(2-Chloroethoxy) Methane	111-91-1		ND	ND	ND	ND	ND
bis(2-Chloroethyl) Ether	111-44-4	X	ND	ND	ND	ND	ND
Chloroform	67-66-3	X	0.13%	0.40%	1.09%	0.82%	0.07%
bis(2-Choroisopropyl) Ether	39638-32-9		ND	ND	ND	ND	ND
Chloromethane	74-87-3	X	0.12%	0.36%	0.84%	1.82%	0.34%
4-Chloro-3-methylphenol	59-50-7		ND	ND	ND	ND	ND
2-Chloronaphthalene	91-58-7		ND	ND	ND	ND	ND
2-Chlorophenol	95-57-8		ND	ND	ND	ND	ND
1-chloro-4-phenoxybenzene	7005-72-3		ND	ND	ND	ND	ND
Chrysene	218-01-9	X	ND	ND	ND	ND	ND
o-Cresol	95-48-7	X	0.00%	ND	ND	ND	0.01%
p-Cresol	106-44-5	X	0.37%	0.11%	ND	ND	0.80%
Crotonaldehyde	4170-30-3		1.28%	0.57%	ND	ND	3.72%
Dibenzofuran	132-64-9	X	0.09%	ND	ND	0.00%	0.10%
Dibutyl Phthalate	84-74-2	X	0.02%	0.09%	0.56%	0.08%	0.02%
1,2-Dichlorobenzene	95-50-1		ND	0.01%	0.10%	0.04%	ND
1,3-Dichlorobenzene	541-73-1		ND	ND	0.10%	0.02%	ND
1,4-Dichlorobenzene	106-46-7	X	0.02%	0.01%	0.06%	0.04%	0.00%
3,3'-Dichlorobenzidine	91-94-1	X	ND	ND	ND	ND	ND
1,1-Dichloroethane	75-34-3	X	0.08%	ND	0.03%	0.02%	0.10%
1,2-Dichloroethane	107-06-2	X	0.08%	ND	0.03%	0.02%	0.10%
1,1-Dichloroethene	75-35-4	X	0.08%	ND	0.11%	0.02%	0.10%
cis-1,2-Dicholorethene	156-59-2		0.08%	ND	0.03%	0.02%	0.10%
trans-1,2-Dichloroethene	156-60-5		0.07%	ND	0.03%	0.02%	0.08%
2,4-Dichlorophenol	120-83-2		0.01%	0.06%	0.16%	0.13%	ND
1,2-Dichloropropane	78-87-5	X	0.09%	0.05%	0.10%	0.02%	0.10%
cis-1,3-Dichloropropene	10061-01-5		0.08%	ND	0.03%	0.02%	0.10%
trans-1,3-Dichloropropene	10061-02-6		0.08%	0.03%	0.09%	0.07%	0.12%
Diethyl Phthalate	84-66-2		0.12%	0.66%	1.19%	0.68%	0.45%

Compound Name	CAS Number	HAP	Power Setting				
			Idle	Approach	Intermediate	Military	Afterburner-1
2,4-Dimethylphenol	105-67-9		ND	ND	ND	ND	ND
Dimethyl phthalate	131-11-3	X	ND	ND	ND	ND	ND
4,6-Dinitro-o-cresol	534-52-1	X	ND	ND	ND	ND	ND
2,4-Dinitrophenol	51-28-5	X	0.04%	0.21%	0.43%	ND	ND
2,4-Dinitrotoluene	121-14-2	X	ND	ND	ND	ND	ND
2,6-Dinitrotoluene	606-20-2		ND	ND	ND	ND	ND
Di(2-Ethylhexyl) Phthalate (DEHP)	117-81-7	X	0.29%	0.78%	2.53%	2.24%	0.14%
Di-n-Octyl phthalate	117-84-0		0.00%	ND	ND	ND	ND
Ethylbenzene	100-41-4	X	1.68%	0.26%	0.28%	0.20%	3.68%
Fluoranthene	206-44-0	X	0.03%	ND	0.02%	ND	ND
Fluorene	86-73-7	X	0.08%	ND	ND	ND	0.00%
Formaldehyde	50-00-0	X	39.58%	41.13%	22.08%	9.82%	2.49%
Hexachlorobenzene	118-74-1	X	ND	ND	ND	ND	ND
Hexachlorobutadiene	87-68-3	X	ND	0.01%	0.15%	0.06%	ND
Hexachlorocyclopentadiene	77-47-4	X	ND	ND	ND	ND	ND
Hexachloroethane	67-72-1	X	ND	ND	ND	ND	ND
Hexanal	66-25-1		0.10%	1.12%	2.78%	0.93%	0.86%
2-Hexanone	591-78-6		0.41%	0.14%	0.52%	0.38%	0.48%
Indeno(1,2,3-cd)pyrene	193-39-5	X	ND	ND	ND	ND	ND
Isophorone	78-59-1	X	ND	ND	ND	ND	ND
Isovaleraldehyde	590-86-3		0.14%	2.24%	2.97%	0.46%	0.50%
Methylene Chloride	75-09-2	X	1.23%	7.17%	23.71%	33.47%	1.42%
2-Methylnaphthalene	91-57-6		4.11%	0.25%	0.20%	0.13%	5.91%
4-Methyl-2-pentanone (MIBK)	108-10-1	X	0.39%	0.08%	0.37%	0.27%	0.48%
Naphthalene	91-20-3	X	4.12%	0.43%	0.36%	0.13%	6.12%
m-Nitroaniline	99-09-2		ND	ND	ND	ND	ND
o-Nitroaniline	88-74-4		ND	ND	ND	ND	ND
4-Nitrobenzenamine	100-01-6		ND	ND	ND	ND	ND
Nitrobenzene	98-95-3	X	ND	ND	ND	ND	ND
2-Nitrophenol	88-75-5		0.05%	ND	ND	ND	1.08%
4-Nitrophenol	100-02-7	X	0.05%	0.12%	ND	ND	0.66%
N-Nitrosodiphenylamine	86-30-6		ND	ND	ND	ND	ND
N-Nitrosodi-n-propylamine	621-64-7		ND	ND	ND	ND	ND
Pentachlorophenol	87-86-5	X	ND	ND	ND	ND	ND
Pentanal	110-62-3		1.79%	0.00%	0.93%	1.85%	0.24%
Phenanthrene	85-01-8	X	0.11%	0.01%	ND	ND	0.00%
Phenol	108-95-2	X	2.07%	20.49%	0.13%	0.03%	3.38%
Propanal	123-38-6	X	1.72%	2.46%	7.61%	17.20%	0.36%
Pyrene	129-00-0	X	0.04%	ND	ND	ND	ND
Styrene	100-42-5	X	2.18%	0.34%	0.21%	0.09%	0.47%
1,1,2,2-Tetrachloroethane	79-34-5	X	0.09%	0.07%	0.22%	0.06%	0.07%
Tetrachloroethene	127-18-4	X	0.10%	0.17%	0.47%	0.50%	0.07%
m -Tolualdehyde	620-23-5		0.46%	0.25%	2.71%	1.02%	2.62%
o-Tolualdehyde	529-20-4		0.11%	0.13%	ND	0.04%	0.58%
Toluene	108-88-3	X	4.89%	1.19%	1.60%	0.88%	9.16%
1,2,4-Trichlorobenzene	120-82-1	X	ND	0.01%	0.22%	0.08%	0.00%
1,1,1-Trichloroethane	71-55-6	X	0.07%	0.06%	0.26%	0.14%	0.06%
1,1,2-Trichloroethane	79-00-5	X	0.08%	ND	0.03%	0.02%	0.10%
Trichloroethene	79-01-6	X	0.08%	0.06%	0.25%	0.09%	0.07%
2,4,5-Trichlorophenol	95-95-4	X	ND	ND	ND	ND	ND
2,4,6-Trichlorophenol	88-06-2	X	ND	ND	ND	ND	ND
Vinyl Acetate	108-05-4	X	0.43%	0.21%	0.74%	1.54%	1.12%
Vinyl Chloride	75-01-4	X	0.08%	ND	0.03%	0.02%	0.10%
m,p-Xylene	1330-20-7	X	3.20%	0.81%	1.20%	1.34%	6.36%
o-Xylene	95-47-6	X	1.38%	0.27%	0.25%	0.31%	3.00%

ND indicates compound not detected at detection limit. Compound may be present at a value less than the detection limit.

0.00% - Value is less than 0.00005.

"X" indicates that compound is a HAP.

Table 2-12. VOC Weight Fractions for Turboprop for Large Aircraft

Compound Name	CAS Number	HAP	Power Setting				
			Idle	Approach	Intermediate	Military	---
Acenaphthene	83-32-9	X	ND	ND	ND	ND	---
Acenaphthylene	208-96-8	X	ND	ND	ND	ND	---
Acetaldehyde	75-07-0	X	13.02%	AA	2.39%	2.10%	---
Acrolein	107-02-8	X	ND	ND	ND	ND	---
Anthracene	120-12-7	X	ND	ND	ND	ND	---
Benzaldehyde	100-52-7		1.41%	1.39%	2.06%	ND	---
Benz(a)anthracene	56-55-3	X	ND	ND	ND	ND	---
Benzene	71-43-2	X	5.96%	7.04%	5.92%	10.02%	---
Benzenemethanol	100-51-6		ND	ND	ND	ND	---
Benzo(b)fluoranthene	205-99-2	X	ND	ND	ND	ND	---
Benzo(k)fluoranthene	207-08-9	X	ND	ND	ND	ND	---
Benzo(g,h,i)perylene	191-24-2	X	ND	ND	ND	ND	---
Benzo(a)pyrene	50-32-8	X	ND	ND	ND	ND	---
Benzoic Acid	65-85-0		8.05%	14.05%	16.87%	25.93%	---
Bromodichloromethane	75-27-4		ND	ND	ND	ND	---
Bromoform	75-25-2	X	ND	ND	ND	ND	---
Bromomethane	74-83-9	X	ND	ND	ND	ND	---
4-Bromophenyl-phenyl Ether	101-55-3		ND	ND	ND	ND	---
1,3-Butadiene	106-99-0	X	---	---	---	---	---
2-Butanone (MEK)	78-93-3		0.58%	0.57%	ND	2.24%	---
Butyl benzyl phthalate	85-68-7		ND	ND	ND	ND	---
Carbon Disulfide	75-15-0	X	0.90%	2.59%	4.58%	3.67%	---
Carbon Tetrachloride	56-23-5	X	ND	0.83%	0.63%	3.00%	---
4-Chloroaniline	106-47-8		ND	ND	ND	ND	---
Chlorobenzene	108-90-7	X	ND	ND	ND	ND	---
Chlorodibromomethane	124-48-1		ND	ND	ND	ND	---
Chloroethane	75-00-3	X	ND	ND	ND	ND	---
bis(2-Chloroethoxy) Methane	111-91-1		ND	ND	ND	ND	---
bis(2-Chloroethyl) Ether	111-44-4	X	ND	ND	ND	ND	---
Chloroform	67-66-3	X	2.79%	0.86%	4.26%	6.59%	---
bis(2-Chloroisopropyl) Ether	39638-32-9		ND	ND	ND	ND	---
Chloromethane	74-87-3	X	ND	0.72%	1.38%	4.63%	---
4-Chloro-3-methylphenol	59-50-7		ND	ND	ND	ND	---
2-Chloronaphthalene	91-58-7		ND	ND	ND	ND	---
2-Chlorophenol	95-57-8		ND	ND	ND	ND	---
1-chloro-4-phenoxybenzene	7005-72-3		ND	ND	ND	ND	---
Chrysene	218-01-9	X	ND	ND	ND	ND	---
o-Cresol	95-48-7	X	ND	ND	ND	ND	---
p-Cresol	106-44-5	X	ND	ND	ND	ND	---
Crotonaldehyde	4170-30-3		ND	ND	ND	ND	---
Dibenzofuran	132-64-9	X	ND	ND	ND	ND	---
Dibutyl Phthalate	84-74-2	X	0.63%	0.53%	0.49%	1.34%	---
1,2-Dichlorobenzene	95-50-1		ND	ND	ND	ND	---
1,3-Dichlorobenzene	541-73-1		ND	ND	ND	ND	---
1,4-Dichlorobenzene	106-46-7	X	ND	ND	ND	ND	---
3,3'-Dichlorobenzidine	91-94-1	X	ND	ND	ND	ND	---
1,1-Dichloroethane	75-34-3	X	ND	ND	ND	ND	---
1,2-Dichloroethane	107-06-2	X	ND	ND	ND	ND	---
1,1-Dichloroethene	75-35-4	X	ND	ND	ND	ND	---
cis-1,2-Dicholorethene	156-59-2		ND	ND	ND	ND	---
trans-1,2-Dichloroethene	156-60-5		ND	ND	ND	ND	---
2,4-Dichlorophenol	120-83-2		ND	ND	ND	ND	---
1,2-Dichloropropane	78-87-5	X	ND	ND	ND	ND	---
cis-1,3-Dichloropropene	10061-01-5		ND	ND	ND	ND	---
trans-1,3-Dichloropropene	10061-02-6		ND	ND	ND	ND	---
Diethyl Phthalate	84-66-2		1.21%	0.41%	ND	5.43%	---

Compound Name	CAS Number	HAP	Power Setting				
			Idle	Approach	Intermediate	Military	---
2,4-Dimethylphenol	105-67-9		ND	ND	ND	ND	---
Dimethyl phthalate	131-11-3	X	ND	ND	ND	ND	---
4,6-Dinitro-o-cresol	534-52-1	X	ND	ND	ND	ND	---
2,4-Dinitrophenol	51-28-5	X	ND	ND	ND	ND	---
2,4-Dinitrotoluene	121-14-2	X	ND	ND	ND	ND	---
2,6-Dinitrotoluene	606-20-2		ND	ND	ND	ND	---
Di(2-Ethylhexyl) Phthalate (DEHP)	117-81-7	X	3.02%	5.25%	5.26%	AA	---
Di-n-Octyl phthalate	117-84-0		ND	ND	ND	ND	---
Ethylbenzene	100-41-4	X	ND	0.64%	0.91%	2.29%	---
Fluoranthene	206-44-0	X	ND	ND	ND	ND	---
Fluorene	86-73-7	X	ND	ND	ND	ND	---
Formaldehyde	50-00-0	X	51.28%	52.91%	40.98%	4.87%	---
Hexachlorobenzene	118-74-1	X	ND	ND	ND	ND	---
Hexachlorobutadiene	87-68-3	X	ND	ND	ND	ND	---
Hexachlorocyclopentadiene	77-47-4	X	ND	ND	ND	ND	---
Hexachloroethane	67-72-1	X	ND	ND	ND	ND	---
Hexanal	66-25-1		ND	ND	ND	ND	---
2-Hexanone	591-78-6		ND	ND	ND	ND	---
Indeno(1,2,3-cd)pyrene	193-39-5	X	ND	ND	ND	ND	---
Isophorone	78-59-1	X	ND	ND	ND	ND	---
Isovaleraldehyde	590-86-3		ND	ND	ND	ND	---
Methylene Chloride	75-09-2	X	0.89%	1.55%	3.45%	5.40%	---
2-Methylnaphthalene	91-57-6		0.91%	1.08%	0.46%	0.44%	---
4-Methyl-2-pentanone (MIBK)	108-10-1	X	ND	ND	ND	ND	---
Naphthalene	91-20-3	X	1.45%	1.64%	0.78%	1.71%	---
m-Nitroaniline	99-09-2		ND	ND	ND	ND	---
o-Nitroaniline	88-74-4		ND	ND	ND	ND	---
4-Nitrobenzenamine	100-01-6		ND	ND	ND	ND	---
Nitrobenzene	98-95-3	X	ND	ND	ND	ND	---
2-Nitrophenol	88-75-5		ND	ND	ND	ND	---
4-Nitrophenol	100-02-7	X	ND	ND	ND	ND	---
N-Nitrosodiphenylamine	86-30-6		ND	ND	ND	ND	---
N-Nitrosodi-n-propylamine	621-64-7		ND	ND	ND	ND	---
Pentachlorophenol	87-86-5	X	ND	ND	ND	ND	---
Pentanal	110-62-3		ND	ND	ND	ND	---
Phenanthrene	85-01-8	X	ND	ND	ND	ND	---
Phenol	108-95-2	X	ND	ND	ND	ND	---
Propanal	123-38-6	X	---	---	---	---	---
Pyrene	129-00-0	X	ND	ND	ND	ND	---
Styrene	100-42-5	X	0.88%	0.58%	ND	ND	---
1,1,2,2-Tetrachloroethane	79-34-5	X	ND	ND	ND	ND	---
Tetrachloroethene	127-18-4	X	ND	ND	ND	2.75%	---
m -Tolualdehyde	620-23-5		ND	ND	ND	ND	---
o-Tolualdehyde	529-20-4		ND	ND	ND	ND	---
Toluene	108-88-3	X	3.38%	3.63%	4.23%	0.32%	---
1,2,4-Trichlorobenzene	120-82-1	X	ND	ND	ND	ND	---
1,1,1-Trichloroethane	71-55-6	X	ND	ND	ND	ND	---
1,1,2-Trichloroethane	79-00-5	X	1.98%	2.06%	2.78%	6.10%	---
Trichloroethene	79-01-6	X	ND	ND	ND	ND	---
2,4,5-Trichlorophenol	95-95-4	X	ND	ND	ND	ND	---
2,4,6-Trichlorophenol	88-06-2	X	ND	ND	ND	ND	---
Vinyl Acetate	108-05-4	X	ND	ND	ND	ND	---
Vinyl Chloride	75-01-4	X	ND	ND	ND	ND	---
m,p-Xylene	1330-20-7	X	0.84%	1.16%	1.83%	8.00%	---
o-Xylene	95-47-6	X	0.82%	0.51%	0.74%	3.17%	---

ND indicates compound not detected at detection limit. Compound may be present at a value less than the detection limit

0.00% - Value is less than 0.00005

"---" Indicates No Data Available

AA – Detected value was below the ambient air value

"X" indicates that compound is a HAP

All emission factors based off the T56-A-7 engine

This class of engine is found on large aircraft such as the C-2 and C-130

Table 2-13. VOC Weight Fractions for Turboprop for Small Aircraft

Compound Name	CAS Number	HAP	Power Setting				
			Ground Idle	Flight Idle	Descend	Approach	Max. Continuous
Acenaphthene	83-32-9	X	ND	ND	ND	ND	ND
Acenaphthylene	208-96-8	X	ND	ND	ND	ND	ND
Acetaldehyde	75-07-0	X	4.12%	4.31%	2.67%	1.46%	1.11%
Acrolein	107-02-8	X	9.85%	7.45%	1.54%	ND	ND
Anthracene	120-12-7	X	ND	ND	ND	ND	ND
Benzaldehyde	100-52-7		0.32%	2.15%	1.35%	1.12%	ND
Benz(a)anthracene	56-55-3	X	ND	ND	ND	ND	ND
Benzene	71-43-2	X	2.30%	6.48%	2.58%	1.45%	0.44%
Benzenemethanol	100-51-6		---	---	---	---	---
Benzo(b)fluoranthene	205-99-2	X	ND	ND	ND	ND	ND
Benzo(k)fluoranthene	207-08-9	X	ND	ND	ND	ND	ND
Benzo(g,h,i)perylene	191-24-2	X	ND	ND	ND	ND	ND
Benzo(a)pyrene	50-32-8	X	ND	ND	ND	ND	ND
Benzoic Acid	65-85-0		---	---	---	---	---
Bromodichloromethane	75-27-4		ND	ND	ND	ND	ND
Bromoform	75-25-2	X	ND	ND	ND	ND	ND
Bromomethane	74-83-9	X	ND	ND	ND	ND	0.08%
4-Bromophenyl-phenyl Ether	101-55-3		---	---	---	---	---
1,3-Butadiene	106-99-0	X	2.05%	3.32%	0.33%	ND	ND
2-Butanone (MEK)	78-93-3		0.18%	ND	0.08%	ND	ND
Butyl benzyl phthalate	85-68-7		---	---	---	---	---
Carbon Disulfide	75-15-0	X	ND	ND	ND	ND	ND
Carbon Tetrachloride	56-23-5	X	ND	ND	ND	ND	ND
4-Chloroaniline	106-47-8		---	---	---	---	---
Chlorobenzene	108-90-7	X	ND	ND	ND	ND	ND
Chlorodibromomethane	124-48-1		ND	ND	ND	ND	ND
Chloroethane	75-00-3	X	ND	ND	ND	ND	ND
bis(2-Chloroethoxy) Methane	111-91-1		---	---	---	---	---
bis(2-Chloroethyl) Ether	111-44-4	X	---	---	---	---	---
Chloroform	67-66-3	X	ND	ND	ND	ND	ND
bis(2-Choroisopropyl) Ether	39638-32-9		---	---	---	---	---
Chloromethane	74-87-3	X	0.02%	ND	0.04%	0.02%	0.29%
4-Chloro-3-methylphenol	59-50-7		---	---	---	---	---
2-Chloronaphthalene	91-58-7		ND	ND	ND	ND	ND
2-Chlorophenol	95-57-8		---	---	---	---	---
1-chloro-4-phenoxybenzene	7005-72-3		---	---	---	---	---
Chrysene	218-01-9	X	ND	ND	ND	ND	ND
o-Cresol	95-48-7	X	---	---	---	---	---
p-Cresol	106-44-5	X	---	---	---	---	---
Crotonaldehyde	4170-30-3		2.87%	2.15%	ND	ND	ND
Dibenzofuran	132-64-9	X	---	---	---	---	---
Dibutyl Phthalate	84-74-2	X	---	---	---	---	---
1,2-Dichlorobenzene	95-50-1		---	---	---	---	---
1,3-Dichlorobenzene	541-73-1		---	---	---	---	---
1,4-Dichlorobenzene	106-46-7	X	---	---	---	---	---
3,3'-Dichlorobenzidine	91-94-1	X	---	---	---	---	---
1,1-Dichloroethane	75-34-3	X	ND	ND	ND	ND	ND
1,2-Dichloroethane	107-06-2	X	ND	ND	ND	ND	ND
1,1-Dichloroethene	75-35-4	X	ND	ND	ND	ND	ND
cis-1,2-Dicholorethene	156-59-2		ND	ND	ND	ND	ND
trans-1,2-Dichloroethene	156-60-5		ND	ND	ND	ND	ND
2,4-Dichlorophenol	120-83-2		---	---	---	---	---
1,2-Dichloropropane	78-87-5	X	ND	ND	ND	ND	ND
cis-1,3-Dichloropropene	10061-01-5		ND	ND	ND	ND	ND
trans-1,3-Dichloropropene	10061-02-6		ND	ND	ND	ND	ND
Diethyl Phthalate	84-66-2		---	---	---	---	---

Compound Name	CAS Number	HAP	Power Setting				
			Ground Idle	Flight Idle	Descend	Approach	Max. Continuous
2,4-Dimethylphenol	105-67-9		---	---	---	---	---
Dimethyl phthalate	131-11-3	X	---	---	---	---	---
4,6-Dinitro-o-cresol	534-52-1	X	---	---	---	---	---
2,4-Dinitrophenol	51-28-5	X	---	---	---	---	---
2,4-Dinitrotoluene	121-14-2	X	---	---	---	---	---
2,6-Dinitrotoluene	606-20-2		---	---	---	---	---
Di(2-Ethylhexyl) Phthalate (DEHP)	117-81-7	X	---	---	---	---	---
Di-n-Octyl phthalate	117-84-0		---	---	---	---	---
Ethylbenzene	100-41-4	X	0.65%	0.62%	0.08%	0.03%	0.05%
Fluoranthene	206-44-0	X	ND	ND	ND	ND	ND
Fluorene	86-73-7	X	ND	ND	ND	ND	ND
Formaldehyde	50-00-0	X	66.10%	65.50%	89.00%	94.41%	11.30%
Hexachlorobenzene	118-74-1	X	---	---	---	---	---
Hexachlorobutadiene	87-68-3	X	---	---	---	---	---
Hexachlorocyclopentadiene	77-47-4	X	---	---	---	---	---
Hexachloroethane	67-72-1	X	---	---	---	---	---
Hexanal	66-25-1		2.15%	ND	ND	ND	ND
2-Hexanone	591-78-6		0.21%	ND	ND	ND	ND
Indeno(1,2,3-cd)pyrene	193-39-5	X	ND	ND	ND	ND	ND
Isophorone	78-59-1	X	---	---	---	---	---
Isovaleraldehyde	590-86-3		ND	ND	ND	ND	ND
Methylene Chloride	75-09-2	X	ND	ND	0.06%	0.05%	0.09%
2-Methylnaphthalene	91-57-6		ND	ND	ND	ND	46.31%
4-Methyl-2-pentanone (MIBK)	108-10-1	X	0.21%	ND	ND	ND	ND
Naphthalene	91-20-3	X	ND	0.14%	ND	ND	39.32%
m-Nitroaniline	99-09-2		---	---	---	---	---
o-Nitroaniline	88-74-4		---	---	---	---	---
4-Nitrobenzenamine	100-01-6		---	---	---	---	---
Nitrobenzene	98-95-3	X	---	---	---	---	---
2-Nitrophenol	88-75-5		---	---	---	---	---
4-Nitrophenol	100-02-7	X	---	---	---	---	---
N-Nitrosodiphenylamine	86-30-6		---	---	---	---	---
N-Nitrosodi-n-propylamine	621-64-7		---	---	---	---	---
Pentachlorophenol	87-86-5	X	---	---	---	---	---
Pentanal	110-62-3		1.32%	0.85%	1.01%	ND	ND
Phenanthrene	85-01-8	X	ND	ND	ND	ND	ND
Phenol	108-95-2	X	---	---	---	---	---
Propanal	123-38-6	X	---	---	---	---	---
Pyrene	129-00-0	X	ND	ND	ND	ND	ND
Styrene	100-42-5	X	0.64%	0.47%	0.24%	ND	ND
1,1,2,2-Tetrachloroethane	79-34-5	X	ND	ND	ND	ND	ND
Tetrachloroethene	127-18-4	X	ND	ND	ND	ND	ND
m -Tolualdehyde	620-23-5		2.15%	1.10%	ND	1.01%	ND
o-Tolualdehyde	529-20-4		ND	ND	ND	ND	ND
Toluene	108-88-3	X	2.27%	3.01%	0.75%	0.33%	0.27%
1,2,4-Trichlorobenzene	120-82-1	X	---	---	---	---	---
1,1,1-Trichloroethane	71-55-6	X	ND	ND	ND	ND	ND
1,1,2-Trichloroethane	79-00-5	X	ND	ND	ND	ND	ND
Trichloroethene	79-01-6	X	ND	ND	ND	ND	ND
2,4,5-Trichlorophenol	95-95-4	X	---	---	---	---	---
2,4,6-Trichlorophenol	88-06-2	X	---	---	---	---	---
Vinyl Acetate	108-05-4	X	0.21%	ND	ND	ND	ND
Vinyl Chloride	75-01-4	X	---	---	---	---	---
m,p-Xylene	1330-20-7	X	1.56%	1.63%	0.18%	0.08%	0.66%
o-Xylene	95-47-6	X	0.82%	0.82%	0.09%	0.04%	0.08%

ND indicates compound not detected at detection limit. Compound may be present at a value less than the detection limit

0.00% - Value is less than 0.00005

"---" Indicates No Data Available

"X" indicates that compound is a HAP

All emission factors based off the PT6A-68 engine

This class of engine is found on small aircraft such as the T6-A

Table 2-14. VOC Weight Fraction for Turbojet Engines

Compound Name	CAS Number	HAP	Power Setting				
			Idle	Approach	Intermediate	Military	Afterburner-1
Acenaphthene	83-32-9	X	ND	---	ND	ND	ND
Acenaphthylene	208-96-8	X	0.04%	---	0.03%	ND	ND
Acetaldehyde	75-07-0	X	5.28%	---	1.27%	0.54%	ND
Acrolein	107-02-8	X	8.96%	---	0.74%	0.41%	ND
Anthracene	120-12-7	X	ND	---	ND	ND	ND
Benzaldehyde	100-52-7		3.36%	---	0.74%	0.41%	ND
Benz(a)anthracene	56-55-3	X	ND	---	ND	ND	ND
Benzene	71-43-2	X	4.23%	---	9.61%	5.49%	11.97%
Benzenemethanol	100-51-6		0.71%	---	0.68%	0.32%	0.24%
Benzo(b)fluoranthene	205-99-2	X	ND	---	ND	ND	ND
Benzo(k)fluoranthene	207-08-9	X	ND	---	ND	ND	ND
Benzo(g,h,i)perylene	191-24-2	X	ND	---	ND	ND	ND
Benzo(a)pyrene	50-32-8	X	ND	---	ND	ND	ND
Benzoic Acid	65-85-0		0.61%	---	3.65%	14.86%	15.58%
Bromodichloromethane	75-27-4		0.07%	---	ND	ND	ND
Bromoform	75-25-2	X	0.08%	---	ND	ND	ND
Bromomethane	74-83-9	X	0.08%	---	0.00%	ND	ND
4-Bromophenyl-phenyl Ether	101-55-3		ND	---	ND	ND	ND
1,3-Butadiene	106-99-0	X	0.41%	---	1.08%	ND	---
2-Butanone (MEK)	78-93-3		1.06%	---	1.00%	0.63%	0.57%
Butyl benzyl phthalate	85-68-7		ND	---	0.02%	0.06%	0.05%
Carbon Disulfide	75-15-0	X	0.09%	---	0.36%	0.60%	0.22%
Carbon Tetrachloride	56-23-5	X	0.07%	---	0.34%	0.05%	ND
4-Chloroaniline	106-47-8		ND	---	ND	ND	ND
Chlorobenzene	108-90-7	X	0.08%	---	ND	ND	ND
Chlorodibromomethane	124-48-1		0.07%	---	ND	ND	ND
Chloroethane	75-00-3	X	0.08%	---	0.01%	ND	ND
bis(2-Chloroethoxy) Methane	111-91-1		ND	---	ND	ND	ND
bis(2-Chloroethyl) Ether	111-44-4	X	ND	---	ND	ND	ND
Chloroform	67-66-3	X	0.08%	---	0.38%	0.50%	0.40%
bis(2-Choroisopropyl) Ether	39638-32-9		ND	---	ND	ND	ND
Chloromethane	74-87-3	X	0.15%	---	0.72%	0.11%	0.29%
4-Chloro-3-methylphenol	59-50-7		ND	---	ND	ND	ND
2-Chloronaphthalene	91-58-7		ND	---	ND	ND	ND
2-Chlorophenol	95-57-8		ND	---	ND	ND	ND
1-chloro-4-phenoxybenzene	7005-72-3		ND	---	ND	ND	ND
Chrysene	218-01-9	X	ND	---	ND	ND	ND
o-Cresol	95-48-7	X	0.23%	---	0.12%	ND	ND
p-Cresol	106-44-5	X	0.58%	---	0.40%	ND	0.30%
Crotonaldehyde	4170-30-3		4.30%	---	0.74%	0.41%	ND
Dibenzofuran	132-64-9	X	0.23%	---	0.10%	ND	0.13%
Dibutyl Phthalate	84-74-2	X	0.02%	---	0.07%	0.35%	0.12%
1,2-Dichlorobenzene	95-50-1		ND	---	ND	ND	ND
1,3-Dichlorobenzene	541-73-1		ND	---	ND	ND	ND
1,4-Dichlorobenzene	106-46-7	X	ND	---	ND	ND	ND
3,3'-Dichlorobenzidine	91-94-1	X	ND	---	ND	ND	ND
1,1-Dichloroethane	75-34-3	X	0.08%	---	ND	ND	ND
1,2-Dichloroethane	107-06-2	X	0.08%	---	ND	ND	ND
1,1-Dichloroethene	75-35-4	X	0.08%	---	ND	ND	ND
cis-1,2-Dicholorethene	156-59-2		0.07%	---	ND	ND	ND
trans-1,2-Dichloroethene	156-60-5		0.08%	---	ND	ND	ND
2,4-Dichlorophenol	120-83-2		ND	---	ND	ND	ND
1,2-Dichloropropane	78-87-5	X	0.11%	---	ND	ND	ND
cis-1,3-Dichloropropene	10061-01-5		0.08%	---	0.01%	ND	ND
trans-1,3-Dichloropropene	10061-02-6		0.08%	---	0.01%	ND	ND
Diethyl Phthalate	84-66-2		ND	---	0.10%	0.84%	1.77%

Compound Name	CAS Number	HAP	Power Setting				
			Idle	Approach	Intermediate	Military	Afterburner-1
2,4-Dimethylphenol	105-67-9		ND	---	ND	ND	ND
Dimethyl phthalate	131-11-3	X	ND	---	ND	ND	ND
4,6-Dinitro-o-cresol	534-52-1	X	ND	---	ND	ND	ND
2,4-Dinitrophenol	51-28-5	X	ND	---	ND	ND	ND
2,4-Dinitrotoluene	121-14-2	X	ND	---	ND	ND	ND
2,6-Dinitrotoluene	606-20-2		ND	---	ND	ND	ND
Di(2-Ethylhexyl) Phthalate (DEHP)	117-81-7	X	0.04%	---	0.25%	0.49%	0.23%
Di-n-Octyl phthalate	117-84-0		ND	---	ND	ND	ND
Ethylbenzene	100-41-4	X	0.67%	---	0.67%	0.16%	0.92%
Fluoranthene	206-44-0	X	ND	---	ND	ND	ND
Fluorene	86-73-7	X	0.07%	---	0.02%	ND	ND
Formaldehyde	50-00-0	X	39.18%	---	55.08%	37.89%	41.97%
Hexachlorobenzene	118-74-1	X	ND	---	ND	ND	ND
Hexachlorobutadiene	87-68-3	X	ND	---	ND	ND	ND
Hexachlorocyclopentadiene	77-47-4	X	ND	---	ND	ND	ND
Hexachloroethane	67-72-1	X	ND	---	ND	ND	ND
Hexanal	66-25-1		0.90%	---	0.74%	0.41%	ND
2-Hexanone	591-78-6		0.10%	---	0.44%	0.58%	0.34%
Indeno(1,2,3-cd)pyrene	193-39-5	X	ND	---	ND	ND	ND
Isophorone	78-59-1	X	ND	---	ND	ND	ND
Isovaleraldehyde	590-86-3		1.13%	---	0.74%	0.41%	ND
Methylene Chloride	75-09-2	X	0.82%	---	4.87%	26.62%	11.29%
2-Methylnaphthalene	91-57-6		3.39%	---	0.81%	0.40%	2.13%
4-Methyl-2-pentanone (MIBK)	108-10-1	X	0.10%	---	0.10%	0.58%	ND
Naphthalene	91-20-3	X	2.47%	---	0.79%	0.52%	1.43%
m-Nitroaniline	99-09-2		ND	---	ND	ND	ND
o-Nitroaniline	88-74-4		ND	---	ND	ND	ND
4-Nitrobenzenamine	100-01-6		ND	---	ND	ND	ND
Nitrobenzene	98-95-3	X	ND	---	ND	ND	ND
2-Nitrophenol	88-75-5		ND	---	0.20%	ND	ND
4-Nitrophenol	100-02-7	X	ND	---	ND	ND	ND
N-Nitrosodiphenylamine	86-30-6		ND	---	ND	ND	ND
N-Nitrosodi-n-propylamine	621-64-7		ND	---	ND	ND	ND
Pentachlorophenol	87-86-5	X	ND	---	ND	ND	ND
Pentanal	110-62-3		3.23%	---	0.74%	0.41%	ND
Phenanthrene	85-01-8	X	0.02%	---	0.04%	ND	ND
Phenol	108-95-2	X	1.73%	---	1.20%	0.79%	1.64%
Propanal	123-38-6	X	2.69%	---	2.23%	1.22%	---
Pyrene	129-00-0	X	ND	---	0.01%	ND	ND
Styrene	100-42-5	X	0.88%	---	0.92%	0.21%	0.50%
1,1,2,2-Tetrachloroethane	79-34-5	X	0.08%	---	ND	ND	ND
Tetrachloroethene	127-18-4	X	0.10%	---	0.44%	0.58%	ND
m -Tolualdehyde	620-23-5		2.05%	---	ND	ND	ND
o-Tolualdehyde	529-20-4		1.77%	---	0.74%	0.41%	ND
Toluene	108-88-3	X	3.52%	---	3.71%	1.72%	3.04%
1,2,4-Trichlorobenzene	120-82-1	X	ND	---	ND	ND	ND
1,1,1-Trichloroethane	71-55-6	X	0.08%	---	ND	ND	ND
1,1,2-Trichloroethane	79-00-5	X	0.08%	---	ND	ND	ND
Trichloroethene	79-01-6	X	0.11%	---	ND	ND	ND
2,4,5-Trichlorophenol	95-95-4	X	ND	---	ND	ND	ND
2,4,6-Trichlorophenol	88-06-2	X	ND	---	ND	ND	ND
Vinyl Acetate	108-05-4	X	0.08%	---	ND	ND	ND
Vinyl Chloride	75-01-4	X	0.11%	---	ND	ND	ND
m,p-Xylene	1330-20-7	X	2.16%	---	2.11%	0.77%	3.29%
o-Xylene	95-47-6	X	0.91%	---	0.97%	0.25%	1.58%

ND indicates compound not detected at detection limit. Compound may be present at a value less than the detection limit

0.00% - Value is less than 0.00005

"---" Indicates No Data Available

"X" indicates that compound is a HAP

The average percentage for idle, intermediate, and military are based on the J69-T-25, J85-GE-5A, and J85-GE-5M

No test data was available for the Approach setting for any engine

Afterburner setting based on J85-GE-5A engine only

Figure 2-1. Example Data Collection Form for On-Wing Engine Testing

Installation Name: **Inventory Year (CY):**
Responsible Organization (Name & Office Symbol):
POC (Name & Phone #):

Building Number or Location	Type of Test Facility *	Type of Aircraft & Engine Tested	Number of Engines Tested During the Year (test/yr)	Average Run Time per Test at Each Power Setting (min/test)	Total Run Time per Test at Each Power Setting [if known] (min/yr)	Average Fuel Flow Rate at Each Power Setting (lb/hr)	Total Fuel Burned During the year [if known] (lb/yr)	Total Synthetic Fuel Used (gal)
		Aircraft: Engine:		Idle: Approach: Intermediate: Military: Afterburner:	Idle: Approach: Intermediate: Military: Afterburner:	Idle: Approach: Intermediate: Military: Afterburner:		
		Aircraft: Engine:		Idle: Approach: Intermediate: Military: Afterburner:	Idle: Approach: Intermediate: Military: Afterburner:	Idle: Approach: Intermediate: Military: Afterburner:		
		Aircraft: Engine:		Idle: Approach: Intermediate: Military: Afterburner:	Idle: Approach: Intermediate: Military: Afterburner:	Idle: Approach: Intermediate: Military: Afterburner:		
		Aircraft: Engine:		Idle: Approach: Intermediate: Military: Afterburner:	Idle: Approach: Intermediate: Military: Afterburner:	Idle: Approach: Intermediate: Military: Afterburner:		

*eg Hush House, Trim Pad, etc.

Figure 2-2. Example Data Collection Form for Aircraft Movements

Installation Name:					**Inventory Year (CY):**		
Responsible Organization (Name & Office Symbol):							
POC (Name & Phone #):							
Aircraft Type	**Aircraft Number**	**Date**	**Number of Landing and Takeoff Cycles (LTO)**	**Number of Touch and Go Cycles (TGO)**	**Number of Low Fly By Cycles (LFB)**	**Number of Low Altitude Flight Patterns (within base air space)**	**Number of Low Altitude Flight Patterns (outside base Air Space)***

*Information on Low Altitude Fly Patterns outside Base air space is only required if specifically requested.

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3 FLIGHTLINE GROUND SUPPORT EQUIPMENT (AGE)

3.1 Introduction

Most Air Force bases operate a variety of Ground Support Equipment (GSE) or Aerospace Ground Equipment (AGE) to support flightline operations and service aircraft. Emissions from AGE or GSE vary by device type, time of operation, and fuel flow rate. For simplicity, both GSE and AGE are generically referred to as GSE in this section. Common examples of military GSE include generators, air conditioners, start carts, heaters, hydraulic test stands, portable light units, air compressors, cargo and bomb lifts, jacking units, aircraft deicers, tractors, tugs, and other service equipment. GSE are designed to be mobile so that they can be used at any number of locations on the flightline, and can be easily transported to support readiness and deployment activities around the world. Depending on whether or not the GSE is designed to be self-propelled, it can be categorized as either vehicular or non-vehicular in nature. Although essentially non-road engines, this section addresses emissions from flightline GSE only, while other non-road engines and equipment are addressed separately in this document in the **Non-Road Engines and Equipment** chapter**.** Emissions of concern from the operation of GSE include the criteria pollutants and several HAPs that are commonly associated with fuel combustion processes and include benzene, 1,3-butadiene, acetaldehyde, and naphthalene.

Most of the GSE operated on an Air Force installation are powered by internal combustion engines fueled by JP-8. Some equipment, however, may be powered by diesel fuel, motor gasoline (MOGAS), Compressed Natural Gas (CNG), or Liquefied Petroleum Gas (LPG). The manner in which fuel ignition occurs in the engine determines whether GSE is categorized as Compression Ignition (CI) or Spark Ignition (SI) in nature. CI GSE include turbine engines fueled with JP-8, and non-turbine engines fueled with diesel. SI GSE may be fueled with MOGAS, CNG, or LPG.

Individual pollutant emissions from each type of GSE are usually calculated using operating time and/or fuel consumption information applied across an operational parameter such as an LTO cycle or over an inventory period (typically one year). Military aircraft and GSE combinations and emission factor data are provided in Table 3-3. This information was obtained from a survey developed and distributed by Air Force Institute for Operational Health (AFIOH/RSEQ) to various flight squadrons and AGE shops throughout the Air Force (Wade 2004). These aircraft-GSE combinations are provided as a guideline and should be used only in the absence of available base-specific data. In instances where military GSE information was unavailable, data was obtained from the FAA Emissions and Dispersion Modeling System (EDMS). Common, non-model specific GSE data from EDMS are provided in Table 3-6.

While most Air Force GSE is intended to be mobile by design, there may be instances where the regular use of the equipment results in it not being moved at least once in a 12-month

period. In such instances, the GSE is generally considered stationary in nature by regulators, a determination that has implications from an air permitting perspective. If an air program manager is uncertain whether a piece of GSE should be considered mobile or stationary for regulatory purposes, he/she should coordinate with their Major Command for assistance, and also consider consulting with the Air Force Regional Environmental Offices to obtain their insight on state-specific requirements as they may apply to GSE.

3.2 Emission Factors

Emission Factors (EFs) for flightline GSE have been developed through testing and measurement, and are provided in a variety of sources. EFs may be model specific and provided in units of lb/hr (Table 3-4), based on the GSE and fuel type (Table 3-7). General EFs for reciprocating internal combustion engines based on model year and provided in units of lb/10^3 gal or lb/10^3 hp-hr (Table 3-9) can also be used. EFs are selected based on the calculation method as described in the next section.

3.3 Emissions Calculation

Information commonly collected and used to calculate emissions from GSE operations include the type and model of the equipment, the operating time, type and volume of fuel consumed, and engine operating load and rated power. There are multiple methods used for calculation of emissions, depending on the available information. A sample data collection form for GSE is provided in Figure 3-1 at the end of the chapter.

3.3.1 Sortie/LTO Method (Preferred Method)

The Sortie/LTO Method is the Air Force's default method and should be used for all GSE that are included in Table 3-3 and Table 3-4. This method involves applying an EF to the operating time of each GSE during a set period of time (e.g., an aircraft sortie or LTO cycle, annually, or another inventory period). Emissions using this method are calculated as follows:

$$\mathbf{E}(\boldsymbol{Pol}) = \boldsymbol{OT} \times \boldsymbol{EF}(\boldsymbol{Pol}) \times \boldsymbol{N}$$

Equation 3-1

Where,

E(Pol) = Emissions of each individual pollutant for each piece of GSE (lb/yr)
EF(Pol) = Emission factor of each pollutant (lb/hr)
OT = Operating time of GSE per sortie (hr/sortie)
N = Number of sorties per year (sortie/yr)

The EFs and operating times for calculating emissions for GSE using the sortie/LTO method may be found in the following tables:

- Operating times per LTO for each GSE and associated aircraft are in Table 3-3.
- EFs for each GSE are found in Table 3-4.

3.3.2 Horsepower/Load Factor Method

The horsepower/load factor method is an alternative method for emissions calculations based on the horsepower (hp) of the engine. This method requires that the GSE engine horsepower, the engine load factor, and operating time for each GSE are known. Emissions from common, non-model specific GSE may be calculated using the data provided in Table 3-6 and Table 3-7. The following general equation is used:

$$\mathbf{E}(\boldsymbol{Pol}) = \boldsymbol{OT} \times \frac{\boldsymbol{LF}}{\mathbf{100}} \times \boldsymbol{hp} \times \frac{\mathbf{1}}{\mathbf{1000}} \times \boldsymbol{EF}(\boldsymbol{Pol}) \times \boldsymbol{N}$$

Equation 3-2

Where,

E(Pol) = Emissions of each individual pollutant (lb/yr)
OT = Operating time (hr/unit)
LF = Load factor (%)
100 = Factor for converting percent to a fraction (%)
hp = Average rated horsepower of engine (hp)
1000 = Factor converting from hp to 10^3 hp (hp/10^3 hp)
EF(Pol) = Emission factor of each pollutant (lb/10^3 hp-hr)
N = Number of ground support equipment used each year (units/yr)

If the average rated horsepower of the engine is unknown, it can be estimated by multiplying the maximum rated horsepower of the engine by a load factor. The following equation is used:

$$\boldsymbol{hp} = \boldsymbol{hp_{max}} \times \frac{\boldsymbol{LF}}{\mathbf{100}}$$

Equation 3-3

Where,

hp = Average rated horsepower of engine (hp)
hp_{max} = Maximum rated horsepower of the engine (hp)
LF = Typical load factor (%)
100 = Factor for converting percent to a fraction (%)

The EFs and operating times for common GSE needed to calculate emissions using the horsepower/load factor method may be found in the following tables:

- The typical commercial GSE assignments are given in Table 3-5.
- Table 3-6 provides the average rated horsepower for each GSE.
- EFs for common GSE are provided in a lb/10^3 hp-hr basis in Table 3-7.
- Table 3-9 provides the EPA EFs for criteria pollutants for uncontrolled diesel reciprocating internal combustion engines.
- Table 3-10 provides EFs for several speciated HAPs for uncontrolled diesel reciprocating internal combustion engines.

3.3.3 Fuel Consumption Method

Another method that can be used to calculate GSE emissions involves multiplying the volume of fuel consumed by an EF that is provided in terms of a mass of pollutant emitted per volume of fuel consumed such as lb/hr or g/hr**.** As with the horsepower/load factor method, the fuel consumption method also requires that the user know the operating time for each GSE**.** The following equation can be used as an alternative method of calculating GSE HAP emissions based exclusively on fuel consumption data:

$$\mathbf{E}(\boldsymbol{Pol}) = \boldsymbol{FC} \times \frac{\mathbf{1}}{\mathbf{1000}} \times \boldsymbol{EF}(\boldsymbol{Pol}) \times \boldsymbol{N}$$

Equation 3-4

Where,

E(Pol) = Emissions of each individual pollutant (lb/yr)
FC = Fuel consumption (gal/unit)
1000 = Factor converting gal into 10^3 gal (gal/10^3gal)
EF(Pol) = Emission factor for each pollutant (lb/10^3gal)
N = Number of ground support equipment used each year (units/yr)

In cases where fuel consumption data is unknown, fuel consumption may be estimated using the operating time and fuel flow rate as shown:

$$\boldsymbol{FC} = \boldsymbol{OT} \times \boldsymbol{FFR}$$

Equation 3-5

Where,

FC = Fuel Consumption (gal/unit)
OT = Operating time (hr/unit)
FFR = Fuel flow rate. This may be available from the manufacturer (gal/hr)

Alternatively, fuel consumption may also be estimated using engine and operating parameters including hp (if known), hours of operation, brake-specific fuel consumption factor, and the heating value of the fuel. The following equation is used:

$$\boldsymbol{FC = \frac{(hp \times OT \times BSFC)}{HV}}$$

Equation 3-6

Where,

FC = Fuel consumption (gal/unit)
hp = Engine horsepower (hp)
OT = Operating time (hr/unit)
BSFC = Brake specific fuel consumption (Btu/hp-hr). **Given in Table 3-1**
HV = Heating value of the fuel (Btu/gal). **Given in Table 3-1**

Table 3-1 provides heating values and brake specific fuel consumption values for several types of fuel that may power GSE operated at Air Force installations.

Table 3-1. Typical High Heating Values and BSFC for GSE Fuels

Fuel Type	Heating Value (Btu/unit fuel)[1]	BSFC (Btu/hp-hr)[2]
Diesel	138,000 Btu/gal	8,089
MOGAS	125,000 Btu/gal	7,000
JP-8	124,000 Btu/gal[(3)]	---
LPG	92,000 Btu/gal	10,577[(4)]
CNG	1,026 Btu/ft^3	7,858

1. SOURCE (Unless otherwise noted): Table C-1 to Subpart C of 40 CFR 98.
2. SOURCE (Unless otherwise noted): *Compendium of Greenhouse Gas Emissions Methodologies for the Oil and Natural Gas Industry*, American Petroleum Institute, 2009.
3. SOURCE: Defense Logistics Agency, Defense Energy Support Center, *Petroleum Quality Information System Fuels Data (2005),* April 2006.
4. SOURCE: Exhaust Emission Factors for Nonroad Engine Modeling: Spark Ignition, EPA420-R-05-019, 2005.

"---" – Indicates no data available

To calculate GSE emissions using the fuel consumption method, the following tables are used:

- Table 3-6 provides typical hp for common GSE
- Table 3-8 provides the uncontrolled HAP EFs for select military GSE.
- Table 3-9 provides the EPAs EFs for criteria pollutants from uncontrolled diesel reciprocating internal combustion engines.
- Table 3-10 provides the EPAs EFs for HAPs from uncontrolled diesel reciprocating internal combustion engines.

3.3.4 Calculating SO_2 Emissions

A more precise method for estimating SO_2 emissions involves applying fuel consumption data to derive an SO_2 EF based on pounds of pollutant emitted per hour of operation (lb/hr), and the conservative assumption that all the sulfur in the fuel is converted to SO_2 during the combustion process. Under this assumption, and with the density and sulfur content values known, an SO_2 EF is calculated using the following equation:

$$\mathbf{EF}(\boldsymbol{SO_2}) = \boldsymbol{FFR} \times \boldsymbol{Density} \times \frac{\boldsymbol{S}}{\mathbf{100}} \times \mathbf{2}$$

Equation 3-7

Where,

$EF(SO_2)$ = SO_2 emission factor (lb/hr)
FFR = Fuel Flow rate (gal/hr)
Density = Density of fuel (lb/gal)
S = Weight percent sulfur content of fuel (%)
100 = Factor for converting a percent to a fraction (%)
2 = Conversion factor which is the ratio of the molecular weight of SO_2 to the molecular weight of S

The value for S typically varies from supplier to supplier and the geographic location where the fuel is produced. For enhanced accuracy of the emissions inventory, the sulfur content and density of the fuel should be obtained from the fuel supplier whenever possible. In the absence of such information, the average density and sulfur content is listed in Table 3-2. The sulfur content of JP-8 varies by region, so if the region specific sulfur content is required, then refer to Table 2-3.

Table 3-2. Average Fuel Density and Weight Percent Sulfur in Non-Road Fuels

Fuel Type	Density (lb/gal)	Sulfur Content (wt. %)
Diesel	7.14	0.025
MOGAS	6.15	0.020
JP-8	6.67(1)	0.053(1)
LPG	4.41	Negligible
CNG	0.046	0.001

SOURCE (Unless otherwise noted): Department of Energy, Energy Information Administration report DOE/EIA-0464/(2005), *Household Vehicles Energy Use: Latest Data & Trends,* Appendix C, Table C4

1. SOURCE: Defense logistics Agency, Defense Energy Support Center, *Petroleum Quality Information System Fuels Data (2005),* April 2006.

3.3.5 Calculating Emissions from Synthetic Aviation Fuel

On-going DOD and Air Force initiatives to reduce dependency on foreign petroleum sources are expected to result in the increased use of non-petroleum fuels in a 50-50 blend with JP-8. Testing and certification of such fuels in aircraft engines indicate the blend reduces PM emissions by an average of 35%, sulfur emissions by 50%, and CO_2 emissions by approximately 2% (USAF Research Laboratory 2007). Accordingly, when collecting information on GSE operations verify the blend percentage and whether synthetic fuel was used. If a 50-50 blend was used, then follow the appropriate emission calculation procedures outlined in previous subsections and apply emission reduction factors of 35%, 50%, and 2%, respectively, for PM, SO_2, and CO_2.

3.4 Information Resources

The base AGE shop is responsible for the operation and repair of most pieces of GSE. Therefore, they should be able to provide most, if not all, of the information needed to calculate the emissions from the GSE used on the installation. In the absence of base-specific data, default EPA information can be used. In some cases, it may be necessary to contact the GSE manufacturer to obtain necessary information. An example of a data collection form that can be used to collect data on GSE is provided in Figure 3-1.

3.5 Example Calculations

The following section provides examples of how to calculate emissions from GSE operations using the various methodologies identified above and their associated equations.

3.5.1 Problem 1 - Sortie/LTO Method

Anytown AFB needs to calculate annual NO_X and xylene emissions from GSE operations associated with their B-1B aircraft. The following information was obtained from the base:

B-1B Aircraft	
GSE Types	A/M32A-86D Generator, A/M 32A-95 Start Cart, B-1B AC unit, MJ-40 Bomb lift, NF-2 Light Cart
Sorties/year	200

Step 1 – Record the operating times and NO_X emission factors for each GSE. Since the table above does not provide specific operating times for these GSE, then the typical operating times for these GSE may be used. Table 3-3 lists the operating times for the generator as **2.20 hr**, the start cart as **0.50 hr**, the AC unit as **2.40 hr**, the bomb lift as **2.50 hr**, and the light cart as **0.50 hr**. Table

3-4 has the NO_X EFs as **6.102 lb/hr** for the generator, **1.470 lb/hr** for the start cart, **7.659 lb/hr** for the AC unit, **0.340 lb/hr** for the bomb lift, and **0.110 lb/hr** for the light cart.

Step 2 – Calculate annual NO_X emissions for each GSE. Using the information in the table above, the data collected in Step 1, and Equation 3-1, the NO_X emissions for each GSE are calculated as follows:

$$E(Pol) = OT \times EF(Pol) \times N$$

$$\boldsymbol{E(NO_x)_{A/M32A-86D}} = 2.20 \frac{\cancel{hr}}{\cancel{sortie}} \times 6.102 \frac{lb}{\cancel{hr}} \times 200 \frac{\cancel{sortie}}{yr} = \boldsymbol{2,684.88 \frac{lb}{yr}}$$

$$\boldsymbol{E(NO_x)_{A/M32A-95}} = 0.50 \frac{\cancel{hr}}{\cancel{sortie}} \times 1.470 \frac{lb}{\cancel{hr}} \times 200 \frac{\cancel{sortie}}{yr} = \boldsymbol{147.00 \frac{lb}{yr}}$$

$$\boldsymbol{E(NO_x)_{B-1B\ AC\ Unit}} = 2.40 \frac{\cancel{hr}}{\cancel{sortie}} \times 7.659 \frac{lb}{\cancel{hr}} \times 200 \frac{\cancel{sortie}}{yr} = \boldsymbol{3,676.32 \frac{lb}{yr}}$$

$$\boldsymbol{E(NO_x)_{MJ-40}} = 2.50 \frac{\cancel{hr}}{\cancel{sortie}} \times 0.340 \frac{lb}{\cancel{hr}} \times 200 \frac{\cancel{sortie}}{yr} = \boldsymbol{170.00 \frac{lb}{yr}}$$

$$\boldsymbol{E(NO_x)_{NF-2}} = 0.50 \frac{\cancel{hr}}{\cancel{sortie}} \times 0.110 \frac{lb}{\cancel{hr}} \times 200 \frac{\cancel{sortie}}{yr} = \boldsymbol{11.00 \frac{lb}{yr}}$$

Step 3 – Calculate total NO_X emissions. Sum the emissions from each GSE to get the total NO_X emissions for GSE the B-1B:

$$E(NO_X)_{Total} = (2684.88 + 147 + 3676.32 + 170 + 11) \frac{lb}{yr}$$

$$\boxed{\boldsymbol{E(NO_X)_{Total} = 6,689.2 \frac{lb}{yr}}}$$

Next, calculate xylene emissions.

Step 4 – Record the fuel flow rate for each GSE. Table 3-4 shows that the fuel flow rate is **6.47 gal/hr** for the generator and **17.14 gal/hr** for the AC unit. Since the fuel flow rate of the start cart, bomb lift, and light cart are not provided in the table, surrogates must be selected. Ideally, the best surrogates will be similar GSE types with similar hp. For this example, the A/M32A-86D was selected as a surrogate for the A/M32A-95, the elevator loader was selected for the MJ-40, and the generator light cart was selected for the NF-2 light cart. The fuel flow rates for the surrogate equipment are listed as **6.47 gal/hr** for the A/M32A-86D, **6.29 gal/hr** for the elevator loader, and **0.62 gal/hr** for the generator light cart.

Step 5 – Calculate the fuel consumption for each GSE. Use the operating times and fuel flow rates recorded in Step 1 and Step 4 above respectively and Equation 3-5**:**

$$FC = OT \times FFR$$

$$\boldsymbol{FC_{A/M32A-86D}} = 2.20\,\frac{\cancel{hr}}{unit} \times 6.47\,\frac{\text{gal}}{\cancel{hr}} = \mathbf{14.23}\,\frac{\boldsymbol{gal}}{\boldsymbol{unit}}$$

$$\boldsymbol{FC_{A/M32A-95}} = 0.50\,\frac{\cancel{hr}}{unit} \times 6.47\,\frac{\text{gal}}{\cancel{hr}} = \mathbf{3.24}\,\frac{\boldsymbol{gal}}{\boldsymbol{unit}}$$

$$\boldsymbol{FC_{B-1B\ AC\ Unit}} = 2.40\,\frac{\cancel{hr}}{unit} \times 17.14\,\frac{\text{gal}}{\cancel{hr}} = \mathbf{41.14}\,\frac{\boldsymbol{gal}}{\boldsymbol{unit}}$$

$$\boldsymbol{FC_{MJ-40}} = 2.50\,\frac{\cancel{hr}}{unit} \times 6.29\,\frac{\text{gal}}{\cancel{hr}} = \mathbf{15.73}\,\frac{\boldsymbol{gal}}{\boldsymbol{unit}}$$

$$\boldsymbol{FC_{NF-2}} = 0.50\,\frac{\cancel{hr}}{unit} \times 0.62\,\frac{\text{gal}}{\cancel{hr}} = \mathbf{0.31}\,\frac{\boldsymbol{gal}}{\boldsymbol{unit}}$$

Step 6 – Calculate the total fuel flow for GSE. Sum the values calculated in Step 5 as follows:

$$\boldsymbol{FC_{GSE(Total)}} = (14.23 + 3.24 + 41.14 + 15.73 + 0.31)\,\frac{gal}{unit} = \mathbf{74.65}\,\frac{\boldsymbol{gal}}{\boldsymbol{unit}}$$

Step 7 – Record the xylene emission factor. Table 3-10 lists the total xylenes emission factor as **3.95E-02 lb/10^3 gal**.

Step 8 – Calculate xylene emissions. With the estimated fuel consumption calculated in Step 6 and the emission factor data from Step 7, use Equation 3-4 to calculate xylene emissions:

$$\text{E}(Pol) = FC \times \frac{1}{1000} \times EF(Pol) \times N$$

$$\text{E}(Xylenes) = 74.65\,\frac{\cancel{gal}}{\cancel{unit}} \times \frac{1}{1000}\left(\frac{\cancel{10^3 gal}}{\cancel{gal}}\right) \times 0.0395\,\frac{lb}{\cancel{10^3 gal}} \times 200\,\frac{\cancel{unit}}{yr}$$

$$\boxed{\text{E}(\boldsymbol{Xylenes}) = \mathbf{0.590}\,\frac{\boldsymbol{lb}}{\boldsymbol{yr}}}$$

3.5.2 Problem 2 - Horsepower/Load Factor Method

Anytown AFB periodically operates two diesel-powered baggage tractors used to transport the luggage of visiting dignitaries. Using the following information obtained from the base, calculate CO and 1,3-butadiene emissions:

GSE Type – Baggage tractor	
# of GSE	2
Operating Time	15 hr/unit

Step 1 – Record the average rated power and average operating load. This information is provided in Table 3-6. The average rate power is given as **83 hp** and the operating load is shown as **55%.**

Step 2 – Record the emission factors for this GSE for CO and 1,3-butadiene. Table 3-7 gives the emission factor for CO for diesel baggage tractors as **11.00 lb/10^3 hp-hr**. Table 3-10 lists the emission factor for 1,3-butadiene as **3.16E-04 lb/10^3 hp-hr**.

Step 3 – Calculate CO and 1,3-butadiene emissions. Use the data collected in Step 1 and Step 2 with Equation 3-2 to calculate the CO and 1,3-butadiene emissions**:**

$$\mathrm{E}(Pol) = OT \times \frac{LF}{100} \times hp \times \frac{1}{1000} \times EF(Pol) \times N$$

For CO:

$$E(CO)_{Baggage} = 15\,\frac{\cancel{hr}}{\cancel{unit}} \times \frac{55\%}{100\%} \times 83\cancel{hp} \times \frac{1}{1000}\left(\frac{\cancel{10^3 hp}}{\cancel{hp}}\right) \times 11.00\,\frac{lb}{\cancel{10^3 hp - hr}} \times 2\,\frac{\cancel{unit}}{yr}$$

$$\boxed{\boldsymbol{E(CO)_{Baggage} = 15.06\,\frac{lb}{yr}}}$$

For 1,3-Butadiene:

$$E(1{,}3-\text{Butadiene})_{Baggage} = 15\,\frac{\cancel{hr}}{\cancel{unit}} \times \frac{55\%}{100\%} \times 83\cancel{hp} \times \frac{1}{1000}\left(\frac{\cancel{10^3 hp}}{\cancel{hp}}\right) \times 0.000316\,\frac{\cancel{lb}}{\cancel{10^3 hp - hr}} \times 2\,\frac{\cancel{unit}}{yr}$$

$$\boxed{\boldsymbol{E(1,3-\text{Butadiene})_{Baggage} = 4.33E-04\,\frac{lb}{yr}}}$$

3.5.3 Problem 3 - Fuel Consumption Method

Anytown AFB wants to estimate total toluene emissions for the previous year resulting from the operation of air start units using JP-8. The following information was obtained from the base.

GSE Type – Air Start Units	
GSE Model	A/M32A-95
# of GSE	35
Fuel Consumption	5,000 gal/unit

Step 1 – Record the toluene emission factor. Table 3-8 provides HAP speciation for some HAPs from a few GSE. This table lists the toluene EF from the A/M32A-95 GSE as **4.36E-03 lb/10^{3}gal**.

Step 2 – Calculate the toluene emissions. Use the emission factor in Step 1, the data from the table above, and Equation 3-4:

$$E(Pol) = FC \times \frac{1}{1000} \times EF(Pol) \times N$$

$$E(\text{Toluene})_{A/M32A-95} = 5000 \frac{\cancel{gal}}{\cancel{unit}} \times \frac{1}{1000} \left(\frac{\cancel{10^3 gal}}{\cancel{gal}}\right) \times 0.00436 \frac{lb}{\cancel{10^3 gal}} \times 35 \frac{\cancel{unit}}{yr}$$

$$\boldsymbol{E(\text{Toluene})_{A/M32A-95} = 0.763 \frac{lb}{yr}}$$

3.5.4 Problem 4 - Estimating SO_2 Emissions

Anytown AFB has been asked to estimate SO_2 emissions from the operation of its GSE. The following information was obtained from the base:

Equipment Data – GSE	
# of GSE	120
Fuel	JP-8
Fuel Flow Rate	1,000 gal/hr
Operating time	2 hours

Calculate SO_2 emissions for Anytown AFB which is located in the East Central United States.

Step 1 – Record the density and sulfur content of JP-8. Table 3-2 lists the density of JP-8 as **6.67 lb/gal**. Though Table 3-2 also provides the sulfur content, since it is known that the AFB is located in the East Central portion of the United States, a more accurate value given in chapter 2 of this document states the sulfur content of JP-8 in that particular region is **0.08%.**

Step 2 - Calculate the SO_2 emission factor. This is accomplished using Equation 3-7:

$$\mathrm{EF}(SO_2) = FFR \times Density \times \frac{S}{100} \times 2$$

$$\mathbf{EF}(\boldsymbol{SO_2}) = 1{,}000\,\frac{\cancel{gal}}{hr} \times 6.67\,\frac{lb}{\cancel{gal}} \times \frac{0.08\%}{100\%} \times 2 = \mathbf{10.67}\,\frac{\boldsymbol{lb}}{\boldsymbol{hr}}$$

Step 3 – Calculate SO_2 emissions. Use the EF calculated in Step 2 and Equation 3-1:

$$\mathrm{E}(Pol) = OT \times EF(Pol) \times N$$

$$\mathrm{E}(SO_2) = 2\,\frac{\cancel{hr}}{\cancel{unit}} \times 10.67\,\frac{lb}{\cancel{hr}} \times 120\,\frac{\cancel{units}}{yr}$$

$$\boxed{\mathbf{E}(\boldsymbol{SO_2}) = \mathbf{2560.8}\,\frac{\boldsymbol{lb}}{\boldsymbol{yr}}}$$

Table 3-3. Military Aircraft and GSE Assignments

Aircraft	GSE Type	GSE Model	Operating Time Per Sortie or LTO (hr)
A-3A, -3B	**See Generic 2**		
A-4, -4C, -4E, -4F, -4L, -4M	**See Generic 2**		
A-6A, -6B, -6C, -6E, -6F	**See Generic 2**		
A-7A, -7B, -7C, -7D, -7E, -7K	**See Generic 2**		
A-10, -10A, -10C	Generator Set	A/M32A-86D	1.00
	Start Cart	A/M32A-60A	1.00
		A/M32A-95	1.00
	Heater	1H1	2.00
	Hydraulic Test Stand	MJ-2A	2.00
	Light Cart	FL-1D **(S)**	2.00
		NF-2	2.00
	Air Compressor	MC-1A	2.00
		MC-2A **(S)**	1.00
	Bomb Lift	MJ-1B[(1)]	1.00 - 8.00
A-37	**See Generic 2**		
AC-130A, -130H, -130U, -130W	**See C-130A**		
AH-1G, -1J	**See Generic 4**		
AH-64A	**See Generic 4**		
AT-38B	**See T-38**		
AU-24	**See Generic 2**		
B-1A, -1B	Generator Set	A/M32A-86D	2.20
	Start Cart	A/M32A-95	0.50
	Heater/Air Conditioner	B-1B Heater/Air Conditioner	2.40
	Heater	H1	4.00
	Light Cart	FL-1D **(S)**	0.50
		NF-2	0.50
	Bomb Lift	MJ-40	2.50
B-2A	Generator Set	A/M32A-86D	3.00
	Start Cart	A/M32A-60A	2.00
		A/M32A-95	2.00
	Air Conditioner	Ace 401	12.00
		PD501	12.00
	Heater	H1	2.00
	Hydraulic Test Stand	MJ-2/TTU-228	1.00
		MJ-2/TTU-229	1.50
		A/M27T-13	4.00
	Light Cart	NF-2	4.00
		FL-1D **(S)**	4.00
	Air Compressor	MC-1A	1.50
		MC-6 **(S)**	5.00
		MC-7	1.50
	Bomb Lift	MJ-40	2.00
B-52D, -52G, -52H	Generator Set	A/M32A-86D	4.00
	Start Cart	A/M32A-95	1.00
	Air Conditioner	MA-3D	1.00
	Light Cart	NF-2	1.00
	Air Compressor	MC-1A	1.00
	Bomb Lift	MJ-1B	2.00
C-1, -1A	**See Generic 1**		
C-2, -2A	**See Generic 4**		

Table 3-3. Military Aircraft and GSE Assignments (continued)

Aircraft	GSE Type	GSE Model	Operating Time Per Sortie or LTO (hr)
C-5A, -5B, -5C, -5M	Generator Set	A/M32A-86D	13.00
	Start Cart	A/M32A-95	2.00
	Air Conditioner	MA-3D	3.00 - 12.00
	Heater	H1	9.00
		BT400-46	10.00
	Hydraulic Test Stand	MJ-1-1[1]	1.00
		M32T1 **(S)**	1.00
		MJ-2A	1.00
	Light Cart	NF-2	16.00
	Air Compressor	MC-2A **(S)**	16.00
		MC-1A	7.00
		MC-7	2.00
	Pumping Unit	AF/M27M-1[1]	3.00
C-9, -9A, -9B, -9C	Generator Set	A/M32A-86D	6.00
	Start Cart	A/M32A-95	0.50
	Air Conditioner	MA-3D	6.00
	Heater	H1	6.00
	Light Cart	NF-2	12.00
	Air Compressor	MC-2A **(S)**	2.00
		MC-1A	0.50
		MC-7	2.00
C-11A	**See Generic 1**		
C-12, -12A, -12C, -12D, -12F, -12J, -12L, -12R, -12S, -12T, -12U	Generator Set	A/M32A-86D	0.75
C-17A	Generator Set	A/M32A-86D	2.00
	Start Cart	A/M32A-95	2.00
	Air Conditioner	MA-3D	1.50
	Heater	BT400-46	1.50
		H1	1.50
	Light Cart	NF-2	1.50
	Air Compressor	MC-1A	0.66
		MC-2A **(S)**	0.66
		MC-7	0.66
	Pumping Unit	AF/M27M-1	0.50
	Bomb Lift	MJ-1B	1.50
C-18B	**See Generic 1**		
C-20A, -20B, -20C, -20D, -20E, -20F, -20G, -20H, -20J	Generator Set	A/M32A-86D	5.50
	Air Conditioner	Ace 802-329S[1]	1.00
		MA-3D	1.00
	Heater	1H1	3.00
	Light Cart	FL-1D **(S)**	6.00
	Air Compressor	MC-2A **(S)**	0.50
		MC-5	0.50
		MC-7	2.00
		MC-8	3.00
C-21A	**See Generic 1**		
C-22A, -22B	Generator Set	A/M32A-86D	1.50
	Start Cart	A/M32A-60A[1]	0.25
	Heater	H1	0.25
	Light Cart	NF-2	0.25
	Air Compressor	MC-1A	0.25
		MC-7	0.25
	Pumping Unit	AF/M27M-1	0.25
C-23A, -23B, -23C	**See Generic 1**		
C-26A, -26B, -26C	**See Generic 1**		

Table 3-3. Military Aircraft and GSE Assignments (continued)

Aircraft	GSE Type	GSE Model	Operating Time Per Sortie or LTO (hr)
C-27J	**See Generic 1**		
C-28A	**See Generic 1**		
C-32A	Generator Set	A/M32A-86D	6.00
C-37A	**See Generic 1**		
C-38	**See Generic 1**		
C-40A, -40B, -40C	**See Generic 1**		
C-123K	**See Generic 1**		
C-130A, -130B, -130D, -130E, -130F, -130H, -130J, -130T	Generator Set	A/M32A-86D	4.00 - 11.00
		Trielectron D200T 400	3.00
	Start Cart	MA-1A **(S)**	0.25
		A/M32A-60A	0.25
		A/M32A-95	0.25
	Air Conditioner	Ace 802-993 **(S)**	1.00
		MA-3D	1.00
	Heater	H1	1.00
	Hydraulic Test Stand	MJ-2A[(1)]	3.00
	Light Cart	NF-2	2.00 - 10.00
	Air Compressor	MC-1A	0.50 - 10.00
		MC-2A **(S)**	0.50 - 10.00
C-135A, -135B, -135C, -135E	Generator Set	A/M32A-86D	10.00
	Start Cart	A/M32A-60A	1.00
		A/M32A-95	0.10
	Air Conditioner	Ace 802-993 **(S)**	10.00
		MA-3C **(S)**	2.00
	Heater	H1	4.00
		1H1	5.00
	Light Cart	NF-2	2.00
	Air Compressor	MC-1A	0.33
C-137B, -137C	**See Generic 1**		
C-140A, -140B	**See Generic 1**		
C-141, -141A, -141B, -141C	Generator Set	A/M32A-86D	0.50
	Start Cart	MD-3 **(S)**	0.10
		A/M32A-60A	0.50
	Heater	H1	0.40
	Hydraulic Test Stand	TTU-228E **(S)**	0.10
		M32T1 **(S)**	0.10
	Light Cart	NF-2	0.50
	Air Compressor	MC-1A	0.10
		MC-2A **(S)**	0.10
CH-3B, -3E	**See Generic 4**		
CH-46, -46A, -46E	**See Generic 4**		
CH-53A, -53D	**See Generic 4**		
CT-1B	**See Generic 1**		
CT-39A, -39E, -39G	**See Generic 1**		
CT-43A	**See T-43A**		
CT-49A	**See Generic 1**		
CV-22, -22A	**See Generic 1**		
DC-130A	**See C-130A**		
E-1B	**See Generic 1**		
E-2, -2B, -2C, -2D	**See Generic 1**		
E-3A, -3B, -3C	**See Generic 1**		
E-4A, -4B	**See Generic 1**		
E-6B	**See Generic 1**		
E-8C	**See Generic 1**		
EA-3B	**See Generic 1**		

Table 3-3. Military Aircraft and GSE Assignments (continued)

Aircraft	GSE Type	GSE Model	Operating Time Per Sortie or LTO (hr)
EA-4F	**See Generic 1**		
EA-6A, -6B	**See Generic 1**		
EA-7L	**See Generic 1**		
EB-57B	**See Generic 1**		
EC-18B, -18D	**See Generic 1**		
EC-24A	**See Generic 1**		
EC-130E, -130H, -130J, -130SJ, -130V	**See C-130A**		
EC-135A, -135B, -135C, -135E, -135G, -135H, -135J, -135K, -135L, -135N, -135P, -135Y	**See C-135A**		
EC-137D	**See Generic 1**		
EF-4J	**See Generic 2**		
EF-111A	**See Generic 2**		
EH-1H, -1X	**See Generic 4**		
EH-60A	**See Generic 4**		
EKA-3B	**See Generic 1**		
EP-3B, -3J	**See Generic 1**		
ERA-3B	**See Generic 2**		
ES-2D	**See Generic 1**		
F-4, -4B, -4C, -4D, -4E, -4G, -4J, -4N, -4S	**See Generic 2**		
F-5A, -5B, -5E, -5F	**See Generic 2**		
F-8, -8J	**See Generic 2**		
F-14A, -14B, -14C, -14D	**See Generic 2**		
F-15A, -15B, -15C, -15D, -15E	Generator Set	A/M32A-86D	0.33
	Start Cart	A/M32A-60A	0.33
		A/M32A-95	0.33
	Heater	H1	0.50
	Hydraulic Test Stand	MJ-1-1	0.50
		MJ-2/TTU-228	0.50
	Light Cart	NF-2	1.00 - 8.00
	Air Compressor	MC-1A	0.33
		MC-2A **(S)**	0.25
		MC-11	2.00
	Bomb Lift	MJ-1B	1.00
F-16, -16A, -16B, -16C, -16D, -16N	Generator Set	A/M32A-86D	0.33
	Start Cart	A/M32A-60A	0.33
		A/M32A-95	0.33
	Heater	H1	0.50
	Hydraulic Test Stand	MJ-1-1	0.50
		MJ-2/TTU-228	0.50
	Light Cart	NF-2	1.00 - 8.00
	Air Compressor	MC-1A	0.33
		MC-2A **(S)**	0.25
		MC-11	2.00
	Bomb Lift	MJ-1B	1.00
F-22A, -22B	**See Generic 2**		
F-35A, -35B, -35C	**See Generic 2**		
F-100	**See Generic 2**		
F-106A, -106B	**See Generic 2**		
F-111, -111A, -111D, -111E, -111F	**See Generic 2**		

Table 3-3. Military Aircraft and GSE Assignments (continued)

Aircraft	GSE Type	GSE Model	Operating Time Per Sortie or LTO (hr)
F-117A	Generator Set	A/M32A-86D	2.00
	Start Cart	A/M32A-60A	2.00
		A/M32A-95	0.50
	Air Conditioner	Ace 802-329S[1]	2.00
	Heater	H1	1.00
	Hydraulic Test Stand	MJ-1-1	1.00
	Light Cart	NF-2	1.00
	Air Compressor	MC-1A	0.33
		MC-2A **(S)**	0.33
	Bomb Lift	MJ-1B	1.00[2]
F/A-18A, -18B, -18C, -18D, -18E, -18F	**See Generic 2**		
FA-22A	**See Generic 2**		
FB-22A	**See Generic 2**		
FB-111A	**See Generic 2**		
HC-130H, -130J, -130N, -130P	**See C-130A**		
HH-1H, -1K, -1N	Generator Set	A/M32A-86D	1.00 - 16.00
	Start Cart	M24A-9 **(S)**	0.25
	Heater	H1	8.00
	Hydraulic Test Stand	MJ-2/TTU-229	1.00
	Light Cart	NF-2D **(S)**	2.00
		TF-1	2.00
	Air Compressor	MC-1A	1.00
		MC-2A **(S)**	1.00
HH-2D	**See Generic 4**		
HH-3A, -3E, -3F	**See Generic 4**		
HH-43	**See Generic 4**		
HH-46A	**See Generic 4**		
HH-52, -52A	**See Generic 4**		
HH-53	**See Generic 4**		
HH-60G	**See Generic 4**		
HV-22A, -22B	**See Generic 1**		
JA-6A	**See Generic 2**		
KA-3B	**See Generic 2**		
KA-6D	**See Generic 2**		
KC-10, -10A	Generator Set	A/M32A-86D	12.00
		90CU24P5 **(S)**	12.00
	Hydraulic Test Stand	9780-0023D **(S)**	2.00
		05-7056-3600 **(S)**	2.00
	Generator Light Cart	Generator Light Cart	6.00
	Air Compressor	MODP160WJDACJF **(S)**	6.00
KC-46A	**See Generic 1**		
KC-130F, -130R, -130T	**See C-130A**		
KC-135, -135A, -135D, -135E, -135Q, -135R, -135T	**See C-135A**		
KC-767A	**See Generic 1**		
LC-130F, -130H, -130R	**See C-130A**		
MC-12W	**See C-12**		
MC-130E, -130H, -130J, -130P, -130W	**See C-130A**		
MH-53J, -53M	Generator Set	A/M32A-86D	3.00
	Heater	H1	8.00
	Hydraulic Test Stand	MJ-2/TTU-228	2.00
	Light Cart	NF-2D **(S)**	2.00
		FL-1D **(S)**	2.00
	Air Compressor	MC-2A **(S)**	4.00
MH-60A, -60G	**See Generic 4**		

Table 3-3. Military Aircraft and GSE Assignments (continued)

Aircraft	GSE Type	GSE Model	Operating Time Per Sortie or LTO (hr)
MV-22A, -22B	See Generic 1		
NA-3B	See Generic 2		
NA-4E, -4F, -4M	See Generic 2		
NA-6A, -6E	See Generic 2		
NA-7A, -7C, -7E	See Generic 2		
NB-52B	See B-52D		
NC-12B	See C-12		
NC-21A	See Generic 1		
NC-130A, -130B, -130E, -130H	See C-130A		
NC-135A, -135W	See C-135A		
NC-141A	See C-141		
NCH-46A	See Generic 4		
NF-4D	See Generic 2		
NF-16A, -16D	See F-16		
NF-106B	See Generic 2		
NF/A-18A, -18B, -18C	See Generic 2		
NKC-135A, -135E	See C-135A		
NPC-3C, -3D	See Generic 1		
NRA-3B	See Generic 2		
NRH-53D	See Generic 4		
NSH-3A	See Generic 4		
NT-33A	See Generic 1		
NT-39A	See Generic 1		
NTA-4F, -4J	See Generic 1		
NUH-1E, -1N	See Generic 4		
NUP-3A	See Generic 1		
NVH-3A	See Generic 4		
O-1	See Generic 1		
O-2A, -2B	See Generic 1		
OA-4M	See Generic 2		
OA-10A	See A-10		
OA-37B	See Generic 2		
OC-135B	See C-135A		
OH-6A	See Generic 4		
OH-58A	See Generic 4		
OT-47B	See Generic 1		
OV-10A	See Generic 1		
P-3B, -3C	See Generic 1		
QF-4B, -4E, -4G	See Generic 2		
QF-106A, -106B	See Generic 2		
QRF-4C	See Generic 2		
QT-33A	See Generic 1		
RA-3B	See Generic 2		
RA-5C	See Generic 2		
RC-12D, -12G, -12H	See C-12		
RC-135M, -135S, -135T, -135U, -135V, -135W, -135X	See C-135A		
RF-4B, -4C	See Generic 2		
RF-8G	See Generic 2		
RF/A-18A	See Generic 2		
RH-53D	See Generic 4		

Table 3-3. Military Aircraft and GSE Assignments (continued)

Aircraft	GSE Type	GSE Model	Operating Time Per Sortie or LTO (hr)
RP-3D	**See Generic 1**		
RQ-4, -4A, -4B [4]	Generator Set	805 **(S)**	24.00
		806 **(S)**	24.00
	Air Conditioner	MA-3D	2.00
	Heater	H1	4.00
	Light Cart	FL-1D **(S)**	6.00
RU-21J	**See Generic 1**		
S-2, -2D, -2E, -2G	**See Generic 1**		
S-3A	**See Generic 2**		
SH-2D, -2F	**See Generic 4**		
SH-3A, -3G	**See Generic 4**		
SH-60	**See Generic 4**		
SV-22A	**See Generic 1**		
T-1A	Generator Set	Jetex **(S)**	0.33
	Hydraulic Test Stand	Airton **(S)**	0.10
T-2	**See Generic 3**		
T-6A	Generator Set	Jettex-40 **(S)**	0.50
	Start Cart	Jet Series 703D **(S)**	0.50
		MA-1A **(S)**	0.50
	Air Conditioner	MA-3D	0.75
	Hydraulic Test Stand	6X620-RDF **(S)**	1.00
	Light Cart	FL-2D **(S)**	1.00
	Tug	(See "Tug" in Table 3-4 and select appropriate size)	0.33
T-28	**See Generic 3**		
T-33A	**See Generic 3**		
T-34, -34C	**See Generic 3**		
T-37, -37B	Generator Set	A/M32A-86D[1]	0.17
	Heater	H1	0.17
	Hydraulic Test Stand	MJ-1-1	0.50
	Light Cart	TL-1D **(S)**	1.00
	Air Compressor	MC-1A	0.50
		MC-2A **(S)**	0.50
	Tug	(See "Tug" in Table 3-4 and select appropriate size)	0.33
T-38, -38A, -38C, -38N	Generator Set	A/M32A-86D	0.25
	Hydraulic Test Stand	MK1 **(S)**	0.75
		MK3A **(S)**	0.75
T-39A, -39B, -39D	**See Generic 3**		
T-41, -41B, -41C, -41D	**See Generic 3**		
T-43A	Generator Set	A/M32A-86D	2.00
		Essex B8098 **(S)**	2.00
	Air Conditioner	MA-3D	12.00
	Hydraulic Test Stand	HPE-45 **(S)**	2.00
	Light Cart	FL-1D **(S)**	2.00
	Air Compressor	MC-1A	1.00
T-44	**See Generic 3**		
T-47A	**See Generic 3**		
TA-3B	**See Generic 2**		
TA-4B, -4F	**See Generic 2**		
TA-7C	**See Generic 2**		
TC-18E, -18F	**See Generic 1**		
TC-130H	**See C-130A**		
TC-135S, -135W	**See C-135A**		
TE-2A, -2C	**See Generic 1**		
TE-8A	**See Generic 1**		
TF-16N	**See F-16**		

Table 3-3. Military Aircraft and GSE Assignments (continued)

Aircraft	GSE Type	GSE Model	Operating Time Per Sortie or LTO (hr)
TF-18A	**See Generic 2**		
TF/A-18A	**See Generic 2**		
TH-1L	**See Generic 4**		
TH-53A	**See Generic 4**		
TS-2A	**See Generic 2**		
TU-2S	**See Generic 2**		
U-2S	**See Generic 2**		
U-21, -21J	**See Generic 1**		
U-28A	**See Generic 1**		
UA-3B	**See Generic 2**		
UC-12B	**See C-12**		
UC-35A, -35C	**See Generic 1**		
UC-123K	**See Generic 1**		
UH-1E, -1H, -1L, -1N, -1V	**See Generic 4**		
UH-2C	**See Generic 4**		
UH-3A	**See Generic 4**		
UH-46A	**See Generic 4**		
UH-60A, -60C, -60Q	Generator Set	A/M32A-86D	1.00 - 5.00
	Start Cart	A/M32A-95	0.50
	Air Conditioner	MA-3D	2.00
	Heater	H1[(1)]	2.00
	Hydraulic Test Stand	MJ-1-1	2.50
		MJ-2/TTU-228	1.00
	Light Cart	FL-1D **(S)**	0.50 - 4.00
	Air Compressor	MC-1A	1.00
		MC-2A **(S)**	2.50
UP-3B	**See Generic 1**		
US-2A, -2B, -2C, -2D	**See Generic 1**		
UV-18B	**See Generic 1**		
UV-20A	**See Generic 1**		
VC-25A	**See C-5A**		
VC-137B, -137C	**See Generic 1**		
VC-140B	**See Generic 1**		
WC-130E, -130H, -130J	**See C-130A**		
WC-135B, -135C, -135W	**See C-135A**		
X-29A	**See Generic 2**		
X-31A	**See Generic 2**		
X-44A	**See Generic 2**		
YA-7D	**See Generic 2**		
YC-14A	**See Generic 1**		
YE-2C	**See Generic 1**		
YF-4J	**See Generic 2**		
YF-15A, -15B	**See F-15A**		
YF-16A, -16B	**See F-16**		
YOV-10D	**See Generic 2**		
YP-3C	**See Generic 1**		
YS-2G	**See Generic 2**		
YSH-2E	**See Generic 4**		

Table 3-3. Military Aircraft and GSE Assignments (continued)

Aircraft	GSE Type	GSE Model	Operating Time Per Sortie or LTO (hr)
Generic 1 Cargo/Bomber (C-130)	Generator Set	A/M32A-86D	4.00 - 11.00
		Trielectron D200T 400	3.00
	Start Cart	MA-1A **(S)**	0.25
		A/M32A-60A	0.25
		A/M32A-95	0.25
	Air Conditioner	Ace 802-993 **(S)**	1.00
		MA-3D	1.00
	Heater	H1	1.00
	Hydraulic Test Stand	MJ-2A[(1)]	3.00
	Light Cart	NF-2	2.00 - 10.00
	Air Compressor	MC-1A	0.50 - 10.00
		MC-2A **(S)**	0.50 - 10.00
Generic 2 Fighter/Fighter Bomber (F-15)	Generator Set	A/M32A-86D	0.33
	Start Cart	A/M32A-60A	0.33
		A/M32A-95	0.33
	Heater	H1	0.50
	Hydraulic Test Stand	MJ-1-1	0.50
		MJ-2/TTU-228	0.50
	Light Cart	NF-2	1.00 - 8.00
	Air Compressor	MC-1A	0.33
		MC-2A **(S)**	0.25
		MC-11	2.00
	Bomb Lift	MJ-1B	1.00
Generic 3 Small Trainers (T-37, -37B)	Generator Set	A/M32A-86D(1)	0.17
	Heater	H1	0.17
	Hydraulic Test Stand	MJ-1-1	0.50
	Light Cart	TL-1D **(S)**	1.00
	Air Compressor	MC-1A	0.50
		MC-2A **(S)**	0.50
	Tug	(See "Tug" in Table 3-4 and select appropriate size)	0.33
Generic 4 Helicopter (UH-60A)	Generator Set	A/M32A-86D	1.00 - 5.00
	Start Cart	A/M32A-95	0.50
	Air Conditioner	MA-3D	2.00
	Heater	H1	2.00
	Hydraulic Test Stand	MJ-1-1	2.50
		MJ-2/TTU-228	1.00
	Light Cart	FL-1D **(S)**	0.50 - 4.00
	Air Compressor	MC-1A	1.00
		MC-2A **(S)**	2.50
Generic (Not otherwise specified)	Aircraft Tug	(See "Tug" in Table 3-4 and select appropriate size)	0.10
	Package Tug	(See "Tug" in Table 3-4 and select appropriate size)	1.30
	Cargo Loader	Cargo Loader	1.50
	Fuel Truck	Fuel Truck	0.60
	Deicer Truck[3]	Deicer Truck	0.15

Notes for Table 3-3 are provided on the following page.

Notes for Table 3-3:

SOURCE (unless otherwise noted): data obtained from USAF, IERA-RS-BR-SR-2005-0001, *Flightline Emission Factors – Aircraft/Auxiliary Power Units/Aerospace Ground Support Equipment December 2004*. Data provided by USAF flight squadrons and associated AGE shops. When calculating GSE emissions, use the data available at the installation. These aircraft/GSE combinations should be used only in the absence of current, more accurate, data.

1. Operating time estimated based on operating time of GSE on similar aircraft.
2. GSE model changed from what was stated in the source document because of suspected error in source.
3. Cold weather months and cold weather bases only.
4. Uses GSE assignments for similar, surrogate engine provided in source document.

"**(S)**" – Indicates that emission factors for this GSE are not found in this document. In the absence of available data, it is recommended that a similar GSE and its associated emission factors are used as a surrogate.

Table 3-4. Military Aircraft GSE Emission Factors

GSE Model	GSE Type	Source of Data[1]	Engine Manufacturer	Model Number	Rated Hp	Fuel	Operational Mode	Fuel Flow Rate (gal/hr)	Emission Factors (lb/hr)						
									NO_X	SO_X[2]	CO	VOC[3]	PM_{10}	$PM_{2.5}$[4]	CO_2e[5]
1H1	Heater	e	---	---	6.5	Diesel/JP-8	All Loads	0.39	0.160	0.011**(C)**	0.180	0.100	0.006	0.006	8.86
A/M27T-13	Hydraulic Test Stand	e	---	---	30	Diesel/JP-8	All Loads	---	0.180	0.051**(C)**	12.250	0.280	0.109[4]	0.105	36.84
A/M32A-60A	Start Cart	e	Garrett	---	180	Diesel/JP-8	All Loads	---	1.820	0.306**(C)**	5.480	0.270	0.211	0.205	221.06
A/M32A-86D	Generator Set	b	Detroit Diesel	4-71N	148	Diesel/JP-8	All Loads	6.47	6.102	0.046	0.457	0.294	0.091	0.089	146.95
A/M32A-95	Start Cart	e	Garrett	---	155	Diesel/JP-8	All Loads	---	1.470	0.264**(C)**	5.860	0.070	0.110	0.107	190.36
A/M32C-18	Air Compressor	a	Detroit Diesel	6V71T	290	Diesel/JP-8	100% Load	16.57	7.973	0.117	1.522	0.205	0.211	0.205	376.34
Ace 401	Air Conditioner	e	Detroit Diesel	---	---	Diesel/JP-8	All Loads	---	7.970	0.408**(C)**	1.520	0.200	0.211	0.205	313.19**(C)**
Ace 802-329S	Air Conditioner	c	Detroit Diesel	6V71N	272	Diesel/JP-8	All Loads	6.8	2.938	0.048	0.150	0.204	0.198	0.192	154.44
AF/M27M-1	Pumping Unit	a	Wisconsin	VH4D	30	Gasoline	100% Load	1.78	0.177	0.004	12.262	0.276	0.109[4]	0.100	34.76
B-1B Heater/Air Conditioner	Heater/Air Conditioner	a	Detroit Diesel	6V-92TA	300	Diesel/JP-8	100% Load	17.14	7.659	0.121	1.409	0.258	0.152	0.148	389.28
BAK-13	Arresting Barrier	a	Wisconsin	MV-465D	64	Gasoline	100% Load	3.9	0.377	0.009	29.207	0.319	0.109[4]	0.100	76.16
BT400-46	Heater	a	Lister-Petter	AC1-389548	6.5	Diesel/JP-8	All Loads	0.39	0.158	0.003	0.181	0.100	0.109[4]	0.105	8.86
Cargo Loader	Cargo Loader	f	---	---	133	Diesel/JP-8	All Loads	7.28	2.554	0.253	1.862	0.399	0.279	0.271	165.34
Deicer Truck	Deicer Truck	f	---	---	270	Gasoline	All Loads	14.78	5.940	0.108	73.170	2.700	0.027	0.243	288.63
Elevator Loader	Elevator Loader	a	Detroit Diesel	3-53 Series	110	Diesel/JP-8	100% Load	6.29	3.128	0.044	1.048	0.129	0.063	0.061	142.86
EMU-15	Generator Set	a	Detroit Diesel	3-71	100	Diesel/JP-8	100% Load	5.71	3.505	0.040	4.905	0.095	0.115	0.111	129.69
EMU-17	Generator Set	a	Detroit Diesel	12V-71N	300	Diesel/JP-8	100% Load	17.14	8.863	0.121	11.078	0.337	0.185	0.180	389.28
EMU-19U	Generator Set	a	Lister	ST-3	30	Diesel/JP-8	All Loads	1.78	0.743	0.013	0.351	0.266	0.109[4]	0.105	40.43
Fuel Truck	Fuel Truck	f	---	---	300	Diesel/JP-8	All Loads	16.42	3.300	0.480	0.900	0.300	0.210	0.204	372.93
Generator Light Cart	Generator Light Cart	d	Onan	P218G-I/10876C	10.5	Diesel/JP-8	All Loads	0.62	0.181	0.004	0.139	0.174	0.109[4]	0.105	14.08
Generator Set	Generator Set	a	Caterpillar	D3333T	214	Diesel/JP-8	100% Load	17.5	3.170	0.124	0.689	0.547	0.071	0.069	397.46
							62% Load	10.46	1.901	0.074	0.383	0.462	0.050	0.048	262.82
Ground Mobile Terminal Generator Set	Ground Mobile Terminal Generator Set	a	Detroit Diesel	4-71-T	150	Diesel/JP-8	100% Load	8.57	6.855	0.061	1.114	0.155	0.109	0.106	194.64
H1	Heater	e	---	---	6.5	Diesel/JP-8	All Loads	0.39	0.160	0.011**(C)**	0.180	0.100	0.006	0.006	8.86
MA-3	Air Conditioner	a	Onan	L643T*I/1C178-C	65	Diesel/JP-8	All Loads	3.79	0.497	0.027	0.133	0.011	0.109[4]	0.105	86.08
MA-3D	Air Conditioner	a	John Deere	4045T	120	Diesel/JP-8	All Loads	7.12	4.167	0.050	0.317	0.053	0.109[4]	0.105	161.71
MA-3D	Air Conditioner	c	John Deere	4039T	110	Diesel/JP-8	All Loads	4.57	0.640	0.032	0.058	0.284	0.063	0.061	103.79

Table 3-4. Military Aircraft GSE Emission Factors (continued)

GSE Model	GSE Type	Source of Data[1]	Engine Manufacturer	Model Number	Rated Hp	Fuel	Operational Mode	Fuel Flow Rate (gal/hr)	Emission Factors (lb/hr)						
									NO_X	SO_X[2]	CO	VOC[3]	PM_{10}	$PM_{2.5}$[4]	CO_2e[5]
MC-1A	Air Compressor	a	Hatz	Z790-193	18.4	Diesel/JP-8	All Loads	1.09	0.419	0.008	0.267	0.267	0.071	0.068	24.76
MC-1A	Air Compressor	a	Lister Engineering Co.	ST2A/MC1A	20	Diesel/JP-8	All Loads	1.19	0.496	0.008	0.234	0.177	0.109[4]	0.105	27.03
MC-5	Air Compressor	c	Deutz	F4L912 4CYL	100	Diesel/JP-8	All Loads	2.38	0.547	0.017	0.333	0.110	0.109[4]	0.105	54.05
MC-5	Air Compressor	a	GMC	Series 4-53	130	Diesel/JP-8	100% Load	7.43	3.396	0.053	0.794	0.195	0.089	0.086	168.75
MC-5	Air Compressor	a	John Deere	4039	110	Diesel/JP-8	All Loads	6.52	2.425	0.046	0.485	0.073	0.109[4]	0.105	148.08
MC-7	Air Compressor	a	John Deere	3164D	52	Diesel/JP-8	100% Load	3.3	1.285	0.023	0.642	0.057	0.109[4]	0.105	74.95
MC-7	Air Compressor	c	John Deere	3179 SPEC FD16694J	48	Diesel/JP-8	All Loads	1.8	0.414	0.013	0.018	0.053	0.109[4]	0.105	40.88
MC-8	Air Compressor	a	Deutz	F6L912	110	Diesel/JP-8	All Loads	6.52	2.983	0.046	0.752	0.121	0.109[4]	0.105	148.08
MC-11	Air Compressor	a	Wisconsin	MVH4D	30	Gasoline	100% Load	1.78	0.177	0.004	12.262	0.276	0.109[4]	0.100	34.76
Miller Concrete Cutter	Miller Concrete Cutter	a	Deutz	BF4D-1011T	75	Diesel/JP-8	All Loads	4.45	1.042	0.031	0.198	0.083	0.109[4]	0.105	101.07
MJ-1-1	Hydraulic Test Stand	a	Detroit Diesel	3-53 N	97	Diesel/JP-8	All Loads	2.52	0.757	0.018	0.043	0.026	0.109[4]	0.105	57.23
MJ-1B	Bomb Lift	e	Detroit Diesel	---	---	Diesel/JP-8	All Loads	---	4.780	0.219**(C)**	3.040	3.040	0.800	0.776	141.24
MJ-2/TTU-228	Hydraulic Test Stand	c	Detroit Diesel	6V-53N	125	Diesel/JP-8	All Loads	4.92	0.937	0.035	0.083	0.292	0.083	0.080	111.74
MJ-2/TTU-228	Hydraulic Test Stand	a	Detroit Diesel	4-53	130	Diesel/JP-8	100% Load	7.43	3.396	0.053	0.794	0.195	0.089	0.086	168.75
MJ-2/TTU-229	Hydraulic Test Stand	a	Detroit Diesel	6V-53N	125	Diesel/JP-8	100% Load	10.86	3.858	0.077	2.466	0.193	0.083	0.080	246.65
MJ-2A	Hydraulic Test Stand	e	Detroit Diesel	---	---	Diesel/JP-8	All Loads	---	3.850	0.238**(C)**	2.460	0.190	0.083	0.076	171.95**(C)**
MJ-40	Bomb Lift	e	Detroit Diesel	---	---	Diesel/JP-8	All Loads	---	0.340	0.219**(C)**	0.210	0.210	0.060	0.055	141.24**(C)**
NF-2	Light Cart	e	---	---	18	Diesel/JP-8	All Loads	---	0.110	0.043**(C)**	0.080	0.010	0.010	0.010	22.11
PD501	Air Conditioner	e	---	---	---	Diesel/JP-8	All Loads	---	7.650	0.408**(C)**	1.410	0.260	0.109[4]	0.105	313.19**(C)**
PMU 27/M	Pumping Unit	a	Petter Diesel Engine	AC-1	6.5	Diesel/JP-8	All Loads	0.39	0.158	0.003	0.181	0.100	0.109[4]	0.105	8.86
R-22	Pumping Unit	a	Detroit Diesel	3-53 Series	110	Diesel/JP-8	100% Load	6.29	3.128	0.044	1.048	0.129	0.063	0.061	142.86
TF-1	Light Cart	e	---	---	---	Diesel/JP-8	All Loads	---	0.170	0.043**(C)**	0.130	0.025**(C)**	0.160	0.155	30.71**(C)**
Trilectron D200T 400	Generator Set	c	Detroit Diesel	8V-71T	236	Diesel/JP-8	All Loads	10.9	8.621	0.077	0.219	0.271	0.208	0.202	247.56
Tug - Large	Tug	f	---	---	617	Diesel/JP-8	All Loads	33.4	0.617	1.049	4.936	0.617	0.864	0.839	758.58
Tug - Medium	Tug	f	---	---	475	Diesel/JP-8	All Loads	25.7	0.475	0.808	3.800	0.475	0.665	0.686	583.70
Tug - Small	Tug	f	---	---	190	Diesel/JP-8	All Loads	10.3	3.230	0.323	1.520	0.190	0.266	0.258	233.93

Notes for Table 3-4 are provided on the following page.

Notes for Table 3-4:

1. Sources of data include the following:
   a. Emission factors were obtained from the manufacturer. any documents? Fuel usage rates were based on 7,500 Btu/hp-hr.
   b. Emission factors were obtained from the Southwest Research Institute report titled *Exhaust Emissions from a USAF A/M32-86D Generator.*
   c. Emission factors were obtained from the Pacific Environmental Services report titled *Aerospace Ground Support Equipment Emissions Characterization for Edwards AFB, California.*
   d. Emission factors are EPA tier I Non-road engine factors.
   e. Emission factors were obtained from *Aircraft/Auxiliary Power Units/Ground Support Equipment Emission Factors,* December 2002
   f. Emission factors calculated using the emission factors in Table 3-7 using the hp stated in the table above. If no hp was given, then the average hp for that equipment type was used (Table 3-6). Fuel usage rates were based on 7,500 Btu/hp-hr.
2. SO_X as SO_2; assumes all sulfur in the fuel reacts to form SO_2 and the national average sulfur content for JP-8 is 0.053 wt.% (density is 6.67 lb/gal) and for gasoline is 0.018 wt.% (density is 6.15 lb/gal). See Section 3.5.5 of this document for reference. Emission factor calculated using Equation 3-7.
3. Emission factors are based on values for total hydrocarbons.
4. $PM_{2.5}$ conservatively estimated at 97% of PM_{10} for JP-8 or diesel and 92% of PM_{10} for gasoline (per *Exhaust and Crankcase Emission Factors for Nonroad Engine Modeling-Compression-Ignition*, EPA420-P-04-009, April 2004). For PM_{10} emission factors that were not available, an average value for all other GSE of 0.109 lb/hr was used.
5. Greenhouse gas emission factors in the form of equivalent CO_2 (CO_2e). This is accomplished by taking the sum of the CO_2, CH_4, and N_2O emissions and their respective global warming potentials (GWP). The GWP for CO_2, CH_4, and N_2O are 1, 25, 298 respectively as given by table A-1 of 40 CFR 98.

"(**C**)" – Indicates that this value was not provided from test data, but was calculated using the stated hp (or hp from Table 3-6) and the appropriate emission factor from Table 3-7.
"---" Indicates No Data Available.

Table 3-5. Typical Commercial Aircraft GSE Assignments

Long Haul Turbine Powered Aircraft	Short Haul/Regional Turbine Powered Aircraft	Turbo-prop Powered Aircraft	Piston Powered Aircraft
Air Conditioner (Diesel/Electric)	Aircraft Tractor (Diesel)	Aircraft Tractor (Diesel)	Fuel Truck (Diesel)
Air Start (Diesel)	Baggage Tractor (Gasoline)	Baggage Tractor (Gasoline)	
Aircraft Tractor/Tug (Diesel)	Belt Loader (Gasoline)	Belt Loader (Gasoline)	
Baggage Tractor (Gasoline)	Catering Truck (Diesel)	Catering Truck (Diesel)	
Belt Loader (Gasoline)	Fuel Truck (Diesel)	Cabin Service Truck (Diesel)	
Cabin Service Truck (Diesel)	Lavatory Truck (Diesel)	Fuel Truck (Diesel)	
Catering Truck (Diesel)	Service Truck (Diesel)	Service Truck (Diesel)	
Hydrant Truck (Diesel)		Cabin Service Truck (Diesel)	
Lavatory Truck (Diesel)			
Service Truck (Diesel)			
Water Service Truck (Diesel)			

SOURCE: FAA Emissions and Dispersion Modeling System, Version 5.02

Table 3-6. Common GSE Operating Parameters

GSE Type	Fuel Type	Average Rated Power (hp)	Average Operating Load (% Max Power)	Operating Time Per LTO (hr)
Air Conditioner	Diesel	255	75	0.50
Air Start	Diesel	613	90	0.12
	Gasoline	---	---	0.12
Aircraft Tractor/Tug	Diesel	617	80	0.13
	Diesel	475	80	0.13
	Diesel	190	80	0.13
	Diesel	88	80	0.13
	Gasoline	110	80	0.13
	CNG/LPG	124	80	0.13
Baggage Tractor	Diesel	83	55	1.20
	Gasoline	107	55	1.20
	CNG	83	55	1.20
	LPG	107	55	1.20
Belt Loader	Diesel	71	50	0.80
	Gasoline	107	50	0.80
	CNG	83	50	0.80
	LPG	107	50	0.80
Bobtail	Diesel	225	55	---
	Gasoline	124	55	---
	CNG	110	55	---
	LPG	124	55	---
Cabin Service Truck	Diesel	210	53	0.33
	Diesel	71	53	0.33
	Gasoline	260	53	0.33
	Gasoline	107	53	0.33
	CNG	360	53	0.33
	CNG	83	53	0.33
	LPG	260	53	0.33
	LPG	107	53	0.33
Cargo Loader	Diesel	133	50	1.33
	Diesel	80	50	1.33
	Gasoline	107	50	1.33
	CNG	83	50	1.33
	LPG	107	50	1.33
Cargo Tractor	Diesel	88	54	---
	Gasoline	107	54	---
	CNG	83	54	---
	LPG	88	54	---

Table 3-6. Common GSE Operating Parameters (continued)

GSE Type	Fuel Type	Average Rated Power (hp)	Average Operating Load (% Max Power)	Operating Time Per LTO (hr)
Cart (Light Cart)	Diesel	25	50	0.17
	Gasoline	25	50	0.17
	CNG/LPG	25	50	0.17
Catering Truck	Diesel	210	53	25.00
	Diesel	71	53	0.25
	Gasoline	260	53	0.25
	Gasoline	107	53	0.25
	CNG	360	53	25.00
	CNG	83	53	0.25
	LPG	260	53	0.25
	LPG	107	53	0.25
Deicer	Diesel	263	95	---
	Diesel	165	95	---
	Gasoline	270	95	---
	Gasoline	107	95	---
	CNG	83	95	---
	CNG	54	95	---
	LPG	270	95	---
	LPG	107	95	---
Forklift	Diesel	55	30	---
	Gasoline	54	30	---
	CNG/LPG	54	30	---
Fuel Truck	Diesel	300	25	0.75
	Diesel	235	25	0.54
	Diesel	175	25	0.33
	Gasoline	420	25	0.75
	Gasoline	260	25	0.54
	CNG	420	25	0.75
	CNG	360	25	0.54
	LPG	420	25	0.75
	LPG	260	25	0.54
Generator Sets	Diesel	158	82	2.00
	Gasoline	107	82	2.00
	CNG/LPG	107	82	2.00
Ground Power Unit	Diesel	194	75	0.67
	Diesel	71	75	0.67
	Gasoline	107	75	0.67
	CNG	83	75	0.67
	LPG	107	75	0.67

Table 3-6. Common GSE Operating Parameters (continued)

GSE Type	Fuel Type	Average Rated Power (hp)	Average Operating Load (% Max Power)	Operating Time Per LTO (hr)
Hydrant Truck	Diesel	235	70	0.20
	Gasoline	260	70	0.20
	CNG	360	70	0.20
	LPG	260	70	0.20
Lavatory Truck	Diesel	235	25	25.00
	Diesel	56	25	0.25
	Gasoline	260	25	0.25
	Gasoline	97	25	0.25
	CNG	360	25	25.00
	CNG	82	25	0.25
	LPG	260	25	0.25
	LPG	89	25	0.25
Lift	Diesel	115	50	0.17
	Gasoline	105	50	0.17
	CNG/LPG	132	50	0.17
Passenger Stand	Diesel	65	57	---
	Gasoline	107	57	---
	CNG	107	57	---
	LPG	83	57	---
Service Truck	Diesel	235	20	25.00
	Gasoline	260	20	0.25
	CNG	360	20	0.25
	LPG	260	20	0.25
Sweeper	Diesel	53	51	---
	Gasoline	53	51	---
	CNG/LPG	45	51	---
Water Service	Diesel	235	20	0.20
	Gasoline	260	20	0.20
	CNG	360	20	0.20
	LPG	260	20	0.20
Other	Diesel	140	50	---
	Gasoline	126	50	---
	CNG/LPG	173	50	---

SOURCE: FAA Emissions and Dispersion Modeling System, Version 5.02

"---" Indicates No Data Available

Table 3-7. Common GSE Emission Factors

GSE Type	Fuel Type	Emission Factors (lb/1000hp-hr)						
		CO	VOC[1]	NO_X	SO_X	PM_{10}[(2)]	$PM_{2.5}$[(3)]	CO_2e[4]
Air Conditioner	Diesel	5.00	1.00	16.40	1.60	1.00	0.97	1330.83
Air Start	Diesel	6.00	1.00	19.30	1.60	1.20	1.16	1330.83
	Gasoline	271.00	10.00	22.00	0.40	0.10	0.09	1093.30
Aircraft Tractor/Tug	Diesel	8.00	1.00	17.00	1.70	1.40	1.36	1330.83
	Gasoline	393.00	13.00	23.20	0.40	0.10	0.09	1093.30
	CNG/LPG	---	---	---	---	---	---	1458.76
Baggage Tractor	Diesel	11.00	2.00	13.70	1.80	2.10	2.04	1330.83
	Gasoline	395.00	13.00	22.30	0.40	0.20	0.18	1093.30
	CNG/LPG	107.00	6.00	26.90	0.00	0.10	0.10	1458.76
Belt Loader	Diesel	8.00	2.00	14.80	1.80	1.70	1.65	1330.83
	Gasoline	275.00	10.00	22.30	0.40	0.20	0.18	1093.30
	CNG	275.00	10.00	22.30	0.00	0.10	0.10	2229.82
	LPG	74.00	4.00	26.90	0.00	0.00	0.00	1453.67
Bobtail	Diesel	8.00	1.00	16.70	1.70	1.30	1.26	1330.83
	Gasoline	398.00	13.00	22.30	0.40	0.20	0.18	1093.30
	CNG/LPG	---	---	---	---	---	---	1458.76
Cabin Service Truck	Diesel	2.00	1.00	10.30	1.60	0.30	0.29	1330.83
	Gasoline	24.00	4.00	10.70	0.30	0.10	0.09	1093.30
	CNG/LPG	107.00	6.00	26.90	0.00	0.10	0.10	1062.84
Cargo Loader	Diesel	14.00	3.00	19.20	1.90	2.10	2.04	1330.83
	Gasoline	400.00	13.00	22.30	0.40	0.20	0.18	1093.30
	CNG/LPG	106.00	5.00	26.80	0.00	0.10	0.10	1062.84
Cargo Tractor	Diesel	12.00	2.00	17.00	1.80	2.40	2.33	1330.83
	Gasoline	404.00	13.00	22.40	0.40	0.20	0.18	1093.30
	CNG/LPG	107.00	6.00	26.90	0.00	0.10	0.10	1062.84
Cart (Light Cart)	Diesel	---	---	---	---	---	---	1330.83
	Gasoline	392.00	13.00	22.30	0.40	0.10	0.09	1093.30
	CNG/LPG	---	---	---	---	---	---	1458.76
Catering Truck	Diesel	2.00	1.00	10.30	1.60	0.30	0.29	1330.83
	Gasoline	24.00	4.00	10.70	0.30	0.10	0.09	1093.30
	CNG/LPG	107.00	6.00	27.00	0.00	0.10	0.10	1062.84
Deicer	Diesel	---	---	---	---	---	---	1330.83
	Gasoline	271.00	10.00	22.00	0.40	0.10	0.09	1093.30
	CNG/LPG	---	---	---	---	---	---	1458.76
Forklift	Diesel	15.00	4.00	22.00	1.90	2.70	2.62	1330.83
	Gasoline	392.00	13.00	22.00	0.40	0.10	0.09	1093.30
	CNG/LPG	108.00	6.00	27.00	0.00	0.10	0.10	1062.84

Table 3-7. Common GSE Emission Factors (continued)

GSE Type	Fuel Type	Emission Factors (lb/1000hp-hr)						
		CO	VOC[1]	NO_X	SO_X	PM_{10}[(2)]	$PM_{2.5}$[(3)]	CO_2e[4]
Fuel Truck	Diesel	3.00	1.00	11.00	1.60	0.70	0.68	1330.83
	Gasoline	37.00	5.00	11.00	0.30	0.10	0.09	1093.30
	CNG/LPG	106.00	5.00	27.00	0.00	0.10	0.10	1062.84
Generator	Diesel	6.00	2.00	20.00	1.60	1.40	1.36	1330.83
	Gasoline	271.00	10.00	22.00	0.40	0.10	0.09	1093.30
	CNG/LPG	---	---	---	---	---	---	1458.76
Ground Power Unit	Diesel	5.00	1.00	17.00	1.60	1.00	0.97	1330.83
	Gasoline	271.00	10.00	22.00	0.40	0.10	0.09	1093.30
	CNG/LPG	---	---	---	---	---	---	---
Hydrant Truck	Diesel	4.00	1.00	12.00	1.60	1.60	1.55	1330.83
	Gasoline	26.00	4.00	11.00	0.30	0.10	0.09	1093.30
	CNG/LPG	---	---	---	---	---	---	1458.76
Lavatory Truck	Diesel	4.00	1.00	12.00	1.60	1.30	1.26	1330.83
	Gasoline	18.00	4.00	11.00	0.30	0.10	0.09	1093.30
	CNG/LPG	106.00	5.00	27.00	0.00	0.10	0.10	1062.84
Lift	Diesel	15.00	4.00	22.00	1.90	2.70	2.62	1330.83
	Gasoline	397.00	13.00	22.00	0.40	0.20	0.18	1093.30
	CNG/LPG	106.00	5.00	27.00	0.00	0.10	0.10	1062.84
Passenger Stand	Diesel	4.00	1.00	12.00	1.60	1.60	1.55	1330.83
	Gasoline	46.00	5.00	11.00	0.30	0.10	0.09	1093.30
	CNG/LPG	106.00	5.00	27.00	0.00	0.10	0.10	1062.84
Service Truck	Diesel	3.00	1.00	11.00	1.60	0.90	0.87	1330.83
	Gasoline	46.00	5.00	11.00	0.30	0.10	0.09	1093.30
Sweeper	Diesel	12.00	2.00	17.00	1.80	2.40	2.33	1330.83
	Gasoline	393.00	13.00	22.00	0.40	0.10	0.09	1093.30
	CNG/LPG	108.00	6.00	27.00	0.00	0.10	0.10	1062.84
Water Service	Diesel	---	---	---	---	---	---	1330.83
	Gasoline	46.00	5.00	11.00	0.30	0.10	0.09	1093.30
	CNG/LPG	---	---	---	---	---	---	1458.76
Other	Diesel	8.00	1.00	17.00	1.70	1.30	1.26	1330.83
	Gasoline	396.00	13.00	22.00	0.40	0.20	0.18	1093.30
	CNG/LPG	106.00	5.00	27.00	0.00	0.10	0.10	1062.84

SOURCE: FAA Emission and Dispersion Modeling System, Version 5.02 for model year 2000 GSE and converted from g/hp-hr to lb/10^3 hp-hr.

1. Reported as HC and conservatively estimated to be equal to VOC.
2. Reported as PM in EDMS. All PM assumed to be PM_{10}.
3. Using assumptions and factors applied by EPA in its NONROAD model, $PM_{2.5}$ emissions can be conservatively estimated as 97% of JP-8 or diesel PM_{10} emissions, 92% of gasoline PM_{10} emissions, and 100% of CNG or LPG PM_{10} emissions.
4. CO_2e is the sum of emission factors for CO_2, CH_4, and N_2O. The emission factors are presented in equivalent CO_2 (CO_2e) using global warming potentials of 25 and 298 for CH_4 and N_2O respectively. The emission factors were provided by the EPA's Emission Factors for Greenhouse Gas Inventories. When "CNG/LPG" is provided as the fuel used, then the greenhouse gas emission factor provided was calculated using the more conservative estimate from LPG. The emission factors for N_2O and CH_4 for CNG and LPG were assumed to be equal to those for gasoline. Calculations were made using the heating values and fuel usage rates provided in Table 3-1

"---" Indicates No Data Available.

Table 3-8. Uncontrolled HAP Emission Factors for Select Military GSE

Hazardous Air Pollutant	Emission Factors (lb/1000gal)			
	MA-1A/2 MB-2/3	A/M32A-60	A/M32A-60A	A/M32A-95
Acetaldehyde	---	2.09E-03	2.09E-03	2.09E-03
Acrolein	---	3.00E-04	3.00E-04	3.00E-04
Benzene	1.30E-05	1.50E-02	1.50E-02	1.50E-02
Ethylbenzene	1.10E-06	8,78E-4	8.78E-04	8.78E-04
Formaldehyde	---	2.03E-02	2.03E-02	2.03E-02
Toluene	6.60E-06	4.36E-03	4.36E-03	4.36E-03
Xylenes	4.80E-06	2.69E-03	2.69E-03	2.69E-03

SOURCE: Flightline Emission Factors – Aircraft/Auxiliary Power Units/Aerospace Ground Support Equipment December 2004, IERA-RS-BR-SR-2005-0001.

"---" Indicates No Data Available.

Table 3-9. EPA Emission Factors for Uncontrolled Diesel Reciprocating IC Engines

Model Year	Emission Factors [1,2]													
	NO_X		CO[2]		SO_X[2]		VOC[3]		PM_{10}[(4)]		$PM_{2.5}$[(4)]		CO_2e[(5)]	
	(lb/10^3gal)	(lb/10^3 hp-hr)	(lb/10^3gal)	(lb/10^3 hp-hr)	(lb/10^3gal)	(lb/10^3 hp-hr)	(lb/10^3gal)	(lb/10^3 hp-hr)	(lb/10^3gal)	(lb/10^3 hp-hr)	(lb/10^3gal)	(lb/10^3 hp-hr)	(lb/10^3gal)	(lb/10^3 hp-hr)
Pre-2005[(2)]	611.67	35.67	131.77	7.68	40.22	2.35	47.77	2.79	43.00	2.51	43.00	2.51	22824.38	1331.12
2005 - Present[6]	197.04[(7)]	11.49[(7)]	131.77	7.68	40.22	2.35	16.54	0.96	22.55	1.32	22.55	1.32	22824.38	1331.12

1. Emission Factors apply to reciprocating internal combustion engines rated at 600hp or less.
2. SOURCE: *Compilation of Air Pollutant Emission Factors Volume I: Stationary Point and Area Sources fifth edition*, January 1995. Section 3.3. Emission factors from the source document provided in lb/MMBtu and units were converted using an average diesel BSFC of 8.089 MMBtu/10^3hp-hr and a diesel average heating value of 138.7MMBtu/10^3gal.
3. Source documents provided emissions in terms of either non-methane hydrocarbons (NMHC), total hydrocarbons (HC), or total organic compounds (TOC). Assuming that TOC is equal to total organic gas (TOG), the VOC emission factors were estimated using the following ratios: HC=TOG/1.07, and VOC=1.053*HC. These ratios provided in *Conversion Factors for Hydrocarbon Emission Components*, EPA-420-R-10-015, July 2010
4. Emission factors for PM only provided by source documents. PM is conservatively assumed to be equal to PM_{10} which is assumed to be equal to $PM_{2.5}$.
5. CO_2e emission factors are the sum of CO_2, CH_4, and N_2O and the product of their respective global warming potentials (GWP). The GWP are 1, 25, and 298 for CO_2, CH_4, and N_2O respectively. Source document provided CO_2 emission factor only. The *Compendium of Greenhouse Gas Emissions Estimation Methodologies for the Oil and Natural Gas Industry* provided emission factors of 6.64E-03 and 1.32E-03 lb/MMBtu for CH_4, and N_2O respectively.
6. SOURCE: These emission factors from 40 CFR 89 and 40 CFR 1039 and represent the worst case emission limit for that year as provided in 40 CFR 89 and 40 CFR 1039.
7. NO_X value estimated from the NO_X+NMHC limit provided in the CFR by using the ratio of NO_X to NMHC as given in AP-42.

Table 3-10. Speciated HAP Emission Factors for Uncontrolled Diesel Reciprocating Internal Combustion Engines

Compound	Emission Factors	
	lb/10^3 gal	lb/10^3hp-hr
1,3-Butadiene	5.42E-03	3.16E-04
Acenaphthene	1.97E-04	1.15E-05
Acenaphthylene	7.02E-04	4.09E-05
Acetaldehyde	1.06E-01	6.20E-03
Acrolein	1.28E-02	7.48E-04
Anthracene	2.59E-04	1.51E-05
Benzo(a)anthracene	2.33E-04	1.36E-05
Benzene	1.29E-01	7.55E-03
Benzo(a)pyrene	2.61E-05	1.52E-06
Benzo(b)fluoranthene	1.37E-05	8.02E-07
Benzo(g,h,i)perylene	6.78E-05	3.96E-06
Benzo(k)fluoranthene	2.15E-05	1.25E-06
Chrysene	4.90E-05	2.86E-06
Dibenz(a,h)anthracene	8.09E-05	4.72E-06
Fluoranthene	1.06E-03	6.16E-05
Fluorene	4.05E-03	2.36E-04
Formaldehyde	1.64E-01	9.55E-03
Indeno(1,2,3-c,d)pyrene	5.20E-05	3.03E-06
Naphthalene	1.18E-02	6.86E-04
Phenanthrene	4.08E-03	2.38E-04
Pyrene	6.63E-04	3.87E-05
Toluene	5.67E-02	3.31E-03
Xylenes	3.95E-02	2.31E-03

SOURCE: *Compilation of Air Pollutant Emission Factors Volume I: Stationary Point and Area Sources fifth edition*, January 1995. Section 3.3. Where necessary, an average BSFC of 8.089 MMBtu/10^3 hp-hr and an average heating value for diesel of 138.7 MMBtu/10^3 gal was used for unit conversion.

Figure 3-1. Example Data Collection Form for Aerospace Ground Support Equipment

Installation Name: **Inventory Year (CY):**
Responsible Organization (Name & Office Symbol):
POC (Name, Phone # and e-mail address):

Equipment Type	Equipment Use	Equipment Manufacturer	Equipment Model Number	Fuel Type	Power Rating (hp)	Typical Operating Load[1]	Estimated Operating Time (hr/yr)	Estimated Fuel Usage (gal/yr)[2]

1. This is the typical load which the equipment was operated at during the inventory year. This may be listed as a horsepower value, percentage (i.e. percent of maximum power), or description. Be sure to specify.
2. While the quantity of fuel used is generally needed only if power rating and operating hours are unknown, fuel consumption data may also be needed to estimate CO_2.

3.6 References

AEE 1997, “Air Quality Procedures for Civilian Airports and Air Force Bases," U.S. Department of Transportation, FAA Office of Environment and Energy (AEE), April 1997

AFCEE 2009, "Air Emissions Factor Guide to Air Force Stationary Sources," Air Force Center for Engineering and the Environment, December 2009

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4 NON-ROAD ENGINES AND EQUIPMENT (NRDE)

4.1 Introduction

Air emissions at Air Force installations result not only from military operations, but also from day to day activities involving non-road engines. Examples of NRDE that are commonly operated on Air Force installations include: industrial equipment (e.g., forklifts, aerial lifts, sweepers, etc.); lawn and garden equipment (lawn mowers, trimmers, leaf blowers, snow blowers, etc.); agricultural equipment (sprayers, agricultural tractors, agricultural mowers, etc.); commercial equipment (e.g., portable generators, pumps, air compressors, etc.); recreational vehicles (e.g., off-road motorcycles, all-terrain vehicles, including utility vehicles, snowmobiles, golf carts, etc.); and logging equipment (e.g., shredders). Aerospace Ground Equipment (AGE) and Ground Support Equipment (GSE) are also non-road engines that are widely used on Air Force installations, but are addressed separately in the "Flightline Ground Support Equipment" section of this document. Emissions of concern from the operation of NRDE include criteria pollutants and HAPs associated with fuel combustion processes.

NRDE are typically powered by either a reciprocating internal combustion engine or a small gas turbine. For reciprocating engines, a piston moves inside a cylinder to compress an air/fuel mixture. The air/fuel mixture combusts and expands, pushing the piston through the cylinder. The piston returns, pushing out the exhaust gases, and the cycle is repeated. For gas turbines, ambient air is pressurized with a compressor. Fuel is introduced to this compressed air and is ignited. The high temperature, high pressure air flows through a turbine where it expands, producing shaft energy that is used to drive both the compressor and the electric generator.

Reciprocating engines may differ in design by the diameter of the cylinders in the engine, known as the bore, and the length of the linear movement of the piston in each cylinder, known as the stroke. The size of the engine is related to its displacement per cylinder, which is a measure of the volume of the cylinder multiplied by the length of the stroke. A reciprocating engine may be classified as either 4-stroke or 2-stroke. For a 4-stroke engine, the combustion cycle involves two revolutions of the crankshaft, to which the pistons are connected, and the cycle consists of four stages. The induction stroke occurs when the piston moves down within the cylinder, creating a vacuum and drawing in air or an air/fuel mixture. During the compression stroke, the piston moves up to pressurize the air or air/fuel mixture which then ignites. The heated air expands generating a force on the piston such that it is forced downward again in what is called the power stroke. Finally, the piston moves upward again to force the exhaust gas out of the cylinder during the exhaust stroke and returns to the starting position of the induction stroke so the cycle may be repeated. 2-stroke engines are able to operate with just one revolution of the crankshaft because induction of the air or air/fuel mixture occurs concurrently with the release of the exhaust gas.

Detonation of the air/fuel mixture during the compression stroke may occur through either compression or spark ignition. In a CI engine, air is first compressed by the piston in the cylinder, which causes the temperature of the air to rise. Fuel is added to the heated air and combusts due to the fact that the temperature of the air is above the auto-ignition temperature of the fuel. Reciprocating CI engines are powered either by diesel fuel or JP-8. Spark ignition (SI) engines, which use gasoline, natural gas, or Liquefied Petroleum Gas (LPG) differ from CI engines in that the fuel/air mixture does not ignite spontaneously, but rather by a spark. Emissions from non-road engines will vary due to operating conditions such as temperature, humidity, torque, ignition timing, or even air/fuel mixture. Even slight variations in the air/fuel mixture will dramatically affect pollutant emissions.

While most NRDE are powered by either diesel or gasoline fuel, engines fueled with JP-8 are becoming increasingly more common. Presently, there are few EPA-approved NRDE EFs developed specifically for JP-8. However, since the combustion characteristics between JP-8 and diesel fuel are similar, emissions from JP-8 fueled NRDE are typically calculated using diesel EFs.

Gas turbines are composed of three major components: a compressor, a combustor, and a power turbine. In a gas turbine, ambient air is drawn in at the front of the engine with a fan, and the pressure is raised up to 30 times the ambient pressure via a compressor. The compressed air is directed into the combustor section where it is sprayed with fuel and ignited with an electric spark. The burning gases expand, and the high-pressure, high-velocity gas stream passes through a turbine area, driving the movement of an output shaft that converts the energy to useful power. Typically, more than half of the shaft energy produced is needed to drive the internal compressor, with the balance available to drive an external load such as an electric generator or water pump. Gas turbines may be more advantageous than reciprocating engines because of their lower operational cost, lower levels of CO and VOC emissions, and potential for use in cogeneration systems. However, the large initial cost of a gas turbine engine means that they are not likely to be part of NRDE.

4.2 Emission Factors

Emission factors for NRDE are provided at the end of this section. They have been developed for specific equipment and are in units of $lb/10^3$ hp-hr. The appropriate emission factor should be selected based on the fuel the engine uses and whether or not the equipment is a 2-stroke or 4-stroke engine, if applicable. The tables also provide typical load factors and calculated BSFC values which may be needed for emissions calculations as described later in this chapter.

4.2.1 Alternative Fuels and Emissions Reduction

Increasingly stringent regulatory requirements resulting from the Energy Policy Act (EPAct), Presidential Executive Orders, and DoD /Air Force pollution prevention and energy conservation

initiatives means that some Air Force installations may be encouraged to operate non-road engines and equipment on alternative fuels such as ethanol-based E85 (a blend of 85% ethanol and 15% gasoline) or B20 (a blend of 20% biodiesel and 80% petroleum diesel). While there are currently no NRDE that use these alternative fuels, there are on-highway flexible fuel vehicles (FFVs) that are capable of operating on E85, and these FFVs are required to meet EPA's Tier II vehicle emission standards regardless of the fuel type. Some research suggests evidence of potential emission reduction benefits from the use of E85, although testing has been limited and emissions impacts have not been fully characterized. While some reduction in evaporative emissions is expected due to the displacement of gasoline, emissions are believed to be generally similar to gasoline emissions. Note, however, that data does indicate that some HAP emissions are reduced while others are increased. Accordingly, EPA does not support the use of emission reduction factors for engines using E85 fuels.

A somewhat similar situation exists with regard to information on the emissions impact of B20 fuels. In October 2002, the EPA issued its technical report on biodiesel emissions (USEPA 2002). This report was developed using various statistical analysis tools to compile and assess the results of 39 studies regarding the impact of B20 use on vehicle emissions. Relative to conventional on-highway diesel fuel (i.e., conventional low sulfur diesel with sulfur content < 500 ppm), B20 showed a +2% impact on NO_X emissions, a -10% impact on PM emissions, a -21% impact on HC emissions, and a -11% impact on CO emissions. Since the time of the study, however, ultra-low sulfur diesel (ULSD) regulations limiting the sulfur content of on-highway diesel fuel to 15 ppm have been enacted. Since June 2007, the sulfur content of non-road diesel fuel has been limited to 500 ppm which was then further reduced to 15 ppm effective June 2010. Another study conducted under the auspices of the DoD Environmental Security Technology Certification Program (ESTCP) sought to measure the impact of B20 on CO, NO_X, PM, HC, and HAP emissions from engines used in on-road and portable power generation applications (Environmental Security Technology Certification Program 2006). Using primarily a B20 biodiesel/ULSD blend, the study showed no significant differences in emissions between the B20 biodiesel blended with ULSD and the ULSD by itself. No consistent trend was observed with regards to HAP emissions.

These examples indicate that efforts to apply emission reduction factors to estimate emissions from alternatively-fueled NRDE should be attempted only after careful review of the most current, validated information available from either the EPA, the Department of Energy (DOE), the DoD, and Service Engineering and Research Organizations. Application of the B20 emission factors developed by the EPA should only be considered if an installation is confident that the non-road diesel fuel it is replacing has a sulfur concentration of 500 ppm or less. It is important to note that should the sulfur content exceed 500 ppm, potential emissions benefits of B20 may be underreported because, to date, emission impacts studies have generally not focused on non-road engines and fuels.

4.3 Emissions Calculation

This section describes several methodologies available for calculating emissions from non-road engines and equipment using either the EPA's NONROAD emissions estimating software model, or the underlying EFs in the NONROAD model and manual calculation procedures. Regardless of which approach is chosen, the methodology is applied to each individual piece of NRDE for each pollutant for which emissions are being calculated. The methodologies are briefly described in the following paragraphs.

4.3.1 Emissions Estimation Using the EPA NONROAD Model

The EPA recommends use of its NONROAD modeling software for estimating emissions from the operation of non-road vehicles and equipment. The software was developed to provide a consistent means of generating emissions data required by the CAA., the current NONROAD model predicts emissions of six exhaust pollutants (HC, NO_X, CO, CO_2, SO_X, and PM) for more than 80 basic and 260 specific types of NRDE across a variety of model years that use gasoline, diesel, CNG or LPG. The model allows PM to be reported as PM_{10} or $PM_{2.5}$. As of June 2014, the NONROAD model was integrated into the MOVES2014 model as an additional module and can now be run within MOVES2014a, therefore is no longer a separate software.

One advantage of the NONROAD model is that it recognizes that an engine's performance degrades over time due to normal operation and use. Engine deterioration not only increases exhaust emissions, but usually leads to a loss of combustion efficiency, and may increase non-exhaust emissions. EPA believes there is insufficient information to justify the use of adjustment factors for small SI engines, so the NONROAD model uses EFs based on unadjusted steady-state test results, and applies an adjustment factor only to SI engines with a power rating greater than 25 hp. In terms of CI engines, the NONROAD model addresses the effects of deterioration by multiplying a zero-hour emission factor for each category of engine by a deterioration factor to reflect degraded performance as the engine ages.

While the core model for NONROAD is written in FORTRAN and can be operated as a stand-alone application in a DOS environment, the graphical user interface will generate scenarios for only one specified set of conditions. If the user wishes to run multiple scenarios in a single model run, the scenarios must be generated in a DOS environment. The NONROAD reporting utility is written in Microsoft Access and operated similar to the graphical user interface. The reporting utility is a stand-alone application and knowledge of Access is not required to generate reports.

EFs for non-road engines and equipment manufactured prior to Model Year 1998 have been derived from the NONROAD model and its underlying data sets by the EPA Office of

Transportation Air Quality. They are provided in Table 4-1 and Table 4-2 and serve as the basis for estimating emissions manually using the methodologies discussed in the following subsections.

4.3.2 Horsepower/Load Factor Method

The most common approach for calculating emissions from non-road engines and equipment is essentially the same as the method incorporated into the NONROAD model and the horsepower/load factor method used in the "Flightline Ground Support Equipment" section. Emissions are estimated based on the engine's rated power output, a load factor, and annual operating time. The following equation is used:

$$\mathbf{E}(\boldsymbol{Pol}) = \boldsymbol{OT} \times \frac{\boldsymbol{LF}}{\mathbf{100}} \times \boldsymbol{hp} \times \frac{\mathbf{1}}{\mathbf{1000}} \times \mathbf{EF}(\boldsymbol{Pol}) \times \boldsymbol{N}$$

Equation 4-1

Where,

E(Pol) = Annual emissions of each individual pollutant (lb/yr)
OT = Operating time (hr/unit)
LF = Load factor (%)
100 = Factor for converting percent to a fraction (%)
hp = Average rated horsepower of engine (hp)
1000 = Factor converting from hp to 10^3 hp (hp/10^3 hp)
EF(Pol) = Emission factor of each pollutant (lb/10^3 hp-hr)
N = Number of non-road engines and equipment used each year (units/yr)

The data required for calculating emissions using the horsepower/load factor method may be found in Table 4-1.

4.3.3 Fuel Consumption Method

Estimating emissions based on fuel consumption can be accomplished in instances when the fuel consumption is known but the operating time of the NRDE is not. The annual fuel consumption, fuel density, BSFC values for the particular piece of equipment, and EF must be known to calculate emissions using this method as shown:

$$\mathbf{E}(\boldsymbol{Pol}) = \frac{(\boldsymbol{FC} \times \boldsymbol{D})}{\boldsymbol{BSFC}} \times \mathbf{EF}(\boldsymbol{Pol}) \times \boldsymbol{N}$$

Equation 4-2

Where,

E(Pol) = Annual emissions of each individual pollutant (lb/yr)
FC = Annual fuel consumption (gal/unit)
D = Fuel density (lb/gal)
BSFC = Brake-specific fuel consumption for the engine (lb/10^3 hp-hr)
EF(Pol) = Emission factor for each pollutant (lb/10^3 hp-hr)
N = Number of equipment used each year (units/yr)

When performing emissions calculations using the fuel consumption method, enhanced accuracy may be achieved by using the density of the fuel as provided by the fuel supplier as well as the BSFC for the engine provided directly from the engine manufacturer. If this data is unavailable, then suggested values for these variables may be found in the following tables:

- Table 3-2 provides the average density for non-road fuels.
- Table 4-1 provides the emission factors and BSFC for specific equipment types in a lb/10^3 hp-hr basis.

4.3.4 VOC and HAP Speciation

There is very little data available for the speciation of VOCs for non-road engines. Whenever the quantity of speciated compounds is required to be calculated, the average percentage of each species within the total VOC may be used as a gross estimate of the emissions of that compound. This section should only be used if no acceptable speciated EFs are available for the engine in question. The percentages for VOC emissions are based on the fuel used by the engine including diesel, gasoline, natural gas (which is further subdivided into 2 and 4 stroke lean burn and 4 stroke rich burn), and LPG.

The following equations were used to calculate the weighted percentage of each pollutant based on the total or the average VOCs from available speciation data. VOC emission factor data came from several sources including *Compilation of Air Pollutant Emission Factors* (AP-42), the Mojave Desert Air Quality Management District, and the EPAs *SPECIATE* database. Since there is limited data available regarding mobile NRDE EFs, those factors presented in these sources were assumed to be representative of all non-road engines. Using these speciated EFs, the average weight percent of the individual pollutant was calculated using the total VOCs as shown:

$$\mathbf{P(Pol)} = \frac{\mathbf{EF}(\boldsymbol{Pol})}{\boldsymbol{EF(VOC)_{Total}}}$$

Equation 4-3

Where,

$P_{(Pol)}$ = Weight percent of a given pollutant (%)

EF(Pol) = Individual pollutant emission factor (lb/10^3 hp-hr)
EF(VOC)$_{Total}$ = Total VOC emission factor (lb/10^3 hp-hr)

Speciated VOCs are calculated by taking the product of the total VOCs and the weighted percentage of the individual VOC as follows:

$$\mathbf{E}(\boldsymbol{Pol}) = \mathbf{E}(\boldsymbol{VOC}) \times \frac{\mathbf{P}(\boldsymbol{Pol})}{\mathbf{100}}$$

Equation 4-4

Where,

E(Pol) = Emissions of speciated VOC (lb/yr)
100 = Factor for converting percent to a fraction (%)
E(VOC) = Emissions of total VOC (lb/yr)

In addition to the EFs and speciation values provided in Table 4-3, most vehicle and equipment manufacturers have data on emissions specific to their product, and many are willing to provide it upon request. HAPs emissions may be calculated using the following tables:

- Table 3-10 has the EPA's EFs for uncontrolled diesel reciprocating internal combustion engines in a lb/1000 hp-hr format and may be used to calculate HAPs directly using Equation 4-1.
- Table 4-3 gives the weight percent VOC/HAP speciation of VOC emissions for estimating specific VOCs/HAPs using Equation 4-4 above.

4.4 Information Resources

The primary source of information for most NRDE is the Transportation Squadron. The Transportation Vehicle Operations Flight and/or the Transportation Vehicle Maintenance Flight typically maintain records on most Air Force owned NRDE. Records include information such as the identity of the shops/organizations operating the vehicles/equipment, hp rating of the vehicles/equipment, and hours of operation. In some cases, it may be necessary to contact the actual organizations/shops using the vehicles/equipment to obtain information that Transportation does not have. For example, for construction equipment and lawn/garden equipment, it will probably be necessary to contact the Civil Engineering (CE) Operations Flight, the CE Flight, and the CE Housing Flight, or a similar organization if base housing has been privatized.

It is important to note that many of the construction and lawn care activities at Air Force installations are performed via contractors, and therefore, it might be necessary to contact the contractors directly to obtain the necessary information on their equipment. The contracts section of the CE

Engineering Flight should be able to provide information on what equipment was used to perform construction and lawn care activities on base during the year.

In addition, some non-road engines and equipment (such as leaf blowers, trimmers/edgers, snow blowers, etc.) operated on Air Force installations may be owned by personnel who live on base. Since this equipment is privately owned, obtaining this information is usually more difficult than for Air Force owned equipment. One approach to obtaining the necessary information is to work with the CE Housing Flight to identify the types of NRDE used in base housing, estimate the number of each different equipment type, estimate the average hp of each equipment type, and estimate the average operating time (hours per year) for each equipment type. If adequate resources and time are available, a more comprehensive approach would be to survey a representative number of housing units to determine the type/size of equipment used and the estimated usage. For non-road engines and equipment in which emissions are calculated using EFs based on fuel usage (i.e., using "g/gal" emission factors), Fuels Supply may be a source of information regarding fuel consumption. An example of a data collection form which can be used to collect data necessary to estimate emissions from NRDE is provided in Figure 4-1.

4.5 Example Calculations

The following section provides examples of how the equations and methodologies discussed earlier are applied in order to calculate emissions from non-road vehicle and equipment operations. The procedures are applied to each individual non-road engine and equipment, and for each pollutant for which emissions must be calculated. Emissions for all non-road engines and equipment and pollutants are then summed to obtain pollutant-specific, base-wide totals. Load factors, BSFCs, and EFs necessary for calculating emissions are obtained from Table 4-1, Table 4-2, and Table 4-3.

4.5.1 Problem 1 - Estimating Emissions Using the Horsepower/Load Factor Method

As part of its requirement to conduct an annual mobile source emissions inventory, Anytown AFB has collected information on the NRDE operating on the base. Calculate the CO emissions associated with the operation of diesel-powered forklifts on base. The following information was obtained from the base:

Equipment Type – Diesel powered forklift (SCC-2270003020)	
# of pieces	6
Power Rating	85 hp
Operating Time	200 hr/unit

Step 1 – Record the CO emission factor and load factor. The emission factor and typical load factor are given in Table 4-1 as **6.50 lb/10^3 hp-hr** and **59%** respectively.

Step 2 – Calculate the annual emissions for the six forklifts. Using the information in the table above and the values recorded in Step 1, the annual CO emissions for the six forklifts are calculated using Equation 4-1:

$$\mathrm{E}(Pol) = OT \times \frac{LF}{100} \times hp \times \frac{1}{1000} \times \mathrm{EF}(Pol) \times N$$

$$\mathrm{E}(CO) = 200 \frac{\cancel{hr}}{\cancel{unit}} \times \frac{59\%}{100\%} \times 85(\cancel{hp}) \times \frac{1}{1000} \left(\frac{\cancel{10^3 hp}}{\cancel{hp}}\right) \times 6.50 \frac{lb}{\cancel{10^3 hp-hr}} \times 6 \frac{\cancel{units}}{yr}$$

$$\boxed{\boldsymbol{E(CO) = 391.17 \frac{lb}{yr}}}$$

4.5.2 Problem 2 - Estimating Emissions Using Fuel Consumption

Anytown AFB operates gasoline fueled commercial lawn mowers to maintain the appearance of public areas on base. Calculate the VOC and formaldehyde emissions associated with operation of the lawnmowers on base. The following information was obtained from the base:

Equipment Type – 4-stroke gasoline lawnmower (SCC 2265004011)	
# of pieces	25
Power rating	5 hp
Fuel Consumption	40 gal each

Step 1 – Record the fuel density, VOC emission factor, and appropriate BSFC. The fuel density is provided in Table 3-2 and the VOC EF and BSFC value for gas powered commercial lawn mowers are provided in Table 4-1. The fuel density is given as **6.15 lb/gal** while the VOC EF and BSFC are given as **103.48** and **880 lb/10^3 hp-hr,** respectively.

Step 2 - Calculate annual VOC emissions. Using the data from Step 1 and Equation 4-2:

$$\mathrm{E}(Pol) = \frac{(FC \times D)}{BSFC} \times \mathrm{EF}(Pol) \times N$$

$$\mathrm{E}(VOC) = \frac{\left(40 \frac{\cancel{gal}}{unit} \times 6.15 \frac{\cancel{lb}}{\cancel{gal}}\right)}{880 \frac{\cancel{lb}}{10^3\ hp-hr}} \times 103.48 \frac{lb}{10^3\ hp-hr} \times 25 \frac{units}{yr}$$

$$\mathrm{E}(VOC) = 0.2795 \frac{\cancel{10^3 hp-hr}}{\cancel{unit}} \times 103.48 \frac{lb}{\cancel{10^3 hp-hr}} \times 25 \frac{\cancel{units}}{yr}$$

$$\mathbf{E(VOC) = 723.07\,\frac{lb}{yr}}$$

Next, calculate formaldehyde emissions.

Step 3 – Record formaldehyde weight percent VOC emissions for 4-stroke gasoline engines. Table 4-3 states this value is **1.32%**.

Step 4 - Calculate annual formaldehyde emissions. Using the formaldehyde weight percent recorded in Step 3 and Equation 4-4:

$$E(Pol) = E(VOC) \times \frac{P(Pol)}{100}$$

$$E(Formaldehyde) = 723.07\,\frac{lb}{yr} \times \frac{1.32\%}{100\%}$$

$$E(Formaldehyde) = 723.07\,\frac{lb}{yr} \times 0.0132$$

$$\mathbf{E(Formaldehyde) = 9.54\,\frac{lb}{yr}}$$

4.5.3 Problem 3 - Estimating SO_x Emissions

Anytown AFB needs to estimate SO_x emissions from the operation of rough terrain forklifts. The following information was obtained from the base:

Equipment Data – Rough terrain forklifts (SCC 2270002057)	
# of pieces	5
Fuel	Diesel
Power rating	80 hp
Model year	1997
Fuel Consumption	200 gal (each); 1,000 gal (total)
Hours of operation	250 hr/unit (each)

Since the model year of the forklifts are pre-1998, then the EFs applicable to these engines are found in Table 4-2 and not Table 4-1. The preferred method of using the horsepower and load factor is used for the calculation of emissions.

Step 1 – Record the load factor and SO_X emission factor. According to Table 4-1, for diesel-powered rough terrain forklifts the typical load factor is **59%** and Table 4-2 states the SO_X EF as **2.05 lb/10^3 hp-hr**.

Step 2 –Calculate the total SO_X emissions. Using these values and the data in the table above, the SO_X emissions are calculated using Equation 4-1:

$$E(Pol) = OT \times \frac{LF}{100} \times hp \times \frac{1}{1000} \times EF(Pol) \times N$$

$$E(SO_X) = 250 \frac{\cancel{hr}}{\cancel{unit}} \times \frac{59\%}{100\%} \times 80\cancel{hp} \times \frac{1}{1000}\left(\frac{\cancel{10^3 hp}}{\cancel{hp}}\right) \times 2.05 \frac{lb}{\cancel{10^3\ hp-hr}} \times 5 \frac{\cancel{units}}{yr}$$

$$\boxed{\mathbf{E(SO_X) = 120.95 \frac{lb}{yr}}}$$

4.5.4 Problem 4 - Estimating Emissions from the Use of B20

Anytown AFB has been blending B20 biodiesel into the non-road diesel fuel used to power its off-highway trucks. The normal sulfur content of the non-road diesel is 500 ppm. The following information was obtained from the base:

Equipment Data – Off-Highway Trucks (SCC 2270002051)	
# of pieces	10
Fuel	B20/nonroad diesel (500 ppm blend)
Power rating	250 hp
Model year	2001
Hours of operation	200 hours (each); 2,000 hours (total)

Estimate the NO_X and PM_{10} emissions from the operation of the vehicles.

Step 1 – Record the NO_X emission factor and load factor. Table 4-1 gives the emission factor and load factor as **11.27 lb/10^3 hp-hr** and **59%** respectively.

Step 2 - Calculate annual NO_X emissions. Use the EF and load factor recorded in Step 1, the data provided in the table, and Equation 4-1 as follows:

$$E(Pol) = OT \times \frac{LF}{100} \times hp \times \frac{1}{1000} \times EF(Pol) \times N$$

$$\mathbf{E(NO_X) = 200 \frac{\cancel{hr}}{\cancel{unit}} \times \frac{59\%}{100\%} \times 250\cancel{hp} \times \frac{1}{1000}\left(\frac{\cancel{10^3 hp}}{\cancel{hp}}\right) \times 11.27 \frac{lb}{\cancel{10^3\ hp-hr}} \times 10 \frac{\cancel{units}}{yr} =}$$

$$\mathbf{3,324.65 \frac{lb}{yr}}$$

Step 3 - Adjust the estimated emissions to reflect the expected 2% increase in NOx attributable to the use of B20.

$$\mathrm{E}(NO_X) = 3324.65\frac{lb}{yr} \times \left(1 + \frac{2\%}{100\%}\right)$$

$$\mathrm{E}(NO_X) = 3324.65\frac{lb}{yr} \times (1.02)$$

$$\boxed{\mathbf{E}(\boldsymbol{NO_X}) = \mathbf{3,391.14}\frac{\boldsymbol{lb}}{\boldsymbol{yr}}}$$

Step 4 – Record the PM_{10} emission factor. Table 4-1 lists this value as **0.57 lb/10^3 hp-hr**.

Step 5 - Calculate annual PM_{10} emissions. Use Equation 4-1, the EF recorded in Step 4 and the data provided in the table above as follows**:**

$$\mathrm{E}(Pol) = OT \times \frac{LF}{100} \times hp \times \frac{1}{1000} \times EF(Pol) \times N$$

$$\mathrm{E}(PM_{10}) = 200\frac{\cancel{hr}}{\cancel{unit}} \times \frac{59\%}{100\%} \times 250\cancel{hp} \times \frac{1}{1000}\left(\frac{\cancel{10^3 hp}}{\cancel{hp}}\right) \times 0.57\frac{lb}{\cancel{10^3\ hp-hr}} \times 10\frac{\cancel{units}}{yr} = \mathbf{168.15}\frac{\boldsymbol{lb}}{\boldsymbol{yr}}$$

Step 6 - Adjust the estimated emissions to reflect the expected 10% decrease in PM emissions attributable to the use of B20 fuel:

$$\mathrm{E}(PM_{10}) = 168.15\frac{lb}{yr} \times \left(1 - \frac{10\%}{100\%}\right)$$

$$\boxed{\mathbf{E}(\boldsymbol{PM_{10}}) = \mathbf{151.34}\frac{\boldsymbol{lb}}{\boldsymbol{yr}}}$$

Table 4-1. Criteria Pollutant Emission Factors for Non-Road Engines and Equipment

SCC	Equipment Description	Load Factor[1] (% Max Power)	BSFC[2] (lb/1000 hp-hr)	Emission Factors (lb/1000 hp-hr)						
				CO	VOC	NO_X	SO_2	PM_{10}[(4)]	$PM_{2.5}$[(5,6)]	CO_2e[7]
2260001010	2 Stroke Motorcycles: Off- Road[3]	100	260	127.07	132.83	0.35	0.09	4.74	4.36	459.30
2260001020	2 Stroke Snowmobiles	34	1640	669.88	281.73	2.45	0.90	6.31	5.80	4488.97
2260001030	2 Stroke ATVs[3]	100	210	126.66	126.74	0.35	0.07	4.45	4.10	299.14
2260001060	2 Stroke Specialty Vehicles/Carts	58	1000	1534.50	56.73	6.77	0.64	0.31	0.28	3154.67
2260002006	2 Stroke Tampers/Rammers	55	680	784.87	197.63	2.54	0.33	20.46	18.83	1606.63
2260002009	2 Stroke Plate Compactors	55	830	645.23	128.11	3.11	0.49	16.87	15.52	2342.89
2260002021	2 Stroke Paving Equipment	59	830	649.75	124.74	3.13	0.49	17.00	15.64	2345.09
2260002027	2 Stroke Signal Boards/Light Plants	72	830	672.94	139.53	3.13	0.46	17.60	16.19	2320.84
2260002039	2 Stroke Concrete/Industrial Saws	78	630	762.36	141.58	2.09	0.33	21.21	19.52	1594.20
2260002054	2 Stroke Crushing/Proc. Equipment	85	830	672.94	125.02	3.13	0.46	17.60	16.19	2320.84
2260003030	2 Stroke Sweepers/Scrubbers	71	820	670.85	131.79	3.11	0.46	17.53	16.13	2311.74
2260003040	2 Stroke Other General Industrial Equipment	54	830	674.27	127.29	3.13	0.46	17.62	16.21	2325.25
2260004015	2 Stroke Rotary Tillers < 6 HP (Residential)	40	940	743.35	322.28	2.51	0.46	17.55	16.15	2332.73
2260004016	2 Stroke Rotary Tillers < 6 HP (Commercial)	40	900	695.06	203.43	2.76	0.49	17.22	15.84	2342.64
2260004020	2 Stroke Chain Saws < 6 HP (Residential)	70	900	700.37	281.71	2.76	0.49	17.07	15.70	2342.64
2260004021	2 Stroke Chain Saws < 6 HP (Commercial)	70	650	764.61	176.42	2.25	0.33	20.97	19.29	1643.27
2260004025	2 Stroke Trimmers/Edgers/Brush Cutter (Residential)	91	890	671.00	291.74	2.80	0.46	17.55	16.15	2331.33
2260004026	2 Stroke Trimmers/Edgers/Brush Cutter (Commercial)	91	810	663.79	152.78	3.00	0.46	17.27	15.88	2243.10
2260004030	2 Stroke Leaf blowers/Vacuums (Residential)	94	890	691.91	319.39	2.76	0.46	17.20	15.82	2340.15
2260004031	2 Stroke Leaf blowers/Vacuums (Commercial)	94	760	710.10	157.99	2.82	0.40	18.48	17.00	1996.95
2260004035	2 Stroke Snow blowers (Residential)	35	870	1211.32	750.65	0.64	0.22	19.23	17.69	1144.48
2260004036	2 Stroke Snow blowers (Commercial)	35	870	1211.25	570.21	0.64	0.22	19.23	17.69	1146.69

Table 4-1. Criteria Pollutant Emission Factors for Non-Road Engines and Equipment (cont.)

SCC	Equipment Description	Load Factor[1] (% Max Power)	BSFC[2] (lb/1000 hp-hr)	Emission Factors (lb/1000 hp-hr)						
				CO	VOC	NO_X	SO_2	PM_{10}[(4)]	$PM_{2.5}$[(5,6)]	CO_2e[7]
2260004071	2 Stroke Commercial Turf Equipment	60	840	643.37	119.05	3.09	0.49	16.69	15.36	2351.99
2260005035	2 Stroke Sprayers	65	840	586.99	156.69	3.06	0.49	17.53	16.13	2347.58
2260006005	2 Stroke Generator Sets	68	830	639.32	130.69	3.11	0.49	16.89	15.54	2351.71
2260006010	2 Stroke Pumps	69	830	617.31	131.46	3.15	0.46	18.35	16.88	2316.43
2260006015	2 Stroke Air Compressors	56	830	672.64	123.63	3.13	0.46	17.60	16.19	2318.63
2260006035	2 Stroke Hydro Power Units	56	830	672.55	122.60	3.13	0.46	17.57	16.17	2318.63
2260007005	2 Stroke Chain Saws > 6 HP	70	620	779.31	165.53	2.12	0.31	21.52	19.80	1541.00
2265001010	4 Stroke Motorcycles: Off- Road	100	160	113.12	12.00	0.88	0.11	0.15	0.14	491.78
2265001030	4 Stroke ATVs	100	170	116.58	13.16	0.86	0.11	0.15	0.14	520.73
2265001050	4 Stroke Golf Carts	46	740	1795.27	26.68	6.13	0.49	0.29	0.26	2322.73
2265001060	4 Stroke Specialty Vehicles/Carts	58	820	1340.31	66.22	7.70	0.53	0.29	0.26	2558.70
2265002003	4 Stroke Pavers	66	700	1315.79	22.84	7.85	0.44	0.24	0.22	2191.51
2265002006	4 Stroke Tampers/Rammers	55	760	1554.83	29.64	6.57	0.49	0.26	0.24	2371.80
2265002009	4 Stroke Plate Compactors	55	830	1537.63	66.66	6.95	0.51	0.46	0.43	2481.80
2265002015	4 Stroke Rollers	62	690	1376.85	20.40	7.12	0.44	0.24	0.22	2173.59
2265002021	4 Stroke Paving Equipment	59	780	1519.71	45.78	6.95	0.49	0.33	0.30	2409.84
2265002024	4 Stroke Surfacing Equipment	49	750	1619.75	35.10	6.42	0.49	0.31	0.28	2340.65
2265002027	4 Stroke Signal Boards/Light Plants	72	780	1655.56	49.48	6.28	0.49	0.40	0.37	2394.41
2265002030	4 Stroke Trenchers	66	710	1315.26	30.16	7.96	0.44	0.29	0.26	2211.64
2265002033	4 Stroke Bore/Drill Rigs	79	790	1204.13	70.58	9.66	0.49	0.44	0.41	2355.00
2265002039	4 Stroke Concrete/Industrial Saws	78	710	1595.89	21.30	6.35	0.46	0.26	0.24	2242.51
2265002042	4 Stroke Cement & Mortar Mixers	59	820	1479.42	60.77	7.34	0.51	0.35	0.32	2507.98

Table 4-1. Criteria Pollutant Emission Factors for Non-Road Engines and Equipment (cont.)

SCC	Equipment Description	Load Factor[1] (% Max Power)	BSFC[2] (lb/1000 hp-hr)	Emission Factors (lb/1000 hp-hr)						
				CO	VOC	NO_X	SO_2	PM_{10}[(4)]	$PM_{2.5}$[(5,6)]	CO_2e[7]
2265002045	4 Stroke Cranes	47	590	483.31	16.56	14.22	0.37	0.15	0.14	1873.12
2265002054	4 Stroke Crushing/Proc. Equipment	85	740	1511.81	32.13	7.23	0.46	0.29	0.26	2294.06
2265002057	4 Stroke Rough Terrain Forklifts	63	570	335.20	13.69	13.76	0.37	0.15	0.14	1790.98
2265002060	4 Stroke Rubber Tire Loaders	71	550	292.32	11.86	12.39	0.35	0.15	0.14	1748.52
2265002066	4 Stroke Tractors/Loaders/ Backhoes	48	730	1589.56	22.60	6.46	0.46	0.26	0.24	2287.17
2265002072	4 Stroke Skid Steer Loaders	58	640	809.50	20.35	11.47	0.42	0.20	0.18	2017.84
2265002078	4 Stroke Dumpers/Tenders	41	800	1448.35	55.06	7.47	0.51	0.31	0.28	2485.37
2265002081	4 Stroke Other Construction Equipment	48	580	354.41	15.59	15.44	0.37	0.15	0.14	1826.53
2265003010	4 Stroke Aerial Lifts	46	630	685.16	20.77	14.60	0.40	0.18	0.16	1986.69
2265003020	4 Stroke Forklifts	30	560	330.18	13.05	14.00	0.37	0.15	0.14	1784.08
2265003030	4 Stroke Sweepers/Scrubbers	71	610	742.23	17.04	9.35	0.40	0.20	0.18	1917.78
2265003040	4 Stroke Other General Industrial Equipment	54	760	1481.10	46.70	7.12	0.46	0.37	0.34	2312.26
2265003050	4 Stroke Other Material Handling Equipment	53	640	766.81	20.99	13.69	0.42	0.20	0.18	2013.43
2265003060	4 Stroke AC/Refrigeration	46	740	1637.19	28.27	6.22	0.49	0.26	0.24	2335.96
2265003070	4 Stroke Terminal Tractors	78	520	224.05	8.27	9.02	0.33	0.15	0.14	1663.89
2265004010	4 Stroke Lawn mowers (Residential)	33	900	1430.49	160.17	7.59	0.53	0.60	0.55	2624.88
2265004011	4 Stroke Lawn mowers (Commercial)	33	880	1531.13	103.48	7.19	0.53	0.62	0.57	2562.58
2265004015	4 Stroke Rotary Tillers < 6 HP (Residential)	40	910	1435.23	164.58	7.65	0.53	0.62	0.57	2649.41
2265004016	4 Stroke Rotary Tillers < 6 HP (Commercial)	40	890	1451.02	100.50	7.50	0.53	0.60	0.55	2598.14
2265004025	4 Stroke Trimmers/Edgers/Brush Cutter HP (Residential)	91	900	1456.87	172.41	7.54	0.53	0.62	0.57	2618.26
2265004026	4 Stroke Trimmers/Edgers/Brush Cutter (Commercial)	91	820	1576.80	76.12	6.77	0.51	0.46	0.43	2466.09
2265004030	4 Stroke Leaf blowers/Vacuums (Residential)	94	900	1459.51	168.68	7.56	0.53	0.64	0.59	2629.29

Table 4-1. Criteria Pollutant Emission Factors for Non-Road Engines and Equipment (cont.)

SCC	Equipment Description	Load Factor[1] (% Max Power)	BSFC[2] (lb/1000 hp-hr)	Emission Factors (lb/1000 hp-hr)						
				CO	VOC	NO_X	SO_2	PM_{10}[(4)]	$PM_{2.5}$[(5,6)]	CO_2e[7]
2265004031	4 Stroke Leaf blowers/Vacuums (Commercial)	94	700	1308.73	26.17	8.05	0.44	0.24	0.22	2198.13
2265004035	4 Stroke Snow blowers (Residential)	35	940	1556.29	183.87	7.08	0.60	0.24	0.22	2947.93
2265004036	4 Stroke Snow blowers (Commercial)	35	940	1556.11	47.72	7.08	0.60	0.24	0.22	2947.93
2265004040	4 Stroke Rear Engine Riding Mowers (Residential)	38	760	1520.17	74.62	6.79	0.49	0.26	0.24	2391.64
2265004041	4 Stroke Rear Engine Riding Mowers (Commercial)	38	740	1612.03	25.84	6.22	0.49	0.26	0.24	2338.16
2265004046	4 Stroke Front Mowers	65	790	1467.91	47.39	7.23	0.51	0.29	0.26	2478.48
2265004051	4 Stroke Shredders < 6 HP	80	890	1439.64	107.93	7.50	0.53	0.60	0.55	2600.34
2265004055	4 Stroke Lawn & Garden Tractors (Residential)	44	760	1515.52	60.57	6.86	0.49	0.26	0.24	2400.46
2265004056	4 Stroke Lawn & Garden Tractors (Commercial)	44	740	1611.02	24.26	6.24	0.49	0.26	0.24	2338.16
2265004066	4 Stroke Chippers/Stump Grinders	78	640	960.78	16.78	8.82	0.42	0.20	0.18	2013.43
2265004071	4 Stroke Commercial Turf Equipment	60	730	1438.01	28.97	6.28	0.46	0.29	0.26	2271.73
2265004075	4 Stroke Other Lawn & Garden Equipment	58	850	1440.00	85.05	7.45	0.53	0.44	0.41	2572.77
2265004076	4 Stroke Other Lawn & Garden Equipment	58	850	1433.38	85.86	7.50	0.53	0.44	0.41	2568.36
2265005010	4 Stroke 2-Wheel Tractors	62	740	1653.35	25.42	6.15	0.49	0.26	0.24	2329.34
2265005015	4 Stroke Agricultural Tractors	62	580	490.61	13.12	11.42	0.37	0.18	0.16	1833.15
2265005020	4 Stroke Combines	74	580	356.81	21.15	16.16	0.37	0.15	0.14	1841.97
2265005025	4 Stroke Balers	62	580	356.90	24.56	16.18	0.37	0.15	0.14	1841.97
2265005030	4 Stroke Agricultural Mowers	48	770	1514.77	34.02	6.88	0.49	0.26	0.24	2416.18
2265005035	4 Stroke Sprayers	65	740	1076.59	50.74	10.36	0.46	0.31	0.28	2298.47
2265005040	4 Stroke Tillers > 6 HP	71	870	1443.48	56.40	6.20	0.55	0.24	0.22	2705.62
2265005045	4 Stroke Swathers	52	580	356.90	21.17	16.18	0.37	0.15	0.14	1841.97
2265005055	4 Stroke Other Agricultural Equipment	55	620	587.81	22.49	14.31	0.40	0.18	0.16	1966.57

Table 4-1. Criteria Pollutant Emission Factors for Non-Road Engines and Equipment (cont.)

SCC	Equipment Description	Load Factor[1] (% Max Power)	BSFC[2] (lb/1000 hp-hr)	Emission Factors (lb/1000 hp-hr)						
				CO	VOC	NO_X	SO_2	PM_{10}[(4)]	$PM_{2.5}$[(5,6)]	CO_2e[7]
2265005060	4 Stroke Irrigation Sets	60	550	300.87	11.84	10.96	0.35	0.15	0.14	1735.29
2265006005	4 Stroke Generator Sets	68	780	1507.10	46.33	6.95	0.51	0.31	0.28	2434.10
2265006010	4 Stroke Pumps	69	760	1375.48	49.99	7.72	0.49	0.37	0.34	2325.49
2265006015	4 Stroke Air Compressors	56	700	1160.36	31.86	8.47	0.44	0.29	0.26	2167.26
2265006025	4 Stroke Welders	68	710	1422.95	25.20	7.47	0.46	0.24	0.22	2224.87
2265006030	4 Stroke Pressure Washers	85	800	1547.98	55.24	6.77	0.51	0.37	0.34	2434.66
2265006035	4 Stroke Hydro Power Units	56	750	1600.17	33.82	6.39	0.49	0.31	0.28	2334.03
2265007010	4 Stroke Shredders > 6 HP	80	800	1445.66	45.05	7.36	0.51	0.29	0.26	2503.01
2265007015	4 Stroke Forest Equipment - Feller/Bunch/Skidder	70	810	1647.29	58.61	6.35	0.49	0.46	0.43	2432.73
2265008005	4 Stroke Airport Ground Support Equipment	56	600	577.42	18.30	10.63	0.37	0.20	0.18	1871.19
2265010010	4 Stroke Other Oil Field Equipment	90	740	1795.20	21.28	6.13	0.49	0.29	0.26	2322.73
2267001060	LPG Specialty Vehicle Carts	58	490	102.03	6.35	23.24	0.02	0.13	0.13	1472.22
2267002003	LPG Pavers	66	460	94.42	4.98	17.79	0.02	0.13	0.13	1393.87
2267002015	LPG Rollers	62	450	89.39	4.08	14.38	0.02	0.13	0.13	1344.97
2267002021	LPG Paving Equipment	59	480	98.67	5.80	21.08	0.02	0.13	0.13	1440.96
2267002024	LPG Surfacing Equipment	49	460	93.76	4.83	17.20	0.02	0.13	0.13	1385.05
2267002030	LPG Trenchers	66	460	95.08	5.09	18.19	0.02	0.13	0.13	1398.28
2267002033	LPG Bore/Drill Rigs	79	490	100.28	6.17	22.71	0.02	0.13	0.13	1465.60
2267002039	LPG Concrete/Industrial Saws	78	430	84.67	3.29	11.36	0.02	0.13	0.13	1302.30
2267002045	LPG Cranes	47	480	98.72	5.80	21.06	0.02	0.13	0.13	1440.96
2267002054	LPG Crushing/Proc. Equipment	85	480	98.41	5.73	20.82	0.02	0.13	0.13	1436.55
2267002057	LPG Rough Terrain Forklifts	63	470	96.51	5.36	19.25	0.02	0.13	0.13	1414.11

Table 4-1. Criteria Pollutant Emission Factors for Non-Road Engines and Equipment (cont.)

SCC	Equipment Description	Load Factor[1] (% Max Power)	BSFC[2] (lb/1000 hp-hr)	Emission Factors (lb/1000 hp-hr)						
				CO	VOC	NO_X	SO_2	PM_{10}[(4)]	$PM_{2.5}$[(5,6)]	CO_2e[7]
2267002060	LPG Rubber Tire Loaders	71	460	94.04	4.85	17.24	0.02	0.13	0.13	1385.05
2267002066	LPG Tractors/Loaders/ Backhoes	48	450	91.55	4.41	15.57	0.02	0.13	0.13	1362.61
2267002072	LPG Skid Steer Loaders	58	470	97.64	5.60	20.22	0.02	0.13	0.13	1429.54
2267002081	LPG Other Construction Equipment	48	480	99.09	5.89	21.45	0.02	0.13	0.13	1445.37
2267003010	LPG Aerial Lifts	46	480	97.88	5.71	20.82	0.02	0.13	0.13	1436.55
2267003020	LPG Forklifts	30	460	93.54	4.83	17.15	0.02	0.13	0.13	1385.05
2267003030	LPG Sweepers/Scrubbers	71	440	88.22	3.88	13.58	0.02	0.13	0.13	1333.56
2267003040	LPG Other General Industrial Equipment	54	450	90.76	4.37	15.41	0.02	0.13	0.13	1360.41
2267003050	LPG Other Material Handling Equipment	53	480	97.70	5.67	20.59	0.02	0.13	0.13	1434.34
2267003070	LPG Terminal Tractors	78	430	84.74	3.29	11.40	0.02	0.13	0.13	1302.30
2267004066	LPG Chippers/Stump Grinders	78	450	92.24	4.56	16.16	0.02	0.13	0.13	1371.43
2267005055	LPG Other Agricultural Equipment	55	490	103.39	6.50	23.68	0.02	0.13	0.13	1478.83
2267005060	LPG Irrigation Sets	60	450	93.23	4.61	16.25	0.02	0.13	0.13	1371.43
2267006005	LPG Generator Sets	68	480	66.39	4.28	20.86	0.02	0.13	0.13	1449.78
2267006010	LPG Pumps	69	470	65.49	3.88	18.74	0.02	0.13	0.13	1420.72
2267006015	LPG Air Compressors	56	460	64.87	3.62	17.33	0.02	0.13	0.13	1402.69
2267006025	LPG Welders	68	460	93.69	5.05	18.21	0.02	0.13	0.13	1400.49
2267006030	LPG Pressure Washers	85	470	95.54	5.49	20.18	0.02	0.13	0.13	1429.54
2267006035	LPG Hydro Power Units	56	460	63.33	3.24	15.59	0.02	0.13	0.13	1378.44
2267008005	LPG Airport Ground Support Equipment	56	450	91.40	4.52	16.10	0.02	0.13	0.13	1369.23
2268002081	CNG Other Construction Equipment	48	480	99.09	0.35	21.45	0.02	0.13	0.13	2885.02
2268003020	CNG Forklifts	30	460	93.91	0.29	17.29	0.02	0.13	0.13	2783.74

Table 4-1. Criteria Pollutant Emission Factors for Non-Road Engines and Equipment (cont.)

SCC	Equipment Description	Load Factor[1] (% Max Power)	BSFC[2] (lb/1000 hp-hr)	Emission Factors (lb/1000 hp-hr)						
				CO	VOC	NO_X	SO_2	PM_{10}[(4)]	$PM_{2.5}$[(5,6)]	CO_2e[7]
2268003030	CNG Sweepers/Scrubbers	71	460	93.84	0.29	17.20	0.02	0.13	0.13	2783.74
2268003040	CNG Other General Industrial Equipment	54	460	92.92	0.29	16.67	0.02	0.13	0.13	2779.33
2268003060	CNG AC\Refrigeration	46	450	90.85	0.26	15.30	0.02	0.13	0.13	2733.09
2268003070	CNG Terminal Tractors	78	430	85.02	0.20	11.51	0.02	0.13	0.13	2636.22
2268005055	CNG Other Agricultural Equipment	55	510	120.57	0.46	27.23	0.02	0.13	0.13	3010.48
2268005060	CNG Irrigation Sets	60	510	121.21	0.46	27.03	0.02	0.13	0.13	3008.28
2268006005	CNG Generator Sets	68	490	68.24	0.26	21.98	0.02	0.13	0.13	2977.56
2268006010	CNG Pumps	69	480	67.47	0.24	20.44	0.02	0.13	0.13	2929.12
2268006015	CNG Air Compressors	56	470	66.30	0.22	18.32	0.02	0.13	0.13	2878.48
2268006020	CNG Gas Compressors	85	410	16.47	0.02	2.54	0.02	0.13	0.13	2583.45
2268006035	CNG Hydro Power Units	56	470	66.44	0.31	18.68	0.02	0.13	0.13	2834.38
2268010010	CNG Other Oil Field Equipment	90	410	67.96	0.11	6.22	0.02	0.13	0.13	2541.55
2270001060	Diesel Specialty Vehicle Carts	21	450	17.29	4.56	15.92	0.99	2.54	2.45	1443.83
2270002003	Diesel Pavers	59	380	4.76	0.90	10.72	0.84	0.88	0.84	1223.54
2270002006	Diesel Tampers/Rammers	43	1000	10.83	2.51	15.83	2.23	1.72	1.68	3214.63
2270002009	Diesel Plate Compactors	43	410	9.92	2.43	14.99	0.90	1.72	1.68	1308.18
2270002015	Diesel Rollers	59	390	5.78	1.01	11.09	0.86	0.99	0.97	1243.67
2270002018	Diesel Scrapers	59	370	4.70	0.66	10.98	0.82	0.68	0.66	1192.39
2270002021	Diesel Paving Equipment	59	390	6.26	1.15	11.69	0.86	1.06	1.04	1237.06
2270002024	Diesel Surfacing Equipment	59	380	7.92	1.23	13.27	0.86	1.19	1.17	1232.36
2270002027	Diesel Signal Boards/Light Plants	43	410	7.32	2.03	13.08	0.90	1.35	1.30	1301.57
2270002030	Diesel Trenchers	59	400	8.05	1.32	11.95	0.88	1.32	1.28	1283.65

Table 4-1. Criteria Pollutant Emission Factors for Non-Road Engines and Equipment (cont.)

SCC	Equipment Description	Load Factor[1] (% Max Power)	BSFC[2] (lb/1000 hp-hr)	Emission Factors (lb/1000 hp-hr)						
				CO	VOC	NO_X	SO_2	PM_{10}[(4)]	$PM_{2.5}$[(5,6)]	CO_2e[7]
2270002033	Diesel Bore/Drill Rigs	43	370	5.49	1.32	15.37	0.84	1.06	1.01	1199.00
2270002036	Diesel Excavators	59	380	3.75	0.75	10.03	0.84	0.71	0.68	1203.70
2270002039	Diesel Concrete/Industrial Saws	59	410	8.78	1.41	11.69	0.90	1.46	1.41	1314.80
2270002042	Diesel Cement & Mortar Mixers	43	390	7.17	1.81	15.79	0.86	1.35	1.30	1252.49
2270002045	Diesel Cranes	43	370	3.02	0.84	12.06	0.82	0.64	0.62	1185.77
2270002048	Diesel Graders	59	370	3.33	0.75	10.05	0.82	0.68	0.66	1194.59
2270002051	Diesel Off-highway Trucks	59	370	3.66	0.64	11.27	0.82	0.57	0.55	1192.39
2270002054	Diesel Crushing/Proc. Equipment	43	380	4.21	0.99	12.72	0.84	0.79	0.77	1212.52
2270002057	Diesel Rough Terrain Forklifts	59	390	7.30	1.23	11.71	0.88	1.21	1.17	1265.72
2270002060	Diesel Rubber Tire Loaders	59	370	4.87	0.86	11.75	0.84	0.82	0.79	1199.00
2270002066	Diesel Tractors/Loaders/ Backhoes	21	460	14.64	3.42	15.61	1.01	2.36	2.27	1472.77
2270002069	Diesel Crawler Tractor/Dozers	59	370	4.50	0.77	11.09	0.84	0.73	0.71	1199.00
2270002072	Diesel Skid Steer Loaders	21	480	19.58	4.85	16.01	1.06	3.11	3.02	1532.88
2270002075	Diesel Off-Highway Tractors	59	370	6.11	0.93	12.97	0.82	0.84	0.82	1192.39
2270002078	Diesel Dumpers/Tenders	21	470	18.74	5.01	16.43	1.04	3.11	3.00	1512.75
2270002081	Diesel Other Construction Equipment	59	370	6.46	0.99	13.01	0.82	0.95	0.93	1194.59
2270003010	Diesel Aerial Lifts	21	480	18.65	4.94	17.46	1.06	2.95	2.87	1535.08
2270003020	Diesel Forklifts	59	400	6.50	0.90	9.97	0.88	0.90	0.88	1274.83
2270003030	Diesel Sweepers/Scrubbers	43	380	3.42	0.93	11.11	0.86	0.75	0.73	1227.95
2270003040	Diesel Other General Industrial Equipment	43	380	3.75	1.04	12.33	0.84	0.79	0.77	1214.72
2270003050	Diesel Other Material Handling Equipment	21	440	12.08	3.37	18.32	0.99	2.18	2.12	1419.29
2270003060	Diesel AC\Refrigeration	43	410	5.45	1.12	11.58	0.90	1.01	0.97	1310.39

Table 4-1. Criteria Pollutant Emission Factors for Non-Road Engines and Equipment (cont.)

SCC	Equipment Description	Load Factor[1] (% Max Power)	BSFC[2] (lb/1000 hp-hr)	Emission Factors (lb/1000 hp-hr)						
				CO	VOC	NO_X	SO_2	PM_{10}[(4)]	$PM_{2.5}$[(5,6)]	CO_2e[7]
2270003070	Diesel Terminal Tractors	59	380	3.57	0.77	9.44	0.84	0.71	0.68	1210.31
2270004031	Diesel Leaf blowers/Vacuums	43	410	9.28	2.78	15.26	0.90	1.59	1.54	1305.98
2270004036	Diesel Snow blowers	43	370	4.70	1.15	13.60	0.82	0.86	0.84	1179.16
2270004046	Diesel Front Mowers	43	410	7.28	2.01	13.03	0.90	1.37	1.32	1308.18
2270004056	Diesel Lawn & Garden Tractors	43	410	7.47	2.07	12.94	0.90	1.30	1.26	1308.18
2270004066	Diesel Chippers/Stump Grinders	43	380	5.67	1.39	13.69	0.84	1.08	1.06	1225.75
2270004071	Diesel Commercial Turf Equipment	43	400	4.28	1.04	11.29	0.88	0.88	0.86	1272.62
2270004076	Diesel Other Lawn & Garden Equipment	43	410	7.54	1.94	13.83	0.90	1.46	1.41	1301.57
2270005010	Diesel 2-Wheel Tractors	59	410	15.61	2.12	12.37	0.90	1.92	1.85	1321.41
2270005015	Diesel Agricultural Tractors	59	380	7.23	1.39	13.30	0.84	1.32	1.30	1219.13
2270005020	Diesel Combines	59	370	5.71	1.32	15.04	0.82	1.61	1.54	1194.59
2270005025	Diesel Balers	59	400	9.44	2.36	13.41	0.88	1.87	1.83	1277.03
2270005030	Diesel Agricultural Mowers	59	410	11.36	2.05	14.13	0.90	2.12	2.05	1321.41
2270005035	Diesel Sprayers	59	380	7.21	2.01	13.38	0.84	1.52	1.48	1203.70
2270005040	Diesel Tillers > 6 HP	59	370	8.33	1.37	13.56	0.84	1.19	1.15	1194.59
2270005045	Diesel Swathers	59	400	8.60	1.72	14.99	0.90	1.96	1.92	1292.47
2270005055	Diesel Other Agricultural Equipment	59	380	7.50	1.59	14.16	0.84	1.57	1.50	1203.70
2270005060	Diesel Irrigation Sets	43	390	4.92	1.37	12.83	0.86	1.08	1.04	1243.67
2270006005	Diesel Generator Sets	43	390	6.95	1.85	13.98	0.88	1.35	1.30	1261.31
2270006010	Diesel Pumps	43	390	6.92	1.76	14.09	0.88	1.37	1.32	1261.31
2270006015	Diesel Air Compressors	43	400	5.49	1.30	12.55	0.88	1.08	1.06	1274.83
2270006020	Diesel Gas Compressors	43	410	5.69	0.95	10.67	0.90	0.77	0.75	1312.59

Table 4-1. Criteria Pollutant Emission Factors for Non-Road Engines and Equipment (cont.)

SCC	Equipment Description	Load Factor[1] (% Max Power)	BSFC[2] (lb/1000 hp-hr)	Emission Factors (lb/1000 hp-hr)						
				CO	VOC	NO_X	SO_2	PM_{10}[(4)]	$PM_{2.5}$[(5,6)]	CO_2e[7]
2270006025	Diesel Welders	21	480	20.31	5.12	15.19	1.06	3.06	2.98	1532.88
2270006030	Diesel Pressure Washers	43	380	6.33	1.83	14.18	0.86	1.12	1.10	1232.36
2270006035	Diesel Hydro Power Units	43	400	5.60	1.35	12.50	0.88	1.10	1.08	1281.44
2270007015	Diesel Forest Equipment - Feller/Bunch/Skidder	59	370	3.26	0.71	9.57	0.84	0.66	0.64	1196.80
2270008005	Diesel Airport Ground Support Equipment	59	380	4.96	0.88	11.44	0.84	0.82	0.79	1205.90
2270009010	Diesel Other Underground Mining Equipment	21	450	15.35	3.75	17.46	0.99	2.36	2.29	1432.80
2270010010	Diesel Other Oil Field Equipment	43	370	3.70	0.88	13.10	0.82	0.66	0.64	1183.57
2282005010	2 Stroke Outboard	21	850	419.61	235.67	5.93	0.44	3.31	3.04	2217.76
2282005015	2 Stroke Personal Water Craft	21	820	404.73	160.85	4.85	0.44	2.93	2.70	2208.10
2282010005	4 Stroke Inboard/Sterndrive	21	630	341.09	38.54	14.24	0.40	0.15	0.14	1982.28
2282020005	Diesel Inboard/Sterndrive	35	370	2.36	0.53	14.46	0.95	0.33	0.31	1183.57
2282020010	Diesel Outboards	35	410	8.40	2.71	13.21	1.06	1.57	1.52	1305.98
2285002015	Diesel Railway Maintenance	21	440	12.74	3.02	16.47	0.97	2.16	2.09	1408.26
2285004015	4 Stroke Railway Maintenance	62	750	1507.93	32.74	6.92	0.49	0.29	0.26	2345.06
2285006015	LPG Railway Maintenance	62	480	97.99	5.64	20.42	0.02	0.13	0.13	1432.14

1. Load factor and activity data obtained from EPA Office of Transportation Air Quality and were derived from *Median Life, Annual Activity, and Load Factor Values for Nonroad Engine Emissions Modeling*, EPA 420-R-10-016, NR-005d, July 2010.
2. BSFC and emission factors obtained from EPA Office of Transportation Air Quality and were derived from *Exhaust Emission Factors for Nonroad Engine Modeling: Spark-Ignition*, EPA 420-R-019, NR-010e, December 2005, and *Exhaust Emission Factors for Nonroad Engine Modeling: Compression-Ignition*, EPA 420-P-04-009, NR-009c, April 2004. The emission factors are composite emission factors that represent the national mix of model years and technology types believed to be in existence in 2007. They represent in-use emissions, and take into account NONROAD model deterioration and transient adjustment factors across the model years.
3. Activities for off-road motorcycles and all-terrain vehicles are in units of miles per year instead of hours per year.
4. PM_{10} is assumed to be equivalent to total PM for gasoline engines.
5. For gasoline engines, $PM_{2.5}$ is assumed to be 92% of the PM_{10} value.
6. For LPG and CNG engines, all PM is assumed to be $PM_{2.5}$.
7. The Carbon Dioxide Equivalent (CO_2e) emission factors are the total of CO_2, CH_4, and N_2O. CH_4 and N_2O were converted to equivalent CO_2 (CO_2e) using a global warming potential (GWP) value of 25 for CH_4 and 298 for N_2O. These were added to the CO_2 emission factor and are presented as the GHG emission factors in units of lb/1000hp-hr. Calculations were made using the stated BSFC, the fuel density in Table 3-2, and if the fuel was not stated, it was assumed to be gasoline.

Table 4-2. Pre-1998 Non-Road CI Engine Criteria Pollutant Emission Factors (Power Rating >50 hp)

Equipment Description	Emission Factors (lb/1000 hp-hr)						
	CO	VOC[1]	NO_X	SO_X	PM_{10}[(2)]	$PM_{2.5}$[(3)]	CO_2e[4]
Construction Equipment							
Asphalt Pavers	7.05	1.35	22.71	2.05	1.98	1.92	1290.21
Plate Compactors	6.83	1.82	20.50	2.05	1.98	1.92	1290.21
Concrete Pavers	10.08	2.48	22.09	2.05	1.98	1.92	1290.21
Rollers	6.83	1.81	20.50	2.20	1.72	1.67	1290.21
Scrapers	11.02	1.57	19.18	1.98	2.78	2.69	1290.21
Paving Equipment	10.14	2.28	24.27	1.98	1.98	1.92	1290.21
Signal Boards	11.02	2.71	17.64	2.05	2.20	2.14	1290.21
Trenchers	20.15	3.47	22.09	2.05	3.17	3.08	1290.21
Bore/Drill Rigs	20.28	3.18	24.27	2.05	3.17	3.08	1290.21
Excavators	11.46	1.57	23.70	2.05	3.17	3.08	1290.21
Concrete/Industrial Saws	20.28	3.18	24.27	2.05	3.17	3.08	1290.21
Cement and Mortar Mixers	10.14	2.28	24.27	2.05	1.98	1.92	1290.21
Cranes	9.26	2.85	22.71	2.05	3.17	3.08	1290.21
Graders	8.38	3.47	21.16	1.92	2.20	2.14	1290.21
Off-Highway Trucks	6.17	1.90	21.16	1.96	1.76	1.71	1290.21
Crushing/Processing Equipment	20.28	3.18	24.27	2.05	3.17	3.08	1290.21
Rough Terrain Forklifts	22.05	3.78	17.64	2.05	3.53	3.42	1290.21
Rubber Tired Dozers	6.17	1.90	21.16	2.05	1.46	1.41	1290.21
Tractors/Loaders/Backhoes	14.99	3.16	22.27	1.87	2.31	2.25	1290.21
Crawler Tractors	10.58	2.85	22.71	1.87	2.45	2.37	1290.21
Skid Steer Loaders	19.84	4.72	21.16	2.05	3.17	3.08	1290.21
Off-Highway Tractors	32.36	5.54	26.26	2.05	4.48	4.34	1290.21
Dumpers/Tenders	6.17	1.90	21.16	1.96	3.17	3.08	1290.21
Other Construction Equipment	20.28	3.18	24.27	2.05	3.17	3.08	1290.21
Industrial Equipment							
Aerial Lifts	13.36	3.53	30.86	2.05	3.53	3.42	1290.21
Forklifts	13.36	3.53	30.86	2.05	3.53	3.42	1290.21
Sweepers/Scrubbers	13.36	3.53	30.86	2.05	3.53	3.42	1290.21
Other General Equipment	13.36	3.53	30.86	2.05	3.53	3.42	1290.21
Other Material Handling Equipment	13.36	3.53	30.86	2.05	3.53	3.42	1290.21
Lawn and Garden Equipment							
Rear Engine Riding Mowers	11.02	2.70	17.64	2.05	2.20	2.14	1290.21
Lawn and Garden Tractors	11.02	2.70	17.64	2.05	2.20	2.14	1290.21
Wood Splitters	11.02	2.70	17.64	2.05	2.20	2.14	1290.21
Chippers/Stump Grinders	11.02	2.70	17.64	2.05	2.20	2.14	1290.21
Other Equipment	11.02	2.70	17.64	2.05	2.20	2.14	1290.21

Table 4-2. Pre-1998 Non-Road CI Engine Criteria Pollutant Emission Factors (continued)

Equipment Description	Emission Factors (lb/1000 hp-hr)						
	CO	VOC[1]	NO_X	SO_X	PM_{10}[(2)]	$PM_{2.5}$[(3)]	CO_2e[4]
Agricultural Equipment							
Tractors	19.71	5.01	24.71	1.92	4.52	4.38	1290.21
Sprayers	8.33	5.01	17.15	2.03	3.33	3.23	1290.21
Tillers	11.02	2.71	17.64	2.03	2.20	2.14	1290.21
Hydro Power Units	8.33	5.01	17.15	2.03	3.33	3.23	1290.21
Other Equipment	9.63	4.11	24.52	2.03	3.33	3.23	1290.21
Logging Equipment							
Skidders	11.46	1.90	24.91	2.10	3.17	3.08	1290.21
Fellers/Bunchers	11.46	1.90	24.91	2.10	3.17	3.08	1290.21
Recreational Equipment							
Specialty Vehicles/Carts	11.02	3.46	17.64	2.05	2.20	2.14	1290.21

SOURCE: *Nonroad Engine and Vehicle Emission Study – Report*, EPA 460/3-91-02, 21A-2001, November 1991.

1. Reported as HC and assumed to be equal to VOC.
2. Reported as PM in the source document and assumed to be equal to PM_{10}.
3. Assumed to be 97% of PM_{10} per *Exhaust and Crankshaft Emission Factors for Nonroad Engine Modeling-Compression-Ignition*, EPA420-P-04-009, April 2004.
4. The Carbon Dioxide Equivalent (CO_2e) emission factors are the total of CO_2, CH_4, and N_2O emission factors from Table C-1 and C-2 in 40 CFR 98 Subpart C. CH_4 and N_2O were converted to equivalent CO_2 (CO_2e) using a global warming potential (GWP) value of 25 for CH_4 and 298 for N_2O. These were added to the CO_2 and are presented as the CO_2e emission factors in units of lb/1000hp-hr. Fuel usage rates were based on the conservative 0.408 lb/hp-hr which is the average fuel usage rate for engines below 100 hp (*from Exhaust and Crankcase Emission Factors for Nonroad Engine Modeling-Compression-Ignition*, EPA420-P-04-009). All engines are assumed to use diesel which has a density of 7.14lb/gal and was used for unit conversion.

Table 4-3. Weight Percent Speciation of VOC Emissions Non-Road Engines

Compound	HAP	Gasoline[1]	Diesel[2]	Natural Gas[3]			LPG[4]
				2-Stroke LB	4-Stroke LB	4-Stroke RB	
Acenaphthene	X	---	0.02%	0.00%	0.00%	---	---
Acenaphthylene	X	---	0.08%	0.00%	0.01%	---	---
Acetaldehyde	X	0.30%	11.88%	6.49%	7.00%	8.63%	0.88%
Acetylene		15.47%	---	---	---	---	---
Acrolein	X	---	1.43%	6.51%	4.31%	8.14%	---
Anthracene	X	---	0.03%	0.00%	---	---	---
Benz(a)anthracene	X	---	0.03%	0.00%	---	---	---
Benzaldehyde		0.26%	---	---	---	---	---
Benzene	X	5.83%	14.46%	1.62%	0.37%	4.89%	3.23%
Benzo(a)pyrene	X	---	0.00%	0.00%	---	---	---
Benzo(b)fluoranthene	X	---	0.00%	0.00%	0.00%	---	---
Benzo(k)fluoranthene	X	---	0.00%	0.00%	---	---	---
Benzo(g,h,i)perylene	X	---	0.01%	0.00%	0.00%	---	---
Benzo(e)pyrene		---	---	0.00%	0.00%	---	---
Biphenyl	X	---	---	0.00%	0.18%	---	---
1,3-Butadiene	X	0.99%	0.61%	0.69%	0.22%	2.05%	---
Butane		---	---	3.97%	0.45%	---	---
n-Butane		2.19%	---	---	---	---	---
1-Butene		0.40%	---	---	---	---	---
cis-2-Butene		0.22%	---	---	---	---	---
trans-2-Butene		0.28%	---	---	---	---	---
Butyr/Isobutyraldehyde		---	---	0.37%	0.09%	0.15%	0.59%
Carbon Tetrachloride	X	---	---	0.05%	0.03%	0.05%	---
Chlorobenzene		---	---	0.04%	0.03%	0.04%	---
Chloroethane	X	---	---	---	0.00%	---	---
Chloroform	X	---	---	0.04%	0.02%	0.04%	---
Chrysene	X	---	0.00%	0.00%	0.00%	---	---
Cyclohexane		---	---	0.26%	---	---	---
Cyclopentane		---	---	0.08%	0.19%	---	---
1,3-Cyclopentadiene		0.26%	---	---	---	---	---
Dibenz(a,h)anthracene	X	---	0.01%	---	---	---	---
1,1-Dichloroethane	X	---	---	0.03%	0.02%	0.03%	---
1,2-Dichloroethane	X	---	---	0.04%	0.02%	0.03%	---
1,2-Dichloropropane	X	---	---	0.04%	0.02%	0.04%	---
1,3-Dichloropropene	X	---	---	0.04%	0.02%	0.04%	---
Dicyclopentadiene		0.27%	---	---	---	---	---
1,2-Diethylbenzene		0.56%	---	---	---	---	---
1,3-Diethylbenzene		0.45%	---	---	---	---	---
2,2-Dimethylbutane		0.30%	---	---	---	---	---
2,3-Dimethylbutane		0.62%	---	---	---	---	---
trans-1,3-Dimethylcyclopentane		0.28%	---	---	---	---	---
2,3-Dimethylhexane		0.32%	---	---	---	---	---
2,4-Dimethylhexane		0.45%	---	---	---	---	---
2,5-Dimethylhexane		0.24%	---	---	---	---	---
2,3-Dimethylpentane		1.16%	---	---	---	---	---
2,4-Dimethylpentane		0.71%	---	---	---	---	---
1,2-Dimethyl-4-Ethylbenzene		0.17%	---	---	---	---	---
1,3-Dimethyl-2-Ethylbenzene		0.34%	---	---	---	---	---
1,3-Dimethyl-4-Ethylbenzene		0.20%	---	---	---	---	---
Ethylbenzene	X	2.00%	---	0.09%	0.03%	0.08%	0.29%
Ethylene		11.39%	---	---	---	---	18.53%
Ethylene Dibromide	X	---	---	0.06%	0.04%	0.07%	---
Fluoranthene	X	---	0.12%	0.00%	0.00%	---	---
Fluorene	X	---	0.45%	0.00%	0.01%	---	---
Formaldehyde	X	1.32%	18.28%	46.17%	44.24%	63.43%	23.82%
n-Heptane		0.78%	---	---	---	---	---
1-Hexene		0.20%	---	---	---	---	---
n-Hexane	X	0.45%	---	0.37%	0.93%	---	0.59%
trans-2-Hexene		0.16%	---	---	---	---	---
Indan		---	---	---	---	---	---
Indeno(1,2,3-c,d)pyrene	X	0.24%	0.01%	0.00%	---	---	---

Compound	HAP	Gasoline[1]	Diesel[2]	Natural Gas[3]			LPG[4]
				2-Stroke LB	4-Stroke LB	4-Stroke RB	
Isobutane		---	---	3.14%	---	---	---
Isobutene		2.02%	---	---	---	---	---
Isopentane		5.50%	---	---	---	---	---
Isoprene		0.32%	---	---	---	---	---
Methanol	X	0.15%	---	2.07%	2.10%	9.47%	---
2-Methyl-1-Butene		0.35%	---	---	---	---	---
2-Methyl-2-Butene		0.37%	---	---	---	---	---
Methylcyclohexane		0.24%	---	0.28%	1.03%	---	---
Methylcyclopentane		0.40%	---	---	---	---	---
1-Methylcyclopentene		0.16%	---	---	---	---	---
1-Methyl-2-Ethylbenzene		0.50%	---	---	---	---	---
1-Methyl-3-Ethylbenzene		1.52%	---	---	---	---	---
1-Methyl-4-Ethylbenzene		0.71%	---	---	---	---	---
2-Methylheptane		0.37%	---	---	---	---	---
3-Methylheptane		0.40%	---	---	---	---	---
4-Methylheptane		0.17%	---	---	---	---	---
2-Methylhexane		1.02%	---	---	---	---	---
3-Methylhexane		1.18%	---	---	---	---	---
3-Methyl-cis-3-Hexene		0.18%	---	---	---	---	---
2-Methylnaphthalene		---	---	0.02%	0.03%	---	---
3-Methyloctane		0.20%	---	---	---	---	---
2-Methyl-2-Pentene		0.18%	---	---	---	---	---
2-Methylpentane		1.73%	---	---	---	---	---
3-Methylpentane		0.99%	---	---	---	---	---
1-Methyl-3-Propylbenzene		0.26%	---	---	---	---	---
Methyl t-butyl ether	X	0.30%	---	---	---	---	---
Naphthalene	X	0.35%	1.31%	0.08%	0.06%	0.30%	---
n-Nonane		---	---	0.03%	0.09%	---	---
1-Nonene		0.61%	---	---	---	---	---
n-Octane		0.30%	---	0.06%	0.29%	---	---
1-Octene		0.22%	---	---	---	---	---
n-Pentane		0.71%	---	1.28%	2.18%	---	---
1-Pentene		0.27%	---	---	---	---	---
cis-2-Pentene		0.21%	---	---	---	---	---
trans-2-Pentene		0.34%	---	---	---	---	---
Perylene		---	---	0.00%	---	---	---
Phenanthrene	X	---	0.46%	0.00%	0.01%	---	---
Phenol	X	---	---	0.03%	0.02%	---	---
1,2-Propadiene		0.29%	---	---	---	---	---
Propane		---	---	24.01%	35.11%	---	---
n-Propylbenzene		0.38%	---	---	---	---	---
Propylene		4.72%	39.98%	---	---	---	49.71%
1-Propyne		0.48%	---	---	---	---	---
Pyrene	X	---	0.07%	0.00%	0.00%	---	---
Styrene	X	---	---	0.05%	0.02%	0.04%	---
Tetrachloroethane		---	---	---	0.00%	---	---
1,1,2,2,-Tetrachloroethane	X	---	---	0.06%	0.03%	0.08%	---
1,2,3,5-Tetramethylbenzene		0.22%	---	---	---	---	---
Tolualdehyde		0.16%	---	---	---	---	---
Toluene	X	8.21%	6.34%	0.81%	0.34%	1.73%	1.18%
1,1,2-Trichloroethane	X	---	---	0.04%	0.03%	0.05%	---
1,2,3-Trimethylbenzene		0.40%	---	0.03%	0.02%	---	---
1,2,4-Trimethylbenzene		2.18%	---	0.09%	0.01%	---	---
1,3,5-Trimethylbenzene		0.77%	---	0.01%	0.03%	---	---
2,2,5-Trimethylhexane		0.30%	---	---	---	---	---
2,2,4-Trimethylpentane	X	2.37%	---	0.71%	0.21%	---	---
2,3,4-Trimethylpentane		0.52%	---	---	---	---	---
Vinyl Chloride	X	---	---	0.02%	0.01%	0.02%	---
Vinylacetylene		0.23%	---	---	---	---	---
o-Vinyltoluene		0.26%	---	---	---	---	---
Xylenes	X	7.47%	4.42%	0.22%	0.15%	0.60%	1.18%

1. SOURCE: Emission factors used to calculate weight percent taken from EPA's SPECIATE profile #4738.
2. SOURCE: Emission factors used to calculate weight percent taken from Section 3.3 of AP-42
3. SOURCE: Emission factors used to calculate weight percent taken from Section 3.2 of AP-42.
4. SOURCE: Emission factors used to calculate weight percent taken from Mojave Desert AQMD.

"X" Indicates the compound is a HAP.

"---" Indicates No Data Available.

Figure 4-1. Example Data Collection Form for Non-Road Vehicles and Equipment

Installation Name: **Inventory Year (CY):**
Responsible Organization (Name & Office Symbol):
POC (Name, Phone # and e-mail address):

Equipment Type	Equipment ID	Equipment Manufacturer	Equipment Model Number	Fuel Type	Power Rating (hp)	Load Factor (% of max)[1]	Estimated Operating Time (hr/yr)	Estimated Fuel Usage (gal/yr)[2]

1. Load factor is the highest % of maximum power which the equipment was operated at durng the inventory year. If this is unknown, a default EPA value should be used.
2. While the quantity of fuel is generally needed only if the power rating and operating hours are unknkown, fuel consumption data may also be needed to estimate CO_2 emissions.

4.6 References

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5 ON-ROAD VEHICLES (VEHE)

Air Force policy considers the dispensing of fuel into on-road vehicles a mobile source of emissions. However, if the regulator insists this category be included as a stationary source, subtract those emissions from the Mobile AEI and add them to the Stationary AEI to avoid duplicate reporting. This is accomplished by manually calculating emissions generated from on-road vehicle refueling using the procedures given in the "Fuel Dispensing" section of this document, then subtracting those values from the emissions generated by on-road vehicles described in this section.

5.1 Introduction

On-road vehicles encompass the full range of passenger cars, light duty trucks, heavy duty trucks, buses, and motorcycles that are specifically designed to operate on highways and other road systems. On-road vehicles in use on Air Force installations are *classified* either as Government Owned Vehicles (GOVs) or Privately Owned Vehicles (POVs). GOVs include all on-road vehicles that are owned or leased and operated by government organizations on the base (e.g., Air Force, Guard, Reserve, etc.). Such vehicles are typically referred to as "fleet vehicles", and range from small passenger cars to large vehicles such as refueling or fire trucks. This classification also includes Tactical Vehicles, defined as any motor vehicle designed to military specifications or a commercially designed motor vehicle modified to military specifications to meet direct transportation support of combat, tactical or relief operations, or for training of personnel for such purposes. POVs are those on-road vehicles that travel on an Air Force installation, but are owned or leased and operated by base employees, and visitors. Both GOVs and POVs typically operate on conventional gasoline and diesel motor fuels, but may also operate on alternative, non-petroleum based fuels.

The emissions of concern from the operation of on-road vehicles include the criteria pollutants: NO_X, VOC, CO, SO_2, $PM_{2.5}$ and PM_{10}, as well as HAPs such as 1,3-butadiene, benzene, acetaldehyde, formaldehyde, acrolein and methyl tert-butyl ether (MTBE). Some of these direct pollutant emissions also participate in atmospheric reactions that contribute to the formation of ground level ozone and fine particulate matter pollution. Factors which impact the volume of pollutants emitted include the vehicle make and model, the Vehicle Miles Traveled (VMT), the average operating speed, vehicle age, climate, altitude, fuel type and quality, and maintenance procedures. To control vehicle emissions, the EPA has adopted an integrated approach to controlling on-road vehicle emissions. This approach has resulted in the establishment of regulatory standards that give full consideration to changes in vehicle and engine design, advanced emission controls, and the mandated use of reformulated and cleaner burning fuels.

Emissions from the operation of on-road vehicles are designated as exhaust, evaporative, or fugitive in nature. Exhaust emissions result from the combustion (sometimes incomplete) of the motor fuel while evaporative emissions result from the volatilization of the fuel in engine components during the different stages of a vehicle's operating cycle. Additionally, fugitive particulate emissions, in the form of road dust, brake wear dust, and tire wear dust, can be attributed to the operation of on-road vehicles.

The EPA is currently proposing to regulate greenhouse gases (GHGs) for both mobile and stationary sources. As a matter of Air Force policy, GHG emissions are to be reported as part of the mobile air emission inventory. Specifically, CO_2 and CH_4 emissions should be estimated for all mobile sources when EFs are available. Additionally, although not currently regulated under the CAA, many regulatory agencies may request installations to include GHG emissions from motor vehicles in mobile source emissions inventories. Specific requests to calculate and provide CO_2 and/or CH_4 emissions data to regulatory agencies as part of the AEI process should be reported through the appropriate Air Force Civil Engineer Center (AFCEC) channels, and coordinated through the chain-of-command. Such coordination should be accomplished prior to responding to the request in order to ensure a consistent Air Force response.

Since 1978, the U.S. EPA has used computer models to estimate emissions from cars, trucks and other mobile sources. The EPA's initial on-road vehicle emissions modeling software, known as the MOBILE model, was expanded many times over the years to incorporate new data. The updates included new data on vehicle emissions and new vehicle emission standards, and better addressed new policy questions, while keeping the basic structure of the model. MOBILE uses average gram per mile emission rates and a series of correction factors to estimate emissions over a wide range of driving conditions. MOBILE6.2, finalized in 2004, was the EPA's official model for highway vehicle emissions. A number of analysts have critiqued the MOBILE series of models and suggested that the EPA develop a modeling "toolkit" that would better serve the range of uses for highway vehicle modeling, including consistent modeling at the aggregate scale, mesoscale, and microscale analysis.

In response to these and other concerns, the EPA developed the Motor Vehicle Emissions Simulator (MOVES) model. MOVES incorporates extensive new data and advanced algorithms to estimate highway vehicle emissions of greenhouse gases, criteria pollutants, and selected air toxics at the national, regional and project level. In July of 2014, the EPA released MOVES2014, which included Tier 3 rule benefits considerations for new EPA rules released since the last version of MOVES, as well as new emissions data and new user-requested features. MOVES2014 is used for EPA internal policy analyses and is required for use (outside California) in the evaluation of State Implementation Plans (SIPs) and transportation conformity determinations. On the official EPA website, use of other models, such as the MOBILE model and previous versions of MOVES, is being discouraged as they contain outdated or otherwise inaccurate data. On October 7, 2014,

the EPA published an announcement in the Federal Register approving the MOVES2014 model for official use (outside of California), marking a two-year grace period for switching to MOVES2014 for SIP and transportation conformity analyses. In December of 2015, MOVES2014a was released with minimal changes to the model. The update did not significantly change the criteria pollutant emissions results of MOVES2014; therefore, it is not considered a new model for SIP and transportation conformity purposes.

The EPA has historically classified on-road vehicles VEHEs into eight broad *categories* based on the motor fuel type and Gross Vehicle Weight (GVW). MOVES was designed to reflect the general fleet distribution or fleet characterization (i.e., fractional vehicle category distribution by year) for a specific location. MOVES can also estimate emission rates (e.g., grams/mile, grams/vehicle) or input VMT and vehicle populations to output total emissions for any year from 1990 and 1999-2050. **The MOVES model incorporates emissions from on-road vehicle refueling, therefore, these emissions are <u>not</u> addressed in the "Fuel Dispensing" section of this document since they are already integrated in the EFs presented in this section.**

Both MOVES and MOBILE6 emission models are better at showing relative changes in emissions over several years rather than obtaining "snapshot" accuracy for a given year. The EPA's April 2007 *Guidance on the Use of Models and Other Analyses for Demonstrating Attainment of Air Quality Goals for Ozone, $PM_{2.5}$, and Regional Haze*; Section 1.3.1 on Page 3 (USEPA 2007) states, "First, we recommend using models in a relative sense in concert with observed air quality data…". Therefore, **MOVES or MOBILE6 should <u>not</u> be used to create a Mobile AEI.**

5.1.1 Vehicle Categories

The 28 vehicle *categories* from MOVES have been grouped into seven major aggregate *categories* based on vehicle type and Gross Vehicle Weight Rating (GVWR). Table 5-1. Air Force On-Road Vehicle Categories, provides the seven major aggregate *categories*. These *categories* were chosen based upon available MOBILE6 EF outputs and readily identifiable general vehicle groupings. The seven aggregate vehicle *categories* are:

- ***Light-Duty Gasoline Vehicles (LDGV)*** – All gasoline-powered passenger cars
- ***Light-Duty Diesel Vehicles (LDDV)*** – All diesel-powered passenger cars
- ***Light-Duty Gasoline Trucks (LDGT)*** – All smaller gasoline-powered trucks (0 to 8,500 lbs. GVWR)
- ***Light-Duty Diesel Trucks (LDDT)*** – All smaller diesel-powered trucks (0 to 8,500 lbs. GVWR)
- ***Heavy-Duty Gasoline Vehicles (HDGV)*** – All larger gasoline-powered vehicles (8,501lbs. to >60,000 lbs. GVWR)
- ***Heavy-Duty Diesel Vehicles (HDDV)*** – All larger diesel-powered vehicles (10,001 lbs. to >60,000 lbs. GVWR)

- ***Motorcycles (MC)*** – All motorcycles (assumed to be gasoline powered)

5.1.2 Vehicle Fleet Characterization

Based upon a review of recent Air Force mobile source emission inventories, the vehicle categories that are most representative of the types of GOVs and POVs expected to be encountered on a typical Air Force installation were identified. The seven Air Force vehicle categories provide the most readily identifiable and discernible vehicle classes for vehicle mix identification and characterization. It is recognized that some vehicles encountered may not fit within the specific weight parameters of the categories chosen. In such instances, personnel conducting the AEI should use professional judgment to assign the vehicles to the listed category which most closely approximates (in terms of fuel type and vehicle weight) the vehicles in question. Table 5-2. Typical Air Force POV & GOV Mix, provides a breakdown of the fleet characterization for the typical POV and GOV vehicle mix at an Air Force installation**. The vehicle mix provided in this table is to be used for estimating vehicle emissions unless specific vehicle mix data is available from a recent traffic study**.

5.1.3 Tactical Vehicles

A tactical vehicle is defined as any motor vehicle designed to military specifications or a commercially designed motor vehicle modified to military specification to meet direct transportation support of combat, tactical or relief operations, or for training of personnel for such purposes. Tactical vehicles are a subset of GOVs and Table 5-3 GOV Tactical and Non-Tactical Vehicle Mix, provides vehicle mix percentages for Tactical Vehicles as well as Non-Tactical Vehicles out of the total GOV Vehicle Mix. This supplemental information is provided if the need to calculate emissions specific to tactical or non-tactical vehicles arises.

Table 5-1. Air Force On-Road Vehicle Categories

CATEGORY		VEHICLE CLASS DECRIPTION
Air Force	MOVES	
Gas/Diesel		
LDGV	LDGV	Light-Duty Gasoline Vehicles (Passenger Cars)
LDDV	LDDV	Light-Duty Diesel Vehicles (Passenger Cars)
LDGT	LDGT1	Light-Duty Gasoline Trucks 1 (0-6,000 lbs. GVWR, 0-3,750 lbs. LVW)
	LDGT2	Light-Duty Gasoline Trucks 2 (0-6,000 lbs. GVWR, 3,751-5,750 lbs. LVW)
	LDGT3	Light-Duty Gasoline Trucks 3 (6,001-8,500 lbs. GVWR, 0-5,750 lbs. ALVW)
	LDGT4	Light-Duty Gasoline Trucks 4 (6,001-8,500 lbs. GVWR, greater than 5,751 lbs. ALVW)
LDDT	LDDT1/2	Light-Duty Diesel Trucks 1 and 2 (0-6,000 lbs. GVWR)
	LDDT3/4	Light-Duty Diesel Trucks 3 and 4 (6,001-8,500 lbs. GVWR)
HDGV	HDGV2b	Class 2b Heavy-Duty Gasoline Vehicles (8,501-10,000 lbs. GVWR)
	HDGV3	Class 3 Heavy-Duty Gasoline Vehicles (10,001-14,000 lbs. GVWR)
	HDGV4	Class 4 Heavy-Duty Gasoline Vehicles (14,001-16,000 lbs. GVWR)
	HDGV5	Class 5 Heavy-Duty Gasoline Vehicles (16,001-19,500 lbs. GVWR)
	HDGV6	Class 6 Heavy-Duty Gasoline Vehicles (19,501-26,000 lbs. GVWR)
	HDGV7	Class 7 Heavy-Duty Gasoline Vehicles (26,001-33,000 lbs. GVWR)
	HDGV8a	Class 8a Heavy-Duty Gasoline Vehicles (33,001-60,000 lbs. GVWR)
	HDGV8b	Class 8b Heavy-Duty Gasoline Vehicles (>60,000 lbs. GVWR)
	HDGB	Gasoline Buses (School, Transit and Urban)
HDDV	HDDV2b	Class 2b Heavy-Duty Diesel Vehicles (8,501-10,000 lbs. GVWR)
	HDDV3	Class 3 Heavy-Duty Diesel Vehicles (10,001-14,000 lbs. GVWR)
	HDDV4	Class 4 Heavy-Duty Diesel Vehicles (14,001-16,000 lbs. GVWR)
	HDDV5	Class 5 Heavy-Duty Diesel Vehicles (16,001-19,500 lbs. GVWR)
	HDDV6	Class 6 Heavy-Duty Diesel Vehicles (19,501-26,000 lbs. GVWR)
	HDDV7	Class 7 Heavy-Duty Diesel Vehicles (26,001-33,000 lbs. GVWR)
	HDDV8a	Class 8a Heavy-Duty Diesel Vehicles (33,001-60,000 lbs. GVWR)
	HDDV8b	Class 8b Heavy-Duty Diesel Vehicles (>60,000 lbs. GVWR)
	HDDBT	Diesel Transit and Urban Buses
	HDDBS	Diesel School Buses
MC	MC	Motorcycles (Gasoline)
HYBRID		
LDGV (H)	---	---
LDGT (H)	---	---
CNG		
LDGV (C)	---	---
LDGT (C)	---	---
HDGV (C)	---	---

Table 5-2. Typical Air Force POV & GOV Mix

CATEGORY		2012 to 2020 Avg. National Vehicle Mix (%)		POV Vehicle Mix (%)[1]	GOV Vehicle Mix (%)[2]
Air Force	MOVES				
Gas/Diesel					
LDGV	LDGV	34.86	34.86	56.17	2.23
LDDV	LDDV	0.03	0.03	0.88	0.28
LDGT	LDGT1	9.57	56.00	34.62	35.54
	LDGT2	31.86			
	LDGT3	9.98			
	LDGT4	4.59			
LDDT	LDDT1/2	0.00	0.19	1.00	21.79
	LDDT3/4	0.19			
HDGV	HDGV2b	2.88	3.46	0.62	2.53
	HDGV3	0.10			
	HDGV4	0.03			
	HDGV5	0.11			
	HDGV6	0.24			
	HDGV7	0.10			
	HDGV8a	0.00			
	HDGV8b	0.00			
	HDGB	0.00			
HDDV	HDGV2a	0.72	3.70	0.22	36.64
	HDDV2b				
	HDDV3	0.22			
	HDDV4	0.21			
	HDDV5	0.10			
	HDDV6	0.41			
	HDDV7	0.59			
	HDDV8a	0.35			
	HDDV8b	0.82			
	HDDBT	0.03			
	HDDBS	0.25			
MC	MC	1.76	1.76	4.49	0.00
HYBRID					
LDGV (H)	---	---	---	1.70	0.48
LDGT (H)	---	---	---	0.24	0.19
CNG					
LDGV (C)	---	---	---	0.06	0.00
LDGT (C)	---	---	---	0.00	0.30
HDGV (C)	---	---	---	0.00	0.02

1. SOURCE: POV vehicle mix was based on available Employee-Certification and Reporting System (ECARS) data collected on 3/7/14.
2. SOURCE: GOV vehicle mix was based on information provided by the Air Force Vehicle and Equipment Management Office (VEMSO).

"---" Indicates No Data Available

Table 5-3 GOV Tactical and Non-Tactical Vehicle Mix

CATEGORY		GOV Tactical Vehicle Mix (%)	GOV Non-Tactical Vehicle Mix (%)
Air Force	MOVES		
Gas/Diesel			
LDGV	LDGV	0.00	5.41
LDDV	LDDV	0.00	1.12
LDGT	LDGT1	0.12	46.23
	LDGT2		
	LDGT3		
	LDGT4		
LDDT	LDDT1/2	0.30	15.87
	LDDT3/4		
HDGV	HDGV2a	0.01	8.18
	HDGV2b		
	HDGV3		
	HDGV4		
	HDGV5		
	HDGV6		
	HDGV7		
	HDGV8a		
	HDGV8b		
	HDGB		
HDDV	HDGV2a	5.42	16.98
	HDDV2b		
	HDDV3		
	HDDV4		
	HDDV5		
	HDDV6		
	HDDV7		
	HDDV8a		
	HDDV8b		
	HDDBT		
	HDDBS		
MC	MC	0.00	0.00
HYBRID			
LDGV (H)	---	0.00	0.06
LDGT (H)	---	0.00	0.30
CNG			
LDGV (C)	---	0.00	0.00
LDGT (C)	---	0.00	0.00
HDGV (C)	---	0.00	0.00

5.2 Emission Factors

Emissions from on-road vehicles include exhaust emissions, which occurs both when the vehicle is in motion and while idling, as well as fugitive particulate emissions from road dust. The methodology for estimating emissions from each of these contributing sources is described in the following sections.

5.2.1 Vehicle Exhaust Emissions

The operation of on-road vehicles results in the generation of vehicle exhaust, which emits criteria pollutants, HAPs, and GHGs. Estimating emissions from vehicle exhaust are made more challenging because the amount of pollutants emitted is different for a vehicle in normal operation versus when the vehicle is idling. The total emissions from vehicle exhaust is quantified by taking the sum of both the idling and normal operating exhaust emissions. **MOVES accounts for idling in proportion to normal driving, therefore calculation of idling emissions is <u>not</u> required for an AEI.** Particulate emissions estimation is made more complex by the fact that particulate is emitted from vehicle exhaust, from both idle and non-idle use, as well as from the suspension of road dust. The EFs for each contributing source are described in more detail below.

5.2.1.1 Vehicle Exhaust Emissions – Normal Vehicle Operation

Emission factors for the Air Force vehicle categories were obtained directly from MOVES2014a. The MOVES2014a model was used to generate estimations of on-road vehicle emissions for each state (except California), the District of Columbia, as well as relevant US territories. This model requires various inputs such as population of personnel and VMT by vehicle type, age distribution and average speed distribution, ambient meteorological conditions, and elevation among other inputs. The "default" input database for MOVES2014 was used for all calculations and derivations. The MOVES2014 model was run for each state and relevant territory for calendar years 2016 through 2020 using the national estimates contained within the default database for all vehicle types listed in Table 5-1. The vehicle types selected for the run were gasoline and diesel vehicles available in the MOVES database. The vehicle model years used for each run include a 30-year span from the calendar year of the run to 30 years prior. The output emission rates were averaged using an activity (mileage) weighted average over all vehicle model years for each calendar year to estimate a representative emission factor for each pollutant for each vehicle type. The resultant emission factors are provided in a **gram/mile format** and are presented in Table 5-21 through Table 5-25 for all states other than California. The State of California uses EMFAC2014 to derive emissions data. Similar to the MOVES2014 model, EMFAC2014 calculates emissions for all motor vehicles in the state using data stored in its default database. County and vehicle specific emission factors for California are presented in Table 5-36 through Table 5-40.

Additionally, there are composite emission factors that are state and year specific. These values account for emissions reductions resulting in the use of alternative fuels and are calculated using Air Force-specific vehicle mix data (refer to Section 1.2.1.3 regarding alternative fuels). The composite emission factors are provided in Table 5-11 through Table 5-20 depending on the calendar year. Furthermore, since the calculation of the composite emission factors account for Air Force vehicle mix data, the tables are further subdivided into POV and GOV. The composite emission factors for the state of California were derived from EMFAC and are provided in Table 5-26 through Table 5-35. The model input and default values used to calculate the emission factors in MOVES and EMFAC are provided in Table 5-4 and Table 5-5, respectively.

Table 5-4. MOVES2014a Inputs Used to Generate On-Road Vehicle Emission Factors

Model Input	Input Value
Scale	National
Calculation Type	Inventory
Model Years	30-year range from calendar year back
Years	2016-2020
Months	All
Days	Weekend and Weekdays
Hours	All
Geographic Bounds	State/Territory Specific
Fuels	Diesel Fuel and Gasoline
Source Use Types	All
Road Types	All
Pollutants and Processes	NO_x, SO_x, CO, VOC, PM_{10}, $PM_{2.5}$, CO_2, NH_3, and all required additional processes
Activity	Distance Traveled, Populations, Starts

There is not a universally accepted set of emission factors based for installations located Outside of the Continental United States (OCONUS). Additionally, determining the vehicle mix or classifying vehicles may be more difficult in a foreign country. Calculating emissions for on-road vehicles at OCONUS facilities can be approximated by calculating the average of all state-specific composite emission factors. The emission factors for vehicle emissions at OCONUS installations are provided in Table 5-41 and Table 5-42 and are to be used with the same methodology as calculating on-road vehicle emissions within the United States.

Table 5-5. EMFAC2014 Inputs Used to Generate On-Road Vehicle Emission Factors

Model Input	Input Value
Run Mode	Emissions
Run Type	Default Activity
Area	County Specific
Years	2016-2020
Season	Annual
Aggregation Level	Day
Vehicle Class	ALL
Model Year	30-year range from calendar year back
Fuel	By Fuel
Speed	Aggregated
Pollutants and Processes	NO_x, SO_x, CO, ROG, PM_{10}, $PM_{2.5}$, CO_2, CH_4
Activities	VMT, Population

5.2.1.2 Vehicle Exhaust Emissions – Idling

An idling vehicle wastes fuel, increases the cost of maintenance, and creates air pollution. Several states have adopted anti-idling restrictions with some including these restrictions in their SIPs. Emission factors for emissions from idling vehicles were developed and are provided in a **gram/hour format.** An idling vehicle is not in motion, therefore, emissions may not be calculated on miles driven, but rather time in the idle mode. For this reason, the total amount of time that a vehicle spends in idle mode must be known or closely approximated. **Note that MOVES emission factors already include vehicle idling in proportion to normal driving. For this reason, the emission factors given here are presented for the purpose of calculating theoretical emissions for NEPA or for intersection modeling.**

Idling emissions will vary depending on the temperature, so the EFs were developed based on summer and winter conditions, which are characterized by temperatures of 75°F and 30°F, respectively. Table 5-6 and Table 5-7 provide these EFs based on summer and winter conditions, respectively, while Table 5-8 provides an average of the two seasons.

Table 5-6. Idling Emission Factors for On-Road Vehicles during Summer Conditions

Vehicle Category	Emission Factors (g/hr)				
	CO	NO_X	VOC	PM_{10}[1]	$PM_{2.5}$[2]
LDGV (Passenger Cars)	229	4.72	16.1	---	---
LDGT (0-8,500 lb GVWR)	339	5.71	24.1	---	---
HDGV (>8,500 lb GVWR)	738	10.2	35.8	---	---
LDDV (Passenger Cars)	9.97	6.50	3.53	---	---
LDDT (Light-Duty Trucks)	11.2	6.67	4.63	---	---
HDDV (>8,500 lb GVWR)	94.0	55.0	12.5	2.58	2.37
MC (Motorcycles)	435	1.69	19.4	---	---

SOURCE: EPA420-F-98-014, *Emission Facts: Idling Vehicle Emissions,* April 1998. Summer conditions are based on a temperature of 75°F and 9.0 psi RVP gasoline.

1. PM_{10} is an average of HDDV particulate emissions.
2. $PM_{2.5}$ value is assumed to be 92% of the PM_{10} value per *Air Emissions Factor Guide to Air Force Mobile Sources,* December 2009.

"---" Indicates No Data Available.

Table 5-7. Idling Emission Factors for On-Road Vehicles during Winter Conditions

Vehicle Category	Emission Factors (g/hr)				
	CO	NO_X	VOC	PM_{10}[1]	$PM_{2.5}$[2]
LDGV (Passenger Cars)	371	6.16	21.1	---	---
LDGT (0-8,500 lb GVWR)	487	7.47	30.7	---	---
HDGV (>8,500 lb GVWR)	682	11.8	44.6	---	---
LDDV (Passenger Cars)	10.1	6.66	3.63	---	---
LDDT (Light-Duty Trucks)	11.5	6.89	4.79	---	---
HDDV (>8,500 lb GVWR)	94.6	56.7	12.6	2.58	2.37
MC (Motorcycles)	388	2.51	20.1	---	---

SOURCE: EPA420-F-98-014, *Emission Facts: Idling Vehicle Emissions,* April 1998. Winter conditions are based on a temperature of 30°F and 13.0 psi RVP gasoline.

1. PM_{10} is an average of HDDV particulate emissions.
2. $PM_{2.5}$ value is assumed to be 92% of the PM_{10} value per *Air Emissions Factor Guide to Air Force Mobile Sources,* December 2009.

"---" Indicates No Data Available

Table 5-8. Average Idling Emission Factors for On-Road Vehicles

Vehicle Category	Emission Factors (g/hr)				
	CO	NO_X	VOC	PM_{10}	$PM_{2.5}$
LDGV (Passenger Cars)	300	5.40	18.6	---	---
LDGT (0-8,500 lb GVWR)	413	6.60	27.4	---	---
HDGV (>8,500 lb GVWR)	710	11.0	40.2	---	---
LDDV (Passenger Cars)	10.0	6.60	3.60	---	---
LDDT (Light-Duty Trucks)	11.4	6.80	4.70	---	---
HDDV (>8,500 lb GVWR)	94.3	55.9	12.6	2.58	2.37
MC (Motorcycles)	412	2.10	19.8	---	---

SOURCE: Data represent average of summer and winter values listed in above tables.
"---" Indicates No Data Available.

5.2.1.3 Alternative Fuel Emission Reduction Factors

Progressively stringent requirements resulting from the Energy Policy Act (EPAct), Presidential Executive Orders, and DoD and Air Force pollution prevention and energy conservation initiatives will result in an increasing number of GOVs and POVs powered by alternative fuels such as E85 (a fuel blend consisting of 85% ethanol and 15% gasoline), Compressed Natural Gas (CNG), or B20 (a fuel blend consisting of 20% biodiesel and 80% petroleum diesel), and advanced hybrid electric vehicles (HEVs). Regardless of fuel type, all vehicles operating on alternative fuels are currently required to meet existing EPA emission standards established for gasoline and/or diesel powered vehicles. However, some fuels offer potential emission reductions beyond those standards.

Relative to conventional gasoline, the higher octane value and oxygen content of E85 fuel should lead to reduced vehicle emissions. The EPA's Office of Transportation Air Quality (OTAQ) notes that while potential reductions will vary with engine design, E85 fuel should lead to reductions in VOCs, CO, PM, and NO_X relative to conventional gasoline (USEPA 2002a). The case with HAP emissions is not as clear since some data indicates a reduction in benzene and fewer total toxics, but an increase in ethanol and acetaldehyde emissions (USEPA 2006a). Adding to the complexity, some studies have shown that with the use of a catalytic converter, there is virtually no difference in exhaust emissions from on-road vehicles powered by gasoline. Due to these inconsistencies and the lack of clear data trends, **at this point in time the application of E85 emission reduction factors is not recommended.**

CNG is recognized as one of the cleanest burning alternative fuels available and offers a number of advantages over gasoline (USDoE 2002). There is limited data for emissions reductions that compressed natural gas offers over conventional gasoline, especially since emissions will vary with engine design and performance. However, the EPA suggests that, relative to conventional gasoline-powered vehicle applications, emissions from CNG-powered vehicles are estimated to be substantially lower for CO, PM, NO_X, and non-methane hydrocarbons.

There have been a few studies on the impact of B20 fuel on vehicle emissions. In October 2002, the EPA issued a draft technical report on biodiesel emissions (USEPA 2002b) that used the results from 39 studies to compare the difference in emissions between vehicles using B20 versus diesel fuel. Relative to low sulfur diesel (sulfur content of 500 ppm), B20 use resulted in notable reduction of NO_X, PM, HC, and CO emissions. Since the publication of the study, Ultra-Low Sulfur Diesel (ULSD) regulations that limit the sulfur content of on-highway diesel fuel to 15 ppm have been enacted and are in place across the country. Another study conducted under the auspices of the DoD Environmental Security Technology Certification Program (ESTCP) sought to measure the impact of B20 on emissions from engines used in on-road and portable power generation applications (DoD 2006). Whereas the EPA study used a B20/low sulfur diesel blend, the ESTCP study used a B20 biodiesel/ULSD blend to reflect the fact that conventional low sulfur diesel is no longer available for use in on-road vehicles. The ESTCP study concluded there were **no statistically significant differences in criteria pollutant emissions between the B20 biodiesel blended with ULSD and the ULSD by itself**. Likewise, no consistent trend was observed with regard to HAP emissions.

Hybrid Electric Vehicles (HEVs) produce fewer criteria pollutant, HAP, and CO_2 emissions than comparable dedicated gasoline-powered vehicles because they utilize an electric motor in conjunction with a traditional, and often smaller, internal combustion engine. The electric motor decreases the frequency in which the combustion engine is used, which reduces fuel consumption and, therefore, emissions. Overall emissions will vary depending on a number of factors including the vehicle's electrical storage capacity and how long it can operate in "electric-only" mode. Additional factors include how advanced the engine controls are, which emission standards the vehicles have been produced to meet, vehicle size, and model year. For these reasons, the emission profile of HEVs must be judged individually based on the miles traveled under each power mode, complicating attempts to estimate vehicle emission reductions. To estimate the potential emission reduction benefits from the use of HEVs, two sources were utilized. These include vehicle family application and emission certification data contained in the EPA OTAQ Certification and Fuel Economy Information System, and the California Air Resources Board (CARB) On-Road Vehicle and Engine Certification website. The assessment of representative certification data indicated NO_X, CO, HC (assumed to be equal to VOCs), and CO_2 were substantially reduced on average (U.S. Environmental Protection Agency, Office of Transportation Air Quality, Certification and Fuel Economy Information System).

Based upon this data, reduction factors for alternative fuels were calculated for on-road vehicles and are provided in Table 5-9. To estimate potential emission reductions from the use of these alternative fuels and advanced vehicle technologies, calculate vehicle emissions using the MOVES2014 gasoline or diesel fuel emission factors provided, and apply an appropriate percent impact based upon the values listed in the table.

Table 5-9. Alternative Fuel Emission Reduction Factors (FERFs)

Alternative Fuel (original fuel type)	Vehicle Category	Fuel Reduction Emission Factor (%)					
		CO	NO_X	VOC[1]	PM_{10}	$PM_{2.5}$	CO_2
CNG (Gasoline)[2]	LDGV, LDGT, HDGV	90	35	50	90(3)	90(3)	25
B20 (Diesel)[4]	LDDV, LDDT, HDDV	0	0	0	0	0	0
HEVs (Gasoline)[5]	LDGV, LDGT	50	75	35	---	---	30

1. Source provided EFs for HCs or non-methane HCs which are assumed to be equivalent to VOC emissions reduction.
2. SOURCE: "Clean Alternative Fuels: Compressed Natural Gas (EPA 420- F-00-033)," U.S. Environmental Protection Agency, March 2002.
3. SOURCE: Arkansas Gas Association, Natural Gas Vehicles
4. Based on emission factors using MOBILE6 default of 15 ppm ULSD for diesel, and results of Department of Defense ESCTP study, *Effect of Biodiesel on Diesel Engine Nitrogen Oxide and Other Regulated Emissions*, Project number WP-0308, May 2006, indicating no statistically significant difference in B20/ULSD vs. ULSD emissions.
5. EFs represent the difference in CO_2 emissions associated with the combustion of one gal of gasoline and one-gallon gasoline equivalent of CNG. Source: California Climate Action Registry, General Reporting Protocol Version 2.2, Table C-3, March 2007.

"---" Indicates No Data Available.

5.2.2 Fugitive Particulate Matter (PM) Emissions

Though roads are themselves stationary, the generation of airborne road dust is the result of the turbulent wake created by on-road vehicles, which are mobile sources. Therefore, road dust emissions are provided in this section. **Note that this section does not describe emissions from asphalt paving since those operations are considered transitory and are addressed in the Transitory Guide.** Since fugitive PM emissions are the result of road dust suspended as the vehicle moves across a road surface, the extent of the emitted PM is dependent on whether the road surface is paved or unpaved. These surfaces are subjected to strong air currents from the turbulent wake that follows behind a vehicle as it passes. The currents disturb the loose material pulverized under the weight of the vehicle and PM is cast into the air. PM emissions will fluctuate for several reasons, including construction activities in the area, road degradation due to vehicular traffic, and the application of granular materials for snow and ice control. Typically, the most important factors regarding road PM emissions are the number and weight of the vehicles that travel the road, and the VMT. Paved and unpaved road EFs are already derived and may be found in Table 5-10.

Table 5-10. Fugitive PM Emission Factors

	POV		GOV	
	PM_{10} (g/mi)	$PM_{2.5}$ (g/mi)	PM_{10} (g/mi)	$PM_{2.5}$ (g/mi)
Paved Road	0.058	0.014	0.069	0.017
Unpaved Road	466.206	46.621	505.981	50.598

The emission factors for suspension of loose material on paved and unpaved road surfaces due to vehicle travel were derived from the following empirical equations from AP-42 Chapter 13.2 (Jan 2011):

$$EF(Pol)_P = k(Pol) \times (sL)^{0.91} \times W^{1.02}$$ AP-42 Chapter 13.2.1.3

Where,

- $EF(Pol)_P$ = Particulate emission factor for paved roads (g/mi)
- k(Pol) = Particle size multiplier (g/mi). **$PM_{2.5}$ = 0.25 and PM_{10} = 1.00**
- sL = Road surface silt loading (g/m^2). **AP-42 Chapter 13.2.1 recommends a default value of 0.015 for limited access roadways (such as Air Force roads)**
- W = Average weight of the vehicles traveling the road (tons). **POVs = 2.581 and GOVs = 3.096**

$$EF(Pol)_U = k(Pol) \times \left(\frac{s}{12}\right)^a \times \left(\frac{W}{3}\right)^b \times 453.6$$ AP-42 Chapter 13.2.2.2

Where,

- $EF(Pol)_U$ = Particulate emission factor for unpaved roads (g/mi)
- k(Pol) = Particle size multiplier (lb/mi). **$PM_{2.5}$ = 0.15 and PM_{10} = 1.5**
- s = Surface material silt content (%). **AP-42 Chapter 13.2.2 value for construction site road value of 8.5**
- a, b = Empirical constants for industrial roads from AP-42 Table 13.2.2-2. **a=0.9 and b=0.45**
- 453.6 = Factor converting lb to grams (g/lb)

***Note**: the equation above calls for the average weight of all vehicles traveling the road and is *not* intended to be used to calculate a separate EF for each vehicle weight class. Rather, one emission factor should be calculated to represent the "fleet" average weight of all vehicles.

5.2.2.1 Corrected Emission Factors Accounting for Precipitation

Average fugitive PM emissions are inversely proportional to the frequency of measurable precipitation (>0.01 inch). The total fugitive PM emissions are calculated using the appropriate emission factor listed above, the total vehicle miles traveled, and a precipitation correction term. When accounting for precipitation, the fugitive PM emission factors must be corrected. The corrected emission factors for both paved and unpaved roads are calculated as follows:

$$\boldsymbol{EF(\text{Pol})_{CP} = EF(Pol)_P \times \left(1 - \frac{P}{4N}\right)}$$

Equation 5-1

$$EF(\mathrm{Pol})_{CU} = EF(Pol)_{U} \times \left(1 - \frac{P}{N}\right)$$

Equation 5-2

Where,

EF(Pol)$_{CP/CU}$ = Corrected emission factor for paved or unpaved roads (g/mi)-specify

P = Number of days in the inventory period in which at least 0.01 inches of precipitation was measured (days). See Figure 5-1 to determine this value based on the installation's geographic location.

N = Number of days in the inventory period (days). 1 year = 365 Days

***Note** – The paved road precipitation factor differs from the unpaved precipitation factor since it incorporates a factor of "4" in the denominator to account for the fact that paved roads dry more quickly than unpaved roads.

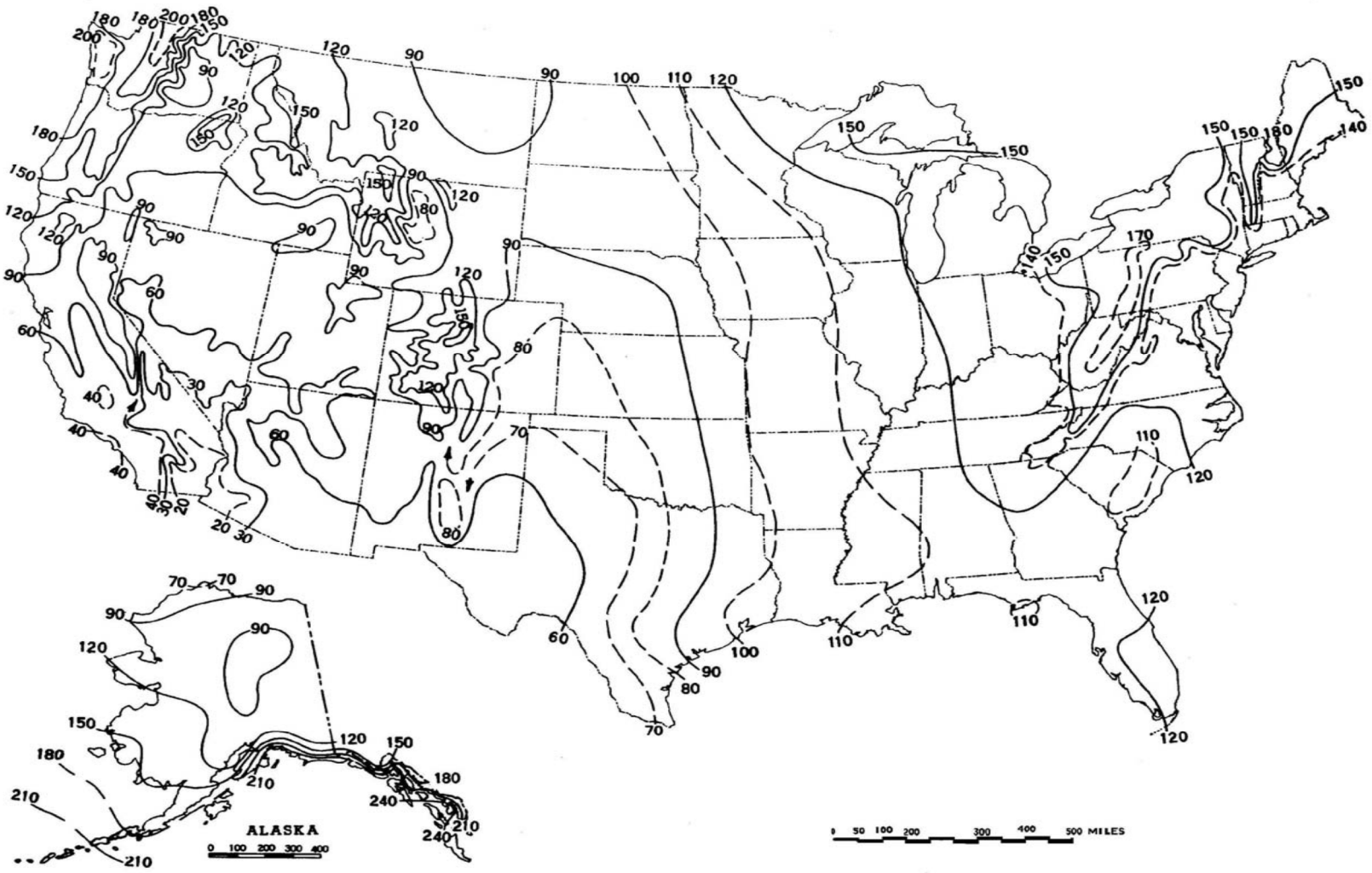

Figure 5-1. Mean Number of Days in the Year with Precipitation of 0.01 Inches or More

5.3 Emissions Calculation

The total emissions from the operation of on-road vehicles are the sum of the emissions from the vehicle exhaust and fugitive PM from road dust. There are three accepted methods for estimating vehicle emissions. Method 1, which is the simplest and preferred method, uses Air Force/State/Territory composite emission factors. Method 2 uses POV and GOV fleet mix from recent traffic studies. Method 3 uses the typical Air Force POV and GOV fleet mix from Table 5-2. No matter the method used for estimation, **POV and GOV emissions are calculated independently.**

5.3.1 Vehicle Exhaust Emissions – Typical Vehicle Operation

Calculating emissions from vehicle exhaust is dependent on the VMT and appropriate EF. Vehicle exhaust emissions are directly dependent on the vehicle mix at the installation. There are two circumstances that determine the method for calculating vehicle exhaust emissions – when the specific vehicle mix is known, or when it is unknown. If the vehicle mix is known, that data may be used for emissions calculations, whereas if unknown, the mix from Table 5-2 may be assumed. Calculating these emissions is discussed below.

5.3.1.1 Method 1: Using Air Force/State/Territory Composite Emission Factors (Preferred Method)

This is the preferred method for emissions estimates because it is the simplest method to use. The emission factors used for this method are selected based on: (1) the emission inventory year, and (2) the state/territory in which the installation is located. The Air Force/State/Territory composite emission factors ($EF(Pol)_{Comp}$) were derived using the assumed vehicle mix as provided in Table 5-2, and Table 5-11 through Table 5-20 for most states. For the State of California, the composite values are provided in Table 5-26 through Table 5-35. Use Table 5-41 and Table 5-42 for OCONUS installations. Note that the tables are separated into POV and GOV since the EFs account for the vehicle mix which differ between these two classifications. Also not that these EFs **have already been adjusted** to reflect the reduction in emissions as a result of vehicles that operate on alternative fuels, so no additional calculation is needed to account for the reduction in emissions from the use of alternative fuels. Emissions calculation using the adjusted EFs is estimated as follows:

$$E(Pol)_{Total} = VMT_{Total} \times EF(Pol)_{Comp} \times 0.002205$$

Equation 5-3

Where,

$E(Pol)_{Total}$ = Total annual emissions of specific pollutant from vehicle exhaust (lb/yr)

VMT_{Total} = Total annual vehicle miles traveled for all POV or GOV (mi/yr). This should be available for GOVs through records, or estimated for GOVs and POVs using Equation 5-4 and Equation 5-5 respectively. **Note that this includes both paved and unpaved roads, if applicable**.

$EF(Pol)_{Comp}$ = Air Force/State/Territory composite EF for specific pollutant (g/mi) from Table 5-11 through Table 5-20 and for California, Table 5-26 through Table 5-35.

0.002205 = Factor for converting grams to pounds (lb/g)

Emissions from GOVs or POVs are calculated using the general formula provided in Equation 5-3. **These steps must be completed independently for each pollutant of concern.** Note GOVs and POVs should not be combined, **GOV and POV emissions must be calculated independently.** Due to the complexity of calculating on-road vehicle emissions, the following steps are recommended for use as a guideline for data collection and emissions calculations:

Step 1 – Gather fleet data. The first step is to determine the number of POVs (N) and GOVs (N) operating on base. Also, the total vehicle miles traveled (VMT_{Total}) or average vehicle miles traveled (AVM) for GOVs should be recorded. This data often can be provided or estimated by the Security Forces Squadron (from the Pass & Registration section) and/or the Military Personnel Flight (MPF). For POVs, VMT_{Total} is calculated using Equation 5-11 while Equation 5-4 may be used, if necessary, to calculate VMT_{Total} for GOVs.

Vehicle Miles Traveled for GOVs:

The total vehicle miles traveled (VMT_{Total}) for GOVs is the sum of all the miles put on GOVs during the inventory period. These values should be available through records kept by the base transportation organization or directly from the organizations that operate and/or maintain the vehicles. Alternatively, VMT_{Total} may be estimated if it is assumed that each vehicle category traveled the same distance per year, as shown:

$$\boldsymbol{VMT_{Total} = AVM \times N}$$

Equation 5-4

Where,

VMT_{Total} = The total vehicle miles travelled for all GOV vehicles (mi/yr)

AVM = The annual average miles travelled per vehicle (mi/yr)

N = The number of vehicles – specifically GOV in this case - at the installation

Vehicle Miles Traveled for POVs:

For POVs, the suggested method for estimating VMT_{Total} is to assume that each POV in operation on an installation travels twice the distance from the main gate to the population centroid of the installation. Not every person will operate their vehicle every day of the year. It is assumed that the majority of POVs will be driven during the workweek. Additionally, a statistical analysis of available Employee-Certification and Reporting System ECARS data revealed that typically only 70% of the installation population actually operates their vehicles on the installation during the week. Using this information, the VMT_{Total} for POVs is estimated as follows:

$$\boldsymbol{VMT_{Total} = AVM \times N = D \times 520 \times 0.7 \times P}$$

Equation 5-5

Where,

- **N** = The number of vehicles – specifically POV in this case – at the installation
- **D** = One-way distance from the main gate to the population centroid of the installation (miles/trip)
- **520** = Factor for converting the number of miles per trip to miles per year (trips/year)
- **0.7** = Fraction of the installation population that operate their vehicle during the week
- **P** = Installation population

In Equation 5-5, the "520" multiplying factor was derived as follows:

$$2\frac{trips}{\cancel{day}} \times 5\frac{\cancel{days}}{\cancel{week}} \times 52\frac{\cancel{weeks}}{yr} = 520\frac{trips}{yr}$$

Step 2 – Select emission factors. These are provided in Table 5-11 through Table 5-20 for all states but California, Table 5-26 through Table 5-35 for California, or Table 5-41 and Table 5-42 for OCONUS installations.

Step 3 – Calculate emissions. Emissions of each pollutant (and *classification*) are calculated *independently* using Equation 5-3.

5.3.1.2 Method 2: Using Specific Vehicle Mix Data

This method is more intensive than the preferred method given above. However, it may be desirable if a recent traffic study conflicts with the typical vehicle mix provided, or if emissions from each vehicle category are required. The emission factors used for this method are selected based on: (1) the emission inventory year, (2) the state in which the installation is located, and (3) the vehicle category (LDGV, LDDV, etc.). The emission factors used for this method, labeled as

the term $EF(Pol)_i$, are provided in Table 5-21 through Table 5-25 for most states or Table 5-36 through Table 5-40 for California. To account for the reduction in emissions due to the use of alternative fuels, the appropriate emissions reduction factor, as given in Table 5-9, is employed. Emissions are estimated using the vehicle miles traveled for each vehicle category and summed as follows:

$$E(Pol)_{Total} = \sum_{i=1}^{n} \left\{ VMT_i \times EF(Pol)_i \times \left[1 - \frac{FERF(Pol)}{100} \right] \times 0.002205 \right\}$$

Equation 5-6

Where,

$E(Pol)_{Total}$ = Total annual emissions of specific pollutant from vehicle exhaust (lb/yr)

VMT_i = Total annual vehicle miles traveled for each vehicle class (mi/yr). This should be available for GOVs through records, and estimated for POVs using Equation 5-5. **Note that this includes both paved and unpaved roads, if applicable**.

$EF(Pol)_i$ = Air Force/State/Territory emission factor for specific pollutant (g/mi)

FERF(Pol) = Pollutant-specific fuel emission reduction factor, as applicable (%). This is given in Table 5-9.

100 = Factor converting percent to fraction

0.002205 = Factor for converting grams to pounds (lb/g)

In order to accurately account for the reduction of emissions through the use of alternative fuels, the VMT_i for each hybrid and compressed natural gas vehicle should be known and treated as a separate vehicle category. If the annual VMT for each vehicle category is not known, the following equation may be used to approximate VMT for each specific vehicle category (VMT_i):

$$VMT_i = AVM_i \times n_i = AVM_i \times N \times \frac{MIX_i}{100}$$

Equation 5-7

Where,

AVM_i = Average annual vehicle miles traveled by each vehicle category (mi/yr)

n_i = Number of vehicles in a specific vehicle category

N = Total number of vehicles, POV or GOV

MIX_i = Vehicle mix for a specific vehicle category (%)

To quantify the emissions from on-road vehicles using this method, the following process is recommended:

Step 1 – Gather fleet data. Data required to calculate vehicle emissions typically includes vehicle category, model year, and vehicle miles traveled (VMT_i) during the course of the year in question.

a. GOV Fleet MIX Data: If a GOV is driven both on and off base during the course of the inventory year, an estimate must be made to apportion the number of miles driven between off and on installation miles. Figure 5-2 provides a sample form that can be used to collect and organize GOV data by vehicle category for use in emission calculations. The best way to collect GOV information is to provide blank forms for each vehicle category to the installation organization(s) responsible for managing GOVs.

b. POV Fleet MIX Data: Prior to conducting an AEI that includes POVs, it is recommended that the individual responsible for preparing the mobile source emission inventory contacts the Base Development and/or Community Planning sections of the Civil Engineering Squadron to determine if a traffic survey has been conducted recently at the installation, which may contain information that will be useful in calculating POV emissions.

If a recent traffic survey is not available, and resources do not allow the conduct of a new traffic survey, data provided by the Security Forces Squadron (from the Pass & Registration section) and/or the Military Personnel Flight (MPF) can be used to estimate POV fleet data. Types of data that can usually be obtained from the Security Forces Squadron and/or MPF include:

1) The estimated average number of registered POVs at the installation during the applicable inventory year;

2) The estimated percentage of registered vehicles that fall under the seven vehicle categories;

3) The estimated distance (in miles) of the average POV travels on the installation during a typical weekday and weekend day; and

4) The estimated number of non-registered vehicles that travel on the installation during a typical weekday and weekend day.

Figure 5-3 provides a sample form that can be used to collect and organize POV data for use in emission calculations.

An alternative approach to obtaining vehicle registration information may be available at some installations. Some installations may be able to provide a listing of the vehicles contained in their databases.

Step 2 – Group vehicle categories. Upon gathering fleet data, group together all vehicles based on the Air Force vehicle categories (i.e., LDGV, LDDV, LGDT, LDDT, HDGV, HDDV, MC, LDGV (H), LDGT(H), LDGV(C), LDGT(C), and HDGV(C)). Record the number of vehicles (n_i) and total annual miles traveled (VMT_i) for each vehicle category.

a. If **VMT_i** is unknown, it may be estimated using Equation 5-7.

$$VMT_i = AVM_i \times n_i$$

b. If there is insufficient fleet data to provide the number of vehicles (n_i) for each vehicle category yet the total number of vehicles and the relative vehicle mix (MIX_i) for each specific vehicle category is known, use Equation 5-7 to approximate n_i:

$$n_i = N \times \frac{MIX_i}{100}$$

Step 3 – Select emission factors. The appropriate emission factors are selected based on the vehicle category, the calendar year you are performing the emissions calculation, and the installation's location. Vehicle exhaust emission factors ($EF(Pol)_i$) are selected from Table 5-21 through Table 5-25 for most states or Table 5-36 through Table 5-40 for California.

Step 4 – Calculate emissions. For vehicle exhaust emissions, calculate the emissions for each individual vehicle category ($EP(Pol)_i$) and sum these values for the total vehicle emissions for that pollutant. Pollutant emissions for each vehicle category are calculated using Equation 5-6.

5.3.1.3 Method 3: Using Air Force Typical Vehicle Mix Data

Another method for calculating on-road vehicle emissions is to calculate the emissions from each vehicle category using the typical Air Force vehicle mix. The method of calculation is similar to that of calculating emissions using specific vehicle mix data. The emission factors used for this method are selected based on: (1) the emission inventory year, (2) the state in which the installation is located, and (3) the vehicle category (LDGV, LDDV, etc.). Emissions are estimated via this method using a slightly modified Equation 5-3 by substituting the correct EF as shown:

$$\boldsymbol{E(Pol)_{Total} = VMT_{Total} \times EF(Pol)_{Total} \times 0.002205}$$

Equation 5-8

Where,

$EF(Pol)_{Total}$ = Total adjusted on-road vehicle exhaust emission (lb/yr). This is calculated using Equation 5-9

The total adjusted on-road vehicle emission factor takes into account any reduction in emissions as a result of alternative fuel use. This is calculated as follows:

$$EF(Pol)_{Total} = \sum_{i=1}^{n} \left\{ \left(\frac{MIX_i}{100} \right) \times EF(Pol)_i \times \left[1 - \frac{FERF(Pol)}{100} \right] \right\}$$

Equation 5-9

The total vehicle miles traveled (VMT_{Total}) is the sum of the average miles traveled for all vehicle categories as shown:

$$VMT_{Total} = \sum_{i=1}^{n} \left(AVM_i \times N \times \frac{MIX_i}{100} \right)$$

Equation 5-10

Emissions from vehicles are calculated by applying the equations in Method 2 using the typical POV or GOV vehicle mix data from Table 5-2**. These steps must be completed independently for each pollutant of concern.** Note GOVs and POVs should not be combined; **GOV and POV emissions must be calculated independently.** Due to the complexity of calculating on-road vehicle emissions, the following steps are recommended for use as a guideline for data collection and emissions calculations:

Step 1- Gather fleet data. In this case fleet data or a traffic survey for the base is not available. Therefore, obtain the total number (N) of vehicles (POV or GOV) driving on base and the overall average annual vehicle miles traveled (AVM) for all vehicle categories. The data can often be provided or estimated by the Security Forces Squadron (from the Pass & Registration section) and/or the Military Personnel Flight (MPF) can be used to estimate POV fleet data. Types of data that can usually be obtained from the Security Forces Squadron and/or MPF include: 1) The estimated average number of registered POVs and/or GOVs at the installation during the applicable inventory year; 2) the estimated distance (in miles) of the average POV travels on the installation during a typical weekday and weekend day; and 3) the estimated number of non-registered vehicles that travel on the installation during a typical weekday and weekend day.

An alternative approach to obtaining vehicle registration information may be available at some installations. Some installations may be able to provide a listing (preferably in both electronic and hardcopy format) of the vehicles contained in their databases. At a minimum, the listing should provide the number of registered vehicles.

Step 2 - Group vehicle categories. Upon gathering fleet data on the total number (N) of vehicles (POV or GOV) driving on base and overall average annual vehicle miles traveled (AVM), obtain and record the typical vehicle mix values (MIX_i) from Table 5-2 for each vehicle category. Then, assuming all vehicle categories traveled the same distance per year, calculate the total annual vehicle miles traveled (VMT_{Total}) for all vehicle categories combined with Equation 5-4.

Step 3 - Select emission factors. Selection of the appropriate emission factor is based on the vehicle category, the calendar year you are performing the emissions calculation, the installation's location (i.e., the state it is located in), and the installation's altitude. The EFs are selected from Table 5-21 through Table 5-25 (or Table 5-36 through Table 5-40 for California).

Once the appropriate pollutant-specific emission factors ($EF(Pol)_i$) for each vehicle category are obtained, calculate the total composite EF using Equation 5-9.

Step 4 - Calculate emissions. The total pollutant emissions from all vehicle categories ($EP(Pol)_{Total}$) for on-road emissions are each calculated using Equation 5-8.

5.3.2 Vehicle Exhaust Emissions (Idling)

Calculating idling emissions is similar to the calculation of on-road vehicle emissions provided above with slight modifications to the equations supplied. The primary difference is that the EFs for idling vehicles are presented in a g/hr format, which means the time spent in idle mode must be known (or estimated). Idling emissions from typical on-road vehicle operation are already addressed in the previous section above. Estimating the emissions from vehicle idling is performed using one of two methods: where the vehicle mix is known, and where the typical Air Force vehicle mix is used. **This section describes the calculation of *theoretical* emissions from idling vehicles for NEPA and intersection modeling, not for a mobile AEI.**

5.3.2.1 Method A: Using Specific Vehicle Mix Data

If necessary, emissions may be calculated using a specific vehicle mix different from the one provided in Table 5-2. This method may be desirable if a recent traffic study conflicts with the typical vehicle mix provided. The EFs used for this method are selected based on: (1) the vehicle category (LDGV, LDDV, etc.) and (2) the season in which the emissions are being calculated (summer, winter, or average). The emission factors used for this method ($EF(Pol)_i$) are provided in Table 5-6 through Table 5-8. Idling emissions are estimated as follows:

$$E(Pol)_{Total} = \sum_{i=1}^{n} \left\{ VIT_i \times EF(Pol)_i \times \left[1 - \frac{FERF(Pol)}{100} \right] \times 0.002205 \right\}$$

Equation 5-11

Where,

$E(Pol)_{Total}$ = Total theoretical emissions of specific pollutant from vehicle idling (lb/yr)
VIT_i = Annual vehicle idling time (hr/yr)
$EF(Pol)_i$ = Idling emission factor for a specific pollutant (g/hr). This is provided in Table 5-6 and Table 5-7.

The vehicle idling time is the most difficult parameter to determine. Depending on the proposed action, idling times of varying lengths may be recommended for each vehicle *category* and/or *classification*. The idling time for each vehicle category may be estimated using an average idling time as shown:

$$\boldsymbol{VIT_i = AVIT_i \times n_i = AVIT_i \times N \times \frac{MIX_i}{100}}$$

Equation 5-12

Where,

$AVIT_i$ = Average annual vehicle idling time (hr/yr)

5.3.2.2 Method B: Using Air Force Typical Vehicle Mix Data

If the specific vehicle mix data is not available from a recent traffic study, the typical vehicle mix from Table 5-2 may be assumed. The emission factors used for this method are selected based on: (1) the vehicle category (LDGV, LDDV, etc.) and (2) the season in which the emissions are being calculated (summer, winter, or average). The emission factors used for this method ($EF_{Idle}(Pol)_i$) are provided in Table 5-6 through Table 5-8. Theoretical emissions from vehicle idling is estimated as follows:

$$\boldsymbol{E(Pol)_{Total} = VIT_{Total} \times EF(Pol)_{Total} \times 0.002205}$$

Equation 5-13

Where,

VIT_{Total} = Total annual vehicle idling time for all POV or GOV (hr/yr)

$EF(Pol)_{Total}$ = Total adjusted idling emission factor (g/hr). This is calculated by Equation 5-14.

The total adjusted idling EF takes into account any reduction in emissions as a result of alternative fuel use. This is calculated as shown:

$$\boldsymbol{EF(Pol)_{Total} = \sum_{i=1}^{n} \left\{ EF(Pol)_i \times \frac{MIX_i}{100} \times \left[1 - \frac{FERF(Pol)}{100} \right] \right\}}$$

Equation 5-14

The total vehicle idling time (VIT_{Total}) is the sum of the average idling time for all vehicle categories as shown:

$$VIT_{Total} = \sum_{i=1}^{n} \left(AVIT_i \times N \times \frac{MIX_i}{100} \right)$$

Equation 5-15

Equation 5-15 may be simplified if it is assumed that each vehicle category will idle for the same amount of time per year, as shown below:

$$VIT_{Total} = AVIT \times N$$

Equation 5-16

In the absence of average vehicle idling time (AVIT) data, contact Base Civil Engineering for assistance in estimating this value.

5.3.3 Fugitive PM Emissions

Particulate emissions are generated from vehicle exhaust and are described in the previous sections. Fugitive particulate emissions, however, are generated from the operation of on-road vehicles across a paved or unpaved road surfaces. The amount of particulate generated is a function of the road surface (paved or unpaved) and the total vehicle miles traveled (VMT_{Total}). The EFs are selected from Table 5-10 based on (1) the road surface (paved or unpaved) and (2) vehicle classification (POV or GOV). The selected EFs must be corrected based on the amount of days in the year with precipitation of 0.01 inches or more using the appropriate equation (either Equation 5-1 or Equation 5-2) and on the road surface. Using the corrected emission factor for paved ($EF(Pol)_{CP}$) and unpaved ($EF(Pol)_{CU}$) roads, fugitive PM emissions are calculated as follows:

$$E(Pol)_{Total} = VMT_{Total} \times \left\{ \left[\frac{\%VMT_P}{100} \times EF(Pol)_{CP} \right] + \left[\frac{\%VMT_U}{100} \times EF(Pol)_{CU} \right] \right\} \times 0.002205$$

Equation 5-17

Where,

$E(Pol)_{Total}$ = Total annual emissions of fugitive PM from on-road vehicles (lb/yr)
$\%VMT_P$ = Percent of total miles driven on paved roads (%)
$\%VMT_U$ = Percent of total miles driven on unpaved roads (%)

5.3.4 VOC Speciation

On-road vehicles have the potential to produce a significant amount of air pollutants released to the atmosphere. The amount of pollution is a function of the amount of on-road vehicles, the average number of miles driven, the time of year, the content of the fuel used, and even the average idling time. The large number of variables impacting air emissions from on-road vehicles

increases the complexity of quantifying their emissions. However, measurements are continually being taken to develop more accurate air emission estimates. Individual VOCs may be estimated using the weight fractions of each chemical to the total emitted VOC.

The weight fractions provided in this document were determined using test data from a variety of sources including the EPA's *SPECIATE* database. The emission profiles used to determine the VOC weight percent are assumed to be representative of the vehicle category's emissions. However, this information should only be used when no alternative emission profiles are available. The average weight percent of individual pollutants were calculated as follows:

$$P_{Pol} = \frac{A_{Pol}}{AVOC_{Total}}$$

Equation 5-18

Where,

P_{Pol} = Weight percent of a given pollutant (%)
A_{Pol} = Individual pollutant emission factor (mg/mi)
$AVOC_{Total}$ = Total VOC emission factor (mg/mi)

Speciated VOCs are calculated by taking the product of the total VOCs and the weighted percentage of the individual VOC as follows:

$$E_{Pol} = E_{VOC} \times \frac{P_{Pol}}{100}$$

Equation 5-19

Where,

E_{Pol} = Emissions of speciated VOC (lb/yr)
100 = Factor for converting percent to a fraction (%)
E_{VOC} -= Emissions of total VOC (lb/yr)

The percentages of each VOC to total VOC are provided in Table 5-43. Note that the light duty gas vehicles, trucks, and heavy duty gas vehicles (LDGV, LDGT, and HDGV) are not further subdivided into hybrid and CNG fueled vehicles. To calculate the emissions specific to these vehicles, apply the vehicle mix (use the default values if no onsite data is available).

5.4 Information Resources

Information required for calculating emissions from GOVs can usually be obtained from the installation transportation organization as it typically maintains records on most, if not all, GOVs assigned to the installation. At some installations it may also be necessary to obtain information directly from the organizations that use and/or maintain the vehicles. For example, the Fire

Department may need to be contacted to obtain information specific to fire trucks and rescue vehicles.

In some cases, it may be necessary to obtain and review data contained in the installation's vehicle maintenance index file (VMIF), on-line vehicle interactive management system (OLVIMS) report, or equivalent vehicle information management system to verify vehicle class/type as some installations do not use the same classification system used by EPA. Some facilities may have a cross-reference tool with management codes that will assist in interpreting how vehicle usage is being tracked (e.g., miles, hours, and kilometers).

Most information required to calculate POV emissions may be obtained from the Security Forces Squadron. The Pass & Registration section of the base Security Forces Squadron usually maintains computer records on all POVs registered at the installation. Some installations perform vehicle registration at MPF. The office that handles vehicle registrations (Pass & Registration or MPF) is also in a good position to survey personnel on their vehicle usage. Since the Security Forces Squadron is responsible for staffing the installation gates, they are usually the best source of information on non-registered vehicles.

If the POV information needed to calculate vehicle emissions cannot be obtained from the Security Forces Squadron, it might be necessary to survey a representative number of installation personnel to obtain the required information. It is also highly recommended that personnel conducting the air emissions inventory check with the Base Development and/or Community Planning sections of the Civil Engineering Squadron to determine whether any recent traffic surveys have been conducted.

For purposes of estimating the length of typical on-installation POV trips, consider the trip length in terms of the mileage from the main gate to a common on-installation destination and back. For instance, if most POVs are believed to be traveling to the Base Exchange, the Commissary, or the Medical Clinic, estimate the distance from the main gate to those locations. In such instances, it may be assumed that a median round trip distance of 3-4 miles is appropriate for use. However, it may also be necessary to estimate vehicle travel distances for individuals who travel on and off the installation more than once per day, such as personnel who leave during lunchtime. In the absence of installation-specific survey data, it can be conservatively assumed that 5% of installation personnel will travel off installation during lunchtime. Since this is a second trip through the gate, you should assume the daily on-installation mileage is doubled for those individuals. If installation organizations are unable to provide required data, it may be possible to obtain trip length and driver behavior data that can be extrapolated to on-installation conditions from the local metropolitan planning office (MPO).

5.5 Example Problems

5.5.1 Problem 1 – Calculating POV and GOV Emissions – Method 1

Anytown Air Force Base is inventorying its calendar year 2016 CO emissions for their POVs and GOVs operated by the facility during the year. Data indicates that there is a total of 422 POVs and 38 GOVs and all vehicles traveled an average of 4,563 miles each. Calculate CO emissions for CY2016 if Anytown Air Force Base is located in Alabama.

Step 1 – Gather fleet data. The data required to calculate emissions is provided in the problem statement. This information includes the number of POVs (**N_{POV} = 422**), the number of GOVs (**N_{GOV} = 38**), and the average miles traveled for each vehicle (**AVM = 4,563 miles/yr**).

Next, calculate total vehicle miles traveled (VMT_{Total}). Using the number of POVs and GOVs, the average vehicle miles traveled (AVM) and Equation 5-4, the VMT_{Total} is calculated as follows:

$$VMT_{Total} = AVM \times N$$

For POVs

$$\boldsymbol{VMT_{Total-POV}} = 4{,}563\,\frac{miles}{yr} \times 422 = \boldsymbol{1{,}925{,}586\,\frac{miles}{yr}}$$

For GOVs:

$$\boldsymbol{VMT_{Total-GOV}} = 4{,}563\,\frac{miles}{yr} \times 38 = \boldsymbol{173{,}394\,\frac{miles}{yr}}$$

Step 2 – Select emission factors. According to Table 5-11, for CY2016 in Alabama, the CO emission factor ($EF(CO)_{Alabama}$) for POVs is **5.725 g/mi**. Similarly, the CO emission factor ($EF(CO)_{Alabama}$) for GOVs, according to Table 5-16, is **6.672 g/mi**.

Step 3 – Calculate emissions. Emissions are calculated using the adjusted EFs from Step 4, the VMT_{Total} calculated from Step 2, and Equation 5-3 as shown:

$$E(Pol)_{Total} = VMT_{Total} \times EF(Pol)_{Total} \times 0.002205$$

For POVs:

$$E(CO)_{Total} = 1{,}925{,}586\,\frac{\cancel{miles}}{yr} \times 5.725\,\frac{\cancel{g}}{\cancel{mi}} \times 0.002205\,\frac{lb}{\cancel{g}}$$

$$\boxed{\boldsymbol{E(CO)_{Total} = 24{,}307.88\,\frac{lb}{yr}}}$$

For GOVs:

$$E(CO)_{Total} = 173{,}394 \frac{\cancel{miles}}{yr} \times 6.672 \frac{\cancel{g}}{\cancel{mi}} \times 0.002205 \frac{lb}{\cancel{g}}$$

$$\boxed{\boldsymbol{E(CO)_{Total} = 2{,}550.93 \frac{lb}{yr}}}$$

5.5.2 Problem 2 – Calculating GOV Emissions – Method 2

Anytown Air Force Base is inventorying its CY2016 CO emissions for their 15 GOVs operated by the facility during the year. The Air Force Base is located in Alabama. For this example, vehicle data was collected and organized by vehicle category using the form shown in Figure 5-2.

Step 1 – Gather fleet data and Step 2 – Group vehicle categories. Since the data was available from the Environmental manager, steps 1 and 2 are combined using the form from Figure 5-2.

Installation Name: Anytown AFB			**Inventory Year:** 2016	
Responsible Organization (Name and Office Symbol):				
POC (Name, Phone #, and email):				
Vehicle Category:				
Vehicle Identification Number (VIN)	**Vehicle Description**	**Bldg. Number**	**Model Year**	**Miles Driven (mi/yr)**
LDGV				
Vehicle #1	Sedan	Bldg. 45-2	1999	4,900
Vehicle #10	Sedan	Bldg. 45-2	1999	5,670
Vehicle #11	Sedan	Bldg. 15-1	2004	4,368
Vehicle #15	Sedan	Bldg. 23-6	2002	6,670
Vehicle #8	Sedan	Bldg. 15	1998	2,700
Vehicle #3	Sedan	Bldg. 1	2004	7,400
Vehicle #5	Sedan	Bldg. 10	1997	1,730
Vehicle #9	Sedan	Bldg. 10	1997	1,450
		Average	**2000**	**4,361**
		Total		**34,888**
LDGT				
Vehicle #6	Pickup	Bldg. 15	2000	4,600
Vehicle #7	Pickup	Bldg. 15	2000	5,200
Vehicle #13	Van	Bldg. 15	1999	6,500
Vehicle #14	SUV	Bldg. 15	2003	3,200
		Average	**2000**	**4,875**
		Total		**19,500**
HDGV				
Vehicle #2	Flatbed	Bldg. 15	1998	4,450
		Average	**1998**	**4,450**
		Total		**4,450**
LDDT				
Vehicle #4	Pickup	Bldg. 1	2004	4,300
		Average	**2004**	**4,300**
		Total		**4,300**
HDDV				
Vehicle #12	Fire Truck	Bldg. 45-2	2002	5,300
		Average	**2002**	**5,300**
		Total		**5,300**

Step 3 – Select emission factors: For vehicles in CY 2016 in Alabama, the CO emission factors for each vehicle category are given in Table 5-21. The emission factors are provided in the table below.

Vehicle Category	CO Emission Factor (g/mi)
LDGV	4.374
LDGT	6.824
HDGV	21.430
LDDV	2.776
LDDT	5.903
HDDV	2.322
MC	14.227

Step 4 – Calculate emissions. No information was provided regarding whether or not any of the vehicles operated on alternative fuel. Using the vehicle miles traveled for each vehicle category (VMT_i) from the fleet data, the EFs recorded in Step 3, and Equation 5-6, the emissions are first calculated for each vehicle category as follows:

$$E(Pol)_{Total} = \sum_{i=1}^{7} \left\{ VMT_i \times EF(Pol)_i \times \left[1 - \frac{FERF(Pol)}{100}\right] \times 0.002205 \right\}$$

$$\boldsymbol{E(CO)_{LDGV}} = 34{,}888 \frac{\cancel{mi}}{yr} \times 4.374 \frac{\cancel{g}}{\cancel{mi}} \times \left[1 - \frac{0\%}{100\%}\right] \times 0.002205 \frac{lb}{\cancel{g}} = \boldsymbol{336.5 \frac{lb}{yr}}$$

$$\boldsymbol{E(CO)_{LDGT}} = 19{,}500 \frac{\cancel{mi}}{yr} \times 6.824 \frac{\cancel{g}}{\cancel{mi}} \times \left[1 - \frac{0\%}{100\%}\right] \times 0.002205 \frac{lb}{\cancel{g}} = \boldsymbol{293.4 \frac{lb}{yr}}$$

$$\boldsymbol{E(CO)_{HDGV}} = 4{,}450 \frac{\cancel{mi}}{yr} \times 21.430 \frac{\cancel{g}}{\cancel{mi}} \times \left[1 - \frac{0\%}{100\%}\right] \times 0.002205 \frac{lb}{\cancel{g}} = \boldsymbol{210.3 \frac{lb}{yr}}$$

$$\boldsymbol{E(CO)_{LDDV}} = 0 \frac{\cancel{mi}}{yr} \times 2.776 \frac{\cancel{g}}{\cancel{mi}} \times \left[1 - \frac{0\%}{100\%}\right] \times 0.002205 \frac{lb}{\cancel{g}} = \boldsymbol{0.0 \frac{lb}{yr}}$$

$$\boldsymbol{E(CO)_{LDDT}} = 4{,}300 \frac{\cancel{mi}}{yr} \times 5.903 \frac{\cancel{g}}{\cancel{mi}} \times \left[1 - \frac{0\%}{100\%}\right] \times 0.002205 \frac{lb}{\cancel{g}} = \boldsymbol{56.0 \frac{lb}{yr}}$$

$$\boldsymbol{E(CO)_{HDDV}} = 5{,}300 \frac{\cancel{mi}}{yr} \times 2.322 \frac{\cancel{g}}{\cancel{mi}} \times \left[1 - \frac{0\%}{100\%}\right] \times 0.002205 \frac{lb}{\cancel{g}} = \boldsymbol{27.1 \frac{lb}{yr}}$$

$$\boldsymbol{E(CO)_{MC}} = 0 \frac{\cancel{mi}}{yr} \times 14.227 \frac{\cancel{g}}{\cancel{mi}} \times \left[1 - \frac{0\%}{100\%}\right] \times 0.002205 \frac{lb}{\cancel{g}} = \boldsymbol{0.0 \frac{lb}{yr}}$$

Finally, the total CO emissions are calculated by summing the contributing CO emissions from each vehicle category.

$$E(Pol)_{Total} = \sum_{i=1}^{7} E(Pol)_i$$

$$E(CO)_{TOTAL} = (336.5 + 293.4 + 210.3 + 0 + 56.0 + 27.1 + 0)\frac{lb}{yr}$$

$$\boxed{\boldsymbol{E(CO)_{TOTAL} = 923.3\frac{lb}{yr}}}$$

5.5.3 Problem 3 – Calculating POV Emissions – Method 2

Anytown Air Force Base (located in Alabama) is conducting an emissions inventory to quantify CY 2016 emissions attributable to the operation of POVs. Using the information provided by the Security Forces Squadron, the following data was used to calculate the CY2016 emissions of CO from the operation of POVs. The collected POV data was organized by vehicle category using the form shown in Figure 5-3.

Step 1 – Gather fleet data. Fleet data information is provided in the figure following Step 2.

Step 2 – Group vehicle categories. The first step in grouping the vehicle categories is to calculate the estimated total number of vehicles (N) driving on base. Using the data provided in the form referenced in Step 1, the total number of POVs is estimated as follows:

$$N = Registered + Unregistered$$

$$\boldsymbol{N = 1{,}675 + 125 = 1{,}800\ vehicles}$$

Installation Name: Anytown AFB	**Inventory Year:** 2016
Responsible Organization (Name and Office Symbol): 58 CES/CD	
POC (Name, Phone #, and email): SSgt John Jones, DSN 234-5678	

Question	**Response**
Can you provide the listing of all registered vehicles on base? (Y/N)? If so, be sure to include all specific information (make/model year, etc.) about the vehicles.	N
What is the estimated average number of registered POVs at the installation during the inventory period?	1,675
What is the estimated percentage of registered vehicles which actually travel on the installation during a typical weekday (Monday-Friday)?	75
What is the estimated percentage of registered vehicles which actually travel on the installation during a typical weekend day (Saturday and Sunday)?	50
What is the estimated distance the average POV travels on base during a typical weekday?	6 mi/day
What is the estimated distance the average POV travels on base during a typical weekend day?	4 mi/day
What is the estimated number of non-registered POVs which travel on base during a typical weekday?	125
What is the estimated average model year of all POVs driven on base during the inventory year? (NOTE: This is not required if the average model years are listed below for each vehicle category)	

Using registration information, provide an estimate of the percentage of registered POVs which fall under each of the 7 vehicle categories listed below.

Vehicle Category	**Category Description**	**Estimated % of Registered Vehicles**
LDGV	Light-Duty Gasoline Vehicles – All gasoline-powered passenger cars	36
LDDV	Light-Duty Diesel Vehicles – All diesel-powered passenger cars	1
LDGT	Light-Duty Gasoline Trucks – All smaller gasoline-powered trucks (0 to 8,500 lbs. GVWR)	54
LDDT	Light-Duty Diesel Trucks (LDDT) – All smaller diesel-powered trucks (0 to 8,500 lbs. GVWR)	1
HDGV	Heavy-Duty Gasoline Vehicles (HDGV) – All larger gasoline-powered vehicles (8,501to >60,000 lbs. GVWR)	4
HDDV	Heavy-Duty Diesel Vehicles – All larger diesel-powered vehicles (10,001to >60,000 lbs. GVWR)	3
MC	Motorcycles (MC) – All motorcycles (assumed to be gasoline powered)	1

Next, the number of vehicles which fall under each vehicle category are calculated under the assumption that the fleet mix for the unregistered vehicles is the same as for the registered vehicles. By slightly modifying Equation 5-7, the number of vehicles for each category (n_i) may be derived from the total number of vehicles (N) and vehicle category mix (MIX_i).

$$n_i = N \times \frac{MIX_i}{100}$$

$$\mathbf{n_{LDGV}} = 1{,}800 \times \frac{36\%}{100\%} = \mathbf{648\ Vehicles}$$

$$\mathbf{n_{LDDV}} = 1{,}800 \times \frac{1\%}{100\%} = \mathbf{18\ Vehicles}$$

$$\mathbf{n_{LDGT}} = 1{,}800 \times \frac{54\%}{100\%} = \mathbf{972\ Vehicles}$$

$$\mathbf{n_{LDDT}} = 1{,}800 \times \frac{1\%}{100\%} = \mathbf{18\ Vehicles}$$

$$\mathbf{n_{HDGV}} = 1{,}800 \times \frac{4\%}{100\%} = \mathbf{72\ Vehicles}$$

$$\mathbf{n_{HDDV}} = 1{,}800 \times \frac{3\%}{100\%} = \mathbf{54\ Vehicles}$$

$$\mathbf{n_{MC}} = 1{,}800 \times \frac{1\%}{100\%} = \mathbf{18\ Vehicles}$$

Next, the average annual vehicle miles traveled (AVM_i) is calculated. Using the data provided in the form above, the AVM traveled is calculated as follows:

$$AVM_i = \frac{52\ weeks}{yr} \times \left[\left(\frac{75\%}{100\%} \times 6\frac{mi}{day} \times 5\frac{day}{week}\right) + \left(\frac{50\%}{100\%} \times 4\frac{mi}{day} \times 2\frac{day}{week}\right)\right]$$

$$AVM_i = \frac{52\ weeks}{yr} \times \left[\left(0.75 \times 6\frac{mi}{\cancel{day}} \times 5\frac{\cancel{day}}{week}\right) + \left(0.5 \times 4\frac{mi}{\cancel{day}} \times 2\frac{\cancel{day}}{week}\right)\right]$$

$$AVM_i = \frac{52\ weeks}{yr} \times \left[\left(22.5\frac{mi}{week}\right) + \left(4\frac{mi}{week}\right)\right]$$

$$\boldsymbol{AVM_i} = \frac{52\ \cancel{weeks}}{yr} \times \left[\left(26.5\frac{mi}{\cancel{week}}\right)\right] = \mathbf{1{,}378}\frac{\boldsymbol{mi}}{\boldsymbol{yr}}$$

Finally, the total annual VMT for each category (VMT_i) is calculated using Equation 5-7.

$$VMT_i = AVM_i \times n_i$$

$$\mathbf{VMT_{LDGV}} = 1378\frac{\text{mi}}{\text{yr}} \times 648\ \text{vehicles} = \mathbf{892{,}944}\frac{\mathbf{mi}}{\mathbf{yr}}$$

$$\mathbf{VMT_{LDDV}} = 1378\frac{\text{mi}}{\text{yr}} \times 18\ \text{vehicles} = \mathbf{24{,}804}\frac{\mathbf{mi}}{\mathbf{yr}}$$

$$\mathbf{VMT_{LDGT}} = 1378\frac{\text{mi}}{\text{yr}} \times 972\ \text{vehicles} = \mathbf{1{,}339{,}416}\frac{\mathbf{mi}}{\mathbf{yr}}$$

$$\mathbf{VMT_{LDDT}} = 1378\,\frac{\text{mi}}{\text{yr}} \times 18\text{ vehicles} = \mathbf{24,804}\,\frac{\mathbf{mi}}{\mathbf{yr}}$$

$$\mathbf{VMT_{HDGV}} = 1378\,\frac{\text{mi}}{\text{yr}} \times 72\text{ vehicles} = \mathbf{99,216}\,\frac{\mathbf{mi}}{\mathbf{yr}}$$

$$\mathbf{VMT_{HDDV}} = 1378\,\frac{\text{mi}}{\text{yr}} \times 54\text{ vehicles} = \mathbf{74,412}\,\frac{\mathbf{mi}}{\mathbf{yr}}$$

$$\mathbf{VMT_{MC}} = 1378\,\frac{\text{mi}}{\text{yr}} \times 18\text{ vehicles} = \mathbf{24,804}\,\frac{\mathbf{mi}}{\mathbf{yr}}$$

Step 3 – Select emission factors. EFs for vehicles in CY2016 are provided in Table 5-21. The CO EFs for a base in Alabama for 2016 are provided in the sub-table below.

Vehicle Category	CO Emission Factor (g/mi)
LDGV	4.374
LDDV	6.824
LDGT	21.430
LDDT	2.776
HDGV	5.903
HDDV	2.322
MC	14.227

Step 4 – Calculate emissions. Emissions are calculated using the vehicle miles traveled as calculated in Step 2, the EFs recorded in Step 3, and Equation 5-6. First the CO emissions from each vehicle category are individually calculated and then summed for total CO emissions. Also, since no information was provided regarding the use of alternative fuels, a FERF value of "0" is used.

$$E(Pol)_{Total} = \sum_{i=1}^{n}\left[VMT_i \times EF(Pol)_i \times \frac{FERF(Pol)}{100} \times 0.002205\right]$$

$$\mathbf{E(CO)_{LDGV}} = 892{,}944\,\frac{\cancel{\text{mi}}}{\text{yr}} \times 4.374\,\frac{\text{g}}{\cancel{\text{mi}}} \times \left[1 - \frac{0\%}{100\%}\right] \times 0.002205\,\frac{\text{lb}}{\text{g}} = \mathbf{8612.2}\,\frac{\mathbf{lb}}{\mathbf{yr}}$$

$$\mathbf{E(CO)_{LDDV}} = 24{,}804\,\frac{\cancel{\text{mi}}}{\text{yr}} \times 6.824\,\frac{\text{g}}{\cancel{\text{mi}}} \times \left[1 - \frac{0\%}{100\%}\right] \times 0.002205\,\frac{\text{lb}}{\text{g}} = \mathbf{373.2}\,\frac{\mathbf{lb}}{\mathbf{yr}}$$

$$\mathbf{E(CO)_{LDGT}} = 1{,}339{,}416\,\frac{\cancel{\text{mi}}}{\text{yr}} \times 21.430\,\frac{\text{g}}{\cancel{\text{mi}}} \times \left[1 - \frac{0\%}{100\%}\right] \times 0.002205\,\frac{\text{lb}}{\text{g}} = \mathbf{63,291.6}\,\frac{\mathbf{lb}}{\mathbf{yr}}$$

$$\mathbf{E(CO)_{LDDT}} = 24{,}804\,\frac{\cancel{\text{mi}}}{\text{yr}} \times 2.776\,\frac{\text{g}}{\cancel{\text{mi}}} \times \left[1 - \frac{0\%}{100\%}\right] \times 0.002205\,\frac{\text{lb}}{\text{g}} = \mathbf{151.8}\,\frac{\mathbf{lb}}{\mathbf{yr}}$$

$$\mathbf{E(CO)_{HDGV}} = 99{,}216\,\frac{\cancel{mi}}{yr} \times\ 5.903\,\frac{\cancel{g}}{\cancel{mi}} \times \left[1 - \frac{0\%}{100\%}\right] \times 0.002205\ \frac{lb}{\cancel{g}} = \mathbf{1{,}291.4}\ \frac{\mathbf{lb}}{\mathbf{yr}}$$

$$\mathbf{E(CO)_{HDDV}} = 74{,}412\,\frac{\cancel{mi}}{yr} \times 2.322\,\frac{\cancel{g}}{\cancel{mi}} \times \left[1 - \frac{0\%}{100\%}\right] \times 0.002205\ \frac{lb}{\cancel{g}} = \mathbf{381.0}\ \frac{\mathbf{lb}}{\mathbf{yr}}$$

$$\mathbf{E(CO)_{MC}} = 24{,}804\,\frac{\cancel{mi}}{yr} \times 14.227\,\frac{\cancel{g}}{\cancel{mi}} \times \left[1 - \frac{0\%}{100\%}\right] \times 0.002205\ \frac{lb}{\cancel{g}} = \mathbf{778.1}\,\frac{\mathbf{lb}}{\mathbf{yr}}$$

The total CO emissions are calculated by summing the CO emissions from each contributing vehicle category:

$$E(Pol)_{Total} = \sum_{i=1}^{n} E(Pol)_i$$

$$E(CO)_{Total} = (8{,}612.2 + 373.2 + 63{,}291.6 + 151.8 + 1{,}291.4 + 381.0 + 778.1)\,\frac{lb}{yr}$$

$$\boxed{\boldsymbol{E(CO)_{TOTAL} = 74{,}879.3\,\frac{lb}{yr}}}$$

5.5.4 Problem 4 – Calculating POV Emissions – Method 3

An Air Force base is interested in determining the NO_X generated by the operation of POVs driven on base. There are approximately 600 POVs that average 3,700 miles per year, but no vehicle studies have been performed to describe the vehicle mix. Using the typical Air Force vehicle mix, determine the NO_X generated by the operation of these vehicles on base for CY 2016. The base is located in Colorado.

Step 1 – Gather fleet data. The problem statement provided information regarding the number of POVs (**N = 600**) and the average vehicle miles driven by each vehicle (**AVM = 3,700 miles per year**).

Step 2 – Group vehicle categories. The first step is to determine the total annual vehicle miles traveled (VMT_{Total}) for all vehicles. The problem statement provided information regarding the average vehicle miles travelled for all POVs (AVM), but not the average miles travelled for each vehicle category (AVM_i). Therefore, the appropriate method for calculating the total annual vehicle miles travelled for all vehicles utilizes Equation 5-4 as shown:

$$VMT_{Total} = AVM \times N$$

$$\boldsymbol{VMT_{Total}} = 3{,}700\,\frac{mi}{yr} \times 600 = \mathbf{2{,}220{,}000}\,\frac{\boldsymbol{mi}}{\boldsymbol{yr}}$$

Since the typical Air Force vehicle mix is assumed for this example, the vehicle mix (MIX_i) for each category for POVs has been extracted from Table 5-2 and presented in the following sub-table.

Vehicle Category	POV Vehicle Mix (%)
LDGV	56.17
LDDV	0.88
LDGT	34.62
LDDT	1.00
HDGV	0.62
HDDV	0.22
MC	4.49
LDGV (H)	1.70
LDGT (H)	0.24
LDGV (C)	0.06
LDGT (C)	0.00
HDGV (C)	0.00

Step 3 – Select emission factors. The EFs for CY 2016 POVs are presented in Table 5-21. The EFs for NO_X in Colorado have been extracted from the table and presented in the following sub-table.

Vehicle Category	NO_X Emission Factor (g/mi)
LDGV	0.470
LDDV	0.199
LDGT	0.829
LDDT	0.656
HDGV	2.547
HDDV	7.464
MC	0.847

Step 4 – Calculate emissions. First, a total composite emission factor is calculated by taking the product of the EF for each vehicle category ($EF(Pol)_i$ – from the sub-table in Step 3), the vehicle mix value for the corresponding vehicle category (MIX_i – from the sub-table in Step 2), and the appropriate FERF from Table 5-9. These values are calculated as follows:

$$EF(Pol)_{Total} = \sum_{i=1}^{n} \left\{ EF(Pol)_i \times \frac{MIX_i}{100} \times \left[1 - \frac{FERF(Pol)}{100} \right] \right\}$$

$$\boldsymbol{EF(NO_X)_{LDGV}} = 0.470 \frac{g}{mi} \times \left(\frac{56.17\%}{100\%} \right) \times \left[1 - \frac{0\%}{100\%} \right] = \mathbf{0.264} \frac{\boldsymbol{g}}{\boldsymbol{mi}}$$

$$\boldsymbol{EF(NO_X)_{LDDV}} = 0.199 \frac{g}{mi} \times \left(\frac{0.88\%}{100\%} \right) \times \left[1 - \frac{0\%}{100\%} \right] = \mathbf{0.00175} \frac{\boldsymbol{g}}{\boldsymbol{mi}}$$

$$\boldsymbol{EF(NO_X)_{LDGT}} = 0.829 \frac{g}{mi} \times \left(\frac{34.62\%}{100\%} \right) \times \left[1 - \frac{0\%}{100\%} \right] = \mathbf{0.287} \frac{\boldsymbol{g}}{\boldsymbol{mi}}$$

$$\boldsymbol{EF(NO_X)_{LDDT}} = 0.656 \frac{g}{mi} \times \left(\frac{1.00\%}{100\%} \right) \times \left[1 - \frac{0\%}{100\%} \right] = \mathbf{0.00656} \frac{\boldsymbol{g}}{\boldsymbol{mi}}$$

$$\boldsymbol{EF(NO_X)_{HDGV}} = 2.547 \frac{g}{mi} \times \left(\frac{0.62\%}{100\%} \right) \times \left[1 - \frac{0\%}{100\%} \right] = \mathbf{0.0158} \frac{\boldsymbol{g}}{\boldsymbol{mi}}$$

$$\boldsymbol{EF(NO_X)_{HDDV}} = 7.464 \frac{g}{mi} \times \left(\frac{0.22\%}{100\%} \right) \times \left[1 - \frac{0\%}{100\%} \right] = \mathbf{0.0164} \frac{\boldsymbol{g}}{\boldsymbol{mi}}$$

$$\boldsymbol{EF(NO_X)_{MC}} = 0.847 \frac{g}{mi} \times \left(\frac{4.49\%}{100\%} \right) \times \left[1 - \frac{0\%}{100\%} \right] = \mathbf{0.0380} \frac{\boldsymbol{g}}{\boldsymbol{mi}}$$

$$\boldsymbol{EF(NO_X)_{LDGV(H)}} = 0.470 \frac{g}{mi} \times \left(\frac{1.70\%}{100\%} \right) \times \left[1 - \frac{75\%}{100\%} \right] = \mathbf{0.00200} \frac{\boldsymbol{g}}{\boldsymbol{mi}}$$

$$\boldsymbol{EF(NO_X)_{LDGT(H)}} = 0.829 \frac{g}{mi} \times \left(\frac{0.24\%}{100\%} \right) \times \left[1 - \frac{75\%}{100\%} \right] = \mathbf{0.000497} \frac{\boldsymbol{g}}{\boldsymbol{mi}}$$

$$\boldsymbol{EF(NO_X)_{LDGV\,(C)}} = 0.470 \frac{g}{mi} \times \left(\frac{0.06\%}{100\%} \right) \times \left[1 - \frac{35\%}{100\%} \right] = \mathbf{0.000183} \frac{\boldsymbol{g}}{\boldsymbol{mi}}$$

$$\boldsymbol{EF(NO_X)_{LDGT\,(C)}} = 0.829 \frac{g}{mi} \times \left(\frac{0.00\%}{100\%} \right) \times \left[1 - \frac{35\%}{100\%} \right] = \mathbf{0.00} \frac{\boldsymbol{g}}{\boldsymbol{mi}}$$

$$\boldsymbol{EF(NO_X)_{HDGV\,(C)}} = 2.547 \frac{g}{mi} \times \left(\frac{0.00\%}{100\%} \right) \times \left[1 - \frac{35\%}{100\%} \right] = \mathbf{0.00} \frac{\boldsymbol{g}}{\boldsymbol{mi}}$$

Next, sum these values for a total composite emission factor ($EF(Pol)_{Total}$) as shown:

$$EF(Pol)_{Total} = \sum_{i=1}^{n} EF(Pol)_i$$

$$\boldsymbol{EF(NO_X)_{Total}} = (0.264 + 0.00175 + 0.287 + 0.00656 + 0.0158 + 0.0164 + 0.0380 + 0.00200 + 0.000497 + 0.000183 + 0.00 + 0.00)\frac{g}{mi} = \mathbf{0.632}\,\frac{\boldsymbol{g}}{\boldsymbol{mi}}$$

Finally, using the total vehicle miles traveled (VMT_{Total}) from Step 2 and the total composite emission factor, the total NO_X emissions are calculated using Equation 5-8 as shown:

$$E(Pol)_{Total} = VMT_{Total} \times EF(Pol)_{Total} \times 0.002205$$

$$E(NO_X)_{Total} = 2{,}220{,}000\,\frac{\cancel{mi}}{yr} \times 0.632\,\frac{\cancel{g}}{\cancel{mi}} \times 0.002205\,\frac{lb}{\cancel{g}}$$

$$\boxed{\boldsymbol{E(NO_X)_{Total} = 3{,}093.7\,\frac{lb}{yr}}}$$

5.5.5 Problem 5 – Calculating Fugitive PM Emissions

Determine the fugitive PM_{10} generated from the POVs and GOVs provided in Problem 1 given that the base is located in central Alabama. It can be assumed that 100% of all miles traveled by POVs are on paved roads, whereas GOVs traveled 90% on paved roads and 10% on unpaved roads.

Step 1 – Gather fleet data. Calculation of fugitive PM_{10} emissions from on-road vehicle operation requires that the total vehicle miles driven (VMT_{Total}) for POVs and GOVs is known. These values have been calculated in Step 1 of Problem 1: **$VMT_{Total\ -\ POV}$ = 1,925,586** and **$VMT_{Total\ -\ GOV}$ = 173,394 miles/year**.

Step 2 – Select emission factors. Fugitive PM_{10} EFs are provided in Table 5-10. For POVs, the EFs for paved and unpaved roads are **0.058** and **466.206 g/mi,** respectively. Similarly, for GOVs, the EFs for paved and unpaved roads are **0.069** and **505.981 g/mi,** respectively.

Once selected, the emission factors must be corrected to account for precipitation at the base. It is given that the base is located in central Alabama. Based on this information, a review of Figure 5-1 reveals that the base is estimated to have 110 days in the year with precipitation of 0.01 inches or more. The EFs are corrected using this value and Equation 5-1 or Equation 5-2.

For POVs:

$$EF(\text{Pol})_{CP} = EF(Pol)_P \times \left(1 - \frac{P}{4N}\right)$$

$$EF(\text{PM}_{10})_{CP} = 0.058\frac{g}{mi} \times \left(1 - \frac{110}{4\times365}\right)$$

$$\boldsymbol{EF(\text{PM}_{10})_{CP}} = 0.058\frac{g}{mi} \times \left(1 - \frac{110}{1460}\right) = \mathbf{0.054}\,\boldsymbol{\frac{g}{mi}}$$

For GOVs:

$$EF(\text{PM}_{10})_{CP} = 0.069\frac{g}{mi} \times \left(1 - \frac{110}{4\times365}\right)$$

$$\boldsymbol{EF(\text{PM}_{10})_{CP}} = 0.069\frac{g}{mi} \times \left(1 - \frac{110}{1460}\right) = \mathbf{0.064}\,\boldsymbol{\frac{g}{mi}}$$

$$EF(\text{Pol})_{CU} = EF(Pol)_U \times \left(1 - \frac{P}{N}\right)$$

$$\boldsymbol{EF(\text{PM}_{10})_{CU}} = 505.981\frac{g}{mi} \times \left(1 - \frac{110}{365}\right) = \mathbf{353.494}\,\boldsymbol{\frac{g}{mi}}$$

Step 3 – Calculate emissions. Using the VMT_{Total} for POVs and GOVs as recorded in Step 1, the estimated percentage of driving on paved and unpaved roads (as given in the problem statement), and Equation 5-17, emissions are calculated as follows:

$$E(Pol)_{Total} = VMT_{Total} \times \left[\left(\frac{\%VMT_P}{100} \times EF(Pol)_{CP}\right) + \left(\frac{\%VMT_U}{100} \times EF(Pol)_{CU}\right)\right] \times 0.002205$$

For POVs:

$$E(PM_{10})_{Total} = 1{,}925{,}586\frac{mi}{yr} \times \left[\left(\frac{100\%}{100\%} \times 0.054\frac{g}{mi}\right) + (0)\right] \times 0.002205\frac{lb}{g}$$

$$E(PM_{10})_{Total} = 1{,}925{,}586\frac{\cancel{mi}}{yr} \times \left[\left(1 \times 0.054\frac{\cancel{g}}{\cancel{mi}}\right)\right] \times 0.002205\frac{lb}{\cancel{g}}$$

$$\boxed{\boldsymbol{E(PM_{10})_{Total} = 229.3\frac{lb}{yr}}}$$

For GOVs:

$$E(PM_{10})_{Total} = 173{,}394\frac{mi}{yr} \times \left[\left(\frac{90\%}{100\%} \times 0.064\frac{g}{mi}\right) + \left(\frac{10\%}{100\%} \times 353.494\frac{g}{mi}\right)\right] \times 0.002205\frac{lb}{g}$$

$$E(PM_{10})_{Total} = 173{,}394\frac{mi}{yr} \times \left[\left(0.9 \times 0.064\frac{g}{mi}\right) + \left(0.1 \times 353.494\frac{g}{mi}\right)\right] \times 0.002205\frac{lb}{g}$$

$$E(PM_{10})_{Total} = 173{,}394\frac{mi}{yr} \times \left[\left(0.0576\frac{g}{mi}\right) + \left(35.3494\frac{g}{mi}\right)\right] \times 0.002205\frac{lb}{g}$$

$$E(PM_{10})_{Total} = 173{,}394\frac{\cancel{mi}}{yr} \times \left[35.407\frac{\cancel{g}}{\cancel{mi}}\right] \times 0.002205\frac{lb}{\cancel{g}}$$

$$\boxed{\boldsymbol{E(PM_{10})_{Total} = 13{,}537.3\frac{lb}{yr}}}$$

Table 5-11. Air Force/State/Territory-Specific On-Road Vehicle Composite Emission Factors – 2016 POV

State	Vehicle Type	Emission Factors (g/mi)							
		Criteria Pollutants and Ozone Precursors							
		NO_x	SO_2	CO	VOC	PM_{10}	$PM_{2.5}$	CO_2	NH_3
ALABAMA	All Vehicles	0.632	0.008	5.725	0.628	0.011	0.010	404.576	0.029
ALASKA	All Vehicles	0.675	0.008	6.230	0.664	0.023	0.020	400.765	0.030
ARIZONA	All Vehicles	0.583	0.005	5.507	0.613	0.010	0.009	413.358	0.030
ARKANSAS	All Vehicles	0.650	0.008	5.900	0.616	0.012	0.010	397.066	0.029
COLORADO	All Vehicles	0.632	0.008	5.565	0.601	0.015	0.014	402.349	0.030
CONNECTICUT	All Vehicles	0.561	0.008	5.062	0.523	0.015	0.013	402.760	0.030
DELAWARE	All Vehicles	0.593	0.008	4.967	0.537	0.012	0.011	406.453	0.030
DISTRICT OF COLUMBIA	All Vehicles	0.546	0.008	4.922	0.526	0.013	0.011	422.919	0.028
FLORIDA	All Vehicles	0.602	0.008	6.036	0.657	0.010	0.009	424.256	0.030
GEORGIA	All Vehicles	0.602	0.008	5.421	0.588	0.012	0.010	399.774	0.030
HAWAII	All Vehicles	0.599	0.008	5.837	0.623	0.009	0.008	412.955	0.030
IDAHO	All Vehicles	0.673	0.008	5.803	0.619	0.015	0.013	397.924	0.029
ILLINOIS	All Vehicles	0.607	0.008	5.670	0.601	0.014	0.013	415.921	0.030
INDIANA	All Vehicles	0.640	0.008	5.997	0.614	0.013	0.012	406.460	0.030
IOWA	All Vehicles	0.668	0.008	6.034	0.641	0.016	0.014	397.049	0.029
KANSAS	All Vehicles	0.660	0.008	5.932	0.626	0.014	0.012	398.701	0.029
KENTUCKY	All Vehicles	0.655	0.008	5.973	0.607	0.012	0.011	395.581	0.030
LOUISIANA	All Vehicles	0.618	0.008	5.834	0.628	0.011	0.009	406.649	0.030
MAINE	All Vehicles	0.662	0.008	5.672	0.628	0.018	0.016	388.496	0.029
MARYLAND	All Vehicles	0.600	0.008	5.131	0.548	0.013	0.012	401.834	0.030
MASSACHUSETTS	All Vehicles	0.603	0.008	5.280	0.563	0.015	0.014	400.570	0.030
MICHIGAN	All Vehicles	0.665	0.008	6.275	0.629	0.015	0.013	403.952	0.030
MINNESOTA	All Vehicles	0.659	0.008	6.113	0.647	0.019	0.017	399.568	0.029
MISSISSIPPI	All Vehicles	0.629	0.008	5.708	0.625	0.011	0.010	398.915	0.029
MISSOURI	All Vehicles	0.639	0.008	5.729	0.595	0.013	0.012	392.563	0.029
MONTANA	All Vehicles	0.700	0.008	6.111	0.643	0.017	0.015	390.785	0.029
NEBRASKA	All Vehicles	0.677	0.008	6.081	0.642	0.016	0.014	397.015	0.030
NEVADA	All Vehicles	0.646	0.008	5.350	0.619	0.012	0.010	413.858	0.030
NEW HAMPSHIRE	All Vehicles	0.606	0.008	5.242	0.575	0.016	0.015	397.588	0.029
NEW JERSEY	All Vehicles	0.593	0.008	5.042	0.521	0.014	0.012	391.770	0.030
NEW MEXICO	All Vehicles	0.679	0.008	5.667	0.632	0.013	0.011	397.137	0.030
NEW YORK	All Vehicles	0.548	0.008	4.881	0.523	0.015	0.013	404.104	0.030
NORTH CAROLINA	All Vehicles	0.634	0.008	5.621	0.616	0.012	0.011	402.096	0.030
NORTH DAKOTA	All Vehicles	0.681	0.008	6.364	0.681	0.021	0.019	392.145	0.029
OHIO	All Vehicles	0.612	0.008	5.802	0.591	0.014	0.012	406.250	0.028
OKLAHOMA	All Vehicles	0.651	0.008	5.915	0.631	0.012	0.010	403.427	0.030
OREGON	All Vehicles	0.636	0.008	5.386	0.569	0.013	0.011	394.103	0.029
PACIFIC ISLANDS	All Vehicles	0.602	0.007	5.414	0.575	0.012	0.011	402.111	0.030
PENNSYLVANIA	All Vehicles	0.604	0.008	5.380	0.571	0.015	0.013	403.925	0.030
PUERTO RICO	All Vehicles	0.585	0.008	6.467	0.659	0.009	0.008	427.104	0.030
RHODE ISLAND	All Vehicles	0.559	0.008	4.993	0.525	0.015	0.013	406.841	0.030
SOUTH CAROLINA	All Vehicles	0.642	0.008	5.795	0.628	0.011	0.010	402.783	0.030
SOUTH DAKOTA	All Vehicles	0.681	0.008	6.176	0.653	0.018	0.016	391.141	0.029
TENNESSEE	All Vehicles	0.626	0.008	5.693	0.602	0.012	0.011	403.274	0.030
TEXAS	All Vehicles	0.582	0.008	5.408	0.580	0.010	0.009	405.811	0.030
UTAH	All Vehicles	0.640	0.008	5.663	0.607	0.015	0.013	408.272	0.030
VERMONT	All Vehicles	0.620	0.008	5.420	0.608	0.018	0.016	389.361	0.029
VIRGIN ISLANDS	All Vehicles	0.575	0.008	6.093	0.628	0.008	0.007	405.304	0.029
VIRGINIA	All Vehicles	0.623	0.008	5.489	0.585	0.013	0.012	402.392	0.030
WASHINGTON	All Vehicles	0.616	0.008	5.513	0.567	0.014	0.012	398.996	0.030
WEST VIRGINIA	All Vehicles	0.660	0.008	5.933	0.613	0.013	0.012	392.030	0.029
WISCONSIN	All Vehicles	0.645	0.008	5.874	0.625	0.017	0.015	397.063	0.029
WYOMING	All Vehicles	0.709	0.008	6.259	0.659	0.017	0.015	392.890	0.030

Table 5-12. Air Force/State/Territory-Specific On-Road Vehicle Composite Emission Factors – 2017 POV

State	Vehicle Type	Emission Factors (g/mi)							
		Criteria Pollutants and Ozone Precursors							
		NO_x	SO_2	CO	VOC	PM_{10}	$PM_{2.5}$	CO_2	NH_3
ALABAMA	All Vehicles	0.470	0.003	5.200	0.555	0.010	0.009	394.896	0.028
ALASKA	All Vehicles	0.511	0.003	5.733	0.584	0.020	0.018	391.336	0.028
ARIZONA	All Vehicles	0.469	0.003	5.107	0.550	0.009	0.008	403.438	0.028
ARKANSAS	All Vehicles	0.487	0.003	5.418	0.546	0.011	0.009	387.602	0.028
COLORADO	All Vehicles	0.477	0.003	5.126	0.540	0.014	0.013	392.791	0.028
CONNECTICUT	All Vehicles	0.422	0.003	4.697	0.468	0.013	0.012	393.181	0.028
DELAWARE	All Vehicles	0.447	0.003	4.600	0.479	0.011	0.010	396.746	0.028
DISTRICT OF COLUMBIA	All Vehicles	0.411	0.003	4.587	0.474	0.011	0.010	412.776	0.026
FLORIDA	All Vehicles	0.447	0.003	5.475	0.580	0.009	0.008	414.035	0.028
GEORGIA	All Vehicles	0.449	0.003	4.929	0.520	0.010	0.009	390.229	0.028
HAWAII	All Vehicles	0.448	0.003	5.347	0.549	0.008	0.007	403.013	0.028
IDAHO	All Vehicles	0.506	0.003	5.319	0.553	0.014	0.012	388.486	0.028
ILLINOIS	All Vehicles	0.455	0.003	5.142	0.532	0.013	0.012	405.992	0.028
INDIANA	All Vehicles	0.478	0.003	5.320	0.544	0.013	0.011	396.779	0.028
IOWA	All Vehicles	0.503	0.003	5.542	0.566	0.014	0.013	387.642	0.028
KANSAS	All Vehicles	0.495	0.003	5.446	0.554	0.012	0.011	389.217	0.028
KENTUCKY	All Vehicles	0.489	0.003	5.363	0.537	0.012	0.010	386.177	0.028
LOUISIANA	All Vehicles	0.459	0.003	5.301	0.554	0.010	0.008	396.909	0.028
MAINE	All Vehicles	0.496	0.003	5.158	0.551	0.016	0.014	379.326	0.028
MARYLAND	All Vehicles	0.450	0.003	4.747	0.488	0.012	0.011	392.261	0.028
MASSACHUSETTS	All Vehicles	0.455	0.003	4.852	0.500	0.014	0.012	391.057	0.028
MICHIGAN	All Vehicles	0.497	0.003	5.523	0.557	0.015	0.013	394.359	0.028
MINNESOTA	All Vehicles	0.497	0.003	5.639	0.575	0.017	0.015	390.114	0.028
MISSISSIPPI	All Vehicles	0.468	0.003	5.186	0.552	0.010	0.009	389.381	0.028
MISSOURI	All Vehicles	0.479	0.003	5.271	0.526	0.012	0.011	383.243	0.028
MONTANA	All Vehicles	0.527	0.003	5.598	0.573	0.015	0.014	381.561	0.028
NEBRASKA	All Vehicles	0.509	0.003	5.586	0.568	0.014	0.012	387.605	0.028
NEVADA	All Vehicles	0.482	0.003	4.910	0.547	0.011	0.009	403.943	0.028
NEW HAMPSHIRE	All Vehicles	0.453	0.003	4.805	0.509	0.015	0.013	387.355	0.028
NEW JERSEY	All Vehicles	0.447	0.003	4.679	0.465	0.012	0.011	382.475	0.028
NEW MEXICO	All Vehicles	0.508	0.003	5.204	0.563	0.012	0.010	387.685	0.028
NEW YORK	All Vehicles	0.412	0.003	4.516	0.468	0.014	0.012	394.489	0.028
NORTH CAROLINA	All Vehicles	0.471	0.003	5.104	0.543	0.011	0.010	392.493	0.028
NORTH DAKOTA	All Vehicles	0.515	0.003	5.867	0.606	0.019	0.017	382.915	0.028
OHIO	All Vehicles	0.457	0.003	5.125	0.525	0.013	0.012	396.576	0.026
OKLAHOMA	All Vehicles	0.487	0.003	5.428	0.559	0.011	0.010	393.796	0.028
OREGON	All Vehicles	0.478	0.003	4.942	0.507	0.012	0.011	384.736	0.028
PACIFIC ISLANDS	All Vehicles	0.458	0.003	4.954	0.512	0.011	0.010	392.517	0.028
PENNSYLVANIA	All Vehicles	0.453	0.003	4.868	0.506	0.013	0.012	394.313	0.028
PUERTO RICO	All Vehicles	0.437	0.003	5.924	0.581	0.008	0.007	416.807	0.028
RHODE ISLAND	All Vehicles	0.422	0.003	4.660	0.472	0.013	0.012	397.154	0.028
SOUTH CAROLINA	All Vehicles	0.477	0.003	5.267	0.554	0.010	0.009	393.157	0.028
SOUTH DAKOTA	All Vehicles	0.513	0.003	5.697	0.582	0.016	0.014	381.910	0.028
TENNESSEE	All Vehicles	0.466	0.003	5.112	0.534	0.011	0.010	393.651	0.028
TEXAS	All Vehicles	0.433	0.003	4.961	0.515	0.009	0.008	396.095	0.028
UTAH	All Vehicles	0.480	0.003	5.202	0.544	0.014	0.012	398.553	0.028
VERMONT	All Vehicles	0.465	0.003	4.909	0.535	0.016	0.014	380.174	0.028
VIRGIN ISLANDS	All Vehicles	0.430	0.003	5.575	0.553	0.007	0.006	395.562	0.027
VIRGINIA	All Vehicles	0.467	0.003	5.048	0.519	0.012	0.010	392.799	0.028
WASHINGTON	All Vehicles	0.463	0.003	5.062	0.506	0.013	0.011	389.509	0.028
WEST VIRGINIA	All Vehicles	0.493	0.003	5.301	0.542	0.013	0.011	382.727	0.028
WISCONSIN	All Vehicles	0.487	0.003	5.419	0.555	0.015	0.014	387.666	0.028
WYOMING	All Vehicles	0.534	0.003	5.735	0.588	0.016	0.014	383.619	0.028

Table 5-13. Air Force/State/Territory-Specific On-Road Vehicle Composite Emission Factors – 2018 POV

State	Vehicle Type	Emission Factors (g/mi)							
		Criteria Pollutants and Ozone Precursors							
		NO_x	SO_2	CO	VOC	PM_{10}	$PM_{2.5}$	CO_2	NH_3
ALABAMA	All Vehicles	0.408	0.003	4.871	0.506	0.009	0.008	384.939	0.026
ALASKA	All Vehicles	0.447	0.003	5.366	0.536	0.018	0.016	381.635	0.026
ARIZONA	All Vehicles	0.407	0.003	4.795	0.504	0.008	0.008	393.233	0.027
ARKANSAS	All Vehicles	0.424	0.003	5.083	0.497	0.010	0.009	377.865	0.026
COLORADO	All Vehicles	0.418	0.003	4.809	0.495	0.013	0.012	382.959	0.027
CONNECTICUT	All Vehicles	0.369	0.003	4.411	0.431	0.012	0.011	383.329	0.027
DELAWARE	All Vehicles	0.387	0.003	4.310	0.439	0.010	0.009	386.771	0.026
DISTRICT OF COLUMBIA	All Vehicles	0.358	0.003	4.313	0.436	0.011	0.009	402.348	0.025
FLORIDA	All Vehicles	0.387	0.003	5.129	0.529	0.008	0.007	403.523	0.027
GEORGIA	All Vehicles	0.391	0.003	4.619	0.475	0.010	0.009	380.410	0.026
HAWAII	All Vehicles	0.388	0.003	5.016	0.500	0.008	0.007	392.788	0.026
IDAHO	All Vehicles	0.441	0.003	4.974	0.504	0.013	0.011	378.778	0.026
ILLINOIS	All Vehicles	0.395	0.003	4.794	0.486	0.012	0.011	395.783	0.027
INDIANA	All Vehicles	0.417	0.003	4.972	0.498	0.012	0.011	386.822	0.026
IOWA	All Vehicles	0.439	0.003	5.190	0.517	0.013	0.012	377.963	0.026
KANSAS	All Vehicles	0.432	0.003	5.105	0.505	0.011	0.010	379.460	0.026
KENTUCKY	All Vehicles	0.426	0.003	5.019	0.491	0.011	0.010	376.501	0.026
LOUISIANA	All Vehicles	0.398	0.003	4.970	0.506	0.009	0.008	386.889	0.026
MAINE	All Vehicles	0.433	0.002	4.817	0.503	0.014	0.013	369.892	0.026
MARYLAND	All Vehicles	0.390	0.003	4.444	0.446	0.011	0.010	382.414	0.027
MASSACHUSETTS	All Vehicles	0.394	0.003	4.514	0.456	0.013	0.011	381.271	0.027
MICHIGAN	All Vehicles	0.433	0.003	5.158	0.509	0.013	0.012	384.492	0.027
MINNESOTA	All Vehicles	0.434	0.003	5.252	0.525	0.016	0.014	380.387	0.026
MISSISSIPPI	All Vehicles	0.406	0.003	4.859	0.504	0.009	0.008	379.574	0.026
MISSOURI	All Vehicles	0.417	0.003	4.937	0.480	0.011	0.010	373.653	0.026
MONTANA	All Vehicles	0.461	0.003	5.233	0.523	0.014	0.012	372.070	0.026
NEBRASKA	All Vehicles	0.445	0.003	5.234	0.518	0.013	0.011	377.925	0.026
NEVADA	All Vehicles	0.417	0.003	4.601	0.501	0.010	0.009	393.748	0.027
NEW HAMPSHIRE	All Vehicles	0.393	0.003	4.472	0.464	0.013	0.012	377.683	0.026
NEW JERSEY	All Vehicles	0.389	0.003	4.387	0.426	0.011	0.010	372.911	0.026
NEW MEXICO	All Vehicles	0.443	0.003	4.879	0.513	0.011	0.009	377.962	0.026
NEW YORK	All Vehicles	0.361	0.003	4.246	0.431	0.012	0.011	384.601	0.027
NORTH CAROLINA	All Vehicles	0.409	0.003	4.778	0.496	0.010	0.009	382.615	0.026
NORTH DAKOTA	All Vehicles	0.450	0.003	5.458	0.554	0.017	0.015	373.415	0.026
OHIO	All Vehicles	0.398	0.003	4.793	0.481	0.012	0.011	386.626	0.025
OKLAHOMA	All Vehicles	0.424	0.003	5.090	0.509	0.010	0.009	383.888	0.026
OREGON	All Vehicles	0.417	0.003	4.623	0.463	0.011	0.010	375.101	0.026
PACIFIC ISLANDS	All Vehicles	0.398	0.003	4.642	0.468	0.010	0.009	382.651	0.026
PENNSYLVANIA	All Vehicles	0.393	0.003	4.549	0.463	0.012	0.011	384.427	0.027
PUERTO RICO	All Vehicles	0.378	0.003	5.560	0.530	0.008	0.007	406.212	0.027
RHODE ISLAND	All Vehicles	0.369	0.003	4.385	0.435	0.012	0.011	387.192	0.027
SOUTH CAROLINA	All Vehicles	0.415	0.003	4.936	0.506	0.010	0.009	383.256	0.026
SOUTH DAKOTA	All Vehicles	0.448	0.003	5.306	0.531	0.015	0.013	372.411	0.026
TENNESSEE	All Vehicles	0.405	0.003	4.783	0.487	0.010	0.009	383.752	0.026
TEXAS	All Vehicles	0.376	0.003	4.653	0.469	0.009	0.008	386.100	0.026
UTAH	All Vehicles	0.418	0.003	4.870	0.497	0.013	0.011	388.556	0.027
VERMONT	All Vehicles	0.404	0.002	4.567	0.487	0.015	0.013	370.722	0.026
VIRGIN ISLANDS	All Vehicles	0.372	0.003	5.227	0.503	0.007	0.006	385.534	0.026
VIRGINIA	All Vehicles	0.406	0.003	4.732	0.475	0.011	0.010	382.931	0.027
WASHINGTON	All Vehicles	0.405	0.003	4.742	0.462	0.012	0.010	379.752	0.027
WEST VIRGINIA	All Vehicles	0.430	0.003	4.959	0.496	0.012	0.010	373.155	0.026
WISCONSIN	All Vehicles	0.424	0.003	5.045	0.506	0.014	0.012	377.997	0.026
WYOMING	All Vehicles	0.467	0.003	5.364	0.537	0.015	0.013	374.080	0.026

Table 5-14. Air Force/State/Territory-Specific On-Road Vehicle Composite Emission Factors – 2019 POV

State	Vehicle Type	Emission Factors (g/mi)							
		Criteria Pollutants and Ozone Precursors							
		NO_x	SO_2	CO	VOC	PM_{10}	$PM_{2.5}$	CO_2	NH_3
ALABAMA	All Vehicles	0.355	0.003	4.579	0.463	0.009	0.008	374.938	0.025
ALASKA	All Vehicles	0.393	0.003	5.040	0.489	0.017	0.015	367.212	0.025
ARIZONA	All Vehicles	0.354	0.002	4.516	0.465	0.008	0.007	382.982	0.025
ARKANSAS	All Vehicles	0.371	0.002	4.785	0.459	0.009	0.008	368.084	0.025
COLORADO	All Vehicles	0.368	0.003	4.526	0.458	0.012	0.011	373.084	0.025
CONNECTICUT	All Vehicles	0.324	0.003	4.155	0.398	0.011	0.010	373.433	0.025
DELAWARE	All Vehicles	0.337	0.003	4.050	0.405	0.010	0.009	376.752	0.025
DISTRICT OF COLUMBIA	All Vehicles	0.312	0.003	4.067	0.404	0.010	0.009	391.876	0.024
FLORIDA	All Vehicles	0.336	0.003	4.823	0.484	0.008	0.007	392.963	0.025
GEORGIA	All Vehicles	0.342	0.002	4.344	0.436	0.009	0.008	370.547	0.025
HAWAII	All Vehicles	0.337	0.003	4.721	0.459	0.007	0.007	382.517	0.025
IDAHO	All Vehicles	0.386	0.002	4.667	0.463	0.012	0.010	369.026	0.025
ILLINOIS	All Vehicles	0.344	0.003	4.487	0.445	0.011	0.010	385.528	0.026
INDIANA	All Vehicles	0.364	0.003	4.663	0.456	0.011	0.010	376.820	0.025
IOWA	All Vehicles	0.385	0.002	4.878	0.476	0.012	0.011	368.240	0.025
KANSAS	All Vehicles	0.378	0.002	4.802	0.466	0.010	0.009	369.659	0.025
KENTUCKY	All Vehicles	0.373	0.002	4.714	0.450	0.010	0.009	366.783	0.025
LOUISIANA	All Vehicles	0.347	0.003	4.675	0.463	0.008	0.008	376.823	0.025
MAINE	All Vehicles	0.379	0.002	4.516	0.461	0.013	0.012	360.416	0.025
MARYLAND	All Vehicles	0.339	0.003	4.176	0.410	0.010	0.009	372.523	0.025
MASSACHUSETTS	All Vehicles	0.343	0.003	4.218	0.417	0.012	0.010	371.442	0.025
MICHIGAN	All Vehicles	0.380	0.003	4.835	0.466	0.012	0.011	374.581	0.025
MINNESOTA	All Vehicles	0.380	0.002	4.911	0.482	0.014	0.013	370.617	0.025
MISSISSIPPI	All Vehicles	0.354	0.002	4.569	0.461	0.009	0.008	369.722	0.025
MISSOURI	All Vehicles	0.365	0.002	4.640	0.442	0.010	0.009	364.020	0.025
MONTANA	All Vehicles	0.379	0.002	4.450	0.425	0.011	0.010	357.433	0.025
NEBRASKA	All Vehicles	0.390	0.002	4.922	0.478	0.012	0.010	368.199	0.025
NEVADA	All Vehicles	0.362	0.003	4.326	0.462	0.009	0.008	383.506	0.025
NEW HAMPSHIRE	All Vehicles	0.342	0.002	4.180	0.425	0.012	0.011	367.968	0.025
NEW JERSEY	All Vehicles	0.340	0.002	4.127	0.392	0.010	0.009	363.305	0.025
NEW MEXICO	All Vehicles	0.387	0.002	4.590	0.475	0.010	0.009	368.195	0.025
NEW YORK	All Vehicles	0.317	0.003	4.002	0.398	0.011	0.010	374.668	0.025
NORTH CAROLINA	All Vehicles	0.356	0.003	4.489	0.453	0.009	0.008	372.693	0.025
NORTH DAKOTA	All Vehicles	0.395	0.002	5.098	0.508	0.016	0.014	363.873	0.025
OHIO	All Vehicles	0.349	0.003	4.499	0.441	0.011	0.010	376.632	0.023
OKLAHOMA	All Vehicles	0.371	0.003	4.789	0.470	0.009	0.008	373.936	0.025
OREGON	All Vehicles	0.365	0.002	4.341	0.425	0.010	0.009	365.424	0.025
PACIFIC ISLANDS	All Vehicles	0.348	0.002	4.364	0.431	0.010	0.009	372.741	0.025
PENNSYLVANIA	All Vehicles	0.343	0.003	4.266	0.424	0.011	0.010	374.498	0.025
PUERTO RICO	All Vehicles	0.329	0.003	5.234	0.486	0.008	0.007	395.568	0.025
RHODE ISLAND	All Vehicles	0.325	0.003	4.138	0.403	0.011	0.010	377.187	0.025
SOUTH CAROLINA	All Vehicles	0.362	0.003	4.642	0.463	0.009	0.008	373.311	0.025
SOUTH DAKOTA	All Vehicles	0.393	0.002	4.963	0.487	0.013	0.012	362.869	0.025
TENNESSEE	All Vehicles	0.353	0.003	4.491	0.446	0.010	0.009	373.810	0.025
TEXAS	All Vehicles	0.328	0.003	4.380	0.433	0.008	0.007	376.059	0.025
UTAH	All Vehicles	0.366	0.003	4.575	0.458	0.012	0.010	378.515	0.025
VERMONT	All Vehicles	0.352	0.002	4.266	0.445	0.013	0.012	361.226	0.025
VIRGIN ISLANDS	All Vehicles	0.324	0.003	4.917	0.460	0.007	0.006	375.458	0.025
VIRGINIA	All Vehicles	0.355	0.003	4.450	0.436	0.010	0.009	373.019	0.025
WASHINGTON	All Vehicles	0.356	0.002	4.457	0.426	0.011	0.010	369.953	0.025
WEST VIRGINIA	All Vehicles	0.376	0.002	4.656	0.454	0.011	0.009	363.541	0.025
WISCONSIN	All Vehicles	0.371	0.002	4.716	0.463	0.013	0.011	368.286	0.025
WYOMING	All Vehicles	0.411	0.002	5.034	0.494	0.013	0.012	364.496	0.025

Table 5-15. Air Force/State/Territory-Specific On-Road Vehicle Composite Emission Factors – 2020 POV

State	Vehicle Type	Emission Factors (g/mi)							
		Criteria Pollutants and Ozone Precursors							
		NO_x	SO_2	CO	VOC	PM_{10}	$PM_{2.5}$	CO_2	NH_3
ALABAMA	All Vehicles	0.313	0.002	4.334	0.429	0.008	0.007	364.855	0.024
ALASKA	All Vehicles	0.349	0.002	4.762	0.458	0.015	0.013	362.059	0.024
ARIZONA	All Vehicles	0.311	0.002	4.282	0.435	0.008	0.007	372.647	0.025
ARKANSAS	All Vehicles	0.328	0.002	4.534	0.425	0.009	0.008	358.223	0.024
COLORADO	All Vehicles	0.326	0.002	4.287	0.428	0.011	0.010	363.128	0.025
CONNECTICUT	All Vehicles	0.287	0.002	3.936	0.372	0.010	0.009	363.457	0.025
DELAWARE	All Vehicles	0.296	0.002	3.828	0.376	0.009	0.008	366.650	0.024
DISTRICT OF COLUMBIA	All Vehicles	0.275	0.003	3.857	0.377	0.009	0.008	381.322	0.023
FLORIDA	All Vehicles	0.294	0.003	4.566	0.448	0.008	0.007	382.317	0.025
GEORGIA	All Vehicles	0.301	0.002	4.113	0.405	0.009	0.008	360.603	0.024
HAWAII	All Vehicles	0.296	0.003	4.476	0.426	0.007	0.006	372.164	0.024
IDAHO	All Vehicles	0.341	0.002	4.409	0.431	0.011	0.010	359.193	0.024
ILLINOIS	All Vehicles	0.302	0.003	4.228	0.412	0.010	0.009	375.193	0.025
INDIANA	All Vehicles	0.322	0.002	4.404	0.423	0.010	0.009	366.737	0.024
IOWA	All Vehicles	0.341	0.002	4.614	0.441	0.011	0.010	358.436	0.024
KANSAS	All Vehicles	0.334	0.002	4.546	0.432	0.010	0.009	359.777	0.024
KENTUCKY	All Vehicles	0.330	0.002	4.459	0.418	0.009	0.008	356.984	0.024
LOUISIANA	All Vehicles	0.305	0.002	4.428	0.429	0.008	0.007	366.674	0.024
MAINE	All Vehicles	0.336	0.002	4.261	0.427	0.012	0.011	350.860	0.024
MARYLAND	All Vehicles	0.298	0.002	3.949	0.381	0.010	0.009	362.552	0.025
MASSACHUSETTS	All Vehicles	0.301	0.002	3.967	0.385	0.011	0.009	361.534	0.025
MICHIGAN	All Vehicles	0.336	0.002	4.563	0.432	0.011	0.010	364.589	0.025
MINNESOTA	All Vehicles	0.337	0.002	4.625	0.446	0.013	0.012	360.765	0.024
MISSISSIPPI	All Vehicles	4.309	0.002	0.313	0.427	0.008	0.007	359.789	0.024
MISSOURI	All Vehicles	0.323	0.002	4.390	0.409	0.010	0.008	354.307	0.024
MONTANA	All Vehicles	0.360	0.002	4.639	0.447	0.012	0.010	352.920	0.024
NEBRASKA	All Vehicles	0.346	0.002	4.658	0.443	0.011	0.010	358.394	0.024
NEVADA	All Vehicles	0.317	0.003	4.096	0.432	0.009	0.008	373.183	0.025
NEW HAMPSHIRE	All Vehicles	0.301	0.002	3.931	0.392	0.011	0.010	358.172	0.024
NEW JERSEY	All Vehicles	0.301	0.002	3.905	0.364	0.010	0.009	353.618	0.024
NEW MEXICO	All Vehicles	0.342	0.002	4.346	0.441	0.009	0.008	358.348	0.024
NEW YORK	All Vehicles	0.280	0.002	3.794	0.372	0.011	0.009	364.655	0.025
NORTH CAROLINA	All Vehicles	0.314	0.002	4.245	0.420	0.009	0.008	362.691	0.024
NORTH DAKOTA	All Vehicles	0.350	0.002	4.796	0.469	0.014	0.013	354.249	0.024
OHIO	All Vehicles	0.308	0.002	4.251	0.410	0.010	0.009	366.557	0.022
OKLAHOMA	All Vehicles	0.327	0.002	4.536	0.436	0.009	0.008	363.902	0.024
OREGON	All Vehicles	0.323	0.002	4.104	0.395	0.010	0.009	355.669	0.024
PACIFIC ISLANDS	All Vehicles	0.307	0.002	4.130	0.400	0.009	0.008	362.751	0.024
PENNSYLVANIA	All Vehicles	0.302	0.002	4.027	0.393	0.010	0.009	364.488	0.025
PUERTO RICO	All Vehicles	0.288	0.003	4.964	0.452	0.007	0.006	384.836	0.025
RHODE ISLAND	All Vehicles	0.288	0.002	3.926	0.376	0.010	0.009	367.101	0.025
SOUTH CAROLINA	All Vehicles	0.318	0.002	4.395	0.429	0.009	0.008	363.284	0.024
SOUTH DAKOTA	All Vehicles	0.349	0.002	4.675	0.449	0.012	0.011	353.246	0.024
TENNESSEE	All Vehicles	0.310	0.002	4.246	0.414	0.009	0.008	363.787	0.024
TEXAS	All Vehicles	0.289	0.002	4.150	0.402	0.008	0.007	365.935	0.024
UTAH	All Vehicles	0.323	0.002	4.326	0.427	0.011	0.010	368.393	0.025
VERMONT	All Vehicles	0.310	0.002	4.011	0.411	0.012	0.011	351.651	0.024
VIRGIN ISLANDS	All Vehicles	0.284	0.002	4.660	0.426	0.006	0.006	365.295	0.024
VIRGINIA	All Vehicles	0.314	0.002	4.213	0.405	0.009	0.008	363.027	0.025
WASHINGTON	All Vehicles	0.316	0.002	4.218	0.396	0.010	0.009	360.075	0.025
WEST VIRGINIA	All Vehicles	0.333	0.002	4.402	0.422	0.010	0.009	353.847	0.024
WISCONSIN	All Vehicles	0.328	0.002	4.439	0.428	0.012	0.010	358.493	0.024
WYOMING	All Vehicles	0.365	0.002	4.757	0.459	0.012	0.011	354.832	0.024

Table 5-16. Air Force/State/Territory-Specific On-Road Vehicle Composite Emission Factors – 2016 GOV

State	Vehicle Type	Emission Factors (g/mi)							
		Criteria Pollutants and Ozone Precursors							
		NO_x	SO_2	CO	VOC	PM_{10}	$PM_{2.5}$	CO_2	NH_3
ALABAMA	All Vehicles	2.229	0.010	6.672	0.631	0.074	0.067	741.289	0.027
ALASKA	All Vehicles	2.596	0.010	6.789	0.695	0.084	0.077	732.083	0.027
ARIZONA	All Vehicles	2.401	0.008	6.761	0.618	0.075	0.069	764.306	0.027
ARKANSAS	All Vehicles	2.369	0.010	6.822	0.638	0.073	0.067	736.527	0.027
COLORADO	All Vehicles	2.398	0.010	6.520	0.613	0.077	0.071	734.534	0.027
CONNECTICUT	All Vehicles	2.107	0.010	6.162	0.540	0.076	0.069	728.862	0.026
DELAWARE	All Vehicles	1.993	0.010	6.003	0.533	0.074	0.068	726.197	0.026
DISTRICT OF COLUMBIA	All Vehicles	2.023	0.010	6.169	0.540	0.080	0.073	759.282	0.027
FLORIDA	All Vehicles	2.094	0.010	7.160	0.651	0.076	0.070	775.496	0.027
GEORGIA	All Vehicles	2.275	0.010	6.456	0.613	0.074	0.067	737.781	0.027
HAWAII	All Vehicles	1.926	0.010	6.906	0.591	0.072	0.066	747.936	0.026
IDAHO	All Vehicles	2.514	0.010	6.621	0.641	0.077	0.070	729.792	0.027
ILLINOIS	All Vehicles	2.119	0.010	6.697	0.605	0.079	0.072	747.778	0.027
INDIANA	All Vehicles	2.335	0.010	6.852	0.636	0.077	0.070	739.963	0.027
IOWA	All Vehicles	2.458	0.010	6.741	0.661	0.077	0.071	729.970	0.027
KANSAS	All Vehicles	2.326	0.010	6.761	0.632	0.074	0.068	730.878	0.027
KENTUCKY	All Vehicles	2.498	0.010	6.872	0.653	0.075	0.069	736.635	0.027
LOUISIANA	All Vehicles	2.230	0.010	6.860	0.639	0.073	0.067	750.882	0.027
MAINE	All Vehicles	2.487	0.009	6.325	0.653	0.077	0.070	716.087	0.027
MARYLAND	All Vehicles	2.194	0.010	6.208	0.571	0.075	0.068	732.484	0.027
MASSACHUSETTS	All Vehicles	2.238	0.010	6.298	0.588	0.076	0.070	728.009	0.027
MICHIGAN	All Vehicles	2.388	0.010	7.045	0.653	0.078	0.071	736.245	0.027
MINNESOTA	All Vehicles	2.277	0.010	6.740	0.640	0.078	0.071	722.569	0.027
MISSISSIPPI	All Vehicles	2.195	0.010	6.609	0.620	0.072	0.066	732.839	0.027
MISSOURI	All Vehicles	2.326	0.010	6.624	0.616	0.073	0.067	725.322	0.027
MONTANA	All Vehicles	2.649	0.010	6.756	0.672	0.078	0.071	724.372	0.027
NEBRASKA	All Vehicles	2.557	0.010	6.856	0.675	0.078	0.071	736.057	0.027
NEVADA	All Vehicles	2.459	0.010	6.556	0.626	0.077	0.071	757.589	0.027
NEW HAMPSHIRE	All Vehicles	2.936	0.010	6.202	0.641	0.094	0.086	807.019	0.027
NEW JERSEY	All Vehicles	2.593	0.010	6.124	0.611	0.077	0.070	737.097	0.027
NEW MEXICO	All Vehicles	2.582	0.010	6.603	0.650	0.075	0.069	736.041	0.027
NEW YORK	All Vehicles	2.156	0.010	5.921	0.547	0.077	0.070	731.170	0.027
NORTH CAROLINA	All Vehicles	2.179	0.010	6.543	0.612	0.073	0.067	732.022	0.027
NORTH DAKOTA	All Vehicles	2.525	0.010	6.825	0.688	0.080	0.073	720.940	0.027
OHIO	All Vehicles	2.241	0.010	6.714	0.606	0.076	0.070	736.263	0.027
OKLAHOMA	All Vehicles	2.311	0.010	6.845	0.636	0.074	0.068	740.752	0.027
OREGON	All Vehicles	2.374	0.010	6.323	0.600	0.074	0.068	721.710	0.027
PACIFIC ISLANDS	All Vehicles	2.274	0.009	6.443	0.601	0.075	0.069	736.175	0.027
PENNSYLVANIA	All Vehicles	2.348	0.010	6.396	0.613	0.077	0.071	738.482	0.027
PUERTO RICO	All Vehicles	1.896	0.010	7.627	0.627	0.074	0.068	779.317	0.027
RHODE ISLAND	All Vehicles	2.208	0.010	6.106	0.559	0.078	0.071	738.513	0.027
SOUTH CAROLINA	All Vehicles	2.382	0.010	6.776	0.655	0.075	0.069	746.259	0.027
SOUTH DAKOTA	All Vehicles	2.620	0.010	6.829	0.686	0.079	0.072	728.277	0.027
TENNESSEE	All Vehicles	2.341	0.010	6.712	0.630	0.075	0.069	742.317	0.027
TEXAS	All Vehicles	2.166	0.010	6.553	0.592	0.073	0.067	747.046	0.027
UTAH	All Vehicles	2.386	0.010	6.683	0.618	0.078	0.072	742.891	0.027
VERMONT	All Vehicles	2.478	0.009	6.184	0.643	0.078	0.071	718.822	0.027
VIRGIN ISLANDS	All Vehicles	1.712	0.010	6.985	0.563	0.065	0.059	736.118	0.026
VIRGINIA	All Vehicles	2.328	0.010	6.486	0.617	0.076	0.069	738.913	0.027
WASHINGTON	All Vehicles	2.390	0.010	6.517	0.610	0.076	0.070	731.372	0.027
WEST VIRGINIA	All Vehicles	2.428	0.010	6.732	0.642	0.074	0.068	725.124	0.027
WISCONSIN	All Vehicles	2.377	0.010	6.600	0.643	0.077	0.071	725.042	0.027
WYOMING	All Vehicles	2.778	0.010	6.938	0.700	0.080	0.073	733.620	0.027

Table 5-17. Air Force/State/Territory-Specific On-Road Vehicle Composite Emission Factors – 2017 GOV

State	Vehicle Type	Emission Factors (g/mi)							
		Criteria Pollutants and Ozone Precursors							
		NO_x	SO_2	CO	VOC	PM_{10}	$PM_{2.5}$	CO_2	NH_3
ALABAMA	All Vehicles	1.888	0.006	5.970	0.544	0.065	0.059	726.991	0.026
ALASKA	All Vehicles	2.227	0.006	6.136	0.609	0.074	0.068	717.965	0.026
ARIZONA	All Vehicles	2.105	0.006	6.176	0.545	0.066	0.061	749.625	0.026
ARKANSAS	All Vehicles	2.022	0.006	6.157	0.555	0.065	0.059	722.307	0.026
COLORADO	All Vehicles	2.041	0.006	5.887	0.538	0.069	0.063	720.412	0.026
CONNECTICUT	All Vehicles	1.775	0.006	5.603	0.470	0.067	0.061	714.930	0.025
DELAWARE	All Vehicles	1.665	0.006	5.446	0.461	0.065	0.059	712.261	0.025
DISTRICT OF COLUMBIA	All Vehicles	1.696	0.006	5.623	0.469	0.070	0.064	744.880	0.026
FLORIDA	All Vehicles	1.767	0.006	6.404	0.559	0.067	0.061	760.667	0.026
GEORGIA	All Vehicles	1.937	0.006	5.780	0.530	0.065	0.059	723.552	0.026
HAWAII	All Vehicles	1.608	0.006	6.218	0.506	0.063	0.058	733.611	0.025
IDAHO	All Vehicles	2.147	0.006	5.958	0.563	0.068	0.062	715.691	0.026
ILLINOIS	All Vehicles	1.778	0.006	5.989	0.522	0.069	0.064	733.540	0.026
INDIANA	All Vehicles	1.983	0.006	6.011	0.554	0.068	0.063	725.713	0.026
IOWA	All Vehicles	2.102	0.006	6.084	0.577	0.068	0.062	715.859	0.026
KANSAS	All Vehicles	1.975	0.006	6.100	0.549	0.066	0.060	716.784	0.026
KENTUCKY	All Vehicles	2.142	0.006	6.093	0.571	0.067	0.061	722.404	0.026
LOUISIANA	All Vehicles	1.894	0.006	6.143	0.552	0.065	0.059	736.419	0.026
MAINE	All Vehicles	2.127	0.005	5.662	0.568	0.068	0.062	702.221	0.026
MARYLAND	All Vehicles	1.857	0.006	5.637	0.496	0.066	0.060	718.431	0.026
MASSACHUSETTS	All Vehicles	1.898	0.006	5.693	0.512	0.067	0.062	714.038	0.026
MICHIGAN	All Vehicles	2.028	0.006	6.147	0.569	0.069	0.063	722.080	0.026
MINNESOTA	All Vehicles	1.927	0.006	6.103	0.559	0.069	0.063	708.659	0.026
MISSISSIPPI	All Vehicles	1.858	0.006	5.914	0.536	0.063	0.058	718.677	0.026
MISSOURI	All Vehicles	1.980	0.006	5.991	0.536	0.065	0.059	711.349	0.026
MONTANA	All Vehicles	2.275	0.006	6.083	0.592	0.069	0.063	710.348	0.026
NEBRASKA	All Vehicles	2.194	0.006	6.190	0.590	0.069	0.063	721.840	0.026
NEVADA	All Vehicles	2.089	0.006	5.911	0.542	0.068	0.062	743.052	0.026
NEW HAMPSHIRE	All Vehicles	1.927	0.005	5.530	0.518	0.067	0.061	706.578	0.026
NEW JERSEY	All Vehicles	2.247	0.006	5.573	0.539	0.068	0.062	722.847	0.026
NEW MEXICO	All Vehicles	2.210	0.006	5.958	0.568	0.067	0.061	721.812	0.026
NEW YORK	All Vehicles	1.826	0.006	5.369	0.477	0.067	0.062	717.140	0.026
NORTH CAROLINA	All Vehicles	1.836	0.006	5.850	0.527	0.065	0.059	717.929	0.026
NORTH DAKOTA	All Vehicles	2.164	0.006	6.185	0.606	0.071	0.065	706.996	0.026
OHIO	All Vehicles	1.895	0.006	5.866	0.528	0.068	0.062	722.115	0.026
OKLAHOMA	All Vehicles	1.963	0.006	6.174	0.552	0.065	0.060	726.473	0.026
OREGON	All Vehicles	2.022	0.006	5.687	0.525	0.066	0.060	707.766	0.026
PACIFIC ISLANDS	All Vehicles	1.945	0.006	5.799	0.524	0.066	0.061	722.005	0.026
PENNSYLVANIA	All Vehicles	2.001	0.006	5.704	0.533	0.068	0.063	724.268	0.026
PUERTO RICO	All Vehicles	1.588	0.006	6.876	0.537	0.065	0.060	764.495	0.026
RHODE ISLAND	All Vehicles	1.874	0.006	5.575	0.489	0.069	0.063	724.375	0.026
SOUTH CAROLINA	All Vehicles	2.033	0.006	6.067	0.567	0.066	0.060	731.857	0.026
SOUTH DAKOTA	All Vehicles	2.255	0.006	6.190	0.605	0.070	0.064	714.195	0.026
TENNESSEE	All Vehicles	1.994	0.006	5.942	0.548	0.067	0.061	728.016	0.026
TEXAS	All Vehicles	1.837	0.006	5.919	0.513	0.064	0.059	732.694	0.026
UTAH	All Vehicles	2.023	0.006	6.020	0.541	0.069	0.063	728.651	0.026
VERMONT	All Vehicles	2.126	0.005	5.521	0.560	0.068	0.063	704.910	0.026
VIRGIN ISLANDS	All Vehicles	1.421	0.006	6.290	0.482	0.057	0.052	721.892	0.025
VIRGINIA	All Vehicles	1.982	0.006	5.863	0.536	0.067	0.061	724.689	0.026
WASHINGTON	All Vehicles	2.038	0.006	5.865	0.534	0.068	0.062	717.300	0.026
WEST VIRGINIA	All Vehicles	2.072	0.006	5.942	0.560	0.066	0.060	711.110	0.026
WISCONSIN	All Vehicles	2.027	0.006	5.983	0.562	0.068	0.063	711.055	0.026
WYOMING	All Vehicles	2.396	0.006	6.251	0.618	0.071	0.065	719.431	0.026

Table 5-18. Air Force/State/Territory-Specific On-Road Vehicle Composite Emission Factors – 2018 GOV

State	Vehicle Type	Emission Factors (g/mi)							
		Criteria Pollutants and Ozone Precursors							
		NO_x	SO_2	CO	VOC	PM_{10}	$PM_{2.5}$	CO_2	NH_3
ALABAMA	All Vehicles	1.688	0.006	5.504	0.486	0.057	0.052	712.605	0.025
ALASKA	All Vehicles	2.007	0.005	5.666	0.550	0.065	0.059	703.784	0.025
ARIZONA	All Vehicles	1.888	0.006	5.711	0.487	0.058	0.053	734.841	0.025
ARKANSAS	All Vehicles	1.817	0.006	5.688	0.497	0.057	0.052	708.023	0.025
COLORADO	All Vehicles	1.829	0.005	5.436	0.483	0.060	0.055	706.201	0.025
CONNECTICUT	All Vehicles	1.576	0.005	5.173	0.421	0.058	0.053	700.880	0.025
DELAWARE	All Vehicles	1.468	0.006	5.018	0.410	0.057	0.052	698.403	0.024
DISTRICT OF COLUMBIA	All Vehicles	1.498	0.006	5.194	0.418	0.061	0.056	730.297	0.025
FLORIDA	All Vehicles	1.574	0.006	5.905	0.496	0.058	0.054	745.696	0.025
GEORGIA	All Vehicles	1.737	0.006	5.332	0.475	0.057	0.052	709.247	0.025
HAWAII	All Vehicles	1.421	0.006	5.737	0.448	0.055	0.050	719.147	0.025
IDAHO	All Vehicles	1.929	0.005	5.491	0.505	0.060	0.054	701.525	0.025
ILLINOIS	All Vehicles	1.574	0.006	5.504	0.465	0.061	0.055	719.148	0.025
INDIANA	All Vehicles	1.775	0.006	5.535	0.496	0.060	0.055	711.369	0.025
IOWA	All Vehicles	1.891	0.005	5.616	0.519	0.060	0.055	701.689	0.025
KANSAS	All Vehicles	1.768	0.005	5.631	0.492	0.057	0.053	702.614	0.025
KENTUCKY	All Vehicles	1.932	0.006	5.620	0.513	0.059	0.054	708.120	0.025
LOUISIANA	All Vehicles	1.697	0.006	5.669	0.493	0.057	0.052	721.869	0.025
MAINE	All Vehicles	1.915	0.005	5.214	0.511	0.060	0.054	688.313	0.025
MARYLAND	All Vehicles	1.654	0.005	5.195	0.443	0.057	0.053	704.276	0.025
MASSACHUSETTS	All Vehicles	1.691	0.005	5.227	0.457	0.059	0.054	699.968	0.025
MICHIGAN	All Vehicles	1.816	0.005	5.659	0.510	0.061	0.055	707.826	0.025
MINNESOTA	All Vehicles	1.720	0.005	5.605	0.501	0.060	0.055	694.661	0.025
MISSISSIPPI	All Vehicles	1.661	0.005	5.454	0.478	0.055	0.051	704.439	0.025
MISSOURI	All Vehicles	1.776	0.005	5.528	0.480	0.057	0.052	697.309	0.025
MONTANA	All Vehicles	2.054	0.005	5.609	0.534	0.060	0.055	696.285	0.025
NEBRASKA	All Vehicles	1.979	0.006	5.718	0.531	0.060	0.055	707.569	0.025
NEVADA	All Vehicles	1.867	0.006	5.452	0.484	0.060	0.055	728.400	0.025
NEW HAMPSHIRE	All Vehicles	1.721	0.005	5.078	0.463	0.059	0.054	692.605	0.025
NEW JERSEY	All Vehicles	2.036	0.006	5.147	0.486	0.060	0.055	708.561	0.026
NEW MEXICO	All Vehicles	1.990	0.005	5.501	0.509	0.058	0.053	707.525	0.025
NEW YORK	All Vehicles	1.628	0.005	4.962	0.429	0.059	0.054	703.002	0.025
NORTH CAROLINA	All Vehicles	1.635	0.005	5.389	0.470	0.056	0.052	703.738	0.025
NORTH DAKOTA	All Vehicles	1.949	0.005	5.683	0.546	0.062	0.057	693.006	0.025
OHIO	All Vehicles	1.691	0.005	5.402	0.473	0.059	0.054	707.861	0.025
OKLAHOMA	All Vehicles	1.758	0.006	5.700	0.494	0.057	0.052	712.111	0.025
OREGON	All Vehicles	1.812	0.005	5.238	0.470	0.058	0.053	693.753	0.025
PACIFIC ISLANDS	All Vehicles	1.740	0.005	5.349	0.468	0.058	0.053	707.744	0.025
PENNSYLVANIA	All Vehicles	1.793	0.006	5.251	0.478	0.060	0.055	709.965	0.025
PUERTO RICO	All Vehicles	1.406	0.006	6.351	0.476	0.057	0.052	749.508	0.025
RHODE ISLAND	All Vehicles	1.672	0.006	5.158	0.440	0.060	0.055	710.121	0.025
SOUTH CAROLINA	All Vehicles	1.827	0.006	5.598	0.508	0.058	0.053	717.383	0.025
SOUTH DAKOTA	All Vehicles	2.038	0.005	5.693	0.545	0.061	0.056	700.076	0.025
TENNESSEE	All Vehicles	1.788	0.006	5.475	0.490	0.058	0.053	713.632	0.025
TEXAS	All Vehicles	1.642	0.006	5.465	0.457	0.056	0.051	718.243	0.025
UTAH	All Vehicles	1.807	0.006	5.550	0.484	0.061	0.055	714.301	0.025
VERMONT	All Vehicles	1.914	0.005	5.071	0.503	0.060	0.055	690.955	0.025
VIRGIN ISLANDS	All Vehicles	1.253	0.005	5.806	0.426	0.050	0.045	707.564	0.024
VIRGINIA	All Vehicles	1.776	0.006	5.410	0.480	0.058	0.053	710.379	0.025
WASHINGTON	All Vehicles	1.829	0.005	5.408	0.479	0.059	0.054	703.145	0.025
WEST VIRGINIA	All Vehicles	1.864	0.005	5.477	0.502	0.058	0.053	697.041	0.025
WISCONSIN	All Vehicles	1.817	0.005	5.496	0.504	0.060	0.055	696.997	0.025
WYOMING	All Vehicles	2.169	0.005	5.768	0.558	0.062	0.057	705.208	0.026

Table 5-19. Air Force/State/Territory-Specific On-Road Vehicle Composite Emission Factors – 2019 GOV

State	Vehicle Type	Emission Factors (g/mi)							
		Criteria Pollutants and Ozone Precursors							
		NO_x	SO_2	CO	VOC	PM_{10}	$PM_{2.5}$	CO_2	NH_3
ALABAMA	All Vehicles	1.513	0.005	5.093	0.435	0.050	0.046	699.118	0.024
ALASKA	All Vehicles	1.814	0.005	5.251	0.441	0.057	0.052	628.724	0.025
ARIZONA	All Vehicles	1.699	0.005	5.298	0.438	0.051	0.047	720.979	0.025
ARKANSAS	All Vehicles	1.639	0.005	5.274	0.448	0.050	0.046	694.637	0.024
COLORADO	All Vehicles	1.644	0.005	5.038	0.437	0.053	0.048	692.878	0.024
CONNECTICUT	All Vehicles	1.403	0.005	4.793	0.379	0.051	0.047	687.701	0.024
DELAWARE	All Vehicles	1.297	0.005	4.638	0.366	0.050	0.045	685.404	0.024
DISTRICT OF COLUMBIA	All Vehicles	1.325	0.006	4.814	0.375	0.053	0.049	716.614	0.024
FLORIDA	All Vehicles	1.405	0.006	5.464	0.443	0.051	0.047	731.652	0.024
GEORGIA	All Vehicles	1.563	0.005	4.936	0.427	0.050	0.046	695.838	0.024
HAWAII	All Vehicles	1.258	0.005	5.311	0.399	0.048	0.044	705.577	0.024
IDAHO	All Vehicles	1.739	0.005	5.079	0.456	0.052	0.048	688.250	0.024
ILLINOIS	All Vehicles	1.396	0.005	5.078	0.415	0.053	0.048	705.646	0.024
INDIANA	All Vehicles	1.594	0.005	5.116	0.446	0.053	0.048	697.923	0.024
IOWA	All Vehicles	1.707	0.005	5.204	0.469	0.053	0.048	688.412	0.024
KANSAS	All Vehicles	1.588	0.005	5.218	0.443	0.051	0.046	689.332	0.024
KENTUCKY	All Vehicles	1.748	0.005	5.204	0.463	0.052	0.047	694.738	0.025
LOUISIANA	All Vehicles	1.525	0.005	5.250	0.442	0.050	0.046	708.227	0.024
MAINE	All Vehicles	1.729	0.005	4.821	0.462	0.052	0.048	675.284	0.024
MARYLAND	All Vehicles	1.477	0.005	4.805	0.398	0.050	0.046	691.002	0.024
MASSACHUSETTS	All Vehicles	1.511	0.005	4.819	0.410	0.052	0.047	686.776	0.024
MICHIGAN	All Vehicles	1.632	0.005	5.229	0.459	0.053	0.049	694.464	0.024
MINNESOTA	All Vehicles	1.540	0.005	5.168	0.451	0.053	0.048	681.539	0.024
MISSISSIPPI	All Vehicles	1.489	0.005	5.048	0.428	0.049	0.044	691.094	0.024
MISSOURI	All Vehicles	1.597	0.005	5.121	0.433	0.050	0.046	684.151	0.024
MONTANA	All Vehicles	1.836	0.005	4.771	0.438	0.052	0.048	679.049	0.025
NEBRASKA	All Vehicles	1.791	0.005	5.301	0.481	0.053	0.049	694.198	0.025
NEVADA	All Vehicles	1.674	0.006	5.047	0.434	0.052	0.048	714.662	0.025
NEW HAMPSHIRE	All Vehicles	1.541	0.005	4.682	0.416	0.051	0.047	679.507	0.024
NEW JERSEY	All Vehicles	1.850	0.005	4.772	0.441	0.053	0.048	695.180	0.025
NEW MEXICO	All Vehicles	1.797	0.005	5.098	0.460	0.051	0.047	694.138	0.025
NEW YORK	All Vehicles	1.454	0.005	4.600	0.387	0.052	0.047	689.745	0.024
NORTH CAROLINA	All Vehicles	1.460	0.005	4.983	0.420	0.050	0.045	690.434	0.024
NORTH DAKOTA	All Vehicles	1.761	0.005	5.244	0.494	0.055	0.050	679.901	0.024
OHIO	All Vehicles	1.514	0.005	4.993	0.425	0.052	0.048	694.497	0.024
OKLAHOMA	All Vehicles	1.579	0.005	5.282	0.444	0.050	0.046	698.646	0.024
OREGON	All Vehicles	1.629	0.005	4.843	0.423	0.051	0.046	680.621	0.024
PACIFIC ISLANDS	All Vehicles	1.561	0.005	4.951	0.421	0.051	0.047	694.375	0.024
PENNSYLVANIA	All Vehicles	1.612	0.005	4.852	0.430	0.053	0.048	696.558	0.024
PUERTO RICO	All Vehicles	1.247	0.006	5.887	0.423	0.050	0.046	735.441	0.024
RHODE ISLAND	All Vehicles	1.496	0.005	4.788	0.397	0.053	0.048	696.754	0.024
SOUTH CAROLINA	All Vehicles	1.648	0.005	5.185	0.456	0.051	0.047	703.818	0.025
SOUTH DAKOTA	All Vehicles	1.848	0.005	5.257	0.493	0.054	0.049	686.851	0.025
TENNESSEE	All Vehicles	1.609	0.005	5.063	0.440	0.051	0.047	700.149	0.024
TEXAS	All Vehicles	1.471	0.005	5.063	0.410	0.049	0.045	704.693	0.024
UTAH	All Vehicles	1.619	0.005	5.135	0.435	0.053	0.049	700.846	0.024
VERMONT	All Vehicles	1.729	0.005	4.676	0.454	0.053	0.048	677.883	0.024
VIRGIN ISLANDS	All Vehicles	1.106	0.005	5.377	0.379	0.043	0.040	694.122	0.023
VIRGINIA	All Vehicles	1.597	0.005	5.010	0.432	0.051	0.047	696.965	0.024
WASHINGTON	All Vehicles	1.645	0.005	5.005	0.432	0.052	0.048	689.877	0.024
WEST VIRGINIA	All Vehicles	1.681	0.005	5.067	0.453	0.051	0.047	683.860	0.024
WISCONSIN	All Vehicles	1.634	0.005	5.070	0.454	0.053	0.048	683.822	0.024
WYOMING	All Vehicles	1.972	0.005	5.343	0.506	0.055	0.050	691.886	0.025

Table 5-20. Air Force/State/Territory-Specific On-Road Vehicle Composite Emission Factors – 2020 GOV

State	Vehicle Type	Emission Factors (g/mi)							
		Criteria Pollutants and Ozone Precursors							
		NO_x	SO_2	CO	VOC	PM_{10}	$PM_{2.5}$	CO_2	NH_3
ALABAMA	All Vehicles	1.361	0.005	4.749	0.393	0.044	0.040	686.373	0.024
ALASKA	All Vehicles	1.645	0.005	4.902	0.456	0.050	0.046	677.949	0.024
ARIZONA	All Vehicles	1.532	0.005	4.953	0.397	0.045	0.041	707.881	0.024
ARKANSAS	All Vehicles	1.482	0.005	4.928	0.407	0.044	0.040	681.990	0.024
COLORADO	All Vehicles	1.481	0.005	4.704	0.397	0.047	0.043	680.294	0.024
CONNECTICUT	All Vehicles	1.251	0.005	4.472	0.344	0.045	0.041	675.249	0.023
DELAWARE	All Vehicles	1.147	0.005	4.317	0.330	0.043	0.040	673.120	0.023
DISTRICT OF COLUMBIA	All Vehicles	1.173	0.005	4.494	0.338	0.047	0.043	703.687	0.024
FLORIDA	All Vehicles	1.258	0.006	5.095	0.398	0.045	0.041	718.377	0.024
GEORGIA	All Vehicles	1.410	0.005	4.604	0.387	0.044	0.040	683.170	0.024
HAWAII	All Vehicles	1.116	0.005	4.957	0.357	0.042	0.039	692.748	0.023
IDAHO	All Vehicles	1.572	0.005	4.735	0.414	0.046	0.042	675.712	0.024
ILLINOIS	All Vehicles	1.240	0.005	4.722	0.373	0.047	0.043	692.890	0.024
INDIANA	All Vehicles	1.435	0.005	4.766	0.404	0.046	0.042	685.221	0.024
IOWA	All Vehicles	1.545	0.005	4.858	0.427	0.046	0.042	675.871	0.024
KANSAS	All Vehicles	1.431	0.005	4.872	0.402	0.045	0.041	676.783	0.024
KENTUCKY	All Vehicles	1.587	0.005	4.856	0.421	0.046	0.042	682.098	0.024
LOUISIANA	All Vehicles	1.374	0.005	4.899	0.399	0.044	0.040	695.336	0.024
MAINE	All Vehicles	1.567	0.005	4.490	0.421	0.046	0.042	662.979	0.024
MARYLAND	All Vehicles	1.322	0.005	4.477	0.359	0.044	0.041	678.461	0.024
MASSACHUSETTS	All Vehicles	1.353	0.005	4.476	0.370	0.045	0.042	674.314	0.024
MICHIGAN	All Vehicles	1.470	0.005	4.870	0.416	0.047	0.043	681.842	0.024
MINNESOTA	All Vehicles	1.381	0.005	4.803	0.408	0.047	0.043	669.142	0.024
MISSISSIPPI	All Vehicles	4.704	0.005	1.339	0.387	0.043	0.039	678.481	0.024
MISSOURI	All Vehicles	1.441	0.005	4.779	0.392	0.044	0.040	671.719	0.024
MONTANA	All Vehicles	1.691	0.005	4.845	0.441	0.047	0.043	670.674	0.024
NEBRASKA	All Vehicles	1.626	0.005	4.952	0.438	0.047	0.043	681.571	0.024
NEVADA	All Vehicles	1.505	0.005	4.708	0.393	0.046	0.042	701.684	0.024
NEW HAMPSHIRE	All Vehicles	1.384	0.005	4.350	0.376	0.045	0.041	667.134	0.024
NEW JERSEY	All Vehicles	1.687	0.005	4.455	0.402	0.047	0.043	682.545	0.024
NEW MEXICO	All Vehicles	1.629	0.005	4.761	0.418	0.045	0.042	681.495	0.024
NEW YORK	All Vehicles	1.301	0.005	4.295	0.351	0.046	0.042	677.220	0.024
NORTH CAROLINA	All Vehicles	1.307	0.005	4.642	0.379	0.044	0.040	677.861	0.024
NORTH DAKOTA	All Vehicles	1.597	0.005	4.877	0.450	0.048	0.044	667.522	0.024
OHIO	All Vehicles	1.358	0.005	4.651	0.384	0.046	0.042	681.872	0.024
OKLAHOMA	All Vehicles	1.422	0.005	4.932	0.402	0.044	0.041	685.924	0.024
OREGON	All Vehicles	1.468	0.005	4.513	0.384	0.045	0.041	668.218	0.024
PACIFIC ISLANDS	All Vehicles	1.405	0.005	4.617	0.381	0.045	0.041	681.746	0.024
PENNSYLVANIA	All Vehicles	1.453	0.005	4.517	0.389	0.046	0.042	683.895	0.024
PUERTO RICO	All Vehicles	1.109	0.006	5.500	0.380	0.044	0.040	722.138	0.024
RHODE ISLAND	All Vehicles	1.341	0.005	4.475	0.361	0.046	0.042	684.128	0.024
SOUTH CAROLINA	All Vehicles	1.491	0.005	4.838	0.413	0.045	0.041	691.002	0.024
SOUTH DAKOTA	All Vehicles	1.681	0.005	4.893	0.449	0.048	0.044	674.362	0.024
TENNESSEE	All Vehicles	1.451	0.005	4.718	0.398	0.045	0.041	687.412	0.024
TEXAS	All Vehicles	1.321	0.005	4.726	0.370	0.043	0.040	691.886	0.024
UTAH	All Vehicles	1.454	0.005	4.788	0.395	0.047	0.043	688.135	0.024
VERMONT	All Vehicles	1.567	0.005	4.344	0.412	0.047	0.043	665.537	0.024
VIRGIN ISLANDS	All Vehicles	0.978	0.005	5.020	0.339	0.038	0.035	681.401	0.023
VIRGINIA	All Vehicles	1.440	0.005	4.674	0.392	0.045	0.041	684.293	0.024
WASHINGTON	All Vehicles	1.484	0.005	4.667	0.392	0.046	0.042	677.347	0.024
WEST VIRGINIA	All Vehicles	1.522	0.005	4.724	0.411	0.045	0.041	671.409	0.024
WISCONSIN	All Vehicles	1.473	0.005	4.713	0.412	0.046	0.042	671.377	0.024
WYOMING	All Vehicles	1.798	0.005	4.987	0.462	0.049	0.044	679.308	0.024

Table 5-21. On-Road Vehicle Emission Factors – 2016

State	Fuel Type	Vehicle Type		Emission Factors (g/mi)							
				Criteria Pollutants and Ozone Precursors							
				NO_x	SO_2	CO	VOC	PM_{10}	$PM_{2.5}$	CO_2	NH_3
Alabama	Gasoline	LDGV	Light-Duty Vehicles (Passanger Cars)	0.479	0.007	4.374	0.470	0.009	0.008	360.031	0.028
	Gasoline	LDGT	Light-Duty Trucks (0-8,500 lbs)	0.839	0.009	6.824	0.634	0.011	0.009	469.894	0.029
	Gasoline	HDGV	Heavy Duty Vehicles (8,501+ lbs)	2.307	0.016	21.430	1.180	0.024	0.021	778.332	0.045
	Diesel	LDDV	Light-Duty Vehicles (Passanger Cars)	0.193	0.003	2.776	0.143	0.005	0.004	359.735	0.008
	Diesel	LDDT	Light-Duty Trucks (0-8,500 lbs)	0.627	0.005	5.903	0.400	0.007	0.007	538.354	0.008
	Diesel	HDDV	Heavy Duty Vehicles (8,501+ lbs)	6.792	0.013	2.322	0.659	0.290	0.267	1554.284	0.028
	NA	MC	Motorcycles	0.720	0.008	14.227	2.772	0.028	0.024	392.853	0.051
Alaska	Gasoline	LDGV	Light-Duty Vehicles (Passanger Cars)	0.510	0.007	5.096	0.561	0.021	0.019	356.472	0.028
	Gasoline	LDGT	Light-Duty Trucks (0-8,500 lbs)	0.880	0.009	6.999	0.675	0.024	0.021	464.847	0.030
	Gasoline	HDGV	Heavy Duty Vehicles (8,501+ lbs)	2.533	0.015	22.020	1.092	0.055	0.049	763.751	0.045
	Diesel	LDDV	Light-Duty Vehicles (Passanger Cars)	0.198	0.003	2.460	0.207	0.005	0.004	349.053	0.008
	Diesel	LDDT	Light-Duty Trucks (0-8,500 lbs)	0.647	0.004	5.264	0.469	0.008	0.007	522.771	0.008
	Diesel	HDDV	Heavy Duty Vehicles (8,501+ lbs)	8.240	0.013	2.563	0.817	0.294	0.271	1541.653	0.030
	NA	MC	Motorcycles	0.880	0.008	15.066	2.052	0.032	0.028	400.782	0.052
Arizona	Gasoline	LDGV	Light-Duty Vehicles (Passanger Cars)	0.435	0.005	4.212	0.442	0.008	0.007	367.513	0.029
	Gasoline	LDGT	Light-Duty Trucks (0-8,500 lbs)	0.754	0.006	6.506	0.573	0.009	0.008	481.246	0.030
	Gasoline	HDGV	Heavy Duty Vehicles (8,501+ lbs)	2.149	0.010	22.896	1.194	0.023	0.021	806.697	0.045
	Diesel	LDDV	Light-Duty Vehicles (Passanger Cars)	0.208	0.003	3.002	0.134	0.005	0.004	368.411	0.008
	Diesel	LDDT	Light-Duty Trucks (0-8,500 lbs)	0.687	0.005	6.434	0.403	0.008	0.007	551.963	0.008
	Diesel	HDDV	Heavy Duty Vehicles (8,501+ lbs)	7.762	0.014	2.484	0.727	0.299	0.275	1611.013	0.029
	NA	MC	Motorcycles	0.813	0.005	13.519	3.250	0.025	0.022	393.401	0.051
Arkansas	Gasoline	LDGV	Light-Duty Vehicles (Passanger Cars)	0.491	0.007	4.566	0.470	0.010	0.008	352.235	0.028
	Gasoline	LDGT	Light-Duty Trucks (0-8,500 lbs)	0.862	0.009	7.016	0.620	0.011	0.010	461.540	0.030
	Gasoline	HDGV	Heavy Duty Vehicles (8,501+ lbs)	2.334	0.015	21.621	1.105	0.027	0.024	770.282	0.044
	Diesel	LDDV	Light-Duty Vehicles (Passanger Cars)	0.197	0.003	2.798	0.150	0.005	0.004	351.459	0.008
	Diesel	LDDT	Light-Duty Trucks (0-8,500 lbs)	0.640	0.005	5.927	0.405	0.008	0.007	527.424	0.008
	Diesel	HDDV	Heavy Duty Vehicles (8,501+ lbs)	7.346	0.013	2.458	0.742	0.287	0.264	1563.541	0.030
	NA	MC	Motorcycles	0.755	0.008	14.164	2.616	0.027	0.024	394.707	0.052
Colorado	Gasoline	LDGV	Light-Duty Vehicles (Passanger Cars)	0.470	0.007	4.353	0.461	0.013	0.012	357.293	0.029
	Gasoline	LDGT	Light-Duty Trucks (0-8,500 lbs)	0.829	0.009	6.365	0.580	0.015	0.014	467.924	0.030
	Gasoline	HDGV	Heavy Duty Vehicles (8,501+ lbs)	2.547	0.015	22.725	1.129	0.038	0.033	775.592	0.045
	Diesel	LDDV	Light-Duty Vehicles (Passanger Cars)	0.199	0.003	2.617	0.169	0.005	0.004	353.958	0.008
	Diesel	LDDT	Light-Duty Trucks (0-8,500 lbs)	0.656	0.005	5.628	0.436	0.008	0.007	531.073	0.008
	Diesel	HDDV	Heavy Duty Vehicles (8,501+ lbs)	7.464	0.013	2.335	0.682	0.291	0.267	1535.428	0.028
	NA	MC	Motorcycles	0.847	0.008	14.386	2.683	0.029	0.026	397.570	0.051
Connecticut	Gasoline	LDGV	Light-Duty Vehicles (Passanger Cars)	0.409	0.007	3.862	0.398	0.013	0.011	357.041	0.029
	Gasoline	LDGT	Light-Duty Trucks (0-8,500 lbs)	0.739	0.009	5.814	0.506	0.015	0.013	469.456	0.030
	Gasoline	HDGV	Heavy Duty Vehicles (8,501+ lbs)	2.463	0.016	22.330	1.121	0.038	0.034	781.436	0.045
	Diesel	LDDV	Light-Duty Vehicles (Passanger Cars)	0.195	0.003	2.663	0.163	0.005	0.004	354.295	0.008
	Diesel	LDDT	Light-Duty Trucks (0-8,500 lbs)	0.646	0.005	5.774	0.438	0.008	0.007	532.906	0.008
	Diesel	HDDV	Heavy Duty Vehicles (8,501+ lbs)	6.399	0.013	2.034	0.528	0.283	0.260	1503.493	0.026
	NA	MC	Motorcycles	0.786	0.008	13.713	2.335	0.029	0.026	398.362	0.051
Delaware	Gasoline	LDGV	Light-Duty Vehicles (Passanger Cars)	0.446	0.007	3.796	0.409	0.011	0.009	362.192	0.028
	Gasoline	LDGT	Light-Duty Trucks (0-8,500 lbs)	0.782	0.009	5.683	0.528	0.012	0.011	472.052	0.030
	Gasoline	HDGV	Heavy Duty Vehicles (8,501+ lbs)	2.399	0.015	21.940	1.132	0.026	0.023	773.058	0.046
	Diesel	LDDV	Light-Duty Vehicles (Passanger Cars)	0.191	0.003	2.593	0.157	0.005	0.004	360.184	0.008
	Diesel	LDDT	Light-Duty Trucks (0-8,500 lbs)	0.622	0.005	5.550	0.416	0.007	0.007	538.948	0.008
	Diesel	HDDV	Heavy Duty Vehicles (8,501+ lbs)	5.834	0.013	1.921	0.460	0.287	0.264	1483.344	0.025
	NA	MC	Motorcycles	0.761	0.008	13.566	2.355	0.026	0.023	394.279	0.051
District of Columbia	Gasoline	LDGV	Light-Duty Vehicles (Passanger Cars)	0.406	0.008	3.751	0.389	0.011	0.009	376.956	0.029
	Gasoline	LDGT	Light-Duty Trucks (0-8,500 lbs)	0.712	0.010	5.591	0.498	0.012	0.011	492.833	0.030
	Gasoline	HDGV	Heavy Duty Vehicles (8,501+ lbs)	2.473	0.016	23.474	1.253	0.028	0.025	813.924	0.047
	Diesel	LDDV	Light-Duty Vehicles (Passanger Cars)	0.189	0.003	2.675	0.151	0.005	0.004	375.126	0.008
	Diesel	LDDT	Light-Duty Trucks (0-8,500 lbs)	0.625	0.005	5.835	0.431	0.008	0.007	562.658	0.008
	Diesel	HDDV	Heavy Duty Vehicles (8,501+ lbs)	6.094	0.013	2.090	0.507	0.312	0.287	1551.469	0.026
	NA	MC	Motorcycles	0.723	0.008	13.542	2.581	0.027	0.024	394.068	0.049

Table 5-21. On-Road Vehicle Emission Factors – 2016 (cont.)

State	Fuel Type	Vehicle Type		Emission Factors (g/mi)							
				Criteria Pollutants and Ozone Precursors							
				NO_x	SO_2	CO	VOC	PM_{10}	$PM_{2.5}$	CO_2	NH_3
Florida	Gasoline	LDGV	Light-Duty Vehicles (Passanger Cars)	0.456	0.008	4.584	0.467	0.008	0.007	378.382	0.029
	Gasoline	LDGT	Light-Duty Trucks (0-8,500 lbs)	0.808	0.010	7.340	0.665	0.009	0.008	493.858	0.030
	Gasoline	HDGV	Heavy Duty Vehicles (8,501+ lbs)	2.248	0.016	23.037	1.336	0.021	0.018	822.580	0.046
	Diesel	LDDV	Light-Duty Vehicles (Passanger Cars)	0.189	0.003	3.030	0.125	0.005	0.004	379.752	0.008
	Diesel	LDDT	Light-Duty Trucks (0-8,500 lbs)	0.619	0.005	6.510	0.395	0.008	0.007	567.946	0.008
	Diesel	HDDV	Heavy Duty Vehicles (8,501+ lbs)	6.291	0.014	2.338	0.626	0.306	0.282	1614.190	0.028
	NA	MC	Motorcycles	0.638	0.008	14.087	3.133	0.027	0.024	391.321	0.050
Georgia	Gasoline	LDGV	Light-Duty Vehicles (Passanger Cars)	0.451	0.007	4.106	0.440	0.010	0.008	354.903	0.028
	Gasoline	LDGT	Light-Duty Trucks (0-8,500 lbs)	0.795	0.009	6.399	0.584	0.011	0.010	464.751	0.030
	Gasoline	HDGV	Heavy Duty Vehicles (8,501+ lbs)	2.319	0.015	21.145	1.142	0.027	0.023	774.565	0.045
	Diesel	LDDV	Light-Duty Vehicles (Passanger Cars)	0.196	0.003	2.791	0.146	0.005	0.004	354.439	0.008
	Diesel	LDDT	Light-Duty Trucks (0-8,500 lbs)	0.636	0.005	5.934	0.403	0.008	0.007	531.567	0.008
	Diesel	HDDV	Heavy Duty Vehicles (8,501+ lbs)	7.083	0.013	2.383	0.698	0.287	0.264	1557.108	0.029
	NA	MC	Motorcycles	0.737	0.008	14.176	2.660	0.029	0.025	394.250	0.052
Hawaii	Gasoline	LDGV	Light-Duty Vehicles (Passanger Cars)	0.453	0.007	4.425	0.450	0.007	0.006	367.823	0.029
	Gasoline	LDGT	Light-Duty Trucks (0-8,500 lbs)	0.802	0.010	7.057	0.631	0.008	0.007	480.452	0.030
	Gasoline	HDGV	Heavy Duty Vehicles (8,501+ lbs)	2.245	0.016	23.141	1.272	0.018	0.016	797.278	0.046
	Diesel	LDDV	Light-Duty Vehicles (Passanger Cars)	0.188	0.003	2.905	0.119	0.005	0.004	369.511	0.008
	Diesel	LDDT	Light-Duty Trucks (0-8,500 lbs)	0.614	0.005	6.215	0.381	0.007	0.007	553.123	0.008
	Diesel	HDDV	Heavy Duty Vehicles (8,501+ lbs)	5.557	0.013	2.013	0.473	0.289	0.266	1542.027	0.026
	NA	MC	Motorcycles	0.685	0.008	13.941	2.932	0.026	0.023	390.820	0.050
Idaho	Gasoline	LDGV	Light-Duty Vehicles (Passanger Cars)	0.506	0.007	4.584	0.489	0.013	0.012	353.763	0.028
	Gasoline	LDGT	Light-Duty Trucks (0-8,500 lbs)	0.882	0.009	6.684	0.615	0.015	0.013	461.701	0.029
	Gasoline	HDGV	Heavy Duty Vehicles (8,501+ lbs)	2.525	0.015	22.034	1.083	0.034	0.030	761.510	0.045
	Diesel	LDDV	Light-Duty Vehicles (Passanger Cars)	0.201	0.003	2.555	0.175	0.005	0.004	350.013	0.008
	Diesel	LDDT	Light-Duty Trucks (0-8,500 lbs)	0.651	0.005	5.435	0.430	0.007	0.007	524.329	0.008
	Diesel	HDDV	Heavy Duty Vehicles (8,501+ lbs)	7.874	0.013	2.458	0.751	0.290	0.267	1538.271	0.029
	NA	MC	Motorcycles	0.868	0.008	14.430	2.473	0.028	0.024	396.458	0.052
Illinois	Gasoline	LDGV	Light-Duty Vehicles (Passanger Cars)	0.453	0.007	4.380	0.449	0.012	0.011	370.088	0.029
	Gasoline	LDGT	Light-Duty Trucks (0-8,500 lbs)	0.808	0.010	6.687	0.620	0.014	0.013	484.627	0.030
	Gasoline	HDGV	Heavy Duty Vehicles (8,501+ lbs)	2.445	0.016	23.430	1.215	0.034	0.030	801.101	0.046
	Diesel	LDDV	Light-Duty Vehicles (Passanger Cars)	0.191	0.003	2.645	0.162	0.005	0.004	367.128	0.008
	Diesel	LDDT	Light-Duty Trucks (0-8,500 lbs)	0.633	0.005	5.762	0.441	0.008	0.007	551.063	0.008
	Diesel	HDDV	Heavy Duty Vehicles (8,501+ lbs)	6.320	0.013	2.093	0.534	0.301	0.277	1532.296	0.026
	NA	MC	Motorcycles	0.745	0.008	13.778	2.527	0.027	0.024	396.453	0.050
Indiana	Gasoline	LDGV	Light-Duty Vehicles (Passanger Cars)	0.483	0.007	4.734	0.473	0.012	0.010	361.942	0.029
	Gasoline	LDGT	Light-Duty Trucks (0-8,500 lbs)	0.844	0.009	6.970	0.624	0.013	0.012	471.942	0.030
	Gasoline	HDGV	Heavy Duty Vehicles (8,501+ lbs)	2.419	0.016	23.166	1.146	0.031	0.027	777.685	0.045
	Diesel	LDDV	Light-Duty Vehicles (Passanger Cars)	0.193	0.003	2.600	0.165	0.005	0.004	358.994	0.008
	Diesel	LDDT	Light-Duty Trucks (0-8,500 lbs)	0.630	0.005	5.577	0.428	0.007	0.007	537.173	0.008
	Diesel	HDDV	Heavy Duty Vehicles (8,501+ lbs)	7.212	0.013	2.373	0.692	0.296	0.272	1544.765	0.029
	NA	MC	Motorcycles	0.775	0.008	14.334	2.472	0.027	0.024	395.483	0.051
Iowa	Gasoline	LDGV	Light-Duty Vehicles (Passanger Cars)	0.507	0.007	4.807	0.517	0.014	0.013	352.921	0.028
	Gasoline	LDGT	Light-Duty Trucks (0-8,500 lbs)	0.878	0.009	6.977	0.649	0.016	0.014	460.619	0.029
	Gasoline	HDGV	Heavy Duty Vehicles (8,501+ lbs)	2.410	0.015	21.526	1.078	0.037	0.032	760.193	0.044
	Diesel	LDDV	Light-Duty Vehicles (Passanger Cars)	0.197	0.003	2.582	0.176	0.005	0.004	349.015	0.008
	Diesel	LDDT	Light-Duty Trucks (0-8,500 lbs)	0.636	0.004	5.477	0.428	0.007	0.007	522.941	0.008
	Diesel	HDDV	Heavy Duty Vehicles (8,501+ lbs)	7.685	0.013	2.486	0.767	0.289	0.266	1543.057	0.030
	NA	MC	Motorcycles	0.809	0.008	14.532	2.328	0.028	0.025	396.585	0.052
Kansas	Gasoline	LDGV	Light-Duty Vehicles (Passanger Cars)	0.499	0.007	4.636	0.486	0.012	0.010	354.119	0.028
	Gasoline	LDGT	Light-Duty Trucks (0-8,500 lbs)	0.874	0.009	6.981	0.634	0.013	0.012	463.229	0.029
	Gasoline	HDGV	Heavy Duty Vehicles (8,501+ lbs)	2.401	0.015	21.829	1.109	0.031	0.028	767.746	0.045
	Diesel	LDDV	Light-Duty Vehicles (Passanger Cars)	0.197	0.003	2.695	0.161	0.005	0.004	351.957	0.008
	Diesel	LDDT	Light-Duty Trucks (0-8,500 lbs)	0.640	0.005	5.729	0.418	0.008	0.007	527.794	0.008
	Diesel	HDDV	Heavy Duty Vehicles (8,501+ lbs)	7.103	0.013	2.315	0.674	0.285	0.262	1534.974	0.028
	NA	MC	Motorcycles	0.786	0.008	14.288	2.515	0.028	0.025	395.514	0.052

Table 5-21. On-Road Vehicle Emission Factors – 2016 (cont.)

State	Fuel Type	Vehicle Type		Emission Factors (g/mi)							
				Criteria Pollutants and Ozone Precursors							
				NO_x	SO_2	CO	VOC	PM_{10}	$PM_{2.5}$	CO_2	NH_3
Kentucky	Gasoline	LDGV	Light-Duty Vehicles (Passanger Cars)	0.493	0.007	4.685	0.468	0.010	0.009	350.739	0.028
	Gasoline	LDGT	Light-Duty Trucks (0-8,500 lbs)	0.867	0.009	7.053	0.618	0.012	0.011	459.702	0.030
	Gasoline	HDGV	Heavy Duty Vehicles (8,501+ lbs)	2.348	0.015	21.877	1.067	0.030	0.026	767.855	0.044
	Diesel	LDDV	Light-Duty Vehicles (Passanger Cars)	0.198	0.003	2.715	0.160	0.005	0.004	348.880	0.008
	Diesel	LDDT	Light-Duty Trucks (0-8,500 lbs)	0.644	0.004	5.768	0.416	0.008	0.007	523.668	0.008
	Diesel	HDDV	Heavy Duty Vehicles (8,501+ lbs)	7.905	0.013	2.600	0.818	0.291	0.268	1571.940	0.031
	NA	MC	Motorcycles	0.774	0.008	13.979	2.448	0.027	0.024	396.260	0.053
Louisiana	Gasoline	LDGV	Light-Duty Vehicles (Passanger Cars)	0.467	0.007	4.444	0.463	0.008	0.007	361.481	0.028
	Gasoline	LDGT	Light-Duty Trucks (0-8,500 lbs)	0.824	0.009	7.012	0.631	0.010	0.009	472.872	0.030
	Gasoline	HDGV	Heavy Duty Vehicles (8,501+ lbs)	2.256	0.016	21.674	1.200	0.024	0.021	789.566	0.045
	Diesel	LDDV	Light-Duty Vehicles (Passanger Cars)	0.194	0.003	2.940	0.137	0.005	0.004	362.070	0.008
	Diesel	LDDT	Light-Duty Trucks (0-8,500 lbs)	0.631	0.005	6.253	0.396	0.008	0.007	542.326	0.008
	Diesel	HDDV	Heavy Duty Vehicles (8,501+ lbs)	6.846	0.014	2.401	0.695	0.291	0.267	1583.489	0.029
	NA	MC	Motorcycles	0.690	0.008	14.161	2.865	0.028	0.025	393.105	0.052
Maine	Gasoline	LDGV	Light-Duty Vehicles (Passanger Cars)	0.502	0.007	4.502	0.518	0.016	0.014	344.685	0.028
	Gasoline	LDGT	Light-Duty Trucks (0-8,500 lbs)	0.864	0.009	6.461	0.636	0.018	0.016	450.587	0.029
	Gasoline	HDGV	Heavy Duty Vehicles (8,501+ lbs)	2.410	0.015	20.136	1.038	0.039	0.035	742.552	0.044
	Diesel	LDDV	Light-Duty Vehicles (Passanger Cars)	0.199	0.003	2.479	0.186	0.005	0.004	339.898	0.008
	Diesel	LDDT	Light-Duty Trucks (0-8,500 lbs)	0.639	0.004	5.225	0.430	0.007	0.007	510.512	0.008
	Diesel	HDDV	Heavy Duty Vehicles (8,501+ lbs)	7.842	0.013	2.470	0.770	0.283	0.260	1519.806	0.030
	NA	MC	Motorcycles	0.845	0.008	14.607	2.125	0.030	0.027	397.227	0.053
Maryland	Gasoline	LDGV	Light-Duty Vehicles (Passanger Cars)	0.446	0.007	3.903	0.411	0.011	0.010	356.488	0.029
	Gasoline	LDGT	Light-Duty Trucks (0-8,500 lbs)	0.793	0.009	5.960	0.546	0.013	0.012	467.838	0.030
	Gasoline	HDGV	Heavy Duty Vehicles (8,501+ lbs)	2.406	0.016	21.513	1.119	0.033	0.029	778.915	0.045
	Diesel	LDDV	Light-Duty Vehicles (Passanger Cars)	0.196	0.003	2.721	0.156	0.005	0.004	354.669	0.008
	Diesel	LDDT	Light-Duty Trucks (0-8,500 lbs)	0.645	0.005	5.851	0.424	0.008	0.007	532.725	0.008
	Diesel	HDDV	Heavy Duty Vehicles (8,501+ lbs)	6.693	0.013	2.167	0.592	0.285	0.262	1524.201	0.027
	NA	MC	Motorcycles	0.766	0.008	13.688	2.412	0.029	0.025	396.645	0.052
Massachuesetts	Gasoline	LDGV	Light-Duty Vehicles (Passanger Cars)	0.447	0.007	4.046	0.433	0.013	0.012	355.393	0.029
	Gasoline	LDGT	Light-Duty Trucks (0-8,500 lbs)	0.794	0.009	6.147	0.573	0.016	0.014	466.181	0.030
	Gasoline	HDGV	Heavy Duty Vehicles (8,501+ lbs)	2.455	0.015	21.874	1.090	0.038	0.034	773.301	0.045
	Diesel	LDDV	Light-Duty Vehicles (Passanger Cars)	0.195	0.003	2.611	0.168	0.005	0.004	352.143	0.008
	Diesel	LDDT	Light-Duty Trucks (0-8,500 lbs)	0.644	0.005	5.628	0.437	0.008	0.007	528.952	0.008
	Diesel	HDDV	Heavy Duty Vehicles (8,501+ lbs)	6.868	0.013	2.182	0.607	0.285	0.262	1512.834	0.027
	NA	MC	Motorcycles	0.801	0.008	13.749	2.266	0.029	0.026	398.015	0.052
Michigan	Gasoline	LDGV	Light-Duty Vehicles (Passanger Cars)	0.501	0.007	4.998	0.492	0.013	0.012	359.152	0.029
	Gasoline	LDGT	Light-Duty Trucks (0-8,500 lbs)	0.881	0.009	7.324	0.653	0.015	0.013	469.398	0.030
	Gasoline	HDGV	Heavy Duty Vehicles (8,501+ lbs)	2.456	0.015	23.290	1.129	0.036	0.032	775.424	0.045
	Diesel	LDDV	Light-Duty Vehicles (Passanger Cars)	0.195	0.003	2.589	0.173	0.005	0.004	355.348	0.008
	Diesel	LDDT	Light-Duty Trucks (0-8,500 lbs)	0.639	0.005	5.563	0.439	0.008	0.007	532.551	0.008
	Diesel	HDDV	Heavy Duty Vehicles (8,501+ lbs)	7.349	0.013	2.369	0.699	0.293	0.270	1538.479	0.029
	NA	MC	Motorcycles	0.802	0.008	14.526	2.357	0.029	0.025	397.372	0.051
Minnesota	Gasoline	LDGV	Light-Duty Vehicles (Passanger Cars)	0.502	0.007	4.887	0.521	0.017	0.015	355.295	0.028
	Gasoline	LDGT	Light-Duty Trucks (0-8,500 lbs)	0.864	0.009	7.044	0.659	0.019	0.017	463.926	0.029
	Gasoline	HDGV	Heavy Duty Vehicles (8,501+ lbs)	2.429	0.015	22.022	1.131	0.044	0.039	762.090	0.045
	Diesel	LDDV	Light-Duty Vehicles (Passanger Cars)	0.196	0.003	2.542	0.182	0.005	0.004	350.387	0.008
	Diesel	LDDT	Light-Duty Trucks (0-8,500 lbs)	0.637	0.005	5.424	0.441	0.008	0.007	525.195	0.008
	Diesel	HDDV	Heavy Duty Vehicles (8,501+ lbs)	6.898	0.013	2.184	0.618	0.282	0.260	1500.153	0.028
	NA	MC	Motorcycles	0.814	0.008	14.729	2.335	0.030	0.027	397.766	0.052
Mississippi	Gasoline	LDGV	Light-Duty Vehicles (Passanger Cars)	0.478	0.007	4.370	0.473	0.009	0.008	354.568	0.028
	Gasoline	LDGT	Light-Duty Trucks (0-8,500 lbs)	0.834	0.009	6.787	0.626	0.010	0.009	463.300	0.029
	Gasoline	HDGV	Heavy Duty Vehicles (8,501+ lbs)	2.268	0.015	21.041	1.148	0.022	0.020	767.439	0.045
	Diesel	LDDV	Light-Duty Vehicles (Passanger Cars)	0.194	0.003	2.782	0.143	0.005	0.004	354.499	0.008
	Diesel	LDDT	Light-Duty Trucks (0-8,500 lbs)	0.625	0.005	5.878	0.393	0.007	0.007	531.184	0.008
	Diesel	HDDV	Heavy Duty Vehicles (8,501+ lbs)	6.665	0.013	2.276	0.644	0.282	0.260	1541.012	0.028
	NA	MC	Motorcycles	0.722	0.008	14.242	2.738	0.027	0.024	392.483	0.052

Table 5-21. On-Road Vehicle Emission Factors – 2016 (cont.)

State	Fuel Type	Vehicle Type		Emission Factors (g/mi)							
				Criteria Pollutants and Ozone Precursors							
				NO_x	SO_2	CO	VOC	PM_{10}	$PM_{2.5}$	CO_2	NH_3
Missouri	Gasoline	LDGV	Light-Duty Vehicles (Passanger Cars)	0.478	0.007	4.444	0.460	0.011	0.010	347.549	0.028
	Gasoline	LDGT	Light-Duty Trucks (0-8,500 lbs)	0.847	0.009	6.757	0.604	0.013	0.012	456.733	0.030
	Gasoline	HDGV	Heavy Duty Vehicles (8,501+ lbs)	2.358	0.015	21.324	1.064	0.033	0.029	763.133	0.044
	Diesel	LDDV	Light-Duty Vehicles (Passanger Cars)	0.199	0.003	2.744	0.160	0.005	0.004	345.638	0.008
	Diesel	LDDT	Light-Duty Trucks (0-8,500 lbs)	0.647	0.004	5.825	0.417	0.008	0.007	519.834	0.008
	Diesel	HDDV	Heavy Duty Vehicles (8,501+ lbs)	7.174	0.013	2.323	0.685	0.279	0.257	1533.022	0.029
	NA	MC	Motorcycles	0.782	0.008	13.972	2.401	0.028	0.025	396.885	0.053
Montana	Gasoline	LDGV	Light-Duty Vehicles (Passanger Cars)	0.530	0.007	4.921	0.526	0.015	0.013	346.780	0.028
	Gasoline	LDGT	Light-Duty Trucks (0-8,500 lbs)	0.916	0.009	7.016	0.644	0.017	0.015	453.243	0.029
	Gasoline	HDGV	Heavy Duty Vehicles (8,501+ lbs)	2.495	0.015	21.380	1.022	0.039	0.034	749.451	0.044
	Diesel	LDDV	Light-Duty Vehicles (Passanger Cars)	0.203	0.003	2.523	0.186	0.005	0.004	342.013	0.008
	Diesel	LDDT	Light-Duty Trucks (0-8,500 lbs)	0.654	0.004	5.325	0.433	0.007	0.007	513.357	0.008
	Diesel	HDDV	Heavy Duty Vehicles (8,501+ lbs)	8.408	0.013	2.611	0.839	0.288	0.265	1546.094	0.031
	NA	MC	Motorcycles	0.886	0.008	14.548	2.303	0.028	0.025	397.567	0.053
Nebraska	Gasoline	LDGV	Light-Duty Vehicles (Passanger Cars)	0.511	0.007	4.814	0.510	0.014	0.012	352.372	0.028
	Gasoline	LDGT	Light-Duty Trucks (0-8,500 lbs)	0.893	0.009	7.098	0.650	0.016	0.014	461.048	0.030
	Gasoline	HDGV	Heavy Duty Vehicles (8,501+ lbs)	2.429	0.015	21.563	1.076	0.038	0.033	766.551	0.044
	Diesel	LDDV	Light-Duty Vehicles (Passanger Cars)	0.199	0.003	2.657	0.173	0.005	0.004	348.944	0.008
	Diesel	LDDT	Light-Duty Trucks (0-8,500 lbs)	0.648	0.004	5.646	0.429	0.008	0.007	523.365	0.008
	Diesel	HDDV	Heavy Duty Vehicles (8,501+ lbs)	8.077	0.013	2.607	0.826	0.292	0.269	1566.856	0.031
	NA	MC	Motorcycles	0.815	0.008	14.485	2.433	0.028	0.025	397.375	0.053
Nevada	Gasoline	LDGV	Light-Duty Vehicles (Passanger Cars)	0.479	0.007	4.051	0.449	0.010	0.009	368.360	0.029
	Gasoline	LDGT	Light-Duty Trucks (0-8,500 lbs)	0.851	0.010	6.248	0.593	0.011	0.010	481.538	0.030
	Gasoline	HDGV	Heavy Duty Vehicles (8,501+ lbs)	2.637	0.016	23.017	1.240	0.027	0.024	800.396	0.046
	Diesel	LDDV	Light-Duty Vehicles (Passanger Cars)	0.204	0.003	2.786	0.147	0.005	0.004	367.599	0.008
	Diesel	LDDT	Light-Duty Trucks (0-8,500 lbs)	0.672	0.005	6.009	0.417	0.008	0.007	550.585	0.008
	Diesel	HDDV	Heavy Duty Vehicles (8,501+ lbs)	7.642	0.014	2.417	0.693	0.303	0.279	1583.541	0.029
	NA	MC	Motorcycles	0.839	0.008	14.166	3.124	0.027	0.024	394.143	0.050
New Hampshire	Gasoline	LDGV	Light-Duty Vehicles (Passanger Cars)	0.446	0.007	4.076	0.457	0.014	0.013	352.617	0.028
	Gasoline	LDGT	Light-Duty Trucks (0-8,500 lbs)	0.783	0.009	5.983	0.577	0.016	0.015	460.581	0.029
	Gasoline	HDGV	Heavy Duty Vehicles (8,501+ lbs)	2.437	0.015	21.204	1.066	0.037	0.033	757.456	0.045
	Diesel	LDDV	Light-Duty Vehicles (Passanger Cars)	0.196	0.003	2.525	0.176	0.005	0.004	348.539	0.008
	Diesel	LDDT	Light-Duty Trucks (0-8,500 lbs)	0.569	0.004	4.924	0.391	0.007	0.006	520.148	0.008
	Diesel	HDDV	Heavy Duty Vehicles (8,501+ lbs)	10.070	0.016	2.843	0.871	0.361	0.333	1890.375	0.032
	NA	MC	Motorcycles	0.821	0.008	14.044	2.195	0.029	0.025	396.820	0.052
New Jersey	Gasoline	LDGV	Light-Duty Vehicles (Passanger Cars)	0.446	0.007	3.905	0.407	0.012	0.010	346.746	0.028
	Gasoline	LDGT	Light-Duty Trucks (0-8,500 lbs)	0.757	0.009	5.735	0.505	0.013	0.012	455.399	0.030
	Gasoline	HDGV	Heavy Duty Vehicles (8,501+ lbs)	2.377	0.015	20.400	0.989	0.034	0.030	765.003	0.044
	Diesel	LDDV	Light-Duty Vehicles (Passanger Cars)	0.200	0.003	2.690	0.163	0.005	0.004	344.507	0.008
	Diesel	LDDT	Light-Duty Trucks (0-8,500 lbs)	0.652	0.004	5.712	0.415	0.008	0.007	517.810	0.008
	Diesel	HDDV	Heavy Duty Vehicles (8,501+ lbs)	8.554	0.014	2.770	0.909	0.294	0.270	1589.418	0.032
	NA	MC	Motorcycles	0.803	0.008	13.578	2.191	0.028	0.025	397.486	0.053
New Mexico	Gasoline	LDGV	Light-Duty Vehicles (Passanger Cars)	0.509	0.007	4.392	0.483	0.011	0.010	352.570	0.028
	Gasoline	LDGT	Light-Duty Trucks (0-8,500 lbs)	0.895	0.009	6.630	0.618	0.012	0.011	461.231	0.030
	Gasoline	HDGV	Heavy Duty Vehicles (8,501+ lbs)	2.524	0.015	21.495	1.098	0.030	0.026	766.924	0.044
	Diesel	LDDV	Light-Duty Vehicles (Passanger Cars)	0.204	0.003	2.672	0.158	0.005	0.004	350.760	0.008
	Diesel	LDDT	Light-Duty Trucks (0-8,500 lbs)	0.663	0.005	5.677	0.413	0.007	0.007	525.902	0.008
	Diesel	HDDV	Heavy Duty Vehicles (8,501+ lbs)	8.140	0.013	2.555	0.793	0.292	0.268	1564.296	0.030
	NA	MC	Motorcycles	0.856	0.008	14.253	2.800	0.027	0.024	395.295	0.052
New York	Gasoline	LDGV	Light-Duty Vehicles (Passanger Cars)	0.405	0.007	3.785	0.407	0.013	0.011	359.142	0.029
	Gasoline	LDGT	Light-Duty Trucks (0-8,500 lbs)	0.707	0.009	5.380	0.490	0.015	0.013	470.003	0.030
	Gasoline	HDGV	Heavy Duty Vehicles (8,501+ lbs)	2.453	0.015	21.944	1.140	0.036	0.032	776.468	0.045
	Diesel	LDDV	Light-Duty Vehicles (Passanger Cars)	0.194	0.003	2.594	0.166	0.005	0.004	356.034	0.008
	Diesel	LDDT	Light-Duty Trucks (0-8,500 lbs)	0.637	0.005	5.591	0.434	0.008	0.007	534.076	0.008
	Diesel	HDDV	Heavy Duty Vehicles (8,501+ lbs)	6.701	0.013	2.156	0.587	0.289	0.266	1513.035	0.027
	NA	MC	Motorcycles	0.788	0.008	14.117	2.348	0.029	0.026	396.807	0.051

Table 5-21. On-Road Vehicle Emission Factors – 2016 (cont.)

State	Fuel Type	Vehicle Type		Emission Factors (g/mi)							
				Criteria Pollutants and Ozone Precursors							
				NO_x	SO_2	CO	VOC	PM_{10}	$PM_{2.5}$	CO_2	NH_3
North Carolina	Gasoline	LDGV	Light-Duty Vehicles (Passanger Cars)	0.478	0.007	4.284	0.462	0.010	0.009	357.482	0.028
	Gasoline	LDGT	Light-Duty Trucks (0-8,500 lbs)	0.842	0.009	6.667	0.626	0.012	0.010	467.313	0.030
	Gasoline	HDGV	Heavy Duty Vehicles (8,501+ lbs)	2.361	0.015	21.479	1.170	0.027	0.024	773.348	0.045
	Diesel	LDDV	Light-Duty Vehicles (Passanger Cars)	0.194	0.003	2.706	0.149	0.005	0.004	356.468	0.008
	Diesel	LDDT	Light-Duty Trucks (0-8,500 lbs)	0.631	0.005	5.772	0.408	0.007	0.007	534.193	0.008
	Diesel	HDDV	Heavy Duty Vehicles (8,501+ lbs)	6.542	0.013	2.174	0.590	0.285	0.262	1523.874	0.027
	NA	MC	Motorcycles	0.746	0.008	14.302	2.669	0.028	0.025	393.958	0.051
North Dakota	Gasoline	LDGV	Light-Duty Vehicles (Passanger Cars)	0.517	0.007	5.206	0.572	0.019	0.017	348.336	0.028
	Gasoline	LDGT	Light-Duty Trucks (0-8,500 lbs)	0.891	0.009	7.243	0.687	0.022	0.019	454.619	0.029
	Gasoline	HDGV	Heavy Duty Vehicles (8,501+ lbs)	2.417	0.015	21.142	1.063	0.047	0.042	747.812	0.044
	Diesel	LDDV	Light-Duty Vehicles (Passanger Cars)	0.200	0.003	2.507	0.196	0.005	0.004	342.225	0.008
	Diesel	LDDT	Light-Duty Trucks (0-8,500 lbs)	0.643	0.004	5.284	0.441	0.007	0.007	513.489	0.008
	Diesel	HDDV	Heavy Duty Vehicles (8,501+ lbs)	7.948	0.013	2.495	0.786	0.284	0.262	1528.018	0.030
	NA	MC	Motorcycles	0.850	0.008	14.858	2.223	0.030	0.027	398.341	0.053
Ohio	Gasoline	LDGV	Light-Duty Vehicles (Passanger Cars)	0.459	0.007	4.569	0.454	0.012	0.010	361.533	0.029
	Gasoline	LDGT	Light-Duty Trucks (0-8,500 lbs)	0.804	0.009	6.674	0.590	0.013	0.012	472.070	0.030
	Gasoline	HDGV	Heavy Duty Vehicles (8,501+ lbs)	2.436	0.016	23.518	1.158	0.032	0.028	778.232	0.045
	Diesel	LDDV	Light-Duty Vehicles (Passanger Cars)	0.193	0.003	2.599	0.165	0.005	0.004	358.519	0.008
	Diesel	LDDT	Light-Duty Trucks (0-8,500 lbs)	0.631	0.005	5.586	0.431	0.008	0.007	537.001	0.008
	Diesel	HDDV	Heavy Duty Vehicles (8,501+ lbs)	6.872	0.013	2.247	0.629	0.293	0.270	1528.020	0.028
	NA	MC	Motorcycles	0.779	0.008	14.438	2.477	0.028	0.024	395.913	0.051
Oklahoma	Gasoline	LDGV	Light-Duty Vehicles (Passanger Cars)	0.492	0.007	4.578	0.476	0.010	0.009	358.679	0.028
	Gasoline	LDGT	Light-Duty Trucks (0-8,500 lbs)	0.864	0.009	7.029	0.632	0.011	0.010	468.764	0.030
	Gasoline	HDGV	Heavy Duty Vehicles (8,501+ lbs)	2.378	0.016	22.125	1.148	0.027	0.024	778.205	0.045
	Diesel	LDDV	Light-Duty Vehicles (Passanger Cars)	0.196	0.003	2.776	0.151	0.005	0.004	357.685	0.008
	Diesel	LDDT	Light-Duty Trucks (0-8,500 lbs)	0.638	0.005	5.909	0.409	0.007	0.007	535.769	0.008
	Diesel	HDDV	Heavy Duty Vehicles (8,501+ lbs)	7.069	0.013	2.360	0.684	0.289	0.266	1556.582	0.029
	NA	MC	Motorcycles	0.756	0.008	14.187	2.718	0.027	0.024	394.180	0.052
Oregon	Gasoline	LDGV	Light-Duty Vehicles (Passanger Cars)	0.480	0.007	4.158	0.440	0.011	0.010	349.921	0.028
	Gasoline	LDGT	Light-Duty Trucks (0-8,500 lbs)	0.828	0.009	6.219	0.568	0.013	0.011	457.567	0.029
	Gasoline	HDGV	Heavy Duty Vehicles (8,501+ lbs)	2.462	0.015	21.771	1.072	0.030	0.026	755.767	0.045
	Diesel	LDDV	Light-Duty Vehicles (Passanger Cars)	0.197	0.003	2.522	0.165	0.005	0.004	347.282	0.008
	Diesel	LDDT	Light-Duty Trucks (0-8,500 lbs)	0.640	0.004	5.373	0.420	0.007	0.007	520.909	0.008
	Diesel	HDDV	Heavy Duty Vehicles (8,501+ lbs)	7.397	0.013	2.339	0.689	0.286	0.263	1516.414	0.029
	NA	MC	Motorcycles	0.844	0.008	14.204	2.347	0.027	0.024	395.676	0.052
Pacific Islands	Gasoline	LDGV	Light-Duty Vehicles (Passanger Cars)	0.450	0.007	4.151	0.433	0.010	0.009	357.183	0.028
	Gasoline	LDGT	Light-Duty Trucks (0-8,500 lbs)	0.791	0.009	6.326	0.573	0.012	0.011	467.551	0.030
	Gasoline	HDGV	Heavy Duty Vehicles (8,501+ lbs)	2.316	0.014	21.930	1.127	0.029	0.026	776.374	0.045
	Diesel	LDDV	Light-Duty Vehicles (Passanger Cars)	0.195	0.003	2.680	0.153	0.005	0.004	355.653	0.008
	Diesel	LDDT	Light-Duty Trucks (0-8,500 lbs)	0.639	0.005	5.744	0.416	0.008	0.007	533.349	0.008
	Diesel	HDDV	Heavy Duty Vehicles (8,501+ lbs)	7.090	0.013	2.321	0.666	0.290	0.267	1541.548	0.028
	NA	MC	Motorcycles	0.771	0.007	13.960	2.540	0.028	0.024	395.328	0.051
Pennsylvania	Gasoline	LDGV	Light-Duty Vehicles (Passanger Cars)	0.449	0.007	4.138	0.436	0.012	0.011	359.053	0.029
	Gasoline	LDGT	Light-Duty Trucks (0-8,500 lbs)	0.794	0.009	6.211	0.572	0.014	0.013	469.447	0.030
	Gasoline	HDGV	Heavy Duty Vehicles (8,501+ lbs)	2.433	0.015	22.046	1.132	0.034	0.030	777.210	0.045
	Diesel	LDDV	Light-Duty Vehicles (Passanger Cars)	0.195	0.003	2.620	0.165	0.005	0.004	356.132	0.008
	Diesel	LDDT	Light-Duty Trucks (0-8,500 lbs)	0.638	0.005	5.628	0.431	0.008	0.007	533.754	0.008
	Diesel	HDDV	Heavy Duty Vehicles (8,501+ lbs)	7.370	0.013	2.399	0.709	0.294	0.271	1546.829	0.029
	NA	MC	Motorcycles	0.784	0.008	14.269	2.412	0.029	0.026	396.570	0.051
Puerto Rico	Gasoline	LDGV	Light-Duty Vehicles (Passanger Cars)	0.442	0.008	4.945	0.465	0.007	0.006	380.354	0.029
	Gasoline	LDGT	Light-Duty Trucks (0-8,500 lbs)	0.790	0.010	7.962	0.668	0.008	0.007	498.280	0.030
	Gasoline	HDGV	Heavy Duty Vehicles (8,501+ lbs)	2.169	0.017	24.490	1.360	0.020	0.018	836.252	0.046
	Diesel	LDDV	Light-Duty Vehicles (Passanger Cars)	0.188	0.003	3.275	0.117	0.005	0.004	382.694	0.008
	Diesel	LDDT	Light-Duty Trucks (0-8,500 lbs)	0.619	0.005	7.033	0.390	0.008	0.007	573.587	0.008
	Diesel	HDDV	Heavy Duty Vehicles (8,501+ lbs)	5.475	0.014	2.121	0.511	0.297	0.273	1612.359	0.026
	NA	MC	Motorcycles	0.614	0.008	13.934	3.255	0.027	0.024	391.645	0.050

Table 5-21. On-Road Vehicle Emission Factors – 2016 (cont.)

State	Fuel Type	Vehicle Type		Emission Factors (g/mi)							
				Criteria Pollutants and Ozone Precursors							
				NO_x	SO_2	CO	VOC	PM_{10}	$PM_{2.5}$	CO_2	NH_3
Rhode Island	Gasoline	LDGV	Light-Duty Vehicles (Passanger Cars)	0.409	0.007	3.854	0.404	0.013	0.011	361.246	0.029
	Gasoline	LDGT	Light-Duty Trucks (0-8,500 lbs)	0.731	0.009	5.630	0.501	0.015	0.013	473.830	0.030
	Gasoline	HDGV	Heavy Duty Vehicles (8,501+ lbs)	2.464	0.016	22.343	1.134	0.037	0.033	786.348	0.045
	Diesel	LDDV	Light-Duty Vehicles (Passanger Cars)	0.193	0.003	2.624	0.164	0.005	0.004	358.270	0.008
	Diesel	LDDT	Light-Duty Trucks (0-8,500 lbs)	0.640	0.005	5.696	0.439	0.008	0.007	538.113	0.008
	Diesel	HDDV	Heavy Duty Vehicles (8,501+ lbs)	6.871	0.013	2.221	0.614	0.294	0.270	1530.718	0.028
	NA	MC	Motorcycles	0.779	0.008	13.709	2.350	0.029	0.025	397.664	0.051
South Carolina	Gasoline	LDGV	Light-Duty Vehicles (Passanger Cars)	0.484	0.007	4.426	0.469	0.009	0.008	357.836	0.028
	Gasoline	LDGT	Light-Duty Trucks (0-8,500 lbs)	0.854	0.009	6.934	0.636	0.011	0.010	468.113	0.030
	Gasoline	HDGV	Heavy Duty Vehicles (8,501+ lbs)	2.323	0.016	21.318	1.161	0.026	0.023	780.884	0.045
	Diesel	LDDV	Light-Duty Vehicles (Passanger Cars)	0.196	0.003	2.809	0.145	0.005	0.004	357.452	0.008
	Diesel	LDDT	Light-Duty Trucks (0-8,500 lbs)	0.636	0.005	5.983	0.403	0.008	0.007	535.566	0.008
	Diesel	HDDV	Heavy Duty Vehicles (8,501+ lbs)	7.430	0.014	2.524	0.764	0.294	0.270	1581.914	0.030
	NA	MC	Motorcycles	0.730	0.008	14.265	2.761	0.028	0.025	394.137	0.052
South Dakota	Gasoline	LDGV	Light-Duty Vehicles (Passanger Cars)	0.514	0.007	4.942	0.530	0.016	0.014	346.733	0.028
	Gasoline	LDGT	Light-Duty Trucks (0-8,500 lbs)	0.895	0.009	7.162	0.660	0.018	0.016	454.044	0.029
	Gasoline	HDGV	Heavy Duty Vehicles (8,501+ lbs)	2.405	0.015	20.984	1.046	0.042	0.037	754.696	0.044
	Diesel	LDDV	Light-Duty Vehicles (Passanger Cars)	0.202	0.003	2.601	0.184	0.005	0.004	342.206	0.008
	Diesel	LDDT	Light-Duty Trucks (0-8,500 lbs)	0.652	0.004	5.492	0.433	0.008	0.007	514.067	0.008
	Diesel	HDDV	Heavy Duty Vehicles (8,501+ lbs)	8.359	0.013	2.652	0.859	0.289	0.266	1559.436	0.031
	NA	MC	Motorcycles	0.835	0.008	14.614	2.348	0.030	0.026	398.302	0.053
Tennessee	Gasoline	LDGV	Light-Duty Vehicles (Passanger Cars)	0.470	0.007	4.378	0.450	0.010	0.009	358.277	0.028
	Gasoline	LDGT	Light-Duty Trucks (0-8,500 lbs)	0.829	0.009	6.706	0.605	0.012	0.010	468.822	0.030
	Gasoline	HDGV	Heavy Duty Vehicles (8,501+ lbs)	2.370	0.016	22.347	1.152	0.028	0.025	780.131	0.045
	Diesel	LDDV	Light-Duty Vehicles (Passanger Cars)	0.195	0.003	2.746	0.152	0.005	0.004	357.014	0.008
	Diesel	LDDT	Light-Duty Trucks (0-8,500 lbs)	0.638	0.005	5.871	0.414	0.008	0.007	535.132	0.008
	Diesel	HDDV	Heavy Duty Vehicles (8,501+ lbs)	7.286	0.013	2.430	0.720	0.293	0.269	1563.337	0.029
	NA	MC	Motorcycles	0.750	0.008	14.243	2.650	0.028	0.025	395.134	0.052
Texas	Gasoline	LDGV	Light-Duty Vehicles (Passanger Cars)	0.434	0.007	4.094	0.423	0.008	0.007	360.303	0.028
	Gasoline	LDGT	Light-Duty Trucks (0-8,500 lbs)	0.772	0.009	6.437	0.570	0.010	0.009	472.435	0.030
	Gasoline	HDGV	Heavy Duty Vehicles (8,501+ lbs)	2.293	0.016	21.626	1.171	0.025	0.022	791.003	0.045
	Diesel	LDDV	Light-Duty Vehicles (Passanger Cars)	0.196	0.003	2.965	0.137	0.005	0.004	360.889	0.008
	Diesel	LDDT	Light-Duty Trucks (0-8,500 lbs)	0.643	0.005	6.323	0.400	0.008	0.007	541.360	0.008
	Diesel	HDDV	Heavy Duty Vehicles (8,501+ lbs)	6.656	0.013	2.276	0.634	0.286	0.264	1567.782	0.028
	NA	MC	Motorcycles	0.706	0.008	13.561	2.805	0.027	0.024	393.901	0.052
Utah	Gasoline	LDGV	Light-Duty Vehicles (Passanger Cars)	0.474	0.007	4.386	0.458	0.013	0.011	362.801	0.029
	Gasoline	LDGT	Light-Duty Trucks (0-8,500 lbs)	0.843	0.009	6.579	0.596	0.015	0.013	475.214	0.030
	Gasoline	HDGV	Heavy Duty Vehicles (8,501+ lbs)	2.600	0.016	23.306	1.176	0.037	0.033	788.154	0.045
	Diesel	LDDV	Light-Duty Vehicles (Passanger Cars)	0.200	0.003	2.662	0.166	0.005	0.004	359.773	0.008
	Diesel	LDDT	Light-Duty Trucks (0-8,500 lbs)	0.662	0.005	5.756	0.439	0.008	0.007	539.794	0.008
	Diesel	HDDV	Heavy Duty Vehicles (8,501+ lbs)	7.354	0.013	2.300	0.655	0.295	0.272	1545.068	0.028
	NA	MC	Motorcycles	0.848	0.008	14.385	2.729	0.029	0.025	397.300	0.051
Vermont	Gasoline	LDGV	Light-Duty Vehicles (Passanger Cars)	0.463	0.007	4.255	0.497	0.016	0.014	345.430	0.028
	Gasoline	LDGT	Light-Duty Trucks (0-8,500 lbs)	0.804	0.009	6.118	0.606	0.018	0.016	451.657	0.029
	Gasoline	HDGV	Heavy Duty Vehicles (8,501+ lbs)	2.415	0.015	20.317	1.044	0.041	0.036	745.427	0.044
	Diesel	LDDV	Light-Duty Vehicles (Passanger Cars)	0.199	0.003	2.505	0.186	0.005	0.004	340.557	0.008
	Diesel	LDDT	Light-Duty Trucks (0-8,500 lbs)	0.641	0.004	5.283	0.432	0.007	0.007	511.481	0.008
	Diesel	HDDV	Heavy Duty Vehicles (8,501+ lbs)	7.931	0.013	2.504	0.787	0.284	0.261	1527.833	0.030
	NA	MC	Motorcycles	0.843	0.008	14.745	2.192	0.030	0.027	397.547	0.053
Virgin Islands	Gasoline	LDGV	Light-Duty Vehicles (Passanger Cars)	0.444	0.007	4.706	0.484	0.006	0.005	360.873	0.028
	Gasoline	LDGT	Light-Duty Trucks (0-8,500 lbs)	0.760	0.009	7.340	0.620	0.007	0.006	471.190	0.029
	Gasoline	HDGV	Heavy Duty Vehicles (8,501+ lbs)	2.014	0.015	22.223	1.199	0.012	0.011	775.846	0.045
	Diesel	LDDV	Light-Duty Vehicles (Passanger Cars)	0.191	0.003	3.094	0.120	0.004	0.004	363.894	0.007
	Diesel	LDDT	Light-Duty Trucks (0-8,500 lbs)	0.601	0.005	6.496	0.357	0.007	0.006	545.254	0.008
	Diesel	HDDV	Heavy Duty Vehicles (8,501+ lbs)	4.779	0.013	1.831	0.406	0.263	0.242	1524.009	0.025
	NA	MC	Motorcycles	0.635	0.008	13.920	2.729	0.024	0.021	387.737	0.052

Table 5-21. On-Road Vehicle Emission Factors – 2016 (cont.)

State	Fuel Type	Vehicle Type		Emission Factors (g/mi)							
				Criteria Pollutants and Ozone Precursors							
				NO_x	SO_2	CO	VOC	PM_{10}	$PM_{2.5}$	CO_2	NH_3
Virginia	Gasoline	LDGV	Light-Duty Vehicles (Passanger Cars)	0.466	0.007	4.204	0.443	0.011	0.010	357.341	0.028
	Gasoline	LDGT	Light-Duty Trucks (0-8,500 lbs)	0.826	0.009	6.468	0.590	0.013	0.011	467.934	0.030
	Gasoline	HDGV	Heavy Duty Vehicles (8,501+ lbs)	2.380	0.016	21.329	1.125	0.031	0.027	778.338	0.045
	Diesel	LDDV	Light-Duty Vehicles (Passanger Cars)	0.195	0.003	2.706	0.155	0.005	0.004	355.682	0.008
	Diesel	LDDT	Light-Duty Trucks (0-8,500 lbs)	0.639	0.005	5.799	0.419	0.008	0.007	533.456	0.008
	Diesel	HDDV	Heavy Duty Vehicles (8,501+ lbs)	7.228	0.013	2.384	0.698	0.292	0.268	1552.142	0.029
	NA	MC	Motorcycles	0.757	0.008	13.919	2.495	0.028	0.025	395.778	0.052
Washington	Gasoline	LDGV	Light-Duty Vehicles (Passanger Cars)	0.456	0.007	4.239	0.431	0.012	0.010	353.886	0.029
	Gasoline	LDGT	Light-Duty Trucks (0-8,500 lbs)	0.807	0.009	6.422	0.572	0.014	0.012	464.158	0.030
	Gasoline	HDGV	Heavy Duty Vehicles (8,501+ lbs)	2.493	0.015	22.496	1.109	0.034	0.030	771.605	0.045
	Diesel	LDDV	Light-Duty Vehicles (Passanger Cars)	0.196	0.003	2.567	0.165	0.005	0.004	351.078	0.008
	Diesel	LDDT	Light-Duty Trucks (0-8,500 lbs)	0.646	0.005	5.539	0.433	0.008	0.007	527.266	0.008
	Diesel	HDDV	Heavy Duty Vehicles (8,501+ lbs)	7.502	0.013	2.380	0.704	0.292	0.268	1534.320	0.029
	NA	MC	Motorcycles	0.830	0.008	14.305	2.390	0.029	0.025	397.644	0.052
West Virginia	Gasoline	LDGV	Light-Duty Vehicles (Passanger Cars)	0.499	0.007	4.660	0.479	0.011	0.010	347.573	0.028
	Gasoline	LDGT	Light-Duty Trucks (0-8,500 lbs)	0.873	0.009	6.940	0.624	0.013	0.012	455.388	0.029
	Gasoline	HDGV	Heavy Duty Vehicles (8,501+ lbs)	2.372	0.015	21.658	1.066	0.031	0.028	756.638	0.044
	Diesel	LDDV	Light-Duty Vehicles (Passanger Cars)	0.197	0.003	2.622	0.165	0.005	0.004	345.052	0.008
	Diesel	LDDT	Light-Duty Trucks (0-8,500 lbs)	0.639	0.004	5.557	0.417	0.008	0.007	518.214	0.008
	Diesel	HDDV	Heavy Duty Vehicles (8,501+ lbs)	7.576	0.013	2.454	0.751	0.285	0.262	1538.507	0.030
	NA	MC	Motorcycles	0.796	0.008	14.392	2.405	0.028	0.025	396.223	0.053
Wisconsin	Gasoline	LDGV	Light-Duty Vehicles (Passanger Cars)	0.486	0.007	4.656	0.500	0.015	0.014	352.798	0.028
	Gasoline	LDGT	Light-Duty Trucks (0-8,500 lbs)	0.849	0.009	6.795	0.637	0.017	0.015	460.920	0.029
	Gasoline	HDGV	Heavy Duty Vehicles (8,501+ lbs)	2.401	0.015	21.409	1.084	0.040	0.035	759.736	0.045
	Diesel	LDDV	Light-Duty Vehicles (Passanger Cars)	0.197	0.003	2.550	0.180	0.005	0.004	348.351	0.008
	Diesel	LDDT	Light-Duty Trucks (0-8,500 lbs)	0.639	0.004	5.428	0.436	0.008	0.007	522.300	0.008
	Diesel	HDDV	Heavy Duty Vehicles (8,501+ lbs)	7.390	0.013	2.352	0.702	0.286	0.263	1521.116	0.029
	NA	MC	Motorcycles	0.810	0.008	14.322	2.271	0.029	0.026	397.546	0.052
Wyoming	Gasoline	LDGV	Light-Duty Vehicles (Passanger Cars)	0.534	0.007	5.039	0.535	0.016	0.014	348.399	0.028
	Gasoline	LDGT	Light-Duty Trucks (0-8,500 lbs)	0.931	0.009	7.233	0.660	0.018	0.016	455.986	0.030
	Gasoline	HDGV	Heavy Duty Vehicles (8,501+ lbs)	2.520	0.015	21.547	1.031	0.043	0.038	758.760	0.044
	Diesel	LDDV	Light-Duty Vehicles (Passanger Cars)	0.205	0.003	2.585	0.186	0.005	0.004	343.598	0.008
	Diesel	LDDT	Light-Duty Trucks (0-8,500 lbs)	0.665	0.004	5.475	0.439	0.008	0.007	515.747	0.008
	Diesel	HDDV	Heavy Duty Vehicles (8,501+ lbs)	8.932	0.014	2.774	0.919	0.294	0.271	1576.088	0.032
	NA	MC	Motorcycles	0.890	0.008	14.596	2.412	0.029	0.026	398.889	0.053

Table 5-22. On-Road Vehicle Emission Factors – 2017

State	Fuel Type	Vehicle Type		Emission Factors (g/mi)							
				Criteria Pollutants and Ozone Precursors							
				NO_x	SO_2	CO	VOC	PM_{10}	$PM_{2.5}$	CO_2	NH_3
Alabama	Gasoline	LDGV	Light-Duty Vehicles (Passanger Cars)	0.352	0.002	3.994	0.406	0.008	0.007	352.057	0.026
	Gasoline	LDGT	Light-Duty Trucks (0-8,500 lbs)	0.602	0.003	6.074	0.534	0.010	0.009	456.339	0.028
	Gasoline	HDGV	Heavy Duty Vehicles (8,501+ lbs)	1.442	0.005	18.840	0.995	0.021	0.019	777.336	0.045
	Diesel	LDDV	Light-Duty Vehicles (Passanger Cars)	0.170	0.003	2.662	0.127	0.004	0.004	348.063	0.008
	Diesel	LDDT	Light-Duty Trucks (0-8,500 lbs)	0.545	0.004	5.422	0.347	0.007	0.007	513.176	0.008
	Diesel	HDDV	Heavy Duty Vehicles (8,501+ lbs)	6.167	0.013	2.134	0.601	0.254	0.234	1539.693	0.028
	NA	MC	Motorcycles	0.710	0.003	13.657	2.766	0.026	0.023	392.987	0.052
Alaska	Gasoline	LDGV	Light-Duty Vehicles (Passanger Cars)	0.383	0.002	4.705	0.488	0.018	0.016	348.708	0.026
	Gasoline	LDGT	Light-Duty Trucks (0-8,500 lbs)	0.639	0.003	6.326	0.577	0.021	0.019	451.637	0.028
	Gasoline	HDGV	Heavy Duty Vehicles (8,501+ lbs)	1.586	0.005	19.510	0.923	0.049	0.043	762.451	0.044
	Diesel	LDDV	Light-Duty Vehicles (Passanger Cars)	0.174	0.003	2.361	0.190	0.004	0.004	337.833	0.008
	Diesel	LDDT	Light-Duty Trucks (0-8,500 lbs)	0.563	0.004	4.833	0.415	0.007	0.007	498.545	0.008
	Diesel	HDDV	Heavy Duty Vehicles (8,501+ lbs)	7.533	0.013	2.378	0.753	0.259	0.238	1526.496	0.030
	NA	MC	Motorcycles	0.872	0.003	14.635	2.021	0.031	0.027	400.910	0.053
Arizona	Gasoline	LDGV	Light-Duty Vehicles (Passanger Cars)	0.343	0.002	3.921	0.387	0.007	0.006	359.351	0.027
	Gasoline	LDGT	Light-Duty Trucks (0-8,500 lbs)	0.593	0.003	5.926	0.497	0.009	0.008	467.338	0.028
	Gasoline	HDGV	Heavy Duty Vehicles (8,501+ lbs)	1.589	0.005	20.809	1.049	0.021	0.019	805.790	0.045
	Diesel	LDDV	Light-Duty Vehicles (Passanger Cars)	0.183	0.003	2.881	0.119	0.005	0.004	356.439	0.008
	Diesel	LDDT	Light-Duty Trucks (0-8,500 lbs)	0.597	0.005	5.917	0.349	0.008	0.007	526.204	0.008
	Diesel	HDDV	Heavy Duty Vehicles (8,501+ lbs)	7.068	0.014	2.292	0.665	0.263	0.242	1595.893	0.029
	NA	MC	Motorcycles	0.808	0.002	13.209	3.182	0.025	0.022	393.535	0.052
Arkansas	Gasoline	LDGV	Light-Duty Vehicles (Passanger Cars)	0.365	0.002	4.215	0.408	0.009	0.008	344.461	0.026
	Gasoline	LDGT	Light-Duty Trucks (0-8,500 lbs)	0.622	0.003	6.316	0.526	0.010	0.009	448.259	0.028
	Gasoline	HDGV	Heavy Duty Vehicles (8,501+ lbs)	1.463	0.005	19.161	0.941	0.024	0.022	769.166	0.044
	Diesel	LDDV	Light-Duty Vehicles (Passanger Cars)	0.174	0.003	2.686	0.134	0.004	0.004	340.051	0.008
	Diesel	LDDT	Light-Duty Trucks (0-8,500 lbs)	0.557	0.004	5.451	0.352	0.007	0.007	502.795	0.008
	Diesel	HDDV	Heavy Duty Vehicles (8,501+ lbs)	6.704	0.013	2.274	0.681	0.252	0.232	1548.313	0.029
	NA	MC	Motorcycles	0.749	0.003	13.768	2.613	0.027	0.023	394.845	0.053
Colorado	Gasoline	LDGV	Light-Duty Vehicles (Passanger Cars)	0.351	0.002	4.005	0.406	0.012	0.011	349.432	0.027
	Gasoline	LDGT	Light-Duty Trucks (0-8,500 lbs)	0.600	0.003	5.766	0.502	0.014	0.013	454.515	0.028
	Gasoline	HDGV	Heavy Duty Vehicles (8,501+ lbs)	1.597	0.005	20.044	0.967	0.034	0.030	774.513	0.045
	Diesel	LDDV	Light-Duty Vehicles (Passanger Cars)	0.175	0.003	2.512	0.152	0.005	0.004	342.513	0.008
	Diesel	LDDT	Light-Duty Trucks (0-8,500 lbs)	0.571	0.004	5.171	0.382	0.008	0.007	506.378	0.008
	Diesel	HDDV	Heavy Duty Vehicles (8,501+ lbs)	6.781	0.013	2.149	0.623	0.255	0.235	1520.962	0.028
	NA	MC	Motorcycles	0.841	0.003	14.176	2.676	0.029	0.026	397.701	0.052
Connecticut	Gasoline	LDGV	Light-Duty Vehicles (Passanger Cars)	0.304	0.002	3.596	0.349	0.011	0.010	349.173	0.027
	Gasoline	LDGT	Light-Duty Trucks (0-8,500 lbs)	0.534	0.003	5.296	0.435	0.014	0.012	455.992	0.028
	Gasoline	HDGV	Heavy Duty Vehicles (8,501+ lbs)	1.558	0.005	20.057	0.952	0.034	0.030	780.496	0.045
	Diesel	LDDV	Light-Duty Vehicles (Passanger Cars)	0.171	0.003	2.557	0.147	0.005	0.004	342.823	0.008
	Diesel	LDDT	Light-Duty Trucks (0-8,500 lbs)	0.563	0.004	5.308	0.383	0.008	0.007	508.150	0.008
	Diesel	HDDV	Heavy Duty Vehicles (8,501+ lbs)	5.761	0.013	1.851	0.477	0.248	0.228	1489.987	0.026
	NA	MC	Motorcycles	0.782	0.003	13.421	2.327	0.029	0.025	398.492	0.052
Delaware	Gasoline	LDGV	Light-Duty Vehicles (Passanger Cars)	0.332	0.002	3.530	0.358	0.009	0.008	354.184	0.026
	Gasoline	LDGT	Light-Duty Trucks (0-8,500 lbs)	0.569	0.003	5.158	0.452	0.011	0.010	458.463	0.028
	Gasoline	HDGV	Heavy Duty Vehicles (8,501+ lbs)	1.518	0.005	19.733	0.959	0.023	0.021	772.349	0.046
	Diesel	LDDV	Light-Duty Vehicles (Passanger Cars)	0.167	0.003	2.486	0.140	0.004	0.004	348.526	0.008
	Diesel	LDDT	Light-Duty Trucks (0-8,500 lbs)	0.541	0.005	5.090	0.363	0.007	0.007	513.764	0.008
	Diesel	HDDV	Heavy Duty Vehicles (8,501+ lbs)	5.221	0.013	1.733	0.410	0.250	0.230	1470.342	0.025
	NA	MC	Motorcycles	0.757	0.003	13.270	2.339	0.026	0.023	394.408	0.051
District of Columbia	Gasoline	LDGV	Light-Duty Vehicles (Passanger Cars)	0.301	0.002	3.506	0.342	0.009	0.008	368.589	0.027
	Gasoline	LDGT	Light-Duty Trucks (0-8,500 lbs)	0.518	0.003	5.126	0.431	0.011	0.010	478.620	0.028
	Gasoline	HDGV	Heavy Duty Vehicles (8,501+ lbs)	1.571	0.005	21.142	1.055	0.025	0.023	813.249	0.047
	Diesel	LDDV	Light-Duty Vehicles (Passanger Cars)	0.165	0.003	2.563	0.135	0.004	0.004	362.994	0.008
	Diesel	LDDT	Light-Duty Trucks (0-8,500 lbs)	0.542	0.005	5.350	0.375	0.007	0.007	536.446	0.008
	Diesel	HDDV	Heavy Duty Vehicles (8,501+ lbs)	5.454	0.013	1.886	0.452	0.273	0.251	1538.532	0.026
	NA	MC	Motorcycles	0.719	0.003	13.255	2.572	0.026	0.023	394.189	0.049

Table 5-22. On-Road Vehicle Emission Factors – 2017 (cont.)

State	Fuel Type	Vehicle Type		Emission Factors (g/mi)							
				Criteria Pollutants and Ozone Precursors							
				NO_x	SO_2	CO	VOC	PM_{10}	$PM_{2.5}$	CO_2	NH_3
Florida	Gasoline	LDGV	Light-Duty Vehicles (Passanger Cars)	0.334	0.002	4.180	0.402	0.007	0.006	369.951	0.027
	Gasoline	LDGT	Light-Duty Trucks (0-8,500 lbs)	0.581	0.003	6.528	0.560	0.008	0.007	479.551	0.028
	Gasoline	HDGV	Heavy Duty Vehicles (8,501+ lbs)	1.415	0.005	20.298	1.123	0.019	0.017	821.861	0.046
	Diesel	LDDV	Light-Duty Vehicles (Passanger Cars)	0.165	0.003	2.904	0.110	0.004	0.004	367.419	0.008
	Diesel	LDDT	Light-Duty Trucks (0-8,500 lbs)	0.538	0.005	5.979	0.341	0.007	0.007	541.405	0.008
	Diesel	HDDV	Heavy Duty Vehicles (8,501+ lbs)	5.691	0.014	2.137	0.567	0.268	0.247	1599.822	0.028
	NA	MC	Motorcycles	0.629	0.003	13.525	3.124	0.026	0.023	391.451	0.050
Georgia	Gasoline	LDGV	Light-Duty Vehicles (Passanger Cars)	0.332	0.002	3.751	0.379	0.008	0.007	347.057	0.026
	Gasoline	LDGT	Light-Duty Trucks (0-8,500 lbs)	0.571	0.003	5.701	0.493	0.010	0.009	451.362	0.028
	Gasoline	HDGV	Heavy Duty Vehicles (8,501+ lbs)	1.447	0.005	18.562	0.963	0.024	0.021	773.509	0.045
	Diesel	LDDV	Light-Duty Vehicles (Passanger Cars)	0.172	0.003	2.679	0.130	0.004	0.004	342.933	0.008
	Diesel	LDDT	Light-Duty Trucks (0-8,500 lbs)	0.554	0.004	5.455	0.350	0.007	0.007	506.741	0.008
	Diesel	HDDV	Heavy Duty Vehicles (8,501+ lbs)	6.449	0.013	2.198	0.639	0.252	0.232	1542.208	0.029
	NA	MC	Motorcycles	0.726	0.003	13.607	2.647	0.027	0.024	394.387	0.053
Hawaii	Gasoline	LDGV	Light-Duty Vehicles (Passanger Cars)	0.334	0.002	4.076	0.388	0.006	0.005	359.627	0.027
	Gasoline	LDGT	Light-Duty Trucks (0-8,500 lbs)	0.580	0.003	6.334	0.534	0.008	0.007	466.527	0.028
	Gasoline	HDGV	Heavy Duty Vehicles (8,501+ lbs)	1.421	0.005	20.612	1.077	0.017	0.015	796.536	0.046
	Diesel	LDDV	Light-Duty Vehicles (Passanger Cars)	0.165	0.003	2.786	0.104	0.004	0.004	357.495	0.008
	Diesel	LDDT	Light-Duty Trucks (0-8,500 lbs)	0.533	0.005	5.708	0.328	0.007	0.007	527.224	0.008
	Diesel	HDDV	Heavy Duty Vehicles (8,501+ lbs)	4.984	0.013	1.821	0.422	0.253	0.233	1528.585	0.026
	NA	MC	Motorcycles	0.679	0.003	13.557	2.876	0.025	0.022	390.953	0.051
Idaho	Gasoline	LDGV	Light-Duty Vehicles (Passanger Cars)	0.377	0.002	4.200	0.429	0.012	0.011	345.994	0.026
	Gasoline	LDGT	Light-Duty Trucks (0-8,500 lbs)	0.637	0.003	6.013	0.529	0.014	0.012	448.478	0.028
	Gasoline	HDGV	Heavy Duty Vehicles (8,501+ lbs)	1.577	0.005	19.413	0.929	0.031	0.028	760.318	0.044
	Diesel	LDDV	Light-Duty Vehicles (Passanger Cars)	0.176	0.003	2.451	0.158	0.004	0.004	338.706	0.008
	Diesel	LDDT	Light-Duty Trucks (0-8,500 lbs)	0.567	0.004	4.990	0.377	0.007	0.007	499.899	0.008
	Diesel	HDDV	Heavy Duty Vehicles (8,501+ lbs)	7.182	0.013	2.273	0.690	0.255	0.234	1523.330	0.029
	NA	MC	Motorcycles	0.862	0.003	14.219	2.467	0.028	0.025	396.591	0.053
Illinois	Gasoline	LDGV	Light-Duty Vehicles (Passanger Cars)	0.336	0.002	3.972	0.390	0.011	0.010	361.909	0.027
	Gasoline	LDGT	Light-Duty Trucks (0-8,500 lbs)	0.585	0.003	5.953	0.528	0.013	0.012	470.702	0.028
	Gasoline	HDGV	Heavy Duty Vehicles (8,501+ lbs)	1.543	0.005	20.703	1.026	0.031	0.028	800.292	0.046
	Diesel	LDDV	Light-Duty Vehicles (Passanger Cars)	0.167	0.003	2.537	0.146	0.005	0.004	355.263	0.008
	Diesel	LDDT	Light-Duty Trucks (0-8,500 lbs)	0.550	0.004	5.287	0.385	0.008	0.007	525.440	0.008
	Diesel	HDDV	Heavy Duty Vehicles (8,501+ lbs)	5.676	0.013	1.898	0.479	0.263	0.242	1519.053	0.026
	NA	MC	Motorcycles	0.739	0.003	13.383	2.495	0.027	0.024	396.577	0.050
Indiana	Gasoline	LDGV	Light-Duty Vehicles (Passanger Cars)	0.357	0.002	4.157	0.412	0.011	0.010	353.961	0.027
	Gasoline	LDGT	Light-Duty Trucks (0-8,500 lbs)	0.608	0.003	6.094	0.533	0.013	0.011	458.389	0.028
	Gasoline	HDGV	Heavy Duty Vehicles (8,501+ lbs)	1.512	0.005	19.682	0.976	0.029	0.026	776.635	0.045
	Diesel	LDDV	Light-Duty Vehicles (Passanger Cars)	0.169	0.003	2.494	0.149	0.004	0.004	347.390	0.008
	Diesel	LDDT	Light-Duty Trucks (0-8,500 lbs)	0.548	0.004	5.118	0.374	0.007	0.007	512.139	0.008
	Diesel	HDDV	Heavy Duty Vehicles (8,501+ lbs)	6.553	0.013	2.183	0.632	0.260	0.239	1530.297	0.029
	NA	MC	Motorcycles	0.766	0.003	13.958	2.449	0.027	0.024	395.612	0.052
Iowa	Gasoline	LDGV	Light-Duty Vehicles (Passanger Cars)	0.379	0.002	4.434	0.449	0.013	0.011	345.179	0.026
	Gasoline	LDGT	Light-Duty Trucks (0-8,500 lbs)	0.636	0.003	6.286	0.553	0.015	0.013	447.436	0.028
	Gasoline	HDGV	Heavy Duty Vehicles (8,501+ lbs)	1.509	0.005	19.074	0.915	0.033	0.029	758.975	0.044
	Diesel	LDDV	Light-Duty Vehicles (Passanger Cars)	0.173	0.003	2.478	0.159	0.004	0.004	337.740	0.008
	Diesel	LDDT	Light-Duty Trucks (0-8,500 lbs)	0.554	0.004	5.030	0.376	0.007	0.007	498.574	0.008
	Diesel	HDDV	Heavy Duty Vehicles (8,501+ lbs)	7.017	0.013	2.302	0.705	0.254	0.234	1527.945	0.030
	NA	MC	Motorcycles	0.802	0.003	14.120	2.320	0.027	0.024	396.719	0.053
Kansas	Gasoline	LDGV	Light-Duty Vehicles (Passanger Cars)	0.371	0.002	4.277	0.422	0.010	0.009	346.319	0.026
	Gasoline	LDGT	Light-Duty Trucks (0-8,500 lbs)	0.632	0.003	6.286	0.539	0.012	0.011	449.929	0.028
	Gasoline	HDGV	Heavy Duty Vehicles (8,501+ lbs)	1.506	0.005	19.369	0.941	0.028	0.025	766.652	0.045
	Diesel	LDDV	Light-Duty Vehicles (Passanger Cars)	0.173	0.003	2.587	0.145	0.004	0.004	340.557	0.008
	Diesel	LDDT	Light-Duty Trucks (0-8,500 lbs)	0.557	0.004	5.264	0.365	0.007	0.007	503.174	0.008
	Diesel	HDDV	Heavy Duty Vehicles (8,501+ lbs)	6.457	0.013	2.132	0.616	0.250	0.230	1520.343	0.028
	NA	MC	Motorcycles	0.779	0.003	13.886	2.509	0.027	0.024	395.649	0.053

Table 5-22. On-Road Vehicle Emission Factors – 2017 (cont.)

State	Fuel Type	Vehicle Type		Emission Factors (g/mi)							
				Criteria Pollutants and Ozone Precursors							
				NO_x	SO_2	CO	VOC	PM_{10}	$PM_{2.5}$	CO_2	NH_3
Kentucky	Gasoline	LDGV	Light-Duty Vehicles (Passanger Cars)	0.365	0.002	4.186	0.406	0.010	0.009	343.017	0.026
	Gasoline	LDGT	Light-Duty Trucks (0-8,500 lbs)	0.623	0.003	6.236	0.527	0.012	0.010	446.502	0.028
	Gasoline	HDGV	Heavy Duty Vehicles (8,501+ lbs)	1.463	0.005	18.773	0.914	0.028	0.025	766.652	0.044
	Diesel	LDDV	Light-Duty Vehicles (Passanger Cars)	0.174	0.003	2.607	0.143	0.004	0.004	337.573	0.008
	Diesel	LDDT	Light-Duty Trucks (0-8,500 lbs)	0.561	0.004	5.304	0.363	0.007	0.007	499.263	0.008
	Diesel	HDDV	Heavy Duty Vehicles (8,501+ lbs)	7.237	0.013	2.415	0.754	0.256	0.236	1556.348	0.030
	NA	MC	Motorcycles	0.766	0.003	13.624	2.422	0.027	0.024	396.398	0.053
Louisiana	Gasoline	LDGV	Light-Duty Vehicles (Passanger Cars)	0.343	0.002	4.060	0.399	0.008	0.007	353.466	0.026
	Gasoline	LDGT	Light-Duty Trucks (0-8,500 lbs)	0.591	0.003	6.246	0.532	0.009	0.008	459.219	0.028
	Gasoline	HDGV	Heavy Duty Vehicles (8,501+ lbs)	1.412	0.005	19.046	1.014	0.021	0.019	788.594	0.045
	Diesel	LDDV	Light-Duty Vehicles (Passanger Cars)	0.170	0.003	2.821	0.121	0.004	0.004	350.304	0.008
	Diesel	LDDT	Light-Duty Trucks (0-8,500 lbs)	0.549	0.004	5.750	0.344	0.007	0.007	516.978	0.008
	Diesel	HDDV	Heavy Duty Vehicles (8,501+ lbs)	6.230	0.013	2.213	0.636	0.255	0.235	1568.493	0.029
	NA	MC	Motorcycles	0.680	0.003	13.594	2.858	0.027	0.024	393.241	0.052
Maine	Gasoline	LDGV	Light-Duty Vehicles (Passanger Cars)	0.373	0.002	4.111	0.448	0.014	0.012	337.153	0.026
	Gasoline	LDGT	Light-Duty Trucks (0-8,500 lbs)	0.621	0.003	5.758	0.538	0.016	0.014	437.721	0.028
	Gasoline	HDGV	Heavy Duty Vehicles (8,501+ lbs)	1.496	0.005	17.640	0.875	0.035	0.031	741.246	0.044
	Diesel	LDDV	Light-Duty Vehicles (Passanger Cars)	0.175	0.003	2.379	0.169	0.004	0.004	328.927	0.008
	Diesel	LDDT	Light-Duty Trucks (0-8,500 lbs)	0.556	0.004	4.799	0.378	0.007	0.007	486.722	0.008
	Diesel	HDDV	Heavy Duty Vehicles (8,501+ lbs)	7.166	0.013	2.289	0.709	0.249	0.229	1504.680	0.030
	NA	MC	Motorcycles	0.833	0.003	14.018	2.108	0.029	0.025	397.362	0.054
Maryland	Gasoline	LDGV	Light-Duty Vehicles (Passanger Cars)	0.330	0.002	3.632	0.359	0.010	0.009	348.621	0.027
	Gasoline	LDGT	Light-Duty Trucks (0-8,500 lbs)	0.574	0.003	5.404	0.466	0.012	0.011	454.395	0.028
	Gasoline	HDGV	Heavy Duty Vehicles (8,501+ lbs)	1.517	0.005	19.326	0.949	0.030	0.026	777.933	0.045
	Diesel	LDDV	Light-Duty Vehicles (Passanger Cars)	0.172	0.003	2.613	0.140	0.005	0.004	343.173	0.008
	Diesel	LDDT	Light-Duty Trucks (0-8,500 lbs)	0.561	0.004	5.379	0.370	0.008	0.007	507.924	0.008
	Diesel	HDDV	Heavy Duty Vehicles (8,501+ lbs)	6.054	0.013	1.983	0.538	0.249	0.229	1510.160	0.027
	NA	MC	Motorcycles	0.761	0.003	13.304	2.400	0.028	0.024	396.777	0.052
Massachuesetts	Gasoline	LDGV	Light-Duty Vehicles (Passanger Cars)	0.333	0.002	3.732	0.377	0.012	0.010	347.573	0.027
	Gasoline	LDGT	Light-Duty Trucks (0-8,500 lbs)	0.578	0.003	5.527	0.490	0.014	0.012	452.823	0.028
	Gasoline	HDGV	Heavy Duty Vehicles (8,501+ lbs)	1.550	0.005	19.628	0.927	0.034	0.030	772.262	0.045
	Diesel	LDDV	Light-Duty Vehicles (Passanger Cars)	0.171	0.003	2.507	0.152	0.005	0.004	340.751	0.008
	Diesel	LDDT	Light-Duty Trucks (0-8,500 lbs)	0.561	0.004	5.172	0.383	0.008	0.007	504.363	0.008
	Diesel	HDDV	Heavy Duty Vehicles (8,501+ lbs)	6.215	0.013	1.999	0.552	0.250	0.230	1498.832	0.027
	NA	MC	Motorcycles	0.796	0.003	13.454	2.257	0.028	0.025	398.146	0.052
Michigan	Gasoline	LDGV	Light-Duty Vehicles (Passanger Cars)	0.371	0.002	4.347	0.428	0.013	0.011	351.254	0.027
	Gasoline	LDGT	Light-Duty Trucks (0-8,500 lbs)	0.634	0.003	6.363	0.558	0.015	0.013	455.952	0.028
	Gasoline	HDGV	Heavy Duty Vehicles (8,501+ lbs)	1.533	0.005	19.644	0.963	0.035	0.031	774.332	0.045
	Diesel	LDDV	Light-Duty Vehicles (Passanger Cars)	0.171	0.003	2.484	0.156	0.004	0.004	343.870	0.008
	Diesel	LDDT	Light-Duty Trucks (0-8,500 lbs)	0.556	0.004	5.108	0.385	0.007	0.007	507.782	0.008
	Diesel	HDDV	Heavy Duty Vehicles (8,501+ lbs)	6.681	0.013	2.181	0.639	0.257	0.237	1523.964	0.029
	NA	MC	Motorcycles	0.792	0.003	14.120	2.341	0.029	0.026	397.502	0.052
Minnesota	Gasoline	LDGV	Light-Duty Vehicles (Passanger Cars)	0.376	0.002	4.512	0.455	0.015	0.013	347.511	0.026
	Gasoline	LDGT	Light-Duty Trucks (0-8,500 lbs)	0.627	0.003	6.386	0.566	0.018	0.016	450.675	0.028
	Gasoline	HDGV	Heavy Duty Vehicles (8,501+ lbs)	1.530	0.005	19.615	0.969	0.039	0.035	760.968	0.045
	Diesel	LDDV	Light-Duty Vehicles (Passanger Cars)	0.172	0.003	2.440	0.165	0.004	0.004	339.081	0.008
	Diesel	LDDT	Light-Duty Trucks (0-8,500 lbs)	0.555	0.004	4.981	0.388	0.007	0.007	500.761	0.008
	Diesel	HDDV	Heavy Duty Vehicles (8,501+ lbs)	6.246	0.013	2.001	0.563	0.248	0.228	1486.107	0.027
	NA	MC	Motorcycles	0.809	0.003	14.462	2.325	0.030	0.026	397.896	0.052
Mississippi	Gasoline	LDGV	Light-Duty Vehicles (Passanger Cars)	0.353	0.002	3.991	0.408	0.008	0.007	346.724	0.026
	Gasoline	LDGT	Light-Duty Trucks (0-8,500 lbs)	0.599	0.003	6.043	0.528	0.009	0.008	449.940	0.028
	Gasoline	HDGV	Heavy Duty Vehicles (8,501+ lbs)	1.416	0.005	18.497	0.972	0.020	0.018	766.402	0.045
	Diesel	LDDV	Light-Duty Vehicles (Passanger Cars)	0.171	0.003	2.668	0.127	0.004	0.004	342.987	0.008
	Diesel	LDDT	Light-Duty Trucks (0-8,500 lbs)	0.544	0.004	5.401	0.341	0.007	0.006	506.307	0.008
	Diesel	HDDV	Heavy Duty Vehicles (8,501+ lbs)	6.053	0.013	2.092	0.587	0.248	0.228	1526.383	0.028
	NA	MC	Motorcycles	0.711	0.003	13.670	2.733	0.026	0.023	392.620	0.053

Table 5-22. On-Road Vehicle Emission Factors – 2017 (cont.)

State	Fuel Type	Vehicle Type		Emission Factors (g/mi)							
				Criteria Pollutants and Ozone Precursors							
				NO_x	SO_2	CO	VOC	PM_{10}	$PM_{2.5}$	CO_2	NH_3
Missouri	Gasoline	LDGV	Light-Duty Vehicles (Passanger Cars)	0.356	0.002	4.113	0.399	0.010	0.009	339.906	0.026
	Gasoline	LDGT	Light-Duty Trucks (0-8,500 lbs)	0.612	0.003	6.094	0.513	0.012	0.011	443.632	0.028
	Gasoline	HDGV	Heavy Duty Vehicles (8,501+ lbs)	1.479	0.005	19.006	0.906	0.029	0.026	761.999	0.044
	Diesel	LDDV	Light-Duty Vehicles (Passanger Cars)	0.175	0.003	2.636	0.144	0.004	0.004	334.427	0.008
	Diesel	LDDT	Light-Duty Trucks (0-8,500 lbs)	0.564	0.004	5.360	0.365	0.008	0.007	495.614	0.008
	Diesel	HDDV	Heavy Duty Vehicles (8,501+ lbs)	6.531	0.013	2.144	0.628	0.245	0.226	1518.193	0.029
	NA	MC	Motorcycles	0.775	0.003	13.572	2.390	0.027	0.024	397.023	0.054
Montana	Gasoline	LDGV	Light-Duty Vehicles (Passanger Cars)	0.396	0.002	4.505	0.462	0.013	0.012	339.202	0.026
	Gasoline	LDGT	Light-Duty Trucks (0-8,500 lbs)	0.661	0.003	6.313	0.555	0.016	0.014	440.302	0.028
	Gasoline	HDGV	Heavy Duty Vehicles (8,501+ lbs)	1.555	0.005	18.797	0.879	0.035	0.031	748.118	0.044
	Diesel	LDDV	Light-Duty Vehicles (Passanger Cars)	0.178	0.003	2.422	0.169	0.004	0.004	330.975	0.008
	Diesel	LDDT	Light-Duty Trucks (0-8,500 lbs)	0.569	0.004	4.892	0.381	0.007	0.007	489.453	0.008
	Diesel	HDDV	Heavy Duty Vehicles (8,501+ lbs)	7.704	0.013	2.429	0.775	0.254	0.233	1530.519	0.031
	NA	MC	Motorcycles	0.880	0.003	14.328	2.298	0.028	0.025	397.703	0.054
Nebraska	Gasoline	LDGV	Light-Duty Vehicles (Passanger Cars)	0.381	0.002	4.443	0.443	0.012	0.011	344.639	0.026
	Gasoline	LDGT	Light-Duty Trucks (0-8,500 lbs)	0.646	0.003	6.398	0.553	0.014	0.013	447.849	0.028
	Gasoline	HDGV	Heavy Duty Vehicles (8,501+ lbs)	1.519	0.005	19.083	0.914	0.034	0.030	765.310	0.044
	Diesel	LDDV	Light-Duty Vehicles (Passanger Cars)	0.175	0.003	2.551	0.156	0.004	0.004	337.661	0.008
	Diesel	LDDT	Light-Duty Trucks (0-8,500 lbs)	0.564	0.004	5.189	0.376	0.007	0.007	499.008	0.008
	Diesel	HDDV	Heavy Duty Vehicles (8,501+ lbs)	7.395	0.013	2.422	0.762	0.257	0.236	1551.301	0.030
	NA	MC	Motorcycles	0.807	0.003	14.075	2.428	0.028	0.025	397.510	0.053
Nevada	Gasoline	LDGV	Light-Duty Vehicles (Passanger Cars)	0.352	0.002	3.734	0.388	0.009	0.008	360.191	0.027
	Gasoline	LDGT	Light-Duty Trucks (0-8,500 lbs)	0.612	0.003	5.618	0.502	0.010	0.009	467.647	0.028
	Gasoline	HDGV	Heavy Duty Vehicles (8,501+ lbs)	1.647	0.005	20.449	1.047	0.025	0.022	799.490	0.045
	Diesel	LDDV	Light-Duty Vehicles (Passanger Cars)	0.178	0.003	2.672	0.131	0.004	0.004	355.686	0.008
	Diesel	LDDT	Light-Duty Trucks (0-8,500 lbs)	0.584	0.004	5.518	0.363	0.007	0.007	524.914	0.008
	Diesel	HDDV	Heavy Duty Vehicles (8,501+ lbs)	6.940	0.013	2.222	0.632	0.266	0.245	1568.961	0.029
	NA	MC	Motorcycles	0.832	0.003	13.774	3.061	0.027	0.024	394.273	0.051
New Hampshire	Gasoline	LDGV	Light-Duty Vehicles (Passanger Cars)	0.333	0.002	3.747	0.398	0.013	0.011	344.879	0.026
	Gasoline	LDGT	Light-Duty Trucks (0-8,500 lbs)	0.567	0.003	5.360	0.492	0.015	0.013	447.400	0.028
	Gasoline	HDGV	Heavy Duty Vehicles (8,501+ lbs)	1.529	0.005	18.917	0.904	0.033	0.029	756.319	0.045
	Diesel	LDDV	Light-Duty Vehicles (Passanger Cars)	0.172	0.003	2.423	0.160	0.004	0.004	337.280	0.008
	Diesel	LDDT	Light-Duty Trucks (0-8,500 lbs)	0.554	0.004	4.938	0.379	0.007	0.007	498.218	0.008
	Diesel	HDDV	Heavy Duty Vehicles (8,501+ lbs)	6.383	0.013	2.045	0.582	0.248	0.228	1487.893	0.028
	NA	MC	Motorcycles	0.814	0.003	13.667	2.185	0.028	0.024	396.952	0.053
New Jersey	Gasoline	LDGV	Light-Duty Vehicles (Passanger Cars)	0.332	0.002	3.640	0.357	0.010	0.009	339.125	0.026
	Gasoline	LDGT	Light-Duty Trucks (0-8,500 lbs)	0.546	0.003	5.219	0.433	0.012	0.011	442.338	0.028
	Gasoline	HDGV	Heavy Duty Vehicles (8,501+ lbs)	1.486	0.005	18.187	0.845	0.031	0.027	763.700	0.044
	Diesel	LDDV	Light-Duty Vehicles (Passanger Cars)	0.176	0.003	2.584	0.146	0.004	0.004	333.340	0.008
	Diesel	LDDT	Light-Duty Trucks (0-8,500 lbs)	0.568	0.004	5.255	0.363	0.007	0.007	493.704	0.008
	Diesel	HDDV	Heavy Duty Vehicles (8,501+ lbs)	7.861	0.013	2.586	0.841	0.259	0.238	1573.240	0.032
	NA	MC	Motorcycles	0.799	0.003	13.288	2.184	0.027	0.024	397.625	0.054
New Mexico	Gasoline	LDGV	Light-Duty Vehicles (Passanger Cars)	0.377	0.002	4.053	0.421	0.010	0.008	344.799	0.026
	Gasoline	LDGT	Light-Duty Trucks (0-8,500 lbs)	0.644	0.003	5.968	0.527	0.011	0.010	447.978	0.028
	Gasoline	HDGV	Heavy Duty Vehicles (8,501+ lbs)	1.572	0.005	19.032	0.933	0.027	0.024	765.747	0.044
	Diesel	LDDV	Light-Duty Vehicles (Passanger Cars)	0.179	0.003	2.565	0.142	0.004	0.004	339.396	0.008
	Diesel	LDDT	Light-Duty Trucks (0-8,500 lbs)	0.577	0.004	5.217	0.360	0.007	0.007	501.368	0.008
	Diesel	HDDV	Heavy Duty Vehicles (8,501+ lbs)	7.442	0.013	2.370	0.729	0.256	0.236	1548.922	0.030
	NA	MC	Motorcycles	0.849	0.003	13.853	2.804	0.027	0.024	395.431	0.053
New York	Gasoline	LDGV	Light-Duty Vehicles (Passanger Cars)	0.301	0.002	3.507	0.356	0.011	0.010	351.228	0.027
	Gasoline	LDGT	Light-Duty Trucks (0-8,500 lbs)	0.510	0.003	4.903	0.423	0.014	0.012	456.518	0.028
	Gasoline	HDGV	Heavy Duty Vehicles (8,501+ lbs)	1.543	0.005	19.519	0.962	0.032	0.028	775.474	0.045
	Diesel	LDDV	Light-Duty Vehicles (Passanger Cars)	0.170	0.003	2.489	0.150	0.004	0.004	344.521	0.008
	Diesel	LDDT	Light-Duty Trucks (0-8,500 lbs)	0.554	0.004	5.133	0.380	0.007	0.007	509.221	0.008
	Diesel	HDDV	Heavy Duty Vehicles (8,501+ lbs)	6.053	0.013	1.970	0.532	0.253	0.233	1499.239	0.027
	NA	MC	Motorcycles	0.780	0.003	13.687	2.337	0.028	0.025	396.936	0.052

Table 5-22. On-Road Vehicle Emission Factors – 2017 (cont.)

State	Fuel Type	Vehicle Type		Emission Factors (g/mi)							
				Criteria Pollutants and Ozone Precursors							
				NO_x	SO_2	CO	VOC	PM_{10}	$PM_{2.5}$	CO_2	NH_3
North Carolina	Gasoline	LDGV	Light-Duty Vehicles (Passanger Cars)	0.352	0.002	3.910	0.398	0.009	0.008	349.576	0.026
	Gasoline	LDGT	Light-Duty Trucks (0-8,500 lbs)	0.605	0.003	5.932	0.528	0.011	0.009	453.852	0.028
	Gasoline	HDGV	Heavy Duty Vehicles (8,501+ lbs)	1.476	0.005	18.893	0.986	0.024	0.021	772.366	0.045
	Diesel	LDDV	Light-Duty Vehicles (Passanger Cars)	0.170	0.003	2.596	0.133	0.004	0.004	344.908	0.008
	Diesel	LDDT	Light-Duty Trucks (0-8,500 lbs)	0.549	0.004	5.301	0.355	0.007	0.007	509.240	0.008
	Diesel	HDDV	Heavy Duty Vehicles (8,501+ lbs)	5.916	0.013	1.988	0.535	0.250	0.230	1509.813	0.027
	NA	MC	Motorcycles	0.735	0.003	13.729	2.662	0.027	0.024	394.092	0.052
North Dakota	Gasoline	LDGV	Light-Duty Vehicles (Passanger Cars)	0.389	0.002	4.803	0.502	0.017	0.015	340.748	0.026
	Gasoline	LDGT	Light-Duty Trucks (0-8,500 lbs)	0.646	0.003	6.569	0.593	0.020	0.017	441.674	0.028
	Gasoline	HDGV	Heavy Duty Vehicles (8,501+ lbs)	1.513	0.005	18.779	0.915	0.042	0.038	746.489	0.044
	Diesel	LDDV	Light-Duty Vehicles (Passanger Cars)	0.176	0.003	2.406	0.178	0.004	0.004	331.200	0.008
	Diesel	LDDT	Light-Duty Trucks (0-8,500 lbs)	0.560	0.004	4.853	0.389	0.007	0.007	489.598	0.008
	Diesel	HDDV	Heavy Duty Vehicles (8,501+ lbs)	7.266	0.013	2.314	0.724	0.250	0.230	1512.799	0.030
	NA	MC	Motorcycles	0.845	0.003	14.585	2.213	0.030	0.026	398.476	0.054
Ohio	Gasoline	LDGV	Light-Duty Vehicles (Passanger Cars)	0.339	0.002	3.986	0.395	0.011	0.010	353.561	0.027
	Gasoline	LDGT	Light-Duty Trucks (0-8,500 lbs)	0.578	0.003	5.814	0.505	0.013	0.012	458.518	0.028
	Gasoline	HDGV	Heavy Duty Vehicles (8,501+ lbs)	1.524	0.005	19.871	0.987	0.030	0.027	777.225	0.045
	Diesel	LDDV	Light-Duty Vehicles (Passanger Cars)	0.169	0.003	2.492	0.149	0.004	0.004	346.929	0.008
	Diesel	LDDT	Light-Duty Trucks (0-8,500 lbs)	0.549	0.004	5.127	0.377	0.007	0.007	511.987	0.008
	Diesel	HDDV	Heavy Duty Vehicles (8,501+ lbs)	6.222	0.013	2.058	0.572	0.257	0.236	1513.971	0.028
	NA	MC	Motorcycles	0.769	0.003	14.061	2.457	0.028	0.025	396.042	0.051
Oklahoma	Gasoline	LDGV	Light-Duty Vehicles (Passanger Cars)	0.365	0.002	4.222	0.412	0.009	0.008	350.751	0.026
	Gasoline	LDGT	Light-Duty Trucks (0-8,500 lbs)	0.624	0.003	6.324	0.537	0.010	0.009	455.267	0.028
	Gasoline	HDGV	Heavy Duty Vehicles (8,501+ lbs)	1.493	0.005	19.639	0.975	0.024	0.021	777.172	0.045
	Diesel	LDDV	Light-Duty Vehicles (Passanger Cars)	0.172	0.003	2.663	0.134	0.004	0.004	346.086	0.008
	Diesel	LDDT	Light-Duty Trucks (0-8,500 lbs)	0.555	0.004	5.430	0.356	0.007	0.007	510.751	0.008
	Diesel	HDDV	Heavy Duty Vehicles (8,501+ lbs)	6.427	0.013	2.173	0.626	0.254	0.233	1541.838	0.029
	NA	MC	Motorcycles	0.749	0.003	13.790	2.716	0.026	0.023	394.314	0.052
Oregon	Gasoline	LDGV	Light-Duty Vehicles (Passanger Cars)	0.357	0.002	3.816	0.385	0.010	0.009	342.216	0.026
	Gasoline	LDGT	Light-Duty Trucks (0-8,500 lbs)	0.597	0.003	5.592	0.488	0.012	0.011	444.432	0.028
	Gasoline	HDGV	Heavy Duty Vehicles (8,501+ lbs)	1.542	0.005	19.185	0.919	0.027	0.024	754.618	0.045
	Diesel	LDDV	Light-Duty Vehicles (Passanger Cars)	0.173	0.003	2.420	0.149	0.004	0.004	336.043	0.008
	Diesel	LDDT	Light-Duty Trucks (0-8,500 lbs)	0.557	0.004	4.933	0.367	0.007	0.007	496.611	0.008
	Diesel	HDDV	Heavy Duty Vehicles (8,501+ lbs)	6.729	0.013	2.156	0.631	0.251	0.231	1501.865	0.029
	NA	MC	Motorcycles	0.838	0.003	14.007	2.342	0.028	0.024	395.811	0.053
Pacific Islands	Gasoline	LDGV	Light-Duty Vehicles (Passanger Cars)	0.338	0.002	3.807	0.377	0.009	0.008	349.291	0.027
	Gasoline	LDGT	Light-Duty Trucks (0-8,500 lbs)	0.581	0.003	5.682	0.490	0.011	0.010	454.097	0.028
	Gasoline	HDGV	Heavy Duty Vehicles (8,501+ lbs)	1.502	0.005	19.409	0.962	0.026	0.023	775.343	0.045
	Diesel	LDDV	Light-Duty Vehicles (Passanger Cars)	0.171	0.003	2.572	0.137	0.004	0.004	344.128	0.008
	Diesel	LDDT	Light-Duty Trucks (0-8,500 lbs)	0.556	0.004	5.277	0.363	0.007	0.007	508.482	0.008
	Diesel	HDDV	Heavy Duty Vehicles (8,501+ lbs)	6.439	0.013	2.135	0.608	0.255	0.234	1527.075	0.028
	NA	MC	Motorcycles	0.764	0.003	13.565	2.528	0.027	0.024	395.459	0.052
Pennsylvania	Gasoline	LDGV	Light-Duty Vehicles (Passanger Cars)	0.332	0.002	3.742	0.378	0.011	0.010	351.140	0.027
	Gasoline	LDGT	Light-Duty Trucks (0-8,500 lbs)	0.572	0.003	5.516	0.486	0.013	0.012	455.975	0.028
	Gasoline	HDGV	Heavy Duty Vehicles (8,501+ lbs)	1.523	0.005	19.242	0.957	0.031	0.028	776.135	0.045
	Diesel	LDDV	Light-Duty Vehicles (Passanger Cars)	0.171	0.003	2.514	0.149	0.004	0.004	344.615	0.008
	Diesel	LDDT	Light-Duty Trucks (0-8,500 lbs)	0.555	0.004	5.168	0.377	0.007	0.007	508.908	0.008
	Diesel	HDDV	Heavy Duty Vehicles (8,501+ lbs)	6.705	0.013	2.211	0.649	0.258	0.238	1532.204	0.029
	NA	MC	Motorcycles	0.775	0.003	13.814	2.407	0.028	0.025	396.701	0.052
Puerto Rico	Gasoline	LDGV	Light-Duty Vehicles (Passanger Cars)	0.326	0.002	4.555	0.399	0.006	0.006	371.875	0.027
	Gasoline	LDGT	Light-Duty Trucks (0-8,500 lbs)	0.573	0.003	7.155	0.565	0.008	0.007	483.837	0.028
	Gasoline	HDGV	Heavy Duty Vehicles (8,501+ lbs)	1.381	0.006	21.828	1.153	0.019	0.017	835.667	0.046
	Diesel	LDDV	Light-Duty Vehicles (Passanger Cars)	0.165	0.003	3.142	0.102	0.005	0.004	370.241	0.008
	Diesel	LDDT	Light-Duty Trucks (0-8,500 lbs)	0.538	0.005	6.470	0.336	0.008	0.007	546.799	0.008
	Diesel	HDDV	Heavy Duty Vehicles (8,501+ lbs)	4.921	0.014	1.924	0.458	0.260	0.239	1598.448	0.026
	NA	MC	Motorcycles	0.608	0.003	13.552	3.187	0.026	0.023	391.777	0.051

Table 5-22. On-Road Vehicle Emission Factors – 2017 (cont.)

State	Fuel Type	Vehicle Type		Emission Factors (g/mi)							
				Criteria Pollutants and Ozone Precursors							
				NO_x	SO_2	CO	VOC	PM_{10}	$PM_{2.5}$	CO_2	NH_3
Rhode Island	Gasoline	LDGV	Light-Duty Vehicles (Passanger Cars)	0.305	0.002	3.605	0.355	0.011	0.010	353.278	0.027
	Gasoline	LDGT	Light-Duty Trucks (0-8,500 lbs)	0.530	0.003	5.175	0.434	0.014	0.012	460.232	0.028
	Gasoline	HDGV	Heavy Duty Vehicles (8,501+ lbs)	1.559	0.005	20.059	0.961	0.033	0.029	785.386	0.045
	Diesel	LDDV	Light-Duty Vehicles (Passanger Cars)	0.170	0.003	2.518	0.148	0.005	0.004	346.682	0.008
	Diesel	LDDT	Light-Duty Trucks (0-8,500 lbs)	0.557	0.004	5.232	0.384	0.008	0.007	513.107	0.008
	Diesel	HDDV	Heavy Duty Vehicles (8,501+ lbs)	6.215	0.013	2.033	0.558	0.257	0.237	1516.786	0.027
	NA	MC	Motorcycles	0.775	0.003	13.417	2.342	0.028	0.025	397.791	0.051
South Carolina	Gasoline	LDGV	Light-Duty Vehicles (Passanger Cars)	0.356	0.002	4.044	0.404	0.008	0.007	349.918	0.026
	Gasoline	LDGT	Light-Duty Trucks (0-8,500 lbs)	0.612	0.003	6.177	0.536	0.010	0.009	454.621	0.028
	Gasoline	HDGV	Heavy Duty Vehicles (8,501+ lbs)	1.450	0.005	18.704	0.981	0.024	0.021	779.811	0.045
	Diesel	LDDV	Light-Duty Vehicles (Passanger Cars)	0.172	0.003	2.696	0.129	0.004	0.004	345.852	0.008
	Diesel	LDDT	Light-Duty Trucks (0-8,500 lbs)	0.554	0.004	5.500	0.351	0.007	0.007	510.560	0.008
	Diesel	HDDV	Heavy Duty Vehicles (8,501+ lbs)	6.783	0.013	2.336	0.702	0.258	0.237	1566.615	0.030
	NA	MC	Motorcycles	0.719	0.003	13.693	2.755	0.027	0.024	394.273	0.052
South Dakota	Gasoline	LDGV	Light-Duty Vehicles (Passanger Cars)	0.385	0.002	4.564	0.465	0.014	0.012	339.157	0.026
	Gasoline	LDGT	Light-Duty Trucks (0-8,500 lbs)	0.647	0.003	6.495	0.569	0.016	0.015	441.084	0.028
	Gasoline	HDGV	Heavy Duty Vehicles (8,501+ lbs)	1.504	0.005	18.603	0.901	0.038	0.034	753.361	0.044
	Diesel	LDDV	Light-Duty Vehicles (Passanger Cars)	0.178	0.003	2.498	0.167	0.004	0.004	331.154	0.008
	Diesel	LDDT	Light-Duty Trucks (0-8,500 lbs)	0.568	0.004	5.049	0.381	0.007	0.007	490.153	0.008
	Diesel	HDDV	Heavy Duty Vehicles (8,501+ lbs)	7.667	0.013	2.470	0.794	0.254	0.234	1543.656	0.031
	NA	MC	Motorcycles	0.829	0.003	14.352	2.340	0.029	0.026	398.439	0.054
Tennessee	Gasoline	LDGV	Light-Duty Vehicles (Passanger Cars)	0.346	0.002	3.921	0.390	0.009	0.008	350.361	0.026
	Gasoline	LDGT	Light-Duty Trucks (0-8,500 lbs)	0.595	0.003	5.916	0.514	0.011	0.010	455.330	0.028
	Gasoline	HDGV	Heavy Duty Vehicles (8,501+ lbs)	1.480	0.005	19.205	0.979	0.026	0.023	779.080	0.045
	Diesel	LDDV	Light-Duty Vehicles (Passanger Cars)	0.171	0.003	2.635	0.136	0.004	0.004	345.441	0.008
	Diesel	LDDT	Light-Duty Trucks (0-8,500 lbs)	0.555	0.004	5.395	0.361	0.007	0.007	510.178	0.008
	Diesel	HDDV	Heavy Duty Vehicles (8,501+ lbs)	6.636	0.013	2.243	0.659	0.257	0.236	1548.440	0.029
	NA	MC	Motorcycles	0.740	0.003	13.807	2.657	0.028	0.024	395.269	0.052
Texas	Gasoline	LDGV	Light-Duty Vehicles (Passanger Cars)	0.319	0.002	3.779	0.365	0.007	0.007	352.316	0.026
	Gasoline	LDGT	Light-Duty Trucks (0-8,500 lbs)	0.554	0.003	5.788	0.483	0.009	0.008	458.800	0.028
	Gasoline	HDGV	Heavy Duty Vehicles (8,501+ lbs)	1.440	0.005	19.306	0.991	0.022	0.020	790.075	0.045
	Diesel	LDDV	Light-Duty Vehicles (Passanger Cars)	0.172	0.003	2.846	0.121	0.005	0.004	349.156	0.008
	Diesel	LDDT	Light-Duty Trucks (0-8,500 lbs)	0.560	0.004	5.817	0.347	0.007	0.007	516.082	0.008
	Diesel	HDDV	Heavy Duty Vehicles (8,501+ lbs)	6.038	0.013	2.090	0.578	0.251	0.231	1553.167	0.028
	NA	MC	Motorcycles	0.699	0.003	13.082	2.793	0.026	0.023	394.037	0.052
Utah	Gasoline	LDGV	Light-Duty Vehicles (Passanger Cars)	0.351	0.002	4.027	0.402	0.012	0.010	354.803	0.027
	Gasoline	LDGT	Light-Duty Trucks (0-8,500 lbs)	0.609	0.003	5.934	0.513	0.014	0.012	461.580	0.028
	Gasoline	HDGV	Heavy Duty Vehicles (8,501+ lbs)	1.631	0.005	20.576	1.006	0.034	0.030	787.167	0.045
	Diesel	LDDV	Light-Duty Vehicles (Passanger Cars)	0.175	0.003	2.554	0.149	0.005	0.004	348.140	0.008
	Diesel	LDDT	Light-Duty Trucks (0-8,500 lbs)	0.576	0.004	5.287	0.384	0.008	0.007	514.701	0.008
	Diesel	HDDV	Heavy Duty Vehicles (8,501+ lbs)	6.666	0.013	2.110	0.597	0.259	0.238	1530.836	0.028
	NA	MC	Motorcycles	0.842	0.003	14.176	2.723	0.029	0.026	397.428	0.051
Vermont	Gasoline	LDGV	Light-Duty Vehicles (Passanger Cars)	0.344	0.002	3.868	0.430	0.014	0.012	337.885	0.026
	Gasoline	LDGT	Light-Duty Trucks (0-8,500 lbs)	0.578	0.003	5.421	0.512	0.016	0.014	438.764	0.028
	Gasoline	HDGV	Heavy Duty Vehicles (8,501+ lbs)	1.499	0.005	17.800	0.883	0.036	0.032	744.116	0.044
	Diesel	LDDV	Light-Duty Vehicles (Passanger Cars)	0.175	0.003	2.405	0.169	0.004	0.004	329.565	0.008
	Diesel	LDDT	Light-Duty Trucks (0-8,500 lbs)	0.558	0.004	4.853	0.380	0.007	0.007	487.658	0.008
	Diesel	HDDV	Heavy Duty Vehicles (8,501+ lbs)	7.253	0.013	2.323	0.725	0.250	0.230	1512.581	0.030
	NA	MC	Motorcycles	0.831	0.003	14.151	2.180	0.029	0.025	397.683	0.054
Virgin Islands	Gasoline	LDGV	Light-Duty Vehicles (Passanger Cars)	0.330	0.002	4.327	0.418	0.006	0.005	352.852	0.026
	Gasoline	LDGT	Light-Duty Trucks (0-8,500 lbs)	0.549	0.003	6.585	0.524	0.007	0.006	457.544	0.027
	Gasoline	HDGV	Heavy Duty Vehicles (8,501+ lbs)	1.273	0.005	19.841	1.026	0.012	0.010	775.019	0.045
	Diesel	LDDV	Light-Duty Vehicles (Passanger Cars)	0.167	0.003	2.964	0.104	0.004	0.004	352.026	0.007
	Diesel	LDDT	Light-Duty Trucks (0-8,500 lbs)	0.522	0.004	5.967	0.308	0.007	0.006	519.537	0.008
	Diesel	HDDV	Heavy Duty Vehicles (8,501+ lbs)	4.277	0.013	1.650	0.361	0.230	0.211	1510.275	0.025
	NA	MC	Motorcycles	0.629	0.003	13.535	2.676	0.023	0.021	387.879	0.053

Table 5-22. On-Road Vehicle Emission Factors – 2017 (cont.)

State	Fuel Type	Vehicle Type		Emission Factors (g/mi)							
				Criteria Pollutants and Ozone Precursors							
				NO_x	SO_2	CO	VOC	PM_{10}	$PM_{2.5}$	CO_2	NH_3
Virginia	Gasoline	LDGV	Light-Duty Vehicles (Passanger Cars)	0.346	0.002	3.889	0.385	0.010	0.008	349.451	0.027
	Gasoline	LDGT	Light-Duty Trucks (0-8,500 lbs)	0.596	0.003	5.835	0.502	0.012	0.010	454.478	0.028
	Gasoline	HDGV	Heavy Duty Vehicles (8,501+ lbs)	1.494	0.005	18.984	0.951	0.028	0.024	777.287	0.045
	Diesel	LDDV	Light-Duty Vehicles (Passanger Cars)	0.171	0.003	2.597	0.139	0.004	0.004	344.157	0.008
	Diesel	LDDT	Light-Duty Trucks (0-8,500 lbs)	0.556	0.004	5.329	0.365	0.007	0.007	508.599	0.008
	Diesel	HDDV	Heavy Duty Vehicles (8,501+ lbs)	6.576	0.013	2.197	0.639	0.256	0.235	1537.435	0.029
	NA	MC	Motorcycles	0.749	0.003	13.464	2.485	0.027	0.024	395.911	0.052
Washington	Gasoline	LDGV	Light-Duty Vehicles (Passanger Cars)	0.339	0.002	3.893	0.377	0.011	0.009	346.090	0.027
	Gasoline	LDGT	Light-Duty Trucks (0-8,500 lbs)	0.583	0.003	5.782	0.491	0.013	0.011	450.840	0.028
	Gasoline	HDGV	Heavy Duty Vehicles (8,501+ lbs)	1.567	0.005	19.816	0.949	0.032	0.028	770.507	0.045
	Diesel	LDDV	Light-Duty Vehicles (Passanger Cars)	0.172	0.003	2.464	0.149	0.005	0.004	339.718	0.008
	Diesel	LDDT	Light-Duty Trucks (0-8,500 lbs)	0.562	0.004	5.089	0.379	0.008	0.007	502.748	0.008
	Diesel	HDDV	Heavy Duty Vehicles (8,501+ lbs)	6.825	0.013	2.194	0.645	0.256	0.236	1519.749	0.029
	NA	MC	Motorcycles	0.824	0.003	14.104	2.385	0.029	0.026	397.775	0.052
West Virginia	Gasoline	LDGV	Light-Duty Vehicles (Passanger Cars)	0.369	0.002	4.139	0.415	0.011	0.009	339.934	0.026
	Gasoline	LDGT	Light-Duty Trucks (0-8,500 lbs)	0.626	0.003	6.104	0.531	0.012	0.011	442.328	0.028
	Gasoline	HDGV	Heavy Duty Vehicles (8,501+ lbs)	1.476	0.005	18.499	0.910	0.029	0.026	755.435	0.044
	Diesel	LDDV	Light-Duty Vehicles (Passanger Cars)	0.173	0.003	2.518	0.149	0.004	0.004	333.877	0.008
	Diesel	LDDT	Light-Duty Trucks (0-8,500 lbs)	0.557	0.004	5.107	0.365	0.007	0.007	494.050	0.008
	Diesel	HDDV	Heavy Duty Vehicles (8,501+ lbs)	6.917	0.013	2.272	0.690	0.250	0.230	1523.392	0.029
	NA	MC	Motorcycles	0.785	0.003	13.961	2.395	0.028	0.025	396.361	0.053
Wisconsin	Gasoline	LDGV	Light-Duty Vehicles (Passanger Cars)	0.363	0.002	4.308	0.437	0.014	0.012	345.066	0.026
	Gasoline	LDGT	Light-Duty Trucks (0-8,500 lbs)	0.616	0.003	6.155	0.547	0.016	0.014	447.744	0.028
	Gasoline	HDGV	Heavy Duty Vehicles (8,501+ lbs)	1.508	0.005	19.126	0.927	0.036	0.032	758.553	0.045
	Diesel	LDDV	Light-Duty Vehicles (Passanger Cars)	0.173	0.003	2.447	0.163	0.004	0.004	337.103	0.008
	Diesel	LDDT	Light-Duty Trucks (0-8,500 lbs)	0.556	0.004	4.986	0.383	0.007	0.007	497.991	0.008
	Diesel	HDDV	Heavy Duty Vehicles (8,501+ lbs)	6.725	0.013	2.169	0.643	0.251	0.231	1506.482	0.029
	NA	MC	Motorcycles	0.805	0.003	14.024	2.256	0.028	0.025	397.678	0.053
Wyoming	Gasoline	LDGV	Light-Duty Vehicles (Passanger Cars)	0.399	0.002	4.616	0.470	0.014	0.012	340.788	0.026
	Gasoline	LDGT	Light-Duty Trucks (0-8,500 lbs)	0.672	0.003	6.512	0.569	0.016	0.014	442.975	0.028
	Gasoline	HDGV	Heavy Duty Vehicles (8,501+ lbs)	1.569	0.005	18.917	0.887	0.039	0.034	757.387	0.044
	Diesel	LDDV	Light-Duty Vehicles (Passanger Cars)	0.180	0.003	2.482	0.169	0.004	0.004	332.508	0.008
	Diesel	LDDT	Light-Duty Trucks (0-8,500 lbs)	0.579	0.004	5.033	0.386	0.007	0.007	491.782	0.008
	Diesel	HDDV	Heavy Duty Vehicles (8,501+ lbs)	8.209	0.013	2.590	0.850	0.259	0.238	1559.992	0.032
	NA	MC	Motorcycles	0.884	0.003	14.373	2.406	0.029	0.026	399.026	0.054

Table 5-23. On-Road Vehicle Emission Factors – 2018

State	Fuel Type	Vehicle Type		Emission Factors (g/mi)							
				Criteria Pollutants and Ozone Precursors							
				NO_x	SO_2	CO	VOC	PM_{10}	$PM_{2.5}$	CO_2	NH_3
Alabama	Gasoline	LDGV	Light-Duty Vehicles (Passanger Cars)	0.300	0.002	3.761	0.362	0.007	0.007	343.542	0.025
	Gasoline	LDGT	Light-Duty Trucks (0-8,500 lbs)	0.518	0.003	5.577	0.472	0.009	0.008	442.881	0.026
	Gasoline	HDGV	Heavy Duty Vehicles (8,501+ lbs)	1.265	0.005	17.368	0.895	0.020	0.018	773.279	0.045
	Diesel	LDDV	Light-Duty Vehicles (Passanger Cars)	0.148	0.003	2.566	0.112	0.004	0.004	336.997	0.008
	Diesel	LDDT	Light-Duty Trucks (0-8,500 lbs)	0.479	0.004	5.042	0.304	0.007	0.006	489.536	0.008
	Diesel	HDDV	Heavy Duty Vehicles (8,501+ lbs)	5.574	0.013	1.961	0.546	0.220	0.202	1524.615	0.028
	NA	MC	Motorcycles	0.707	0.003	13.453	2.749	0.026	0.023	393.105	0.053
Alaska	Gasoline	LDGV	Light-Duty Vehicles (Passanger Cars)	0.329	0.002	4.414	0.443	0.016	0.014	340.419	0.025
	Gasoline	LDGT	Light-Duty Trucks (0-8,500 lbs)	0.552	0.003	5.819	0.517	0.019	0.017	438.511	0.026
	Gasoline	HDGV	Heavy Duty Vehicles (8,501+ lbs)	1.394	0.005	17.994	0.833	0.043	0.038	758.236	0.044
	Diesel	LDDV	Light-Duty Vehicles (Passanger Cars)	0.152	0.003	2.275	0.173	0.004	0.004	327.193	0.008
	Diesel	LDDT	Light-Duty Trucks (0-8,500 lbs)	0.495	0.004	4.492	0.370	0.007	0.007	475.804	0.008
	Diesel	HDDV	Heavy Duty Vehicles (8,501+ lbs)	6.862	0.013	2.206	0.692	0.224	0.206	1510.982	0.030
	NA	MC	Motorcycles	0.869	0.003	14.396	2.007	0.030	0.027	401.022	0.053
Arizona	Gasoline	LDGV	Light-Duty Vehicles (Passanger Cars)	0.291	0.002	3.704	0.346	0.007	0.006	350.632	0.025
	Gasoline	LDGT	Light-Duty Trucks (0-8,500 lbs)	0.509	0.003	5.455	0.440	0.008	0.007	453.530	0.026
	Gasoline	HDGV	Heavy Duty Vehicles (8,501+ lbs)	1.395	0.005	19.259	0.944	0.020	0.018	801.677	0.045
	Diesel	LDDV	Light-Duty Vehicles (Passanger Cars)	0.160	0.003	2.779	0.103	0.004	0.004	345.089	0.008
	Diesel	LDDT	Light-Duty Trucks (0-8,500 lbs)	0.525	0.004	5.508	0.305	0.007	0.007	502.007	0.008
	Diesel	HDDV	Heavy Duty Vehicles (8,501+ lbs)	6.409	0.013	2.114	0.607	0.227	0.209	1580.256	0.029
	NA	MC	Motorcycles	0.805	0.002	13.018	3.163	0.025	0.022	393.653	0.052
Arkansas	Gasoline	LDGV	Light-Duty Vehicles (Passanger Cars)	0.312	0.002	3.976	0.365	0.008	0.007	336.157	0.025
	Gasoline	LDGT	Light-Duty Trucks (0-8,500 lbs)	0.537	0.003	5.811	0.466	0.010	0.009	435.067	0.026
	Gasoline	HDGV	Heavy Duty Vehicles (8,501+ lbs)	1.285	0.005	17.685	0.848	0.022	0.020	765.075	0.044
	Diesel	LDDV	Light-Duty Vehicles (Passanger Cars)	0.152	0.003	2.591	0.119	0.004	0.004	329.239	0.008
	Diesel	LDDT	Light-Duty Trucks (0-8,500 lbs)	0.490	0.004	5.074	0.310	0.007	0.007	479.677	0.008
	Diesel	HDDV	Heavy Duty Vehicles (8,501+ lbs)	6.095	0.013	2.104	0.624	0.218	0.201	1532.714	0.029
	NA	MC	Motorcycles	0.746	0.003	13.559	2.576	0.026	0.023	394.966	0.054
Colorado	Gasoline	LDGV	Light-Duty Vehicles (Passanger Cars)	0.302	0.002	3.767	0.365	0.011	0.010	341.039	0.025
	Gasoline	LDGT	Light-Duty Trucks (0-8,500 lbs)	0.520	0.003	5.313	0.448	0.013	0.012	441.198	0.026
	Gasoline	HDGV	Heavy Duty Vehicles (8,501+ lbs)	1.404	0.005	18.475	0.870	0.031	0.027	770.392	0.045
	Diesel	LDDV	Light-Duty Vehicles (Passanger Cars)	0.153	0.003	2.422	0.136	0.004	0.004	331.662	0.008
	Diesel	LDDT	Light-Duty Trucks (0-8,500 lbs)	0.502	0.004	4.809	0.338	0.007	0.007	483.193	0.008
	Diesel	HDDV	Heavy Duty Vehicles (8,501+ lbs)	6.134	0.013	1.977	0.569	0.221	0.203	1506.027	0.028
	NA	MC	Motorcycles	0.838	0.003	13.956	2.636	0.029	0.026	397.815	0.053
Connecticut	Gasoline	LDGV	Light-Duty Vehicles (Passanger Cars)	0.261	0.002	3.391	0.315	0.010	0.009	340.773	0.025
	Gasoline	LDGT	Light-Duty Trucks (0-8,500 lbs)	0.461	0.003	4.876	0.390	0.013	0.011	442.622	0.026
	Gasoline	HDGV	Heavy Duty Vehicles (8,501+ lbs)	1.370	0.005	18.531	0.857	0.031	0.027	776.429	0.045
	Diesel	LDDV	Light-Duty Vehicles (Passanger Cars)	0.150	0.003	2.468	0.131	0.004	0.004	331.947	0.008
	Diesel	LDDT	Light-Duty Trucks (0-8,500 lbs)	0.495	0.004	4.940	0.339	0.008	0.007	484.904	0.008
	Diesel	HDDV	Heavy Duty Vehicles (8,501+ lbs)	5.155	0.013	1.682	0.429	0.214	0.197	1475.907	0.026
	NA	MC	Motorcycles	0.779	0.003	13.212	2.313	0.028	0.025	398.605	0.053
Delaware	Gasoline	LDGV	Light-Duty Vehicles (Passanger Cars)	0.282	0.002	3.322	0.322	0.009	0.008	345.636	0.025
	Gasoline	LDGT	Light-Duty Trucks (0-8,500 lbs)	0.487	0.003	4.730	0.402	0.010	0.009	444.975	0.026
	Gasoline	HDGV	Heavy Duty Vehicles (8,501+ lbs)	1.334	0.005	18.269	0.862	0.021	0.019	769.377	0.046
	Diesel	LDDV	Light-Duty Vehicles (Passanger Cars)	0.146	0.003	2.395	0.125	0.004	0.004	337.471	0.008
	Diesel	LDDT	Light-Duty Trucks (0-8,500 lbs)	0.474	0.004	4.728	0.320	0.007	0.006	490.116	0.008
	Diesel	HDDV	Heavy Duty Vehicles (8,501+ lbs)	4.639	0.013	1.561	0.365	0.216	0.198	1457.305	0.025
	NA	MC	Motorcycles	0.754	0.003	13.070	2.324	0.026	0.023	394.521	0.052
District of Columbia	Gasoline	LDGV	Light-Duty Vehicles (Passanger Cars)	0.257	0.002	3.309	0.308	0.009	0.008	359.663	0.025
	Gasoline	LDGT	Light-Duty Trucks (0-8,500 lbs)	0.446	0.003	4.731	0.386	0.011	0.009	464.521	0.027
	Gasoline	HDGV	Heavy Duty Vehicles (8,501+ lbs)	1.381	0.005	19.568	0.947	0.023	0.021	809.207	0.047
	Diesel	LDDV	Light-Duty Vehicles (Passanger Cars)	0.144	0.003	2.469	0.120	0.004	0.004	351.487	0.008
	Diesel	LDDT	Light-Duty Trucks (0-8,500 lbs)	0.475	0.004	4.967	0.330	0.007	0.007	511.813	0.008
	Diesel	HDDV	Heavy Duty Vehicles (8,501+ lbs)	4.846	0.013	1.699	0.401	0.235	0.216	1524.744	0.026
	NA	MC	Motorcycles	0.717	0.003	13.053	2.556	0.026	0.023	394.294	0.050

Table 5-23. On-Road Vehicle Emission Factors – 2018 (cont.)

State	Fuel Type	Vehicle Type		Emission Factors (g/mi)							
				Criteria Pollutants and Ozone Precursors							
				NO_x	SO_2	CO	VOC	PM_{10}	$PM_{2.5}$	CO_2	NH_3
Florida	Gasoline	LDGV	Light-Duty Vehicles (Passanger Cars)	0.283	0.002	3.941	0.357	0.006	0.006	360.949	0.025
	Gasoline	LDGT	Light-Duty Trucks (0-8,500 lbs)	0.499	0.003	5.995	0.493	0.008	0.007	465.353	0.026
	Gasoline	HDGV	Heavy Duty Vehicles (8,501+ lbs)	1.242	0.005	18.735	1.009	0.018	0.016	817.793	0.046
	Diesel	LDDV	Light-Duty Vehicles (Passanger Cars)	0.144	0.003	2.800	0.094	0.004	0.004	355.723	0.008
	Diesel	LDDT	Light-Duty Trucks (0-8,500 lbs)	0.472	0.004	5.560	0.297	0.007	0.007	516.462	0.008
	Diesel	HDDV	Heavy Duty Vehicles (8,501+ lbs)	5.122	0.013	1.953	0.512	0.231	0.213	1584.765	0.028
	NA	MC	Motorcycles	0.626	0.003	13.328	3.103	0.026	0.023	391.564	0.051
Georgia	Gasoline	LDGV	Light-Duty Vehicles (Passanger Cars)	0.284	0.002	3.532	0.339	0.008	0.007	338.676	0.025
	Gasoline	LDGT	Light-Duty Trucks (0-8,500 lbs)	0.492	0.003	5.237	0.437	0.010	0.008	438.065	0.026
	Gasoline	HDGV	Heavy Duty Vehicles (8,501+ lbs)	1.270	0.005	17.097	0.867	0.022	0.020	769.432	0.045
	Diesel	LDDV	Light-Duty Vehicles (Passanger Cars)	0.151	0.003	2.584	0.114	0.004	0.004	332.026	0.008
	Diesel	LDDT	Light-Duty Trucks (0-8,500 lbs)	0.487	0.004	5.077	0.308	0.007	0.007	483.434	0.008
	Diesel	HDDV	Heavy Duty Vehicles (8,501+ lbs)	5.846	0.013	2.028	0.584	0.218	0.201	1526.882	0.029
	NA	MC	Motorcycles	0.724	0.003	13.404	2.631	0.027	0.024	394.506	0.053
Hawaii	Gasoline	LDGV	Light-Duty Vehicles (Passanger Cars)	0.284	0.002	3.849	0.345	0.006	0.005	350.877	0.025
	Gasoline	LDGT	Light-Duty Trucks (0-8,500 lbs)	0.499	0.003	5.822	0.470	0.007	0.006	452.707	0.026
	Gasoline	HDGV	Heavy Duty Vehicles (8,501+ lbs)	1.248	0.005	19.086	0.969	0.016	0.014	792.555	0.046
	Diesel	LDDV	Light-Duty Vehicles (Passanger Cars)	0.144	0.003	2.686	0.089	0.004	0.004	346.102	0.008
	Diesel	LDDT	Light-Duty Trucks (0-8,500 lbs)	0.468	0.004	5.307	0.285	0.007	0.007	502.895	0.008
	Diesel	HDDV	Heavy Duty Vehicles (8,501+ lbs)	4.441	0.013	1.645	0.375	0.218	0.200	1514.455	0.026
	NA	MC	Motorcycles	0.677	0.003	13.365	2.856	0.025	0.022	391.070	0.052
Idaho	Gasoline	LDGV	Light-Duty Vehicles (Passanger Cars)	0.323	0.002	3.940	0.385	0.011	0.010	337.700	0.025
	Gasoline	LDGT	Light-Duty Trucks (0-8,500 lbs)	0.549	0.003	5.514	0.470	0.013	0.011	435.344	0.026
	Gasoline	HDGV	Heavy Duty Vehicles (8,501+ lbs)	1.386	0.005	17.886	0.836	0.028	0.025	756.195	0.044
	Diesel	LDDV	Light-Duty Vehicles (Passanger Cars)	0.154	0.003	2.362	0.142	0.004	0.004	327.986	0.008
	Diesel	LDDT	Light-Duty Trucks (0-8,500 lbs)	0.498	0.004	4.639	0.334	0.007	0.006	476.968	0.008
	Diesel	HDDV	Heavy Duty Vehicles (8,501+ lbs)	6.525	0.013	2.102	0.632	0.221	0.203	1508.003	0.029
	NA	MC	Motorcycles	0.858	0.003	13.997	2.432	0.028	0.024	396.707	0.053
Illinois	Gasoline	LDGV	Light-Duty Vehicles (Passanger Cars)	0.286	0.002	3.718	0.349	0.010	0.009	353.180	0.025
	Gasoline	LDGT	Light-Duty Trucks (0-8,500 lbs)	0.503	0.003	5.437	0.468	0.012	0.011	456.882	0.027
	Gasoline	HDGV	Heavy Duty Vehicles (8,501+ lbs)	1.356	0.005	19.128	0.922	0.028	0.025	796.217	0.046
	Diesel	LDDV	Light-Duty Vehicles (Passanger Cars)	0.146	0.003	2.445	0.130	0.004	0.004	344.010	0.008
	Diesel	LDDT	Light-Duty Trucks (0-8,500 lbs)	0.482	0.004	4.913	0.340	0.007	0.007	501.367	0.008
	Diesel	HDDV	Heavy Duty Vehicles (8,501+ lbs)	5.065	0.013	1.719	0.429	0.227	0.209	1505.085	0.026
	NA	MC	Motorcycles	0.737	0.003	13.172	2.490	0.027	0.023	396.683	0.051
Indiana	Gasoline	LDGV	Light-Duty Vehicles (Passanger Cars)	0.306	0.002	3.898	0.369	0.010	0.009	345.441	0.025
	Gasoline	LDGT	Light-Duty Trucks (0-8,500 lbs)	0.524	0.003	5.586	0.474	0.012	0.011	444.933	0.026
	Gasoline	HDGV	Heavy Duty Vehicles (8,501+ lbs)	1.328	0.005	18.126	0.878	0.026	0.023	772.526	0.045
	Diesel	LDDV	Light-Duty Vehicles (Passanger Cars)	0.148	0.003	2.403	0.133	0.004	0.004	336.387	0.008
	Diesel	LDDT	Light-Duty Trucks (0-8,500 lbs)	0.481	0.004	4.756	0.330	0.007	0.007	488.631	0.008
	Diesel	HDDV	Heavy Duty Vehicles (8,501+ lbs)	5.927	0.013	2.008	0.576	0.225	0.207	1515.326	0.028
	NA	MC	Motorcycles	0.763	0.003	13.738	2.451	0.027	0.024	395.725	0.052
Iowa	Gasoline	LDGV	Light-Duty Vehicles (Passanger Cars)	0.326	0.002	4.168	0.404	0.011	0.010	336.913	0.025
	Gasoline	LDGT	Light-Duty Trucks (0-8,500 lbs)	0.550	0.003	5.779	0.492	0.013	0.012	434.339	0.026
	Gasoline	HDGV	Heavy Duty Vehicles (8,501+ lbs)	1.326	0.005	17.599	0.825	0.029	0.026	754.847	0.044
	Diesel	LDDV	Light-Duty Vehicles (Passanger Cars)	0.151	0.003	2.388	0.143	0.004	0.004	327.052	0.008
	Diesel	LDDT	Light-Duty Trucks (0-8,500 lbs)	0.487	0.004	4.678	0.333	0.007	0.006	475.704	0.008
	Diesel	HDDV	Heavy Duty Vehicles (8,501+ lbs)	6.383	0.013	2.132	0.647	0.220	0.202	1512.474	0.029
	NA	MC	Motorcycles	0.799	0.003	13.895	2.290	0.027	0.024	396.836	0.053
Kansas	Gasoline	LDGV	Light-Duty Vehicles (Passanger Cars)	0.318	0.002	4.029	0.378	0.009	0.008	337.990	0.025
	Gasoline	LDGT	Light-Duty Trucks (0-8,500 lbs)	0.546	0.003	5.780	0.478	0.011	0.010	436.718	0.026
	Gasoline	HDGV	Heavy Duty Vehicles (8,501+ lbs)	1.323	0.005	17.887	0.848	0.026	0.023	762.571	0.045
	Diesel	LDDV	Light-Duty Vehicles (Passanger Cars)	0.151	0.003	2.494	0.129	0.004	0.004	329.750	0.008
	Diesel	LDDT	Light-Duty Trucks (0-8,500 lbs)	0.490	0.004	4.897	0.322	0.007	0.007	480.064	0.008
	Diesel	HDDV	Heavy Duty Vehicles (8,501+ lbs)	5.844	0.013	1.962	0.562	0.216	0.199	1505.286	0.028
	NA	MC	Motorcycles	0.776	0.003	13.671	2.475	0.027	0.024	395.767	0.053

Table 5-23. On-Road Vehicle Emission Factors – 2018 (cont.)

State	Fuel Type	Vehicle Type		Emission Factors (g/mi)							
				Criteria Pollutants and Ozone Precursors							
				NO_x	SO_2	CO	VOC	PM_{10}	$PM_{2.5}$	CO_2	NH_3
Kentucky	Gasoline	LDGV	Light-Duty Vehicles (Passanger Cars)	0.312	0.002	3.935	0.365	0.009	0.008	334.769	0.025
	Gasoline	LDGT	Light-Duty Trucks (0-8,500 lbs)	0.538	0.003	5.725	0.467	0.011	0.009	433.389	0.026
	Gasoline	HDGV	Heavy Duty Vehicles (8,501+ lbs)	1.285	0.005	17.272	0.823	0.026	0.023	762.511	0.044
	Diesel	LDDV	Light-Duty Vehicles (Passanger Cars)	0.153	0.003	2.515	0.128	0.004	0.004	326.857	0.008
	Diesel	LDDT	Light-Duty Trucks (0-8,500 lbs)	0.494	0.004	4.937	0.320	0.007	0.007	476.356	0.008
	Diesel	HDDV	Heavy Duty Vehicles (8,501+ lbs)	6.602	0.013	2.245	0.693	0.222	0.204	1540.430	0.030
	NA	MC	Motorcycles	0.763	0.003	13.414	2.424	0.027	0.024	396.518	0.054
Louisiana	Gasoline	LDGV	Light-Duty Vehicles (Passanger Cars)	0.292	0.002	3.828	0.356	0.007	0.006	344.906	0.025
	Gasoline	LDGT	Light-Duty Trucks (0-8,500 lbs)	0.508	0.003	5.741	0.470	0.009	0.008	445.662	0.026
	Gasoline	HDGV	Heavy Duty Vehicles (8,501+ lbs)	1.239	0.005	17.556	0.913	0.020	0.018	784.514	0.045
	Diesel	LDDV	Light-Duty Vehicles (Passanger Cars)	0.149	0.003	2.721	0.106	0.004	0.004	339.151	0.008
	Diesel	LDDT	Light-Duty Trucks (0-8,500 lbs)	0.483	0.004	5.352	0.301	0.007	0.007	493.175	0.008
	Diesel	HDDV	Heavy Duty Vehicles (8,501+ lbs)	5.646	0.013	2.040	0.580	0.221	0.203	1553.028	0.029
	NA	MC	Motorcycles	0.677	0.003	13.394	2.840	0.027	0.024	393.360	0.053
Maine	Gasoline	LDGV	Light-Duty Vehicles (Passanger Cars)	0.320	0.002	3.849	0.404	0.012	0.011	329.110	0.025
	Gasoline	LDGT	Light-Duty Trucks (0-8,500 lbs)	0.535	0.003	5.276	0.479	0.015	0.013	424.934	0.026
	Gasoline	HDGV	Heavy Duty Vehicles (8,501+ lbs)	1.313	0.005	16.222	0.788	0.031	0.028	737.136	0.044
	Diesel	LDDV	Light-Duty Vehicles (Passanger Cars)	0.153	0.003	2.293	0.153	0.004	0.004	318.528	0.008
	Diesel	LDDT	Light-Duty Trucks (0-8,500 lbs)	0.489	0.004	4.462	0.336	0.007	0.006	464.403	0.008
	Diesel	HDDV	Heavy Duty Vehicles (8,501+ lbs)	6.523	0.013	2.123	0.652	0.216	0.198	1489.257	0.029
	NA	MC	Motorcycles	0.829	0.003	13.795	2.094	0.029	0.025	397.481	0.054
Maryland	Gasoline	LDGV	Light-Duty Vehicles (Passanger Cars)	0.281	0.002	3.416	0.323	0.009	0.008	340.221	0.025
	Gasoline	LDGT	Light-Duty Trucks (0-8,500 lbs)	0.492	0.003	4.954	0.413	0.011	0.010	441.045	0.026
	Gasoline	HDGV	Heavy Duty Vehicles (8,501+ lbs)	1.333	0.005	17.837	0.854	0.027	0.024	773.864	0.045
	Diesel	LDDV	Light-Duty Vehicles (Passanger Cars)	0.150	0.003	2.521	0.124	0.004	0.004	332.275	0.008
	Diesel	LDDT	Light-Duty Trucks (0-8,500 lbs)	0.494	0.004	5.006	0.326	0.007	0.007	484.639	0.008
	Diesel	HDDV	Heavy Duty Vehicles (8,501+ lbs)	5.447	0.013	1.814	0.488	0.215	0.198	1495.601	0.027
	NA	MC	Motorcycles	0.759	0.003	13.101	2.386	0.028	0.024	396.893	0.053
Massachuesetts	Gasoline	LDGV	Light-Duty Vehicles (Passanger Cars)	0.283	0.002	3.486	0.338	0.010	0.009	339.225	0.025
	Gasoline	LDGT	Light-Duty Trucks (0-8,500 lbs)	0.495	0.003	5.027	0.433	0.013	0.011	439.556	0.026
	Gasoline	HDGV	Heavy Duty Vehicles (8,501+ lbs)	1.362	0.005	18.126	0.834	0.031	0.027	768.173	0.045
	Diesel	LDDV	Light-Duty Vehicles (Passanger Cars)	0.150	0.003	2.419	0.136	0.004	0.004	329.951	0.008
	Diesel	LDDT	Light-Duty Trucks (0-8,500 lbs)	0.493	0.004	4.811	0.339	0.007	0.007	481.278	0.008
	Diesel	HDDV	Heavy Duty Vehicles (8,501+ lbs)	5.596	0.013	1.830	0.501	0.216	0.199	1484.327	0.027
	NA	MC	Motorcycles	0.794	0.003	13.243	2.243	0.028	0.025	398.260	0.053
Michigan	Gasoline	LDGV	Light-Duty Vehicles (Passanger Cars)	0.318	0.002	4.073	0.385	0.011	0.010	342.823	0.025
	Gasoline	LDGT	Light-Duty Trucks (0-8,500 lbs)	0.547	0.003	5.832	0.496	0.014	0.012	442.600	0.026
	Gasoline	HDGV	Heavy Duty Vehicles (8,501+ lbs)	1.347	0.005	18.075	0.866	0.031	0.028	770.203	0.045
	Diesel	LDDV	Light-Duty Vehicles (Passanger Cars)	0.150	0.003	2.395	0.140	0.004	0.004	332.986	0.008
	Diesel	LDDT	Light-Duty Trucks (0-8,500 lbs)	0.488	0.004	4.749	0.341	0.007	0.007	484.526	0.008
	Diesel	HDDV	Heavy Duty Vehicles (8,501+ lbs)	6.047	0.013	2.008	0.583	0.222	0.205	1508.975	0.028
	NA	MC	Motorcycles	0.789	0.003	13.895	2.338	0.029	0.026	397.614	0.052
Minnesota	Gasoline	LDGV	Light-Duty Vehicles (Passanger Cars)	0.322	0.002	4.212	0.410	0.013	0.012	339.200	0.025
	Gasoline	LDGT	Light-Duty Trucks (0-8,500 lbs)	0.542	0.003	5.840	0.504	0.016	0.014	437.509	0.026
	Gasoline	HDGV	Heavy Duty Vehicles (8,501+ lbs)	1.344	0.005	18.005	0.873	0.035	0.031	756.872	0.045
	Diesel	LDDV	Light-Duty Vehicles (Passanger Cars)	0.150	0.003	2.352	0.149	0.004	0.004	328.362	0.008
	Diesel	LDDT	Light-Duty Trucks (0-8,500 lbs)	0.487	0.004	4.630	0.344	0.007	0.007	477.826	0.008
	Diesel	HDDV	Heavy Duty Vehicles (8,501+ lbs)	5.628	0.013	1.833	0.512	0.214	0.197	1471.595	0.027
	NA	MC	Motorcycles	0.806	0.003	14.220	2.309	0.029	0.026	398.009	0.053
Mississippi	Gasoline	LDGV	Light-Duty Vehicles (Passanger Cars)	0.300	0.002	3.759	0.365	0.007	0.006	338.345	0.025
	Gasoline	LDGT	Light-Duty Trucks (0-8,500 lbs)	0.515	0.003	5.550	0.466	0.009	0.008	436.671	0.026
	Gasoline	HDGV	Heavy Duty Vehicles (8,501+ lbs)	1.242	0.005	17.053	0.875	0.019	0.017	762.371	0.045
	Diesel	LDDV	Light-Duty Vehicles (Passanger Cars)	0.149	0.003	2.572	0.112	0.004	0.004	332.075	0.008
	Diesel	LDDT	Light-Duty Trucks (0-8,500 lbs)	0.478	0.004	5.023	0.299	0.007	0.006	482.957	0.008
	Diesel	HDDV	Heavy Duty Vehicles (8,501+ lbs)	5.471	0.013	1.922	0.535	0.214	0.197	1511.316	0.028
	NA	MC	Motorcycles	0.708	0.003	13.467	2.716	0.026	0.023	392.740	0.053

Table 5-23. On-Road Vehicle Emission Factors – 2018 (cont.)

State	Fuel Type	Vehicle Type		Emission Factors (g/mi)							
				Criteria Pollutants and Ozone Precursors							
				NO_x	SO_2	CO	VOC	PM_{10}	$PM_{2.5}$	CO_2	NH_3
Missouri	Gasoline	LDGV	Light-Duty Vehicles (Passanger Cars)	0.304	0.002	3.871	0.358	0.009	0.008	331.741	0.025
	Gasoline	LDGT	Light-Duty Trucks (0-8,500 lbs)	0.527	0.003	5.596	0.455	0.011	0.010	430.614	0.026
	Gasoline	HDGV	Heavy Duty Vehicles (8,501+ lbs)	1.300	0.005	17.542	0.816	0.027	0.024	757.918	0.044
	Diesel	LDDV	Light-Duty Vehicles (Passanger Cars)	0.153	0.003	2.544	0.128	0.004	0.004	323.802	0.008
	Diesel	LDDT	Light-Duty Trucks (0-8,500 lbs)	0.497	0.004	4.992	0.322	0.007	0.007	472.884	0.008
	Diesel	HDDV	Heavy Duty Vehicles (8,501+ lbs)	5.921	0.013	1.979	0.575	0.212	0.195	1502.994	0.028
	NA	MC	Motorcycles	0.773	0.003	13.363	2.362	0.027	0.024	397.144	0.054
Montana	Gasoline	LDGV	Light-Duty Vehicles (Passanger Cars)	0.341	0.002	4.224	0.416	0.012	0.011	331.109	0.025
	Gasoline	LDGT	Light-Duty Trucks (0-8,500 lbs)	0.572	0.003	5.795	0.494	0.014	0.013	427.441	0.026
	Gasoline	HDGV	Heavy Duty Vehicles (8,501+ lbs)	1.366	0.005	17.297	0.792	0.031	0.028	743.966	0.044
	Diesel	LDDV	Light-Duty Vehicles (Passanger Cars)	0.156	0.003	2.335	0.153	0.004	0.004	320.513	0.008
	Diesel	LDDT	Light-Duty Trucks (0-8,500 lbs)	0.501	0.004	4.549	0.338	0.007	0.006	467.025	0.008
	Diesel	HDDV	Heavy Duty Vehicles (8,501+ lbs)	7.035	0.013	2.260	0.714	0.220	0.203	1514.670	0.030
	NA	MC	Motorcycles	0.877	0.003	14.101	2.266	0.028	0.025	397.822	0.054
Nebraska	Gasoline	LDGV	Light-Duty Vehicles (Passanger Cars)	0.327	0.002	4.181	0.399	0.011	0.010	336.381	0.025
	Gasoline	LDGT	Light-Duty Trucks (0-8,500 lbs)	0.558	0.003	5.885	0.492	0.013	0.012	434.736	0.026
	Gasoline	HDGV	Heavy Duty Vehicles (8,501+ lbs)	1.335	0.005	17.594	0.824	0.030	0.027	761.146	0.044
	Diesel	LDDV	Light-Duty Vehicles (Passanger Cars)	0.154	0.003	2.460	0.140	0.004	0.004	326.966	0.008
	Diesel	LDDT	Light-Duty Trucks (0-8,500 lbs)	0.496	0.004	4.829	0.333	0.007	0.007	476.146	0.008
	Diesel	HDDV	Heavy Duty Vehicles (8,501+ lbs)	6.747	0.013	2.251	0.701	0.223	0.205	1535.421	0.030
	NA	MC	Motorcycles	0.804	0.003	13.853	2.395	0.028	0.024	397.628	0.054
Nevada	Gasoline	LDGV	Light-Duty Vehicles (Passanger Cars)	0.298	0.002	3.517	0.347	0.008	0.007	351.471	0.025
	Gasoline	LDGT	Light-Duty Trucks (0-8,500 lbs)	0.524	0.003	5.153	0.444	0.010	0.009	453.861	0.026
	Gasoline	HDGV	Heavy Duty Vehicles (8,501+ lbs)	1.446	0.005	18.902	0.942	0.023	0.020	795.383	0.045
	Diesel	LDDV	Light-Duty Vehicles (Passanger Cars)	0.156	0.003	2.576	0.115	0.004	0.004	344.389	0.008
	Diesel	LDDT	Light-Duty Trucks (0-8,500 lbs)	0.512	0.004	5.130	0.318	0.007	0.007	500.799	0.008
	Diesel	HDDV	Heavy Duty Vehicles (8,501+ lbs)	6.275	0.013	2.043	0.575	0.230	0.211	1553.805	0.029
	NA	MC	Motorcycles	0.828	0.003	13.572	3.044	0.027	0.024	394.386	0.051
New Hampshire	Gasoline	LDGV	Light-Duty Vehicles (Passanger Cars)	0.284	0.002	3.496	0.357	0.011	0.010	336.617	0.025
	Gasoline	LDGT	Light-Duty Trucks (0-8,500 lbs)	0.486	0.003	4.880	0.435	0.014	0.012	434.308	0.026
	Gasoline	HDGV	Heavy Duty Vehicles (8,501+ lbs)	1.344	0.005	17.458	0.814	0.030	0.026	752.238	0.045
	Diesel	LDDV	Light-Duty Vehicles (Passanger Cars)	0.150	0.003	2.335	0.144	0.004	0.004	326.606	0.008
	Diesel	LDDT	Light-Duty Trucks (0-8,500 lbs)	0.487	0.004	4.590	0.336	0.007	0.007	475.370	0.008
	Diesel	HDDV	Heavy Duty Vehicles (8,501+ lbs)	5.761	0.013	1.876	0.530	0.214	0.197	1473.255	0.028
	NA	MC	Motorcycles	0.811	0.003	13.450	2.171	0.027	0.024	397.067	0.053
New Jersey	Gasoline	LDGV	Light-Duty Vehicles (Passanger Cars)	0.283	0.002	3.427	0.322	0.009	0.008	330.984	0.025
	Gasoline	LDGT	Light-Duty Trucks (0-8,500 lbs)	0.470	0.003	4.793	0.384	0.011	0.010	429.360	0.026
	Gasoline	HDGV	Heavy Duty Vehicles (8,501+ lbs)	1.305	0.005	16.747	0.761	0.028	0.025	759.512	0.044
	Diesel	LDDV	Light-Duty Vehicles (Passanger Cars)	0.155	0.003	2.493	0.131	0.004	0.004	322.756	0.008
	Diesel	LDDT	Light-Duty Trucks (0-8,500 lbs)	0.500	0.004	4.894	0.321	0.007	0.007	471.083	0.008
	Diesel	HDDV	Heavy Duty Vehicles (8,501+ lbs)	7.202	0.013	2.415	0.777	0.225	0.207	1556.809	0.031
	NA	MC	Motorcycles	0.796	0.003	13.083	2.170	0.027	0.024	397.747	0.054
New Mexico	Gasoline	LDGV	Light-Duty Vehicles (Passanger Cars)	0.322	0.002	3.818	0.377	0.009	0.008	336.501	0.025
	Gasoline	LDGT	Light-Duty Trucks (0-8,500 lbs)	0.555	0.003	5.485	0.466	0.011	0.009	434.813	0.026
	Gasoline	HDGV	Heavy Duty Vehicles (8,501+ lbs)	1.380	0.005	17.557	0.840	0.024	0.022	761.624	0.044
	Diesel	LDDV	Light-Duty Vehicles (Passanger Cars)	0.157	0.003	2.473	0.126	0.004	0.004	328.625	0.008
	Diesel	LDDT	Light-Duty Trucks (0-8,500 lbs)	0.507	0.004	4.853	0.318	0.007	0.007	478.339	0.008
	Diesel	HDDV	Heavy Duty Vehicles (8,501+ lbs)	6.779	0.013	2.198	0.670	0.222	0.204	1533.192	0.030
	NA	MC	Motorcycles	0.846	0.003	13.640	2.758	0.027	0.024	395.550	0.053
New York	Gasoline	LDGV	Light-Duty Vehicles (Passanger Cars)	0.258	0.002	3.302	0.321	0.010	0.009	342.780	0.025
	Gasoline	LDGT	Light-Duty Trucks (0-8,500 lbs)	0.441	0.003	4.528	0.379	0.013	0.011	443.130	0.026
	Gasoline	HDGV	Heavy Duty Vehicles (8,501+ lbs)	1.356	0.005	18.011	0.865	0.029	0.026	771.398	0.045
	Diesel	LDDV	Light-Duty Vehicles (Passanger Cars)	0.148	0.003	2.400	0.134	0.004	0.004	333.604	0.008
	Diesel	LDDT	Light-Duty Trucks (0-8,500 lbs)	0.486	0.004	4.773	0.336	0.007	0.007	485.882	0.008
	Diesel	HDDV	Heavy Duty Vehicles (8,501+ lbs)	5.438	0.013	1.798	0.482	0.218	0.201	1484.892	0.027
	NA	MC	Motorcycles	0.777	0.003	13.474	2.322	0.028	0.025	397.048	0.052

Table 5-23. On-Road Vehicle Emission Factors – 2018 (cont.)

State	Fuel Type	Vehicle Type		Emission Factors (g/mi)							
				Criteria Pollutants and Ozone Precursors							
				NO_x	SO_2	CO	VOC	PM_{10}	$PM_{2.5}$	CO_2	NH_3
North Carolina	Gasoline	LDGV	Light-Duty Vehicles (Passanger Cars)	0.300	0.002	3.677	0.356	0.008	0.007	341.134	0.025
	Gasoline	LDGT	Light-Duty Trucks (0-8,500 lbs)	0.520	0.003	5.441	0.467	0.010	0.009	440.487	0.026
	Gasoline	HDGV	Heavy Duty Vehicles (8,501+ lbs)	1.295	0.005	17.417	0.887	0.022	0.019	768.327	0.045
	Diesel	LDDV	Light-Duty Vehicles (Passanger Cars)	0.149	0.003	2.503	0.117	0.004	0.004	333.949	0.008
	Diesel	LDDT	Light-Duty Trucks (0-8,500 lbs)	0.482	0.004	4.930	0.312	0.007	0.007	485.812	0.008
	Diesel	HDDV	Heavy Duty Vehicles (8,501+ lbs)	5.323	0.013	1.817	0.485	0.216	0.198	1495.234	0.027
	NA	MC	Motorcycles	0.732	0.003	13.522	2.646	0.027	0.024	394.209	0.053
North Dakota	Gasoline	LDGV	Light-Duty Vehicles (Passanger Cars)	0.334	0.002	4.472	0.453	0.015	0.013	332.644	0.025
	Gasoline	LDGT	Light-Duty Trucks (0-8,500 lbs)	0.558	0.003	6.007	0.529	0.018	0.016	428.807	0.026
	Gasoline	HDGV	Heavy Duty Vehicles (8,501+ lbs)	1.328	0.005	17.212	0.825	0.038	0.033	742.344	0.044
	Diesel	LDDV	Light-Duty Vehicles (Passanger Cars)	0.154	0.003	2.319	0.162	0.004	0.004	320.748	0.008
	Diesel	LDDT	Light-Duty Trucks (0-8,500 lbs)	0.493	0.004	4.513	0.346	0.007	0.006	467.182	0.008
	Diesel	HDDV	Heavy Duty Vehicles (8,501+ lbs)	6.618	0.013	2.147	0.666	0.217	0.199	1497.281	0.030
	NA	MC	Motorcycles	0.842	0.003	14.336	2.198	0.029	0.026	398.592	0.054
Ohio	Gasoline	LDGV	Light-Duty Vehicles (Passanger Cars)	0.290	0.002	3.740	0.355	0.010	0.009	345.052	0.025
	Gasoline	LDGT	Light-Duty Trucks (0-8,500 lbs)	0.499	0.003	5.334	0.449	0.012	0.011	445.062	0.026
	Gasoline	HDGV	Heavy Duty Vehicles (8,501+ lbs)	1.339	0.005	18.300	0.887	0.027	0.024	773.136	0.045
	Diesel	LDDV	Light-Duty Vehicles (Passanger Cars)	0.148	0.003	2.402	0.133	0.004	0.004	335.939	0.008
	Diesel	LDDT	Light-Duty Trucks (0-8,500 lbs)	0.482	0.004	4.765	0.333	0.007	0.007	488.498	0.008
	Diesel	HDDV	Heavy Duty Vehicles (8,501+ lbs)	5.604	0.013	1.884	0.519	0.222	0.204	1499.379	0.028
	NA	MC	Motorcycles	0.766	0.003	13.839	2.459	0.028	0.025	396.154	0.052
Oklahoma	Gasoline	LDGV	Light-Duty Vehicles (Passanger Cars)	0.312	0.002	3.981	0.369	0.008	0.007	342.286	0.025
	Gasoline	LDGT	Light-Duty Trucks (0-8,500 lbs)	0.538	0.003	5.814	0.475	0.010	0.009	441.865	0.026
	Gasoline	HDGV	Heavy Duty Vehicles (8,501+ lbs)	1.312	0.005	18.142	0.878	0.022	0.020	773.091	0.045
	Diesel	LDDV	Light-Duty Vehicles (Passanger Cars)	0.151	0.003	2.568	0.119	0.004	0.004	335.091	0.008
	Diesel	LDDT	Light-Duty Trucks (0-8,500 lbs)	0.488	0.004	5.051	0.313	0.007	0.007	487.262	0.008
	Diesel	HDDV	Heavy Duty Vehicles (8,501+ lbs)	5.819	0.013	2.000	0.571	0.220	0.202	1526.634	0.028
	NA	MC	Motorcycles	0.747	0.003	13.581	2.676	0.026	0.023	394.432	0.053
Oregon	Gasoline	LDGV	Light-Duty Vehicles (Passanger Cars)	0.305	0.002	3.584	0.345	0.009	0.008	333.990	0.025
	Gasoline	LDGT	Light-Duty Trucks (0-8,500 lbs)	0.515	0.003	5.123	0.432	0.011	0.010	431.386	0.026
	Gasoline	HDGV	Heavy Duty Vehicles (8,501+ lbs)	1.355	0.005	17.682	0.827	0.025	0.022	750.543	0.045
	Diesel	LDDV	Light-Duty Vehicles (Passanger Cars)	0.151	0.003	2.333	0.133	0.004	0.004	325.388	0.008
	Diesel	LDDT	Light-Duty Trucks (0-8,500 lbs)	0.489	0.004	4.586	0.325	0.007	0.007	473.804	0.008
	Diesel	HDDV	Heavy Duty Vehicles (8,501+ lbs)	6.094	0.013	1.986	0.576	0.217	0.200	1486.909	0.028
	NA	MC	Motorcycles	0.835	0.003	13.794	2.314	0.028	0.024	395.928	0.053
Pacific Islands	Gasoline	LDGV	Light-Duty Vehicles (Passanger Cars)	0.289	0.002	3.583	0.338	0.008	0.007	340.865	0.025
	Gasoline	LDGT	Light-Duty Trucks (0-8,500 lbs)	0.500	0.003	5.217	0.434	0.010	0.009	440.738	0.026
	Gasoline	HDGV	Heavy Duty Vehicles (8,501+ lbs)	1.319	0.005	17.903	0.865	0.024	0.021	771.258	0.045
	Diesel	LDDV	Light-Duty Vehicles (Passanger Cars)	0.150	0.003	2.480	0.122	0.004	0.004	333.201	0.008
	Diesel	LDDT	Light-Duty Trucks (0-8,500 lbs)	0.488	0.004	4.908	0.320	0.007	0.007	485.135	0.008
	Diesel	HDDV	Heavy Duty Vehicles (8,501+ lbs)	5.821	0.013	1.963	0.554	0.220	0.203	1512.120	0.028
	NA	MC	Motorcycles	0.761	0.003	13.360	2.506	0.027	0.024	395.574	0.053
Pennsylvania	Gasoline	LDGV	Light-Duty Vehicles (Passanger Cars)	0.283	0.002	3.508	0.339	0.010	0.009	342.694	0.025
	Gasoline	LDGT	Light-Duty Trucks (0-8,500 lbs)	0.492	0.003	5.048	0.431	0.012	0.011	442.597	0.026
	Gasoline	HDGV	Heavy Duty Vehicles (8,501+ lbs)	1.338	0.005	17.725	0.861	0.028	0.025	772.013	0.045
	Diesel	LDDV	Light-Duty Vehicles (Passanger Cars)	0.149	0.003	2.423	0.133	0.004	0.004	333.695	0.008
	Diesel	LDDT	Light-Duty Trucks (0-8,500 lbs)	0.488	0.004	4.806	0.333	0.007	0.007	485.579	0.008
	Diesel	HDDV	Heavy Duty Vehicles (8,501+ lbs)	6.073	0.013	2.037	0.592	0.223	0.206	1517.108	0.029
	NA	MC	Motorcycles	0.772	0.003	13.599	2.392	0.028	0.025	396.814	0.052
Puerto Rico	Gasoline	LDGV	Light-Duty Vehicles (Passanger Cars)	0.277	0.002	4.306	0.355	0.006	0.005	362.817	0.025
	Gasoline	LDGT	Light-Duty Trucks (0-8,500 lbs)	0.493	0.003	6.587	0.497	0.007	0.007	469.501	0.027
	Gasoline	HDGV	Heavy Duty Vehicles (8,501+ lbs)	1.214	0.006	20.214	1.038	0.018	0.016	831.632	0.046
	Diesel	LDDV	Light-Duty Vehicles (Passanger Cars)	0.144	0.003	3.033	0.087	0.004	0.004	358.433	0.008
	Diesel	LDDT	Light-Duty Trucks (0-8,500 lbs)	0.472	0.004	6.024	0.292	0.007	0.007	521.624	0.008
	Diesel	HDDV	Heavy Duty Vehicles (8,501+ lbs)	4.396	0.013	1.743	0.409	0.224	0.206	1583.782	0.026
	NA	MC	Motorcycles	0.606	0.003	13.361	3.166	0.026	0.023	391.892	0.051

Table 5-23. On-Road Vehicle Emission Factors – 2018 (cont.)

State	Fuel Type	Vehicle Type		Emission Factors (g/mi)							
				Criteria Pollutants and Ozone Precursors							
				NO_x	SO_2	CO	VOC	PM_{10}	$PM_{2.5}$	CO_2	NH_3
Rhode Island	Gasoline	LDGV	Light-Duty Vehicles (Passanger Cars)	0.262	0.002	3.402	0.321	0.010	0.009	344.774	0.025
	Gasoline	LDGT	Light-Duty Trucks (0-8,500 lbs)	0.458	0.003	4.785	0.390	0.013	0.011	446.733	0.026
	Gasoline	HDGV	Heavy Duty Vehicles (8,501+ lbs)	1.370	0.005	18.529	0.864	0.030	0.026	781.285	0.045
	Diesel	LDDV	Light-Duty Vehicles (Passanger Cars)	0.148	0.003	2.429	0.132	0.004	0.004	335.694	0.008
	Diesel	LDDT	Light-Duty Trucks (0-8,500 lbs)	0.489	0.004	4.865	0.340	0.007	0.007	489.622	0.008
	Diesel	HDDV	Heavy Duty Vehicles (8,501+ lbs)	5.592	0.013	1.859	0.506	0.222	0.204	1502.284	0.027
	NA	MC	Motorcycles	0.772	0.003	13.208	2.328	0.028	0.025	397.902	0.052
South Carolina	Gasoline	LDGV	Light-Duty Vehicles (Passanger Cars)	0.304	0.002	3.810	0.361	0.008	0.007	341.463	0.025
	Gasoline	LDGT	Light-Duty Trucks (0-8,500 lbs)	0.527	0.003	5.676	0.474	0.009	0.008	441.222	0.026
	Gasoline	HDGV	Heavy Duty Vehicles (8,501+ lbs)	1.272	0.005	17.222	0.883	0.022	0.019	775.699	0.045
	Diesel	LDDV	Light-Duty Vehicles (Passanger Cars)	0.150	0.003	2.600	0.113	0.004	0.004	334.855	0.008
	Diesel	LDDT	Light-Duty Trucks (0-8,500 lbs)	0.487	0.004	5.118	0.308	0.007	0.007	487.082	0.008
	Diesel	HDDV	Heavy Duty Vehicles (8,501+ lbs)	6.169	0.013	2.162	0.643	0.224	0.206	1550.906	0.030
	NA	MC	Motorcycles	0.717	0.003	13.489	2.738	0.027	0.024	394.392	0.053
South Dakota	Gasoline	LDGV	Light-Duty Vehicles (Passanger Cars)	0.331	0.002	4.259	0.418	0.013	0.011	331.065	0.025
	Gasoline	LDGT	Light-Duty Trucks (0-8,500 lbs)	0.559	0.003	5.943	0.506	0.015	0.013	428.201	0.026
	Gasoline	HDGV	Heavy Duty Vehicles (8,501+ lbs)	1.320	0.005	17.036	0.812	0.034	0.030	749.187	0.044
	Diesel	LDDV	Light-Duty Vehicles (Passanger Cars)	0.156	0.003	2.409	0.151	0.004	0.004	320.679	0.008
	Diesel	LDDT	Light-Duty Trucks (0-8,500 lbs)	0.500	0.004	4.699	0.338	0.007	0.007	467.716	0.008
	Diesel	HDDV	Heavy Duty Vehicles (8,501+ lbs)	7.009	0.013	2.301	0.732	0.221	0.203	1527.615	0.031
	NA	MC	Motorcycles	0.826	0.003	14.115	2.325	0.029	0.026	398.558	0.054
Tennessee	Gasoline	LDGV	Light-Duty Vehicles (Passanger Cars)	0.295	0.002	3.685	0.349	0.008	0.007	341.907	0.025
	Gasoline	LDGT	Light-Duty Trucks (0-8,500 lbs)	0.512	0.003	5.424	0.454	0.010	0.009	441.932	0.026
	Gasoline	HDGV	Heavy Duty Vehicles (8,501+ lbs)	1.299	0.005	17.680	0.881	0.024	0.021	774.972	0.045
	Diesel	LDDV	Light-Duty Vehicles (Passanger Cars)	0.150	0.003	2.541	0.120	0.004	0.004	334.469	0.008
	Diesel	LDDT	Light-Duty Trucks (0-8,500 lbs)	0.488	0.004	5.019	0.318	0.007	0.007	486.748	0.008
	Diesel	HDDV	Heavy Duty Vehicles (8,501+ lbs)	6.018	0.013	2.070	0.602	0.222	0.205	1533.095	0.029
	NA	MC	Motorcycles	0.738	0.003	13.597	2.641	0.028	0.024	395.385	0.053
Texas	Gasoline	LDGV	Light-Duty Vehicles (Passanger Cars)	0.272	0.002	3.566	0.326	0.007	0.006	343.786	0.025
	Gasoline	LDGT	Light-Duty Trucks (0-8,500 lbs)	0.477	0.003	5.320	0.426	0.009	0.008	445.260	0.026
	Gasoline	HDGV	Heavy Duty Vehicles (8,501+ lbs)	1.264	0.005	17.829	0.892	0.021	0.018	786.013	0.045
	Diesel	LDDV	Light-Duty Vehicles (Passanger Cars)	0.151	0.003	2.747	0.106	0.004	0.004	338.034	0.008
	Diesel	LDDT	Light-Duty Trucks (0-8,500 lbs)	0.492	0.004	5.417	0.304	0.007	0.007	492.346	0.008
	Diesel	HDDV	Heavy Duty Vehicles (8,501+ lbs)	5.452	0.013	1.918	0.525	0.217	0.200	1538.052	0.028
	NA	MC	Motorcycles	0.697	0.003	12.888	2.756	0.026	0.023	394.157	0.053
Utah	Gasoline	LDGV	Light-Duty Vehicles (Passanger Cars)	0.300	0.002	3.783	0.360	0.011	0.009	346.265	0.025
	Gasoline	LDGT	Light-Duty Trucks (0-8,500 lbs)	0.525	0.003	5.448	0.456	0.013	0.012	448.043	0.026
	Gasoline	HDGV	Heavy Duty Vehicles (8,501+ lbs)	1.434	0.005	18.974	0.905	0.031	0.027	783.047	0.045
	Diesel	LDDV	Light-Duty Vehicles (Passanger Cars)	0.153	0.003	2.463	0.134	0.004	0.004	337.109	0.008
	Diesel	LDDT	Light-Duty Trucks (0-8,500 lbs)	0.505	0.004	4.917	0.339	0.007	0.007	491.134	0.008
	Diesel	HDDV	Heavy Duty Vehicles (8,501+ lbs)	6.014	0.013	1.936	0.543	0.224	0.206	1516.059	0.028
	NA	MC	Motorcycles	0.839	0.003	13.956	2.682	0.029	0.025	397.540	0.052
Vermont	Gasoline	LDGV	Light-Duty Vehicles (Passanger Cars)	0.293	0.002	3.603	0.385	0.013	0.011	329.827	0.025
	Gasoline	LDGT	Light-Duty Trucks (0-8,500 lbs)	0.495	0.003	4.937	0.454	0.015	0.013	425.952	0.026
	Gasoline	HDGV	Heavy Duty Vehicles (8,501+ lbs)	1.316	0.005	16.367	0.796	0.032	0.029	739.991	0.044
	Diesel	LDDV	Light-Duty Vehicles (Passanger Cars)	0.154	0.003	2.318	0.153	0.004	0.004	319.147	0.008
	Diesel	LDDT	Light-Duty Trucks (0-8,500 lbs)	0.491	0.004	4.513	0.337	0.007	0.006	465.307	0.008
	Diesel	HDDV	Heavy Duty Vehicles (8,501+ lbs)	6.608	0.013	2.156	0.667	0.217	0.199	1497.039	0.030
	NA	MC	Motorcycles	0.827	0.003	13.925	2.165	0.029	0.025	397.802	0.054
Virgin Islands	Gasoline	LDGV	Light-Duty Vehicles (Passanger Cars)	0.281	0.002	4.081	0.372	0.005	0.005	344.279	0.024
	Gasoline	LDGT	Light-Duty Trucks (0-8,500 lbs)	0.472	0.003	6.053	0.461	0.006	0.006	443.987	0.026
	Gasoline	HDGV	Heavy Duty Vehicles (8,501+ lbs)	1.118	0.005	18.408	0.925	0.011	0.010	771.117	0.045
	Diesel	LDDV	Light-Duty Vehicles (Passanger Cars)	0.146	0.003	2.854	0.089	0.004	0.004	340.779	0.007
	Diesel	LDDT	Light-Duty Trucks (0-8,500 lbs)	0.458	0.004	5.548	0.267	0.006	0.006	495.396	0.008
	Diesel	HDDV	Heavy Duty Vehicles (8,501+ lbs)	3.801	0.013	1.483	0.319	0.198	0.182	1495.992	0.025
	NA	MC	Motorcycles	0.627	0.003	13.340	2.655	0.023	0.021	388.004	0.053

Table 5-23. On-Road Vehicle Emission Factors – 2018 (cont.)

State	Fuel Type	Vehicle Type		Emission Factors (g/mi)							
				Criteria Pollutants and Ozone Precursors							
				NO_x	SO_2	CO	VOC	PM_{10}	$PM_{2.5}$	CO_2	NH_3
Virginia	Gasoline	LDGV	Light-Duty Vehicles (Passanger Cars)	0.295	0.002	3.663	0.345	0.009	0.008	341.026	0.025
	Gasoline	LDGT	Light-Duty Trucks (0-8,500 lbs)	0.514	0.003	5.363	0.446	0.011	0.009	441.115	0.026
	Gasoline	HDGV	Heavy Duty Vehicles (8,501+ lbs)	1.312	0.005	17.500	0.856	0.025	0.022	773.184	0.045
	Diesel	LDDV	Light-Duty Vehicles (Passanger Cars)	0.150	0.003	2.504	0.123	0.004	0.004	333.231	0.008
	Diesel	LDDT	Light-Duty Trucks (0-8,500 lbs)	0.489	0.004	4.958	0.322	0.007	0.007	485.259	0.008
	Diesel	HDDV	Heavy Duty Vehicles (8,501+ lbs)	5.956	0.013	2.024	0.583	0.221	0.204	1522.269	0.029
	NA	MC	Motorcycles	0.747	0.003	13.259	2.470	0.027	0.024	396.027	0.053
Washington	Gasoline	LDGV	Light-Duty Vehicles (Passanger Cars)	0.292	0.002	3.662	0.338	0.010	0.008	337.767	0.025
	Gasoline	LDGT	Light-Duty Trucks (0-8,500 lbs)	0.504	0.003	5.308	0.436	0.012	0.011	437.615	0.026
	Gasoline	HDGV	Heavy Duty Vehicles (8,501+ lbs)	1.377	0.005	18.254	0.854	0.029	0.025	766.390	0.045
	Diesel	LDDV	Light-Duty Vehicles (Passanger Cars)	0.151	0.003	2.377	0.133	0.004	0.004	328.947	0.008
	Diesel	LDDT	Light-Duty Trucks (0-8,500 lbs)	0.494	0.004	4.733	0.335	0.007	0.007	479.730	0.008
	Diesel	HDDV	Heavy Duty Vehicles (8,501+ lbs)	6.183	0.013	2.023	0.589	0.222	0.204	1504.728	0.029
	NA	MC	Motorcycles	0.821	0.003	13.888	2.357	0.029	0.025	397.890	0.053
West Virginia	Gasoline	LDGV	Light-Duty Vehicles (Passanger Cars)	0.316	0.002	3.887	0.373	0.010	0.008	331.775	0.025
	Gasoline	LDGT	Light-Duty Trucks (0-8,500 lbs)	0.541	0.003	5.601	0.471	0.012	0.010	429.353	0.026
	Gasoline	HDGV	Heavy Duty Vehicles (8,501+ lbs)	1.296	0.005	17.013	0.820	0.027	0.023	751.334	0.044
	Diesel	LDDV	Light-Duty Vehicles (Passanger Cars)	0.152	0.003	2.428	0.133	0.004	0.004	323.286	0.008
	Diesel	LDDT	Light-Duty Trucks (0-8,500 lbs)	0.490	0.004	4.752	0.322	0.007	0.007	471.373	0.008
	Diesel	HDDV	Heavy Duty Vehicles (8,501+ lbs)	6.290	0.013	2.104	0.634	0.217	0.200	1507.938	0.029
	NA	MC	Motorcycles	0.782	0.003	13.745	2.399	0.028	0.025	396.480	0.054
Wisconsin	Gasoline	LDGV	Light-Duty Vehicles (Passanger Cars)	0.311	0.002	4.019	0.393	0.012	0.011	336.810	0.025
	Gasoline	LDGT	Light-Duty Trucks (0-8,500 lbs)	0.530	0.003	5.621	0.486	0.015	0.013	434.654	0.026
	Gasoline	HDGV	Heavy Duty Vehicles (8,501+ lbs)	1.325	0.005	17.574	0.835	0.032	0.028	754.437	0.044
	Diesel	LDDV	Light-Duty Vehicles (Passanger Cars)	0.151	0.003	2.359	0.147	0.004	0.004	326.441	0.008
	Diesel	LDDT	Light-Duty Trucks (0-8,500 lbs)	0.489	0.004	4.636	0.340	0.007	0.007	475.176	0.008
	Diesel	HDDV	Heavy Duty Vehicles (8,501+ lbs)	6.095	0.013	2.000	0.588	0.217	0.200	1491.448	0.029
	NA	MC	Motorcycles	0.802	0.003	13.794	2.242	0.028	0.025	397.792	0.053
Wyoming	Gasoline	LDGV	Light-Duty Vehicles (Passanger Cars)	0.344	0.002	4.331	0.423	0.012	0.011	332.658	0.025
	Gasoline	LDGT	Light-Duty Trucks (0-8,500 lbs)	0.581	0.003	5.982	0.507	0.015	0.013	430.043	0.026
	Gasoline	HDGV	Heavy Duty Vehicles (8,501+ lbs)	1.378	0.005	17.393	0.800	0.035	0.031	753.172	0.044
	Diesel	LDDV	Light-Duty Vehicles (Passanger Cars)	0.158	0.003	2.394	0.153	0.004	0.004	321.997	0.008
	Diesel	LDDT	Light-Duty Trucks (0-8,500 lbs)	0.510	0.004	4.684	0.343	0.007	0.007	469.294	0.008
	Diesel	HDDV	Heavy Duty Vehicles (8,501+ lbs)	7.521	0.013	2.420	0.786	0.225	0.207	1543.653	0.031
	NA	MC	Motorcycles	0.880	0.003	14.144	2.372	0.029	0.025	399.144	0.054

Table 5-24. On-Road Vehicle Emission Factors – 2019

State	Fuel Type	Vehicle Type		Emission Factors (g/mi)							
				Criteria Pollutants and Ozone Precursors							
				NO_x	SO_2	CO	VOC	PM_{10}	$PM_{2.5}$	CO_2	NH_3
Alabama	Gasoline	LDGV	Light-Duty Vehicles (Passanger Cars)	0.256	0.002	3.551	0.325	0.007	0.006	334.488	0.024
	Gasoline	LDGT	Light-Duty Trucks (0-8,500 lbs)	0.447	0.003	5.139	0.419	0.009	0.008	430.101	0.025
	Gasoline	HDGV	Heavy Duty Vehicles (8,501+ lbs)	1.114	0.005	16.088	0.811	0.019	0.016	769.408	0.045
	Diesel	LDDV	Light-Duty Vehicles (Passanger Cars)	0.138	0.003	2.564	0.105	0.004	0.004	326.534	0.008
	Diesel	LDDT	Light-Duty Trucks (0-8,500 lbs)	0.420	0.004	4.690	0.268	0.007	0.006	467.975	0.008
	Diesel	HDDV	Heavy Duty Vehicles (8,501+ lbs)	5.053	0.013	1.810	0.499	0.191	0.176	1510.675	0.028
	NA	MC	Motorcycles	0.705	0.003	13.275	2.709	0.026	0.023	393.209	0.053
Alaska	Gasoline	LDGV	Light-Duty Vehicles (Passanger Cars)	0.285	0.002	4.152	0.403	0.014	0.013	331.600	0.024
	Gasoline	LDGT	Light-Duty Trucks (0-8,500 lbs)	0.478	0.003	5.370	0.466	0.018	0.016	426.045	0.025
	Gasoline	HDGV	Heavy Duty Vehicles (8,501+ lbs)	1.230	0.005	16.676	0.044	0.039	0.034	0.005	0.044
	Diesel	LDDV	Light-Duty Vehicles (Passanger Cars)	0.142	0.003	2.274	0.165	0.004	0.004	317.163	0.008
	Diesel	LDDT	Light-Duty Trucks (0-8,500 lbs)	0.434	0.004	4.178	0.332	0.007	0.006	455.059	0.008
	Diesel	HDDV	Heavy Duty Vehicles (8,501+ lbs)	6.271	0.013	2.056	0.639	0.195	0.180	1496.654	0.030
	NA	MC	Motorcycles	0.866	0.003	14.184	1.993	0.030	0.026	401.120	0.054
Arizona	Gasoline	LDGV	Light-Duty Vehicles (Passanger Cars)	0.247	0.002	3.506	0.311	0.006	0.005	341.361	0.024
	Gasoline	LDGT	Light-Duty Trucks (0-8,500 lbs)	0.438	0.003	5.035	0.391	0.008	0.007	440.415	0.025
	Gasoline	HDGV	Heavy Duty Vehicles (8,501+ lbs)	1.228	0.005	17.910	0.856	0.019	0.017	797.739	0.045
	Diesel	LDDV	Light-Duty Vehicles (Passanger Cars)	0.148	0.003	2.777	0.097	0.004	0.004	334.348	0.008
	Diesel	LDDT	Light-Duty Trucks (0-8,500 lbs)	0.460	0.004	5.129	0.268	0.007	0.007	479.935	0.008
	Diesel	HDDV	Heavy Duty Vehicles (8,501+ lbs)	5.830	0.013	1.959	0.556	0.198	0.182	1565.797	0.029
	NA	MC	Motorcycles	0.802	0.002	12.850	3.144	0.025	0.022	393.757	0.053
Arkansas	Gasoline	LDGV	Light-Duty Vehicles (Passanger Cars)	0.268	0.002	3.761	0.329	0.007	0.006	327.323	0.023
	Gasoline	LDGT	Light-Duty Trucks (0-8,500 lbs)	0.465	0.003	5.365	0.415	0.009	0.008	422.539	0.025
	Gasoline	HDGV	Heavy Duty Vehicles (8,501+ lbs)	1.133	0.005	16.406	0.770	0.021	0.019	761.178	0.044
	Diesel	LDDV	Light-Duty Vehicles (Passanger Cars)	0.142	0.003	2.589	0.112	0.004	0.004	319.023	0.008
	Diesel	LDDT	Light-Duty Trucks (0-8,500 lbs)	0.430	0.004	4.725	0.273	0.007	0.006	458.595	0.008
	Diesel	HDDV	Heavy Duty Vehicles (8,501+ lbs)	5.557	0.013	1.956	0.574	0.190	0.175	1518.295	0.029
	NA	MC	Motorcycles	0.744	0.003	13.377	2.583	0.026	0.023	395.072	0.054
Colorado	Gasoline	LDGV	Light-Duty Vehicles (Passanger Cars)	0.261	0.002	3.553	0.331	0.010	0.009	332.112	0.024
	Gasoline	LDGT	Light-Duty Trucks (0-8,500 lbs)	0.452	0.003	4.910	0.403	0.012	0.011	428.553	0.025
	Gasoline	HDGV	Heavy Duty Vehicles (8,501+ lbs)	1.238	0.005	17.112	0.789	0.029	0.025	766.478	0.045
	Diesel	LDDV	Light-Duty Vehicles (Passanger Cars)	0.142	0.003	2.421	0.130	0.004	0.004	321.417	0.008
	Diesel	LDDT	Light-Duty Trucks (0-8,500 lbs)	0.440	0.004	4.475	0.300	0.007	0.007	462.042	0.008
	Diesel	HDDV	Heavy Duty Vehicles (8,501+ lbs)	5.563	0.013	1.828	0.521	0.192	0.176	1492.220	0.028
	NA	MC	Motorcycles	0.835	0.003	13.762	2.639	0.029	0.025	397.916	0.053
Connecticut	Gasoline	LDGV	Light-Duty Vehicles (Passanger Cars)	0.225	0.002	3.204	0.286	0.009	0.008	331.840	0.024
	Gasoline	LDGT	Light-Duty Trucks (0-8,500 lbs)	0.399	0.003	4.504	0.351	0.012	0.010	429.926	0.025
	Gasoline	HDGV	Heavy Duty Vehicles (8,501+ lbs)	1.209	0.005	17.204	0.777	0.029	0.025	772.560	0.045
	Diesel	LDDV	Light-Duty Vehicles (Passanger Cars)	0.139	0.003	2.466	0.124	0.004	0.004	321.676	0.008
	Diesel	LDDT	Light-Duty Trucks (0-8,500 lbs)	0.435	0.004	4.599	0.300	0.007	0.007	463.697	0.008
	Diesel	HDDV	Heavy Duty Vehicles (8,501+ lbs)	4.623	0.012	1.535	0.388	0.185	0.171	1462.875	0.026
	NA	MC	Motorcycles	0.776	0.003	13.029	2.293	0.028	0.025	398.706	0.053
Delaware	Gasoline	LDGV	Light-Duty Vehicles (Passanger Cars)	0.240	0.002	3.133	0.291	0.008	0.007	336.549	0.024
	Gasoline	LDGT	Light-Duty Trucks (0-8,500 lbs)	0.418	0.003	4.351	0.358	0.010	0.009	432.167	0.025
	Gasoline	HDGV	Heavy Duty Vehicles (8,501+ lbs)	1.176	0.005	16.987	0.781	0.020	0.018	766.516	0.046
	Diesel	LDDV	Light-Duty Vehicles (Passanger Cars)	0.136	0.003	2.393	0.118	0.004	0.004	327.024	0.008
	Diesel	LDDT	Light-Duty Trucks (0-8,500 lbs)	0.415	0.004	4.393	0.283	0.007	0.006	468.545	0.008
	Diesel	HDDV	Heavy Duty Vehicles (8,501+ lbs)	4.128	0.013	1.411	0.325	0.187	0.172	1445.250	0.025
	NA	MC	Motorcycles	0.752	0.003	12.890	2.310	0.025	0.023	394.621	0.052
District of Columbia	Gasoline	LDGV	Light-Duty Vehicles (Passanger Cars)	0.220	0.002	3.128	0.278	0.008	0.007	350.177	0.024
	Gasoline	LDGT	Light-Duty Trucks (0-8,500 lbs)	0.385	0.003	4.377	0.347	0.010	0.009	451.129	0.025
	Gasoline	HDGV	Heavy Duty Vehicles (8,501+ lbs)	1.217	0.005	18.200	0.857	0.022	0.019	805.338	0.046
	Diesel	LDDV	Light-Duty Vehicles (Passanger Cars)	0.133	0.003	2.468	0.113	0.004	0.004	340.603	0.008
	Diesel	LDDT	Light-Duty Trucks (0-8,500 lbs)	0.416	0.004	4.613	0.291	0.007	0.007	489.332	0.008
	Diesel	HDDV	Heavy Duty Vehicles (8,501+ lbs)	4.313	0.013	1.537	0.357	0.203	0.187	1511.991	0.026
	NA	MC	Motorcycles	0.715	0.003	12.876	2.532	0.026	0.023	394.387	0.050

Table 5-24. On-Road Vehicle Emission Factors – 2019 (cont.)

State	Fuel Type	Vehicle Type		Emission Factors (g/mi)							
				Criteria Pollutants and Ozone Precursors							
				NO_x	SO_2	CO	VOC	PM_{10}	$PM_{2.5}$	CO_2	NH_3
Florida	Gasoline	LDGV	Light-Duty Vehicles (Passanger Cars)	0.241	0.002	3.726	0.319	0.006	0.005	351.380	0.024
	Gasoline	LDGT	Light-Duty Trucks (0-8,500 lbs)	0.430	0.003	5.524	0.436	0.008	0.007	451.868	0.025
	Gasoline	HDGV	Heavy Duty Vehicles (8,501+ lbs)	1.093	0.005	17.374	0.914	0.017	0.015	813.883	0.046
	Diesel	LDDV	Light-Duty Vehicles (Passanger Cars)	0.134	0.003	2.797	0.088	0.004	0.004	344.644	0.008
	Diesel	LDDT	Light-Duty Trucks (0-8,500 lbs)	0.413	0.004	5.171	0.259	0.007	0.006	493.706	0.008
	Diesel	HDDV	Heavy Duty Vehicles (8,501+ lbs)	4.622	0.013	1.793	0.464	0.201	0.185	1570.837	0.028
	NA	MC	Motorcycles	0.624	0.003	13.155	3.055	0.026	0.023	391.665	0.051
Georgia	Gasoline	LDGV	Light-Duty Vehicles (Passanger Cars)	0.243	0.002	3.334	0.304	0.007	0.006	329.762	0.024
	Gasoline	LDGT	Light-Duty Trucks (0-8,500 lbs)	0.426	0.003	4.827	0.390	0.009	0.008	425.438	0.025
	Gasoline	HDGV	Heavy Duty Vehicles (8,501+ lbs)	1.118	0.005	15.824	0.786	0.021	0.018	765.549	0.044
	Diesel	LDDV	Light-Duty Vehicles (Passanger Cars)	0.140	0.003	2.582	0.108	0.004	0.004	321.718	0.008
	Diesel	LDDT	Light-Duty Trucks (0-8,500 lbs)	0.427	0.004	4.726	0.271	0.007	0.006	462.179	0.008
	Diesel	HDDV	Heavy Duty Vehicles (8,501+ lbs)	5.315	0.013	1.879	0.536	0.190	0.175	1512.716	0.029
	NA	MC	Motorcycles	0.721	0.003	13.226	2.597	0.027	0.024	394.613	0.054
Hawaii	Gasoline	LDGV	Light-Duty Vehicles (Passanger Cars)	0.242	0.002	3.643	0.309	0.005	0.005	341.574	0.024
	Gasoline	LDGT	Light-Duty Trucks (0-8,500 lbs)	0.430	0.003	5.368	0.417	0.007	0.006	439.582	0.025
	Gasoline	HDGV	Heavy Duty Vehicles (8,501+ lbs)	1.100	0.005	17.756	0.879	0.015	0.013	788.735	0.046
	Diesel	LDDV	Light-Duty Vehicles (Passanger Cars)	0.134	0.003	2.683	0.083	0.004	0.004	335.317	0.008
	Diesel	LDDT	Light-Duty Trucks (0-8,500 lbs)	0.410	0.004	4.936	0.249	0.007	0.006	480.704	0.008
	Diesel	HDDV	Heavy Duty Vehicles (8,501+ lbs)	3.964	0.013	1.491	0.334	0.189	0.174	1501.375	0.026
	NA	MC	Motorcycles	0.675	0.003	13.196	2.838	0.025	0.022	391.173	0.052
Idaho	Gasoline	LDGV	Light-Duty Vehicles (Passanger Cars)	0.277	0.002	3.707	0.347	0.010	0.009	328.877	0.024
	Gasoline	LDGT	Light-Duty Trucks (0-8,500 lbs)	0.474	0.003	5.074	0.419	0.012	0.011	422.872	0.025
	Gasoline	HDGV	Heavy Duty Vehicles (8,501+ lbs)	1.222	0.005	16.559	0.758	0.026	0.023	752.283	0.044
	Diesel	LDDV	Light-Duty Vehicles (Passanger Cars)	0.143	0.003	2.361	0.135	0.004	0.004	317.867	0.008
	Diesel	LDDT	Light-Duty Trucks (0-8,500 lbs)	0.437	0.004	4.315	0.297	0.007	0.006	456.054	0.008
	Diesel	HDDV	Heavy Duty Vehicles (8,501+ lbs)	5.946	0.013	1.953	0.582	0.192	0.177	1493.845	0.029
	NA	MC	Motorcycles	0.856	0.003	13.801	2.419	0.028	0.024	396.809	0.054
Illinois	Gasoline	LDGV	Light-Duty Vehicles (Passanger Cars)	0.244	0.002	3.492	0.313	0.009	0.008	343.901	0.024
	Gasoline	LDGT	Light-Duty Trucks (0-8,500 lbs)	0.432	0.003	4.984	0.415	0.011	0.010	443.756	0.025
	Gasoline	HDGV	Heavy Duty Vehicles (8,501+ lbs)	1.196	0.005	17.759	0.834	0.026	0.023	792.330	0.046
	Diesel	LDDV	Light-Duty Vehicles (Passanger Cars)	0.135	0.003	2.443	0.123	0.004	0.004	333.374	0.008
	Diesel	LDDT	Light-Duty Trucks (0-8,500 lbs)	0.423	0.004	4.567	0.301	0.007	0.007	479.399	0.008
	Diesel	HDDV	Heavy Duty Vehicles (8,501+ lbs)	4.528	0.013	1.562	0.385	0.196	0.181	1492.162	0.026
	NA	MC	Motorcycles	0.734	0.003	12.987	2.464	0.026	0.023	396.779	0.051
Indiana	Gasoline	LDGV	Light-Duty Vehicles (Passanger Cars)	0.262	0.002	3.666	0.332	0.009	0.008	336.382	0.024
	Gasoline	LDGT	Light-Duty Trucks (0-8,500 lbs)	0.453	0.003	5.139	0.422	0.011	0.010	432.155	0.025
	Gasoline	HDGV	Heavy Duty Vehicles (8,501+ lbs)	1.171	0.005	16.776	0.795	0.024	0.021	768.617	0.045
	Diesel	LDDV	Light-Duty Vehicles (Passanger Cars)	0.137	0.003	2.401	0.126	0.004	0.004	325.993	0.008
	Diesel	LDDT	Light-Duty Trucks (0-8,500 lbs)	0.422	0.004	4.420	0.293	0.007	0.006	467.186	0.008
	Diesel	HDDV	Heavy Duty Vehicles (8,501+ lbs)	5.376	0.013	1.855	0.527	0.195	0.180	1501.491	0.028
	NA	MC	Motorcycles	0.761	0.003	13.546	2.420	0.027	0.024	395.825	0.053
Iowa	Gasoline	LDGV	Light-Duty Vehicles (Passanger Cars)	0.281	0.002	3.930	0.366	0.010	0.009	328.119	0.023
	Gasoline	LDGT	Light-Duty Trucks (0-8,500 lbs)	0.476	0.003	5.331	0.441	0.012	0.011	421.902	0.025
	Gasoline	HDGV	Heavy Duty Vehicles (8,501+ lbs)	1.169	0.005	16.319	0.749	0.027	0.024	750.929	0.044
	Diesel	LDDV	Light-Duty Vehicles (Passanger Cars)	0.141	0.003	2.387	0.136	0.004	0.004	316.964	0.008
	Diesel	LDDT	Light-Duty Trucks (0-8,500 lbs)	0.427	0.004	4.351	0.296	0.007	0.006	454.846	0.008
	Diesel	HDDV	Heavy Duty Vehicles (8,501+ lbs)	5.823	0.013	1.983	0.596	0.192	0.176	1498.183	0.029
	NA	MC	Motorcycles	0.797	0.003	13.699	2.292	0.027	0.024	396.938	0.054
Kansas	Gasoline	LDGV	Light-Duty Vehicles (Passanger Cars)	0.274	0.002	3.804	0.342	0.008	0.007	329.129	0.024
	Gasoline	LDGT	Light-Duty Trucks (0-8,500 lbs)	0.472	0.003	5.334	0.427	0.010	0.009	424.173	0.025
	Gasoline	HDGV	Heavy Duty Vehicles (8,501+ lbs)	1.167	0.005	16.599	0.770	0.024	0.021	758.688	0.044
	Diesel	LDDV	Light-Duty Vehicles (Passanger Cars)	0.141	0.003	2.493	0.122	0.004	0.004	319.543	0.008
	Diesel	LDDT	Light-Duty Trucks (0-8,500 lbs)	0.430	0.004	4.558	0.285	0.007	0.006	458.987	0.008
	Diesel	HDDV	Heavy Duty Vehicles (8,501+ lbs)	5.304	0.013	1.815	0.515	0.188	0.173	1491.365	0.028
	NA	MC	Motorcycles	0.774	0.003	13.484	2.480	0.027	0.024	395.871	0.054

Table 5-24. On-Road Vehicle Emission Factors – 2019 (cont.)

State	Fuel Type	Vehicle Type		Emission Factors (g/mi)							
				Criteria Pollutants and Ozone Precursors							
				NO_x	SO_2	CO	VOC	PM_{10}	$PM_{2.5}$	CO_2	NH_3
Kentucky	Gasoline	LDGV	Light-Duty Vehicles (Passanger Cars)	0.268	0.002	3.711	0.328	0.008	0.007	325.994	0.024
	Gasoline	LDGT	Light-Duty Trucks (0-8,500 lbs)	0.466	0.003	5.275	0.416	0.010	0.009	420.938	0.025
	Gasoline	HDGV	Heavy Duty Vehicles (8,501+ lbs)	1.132	0.005	15.970	0.747	0.024	0.021	758.580	0.044
	Diesel	LDDV	Light-Duty Vehicles (Passanger Cars)	0.142	0.003	2.513	0.121	0.004	0.004	316.736	0.008
	Diesel	LDDT	Light-Duty Trucks (0-8,500 lbs)	0.434	0.004	4.597	0.283	0.007	0.006	455.465	0.008
	Diesel	HDDV	Heavy Duty Vehicles (8,501+ lbs)	6.043	0.013	2.096	0.640	0.194	0.178	1525.725	0.030
	NA	MC	Motorcycles	0.761	0.003	13.229	2.394	0.027	0.024	396.624	0.054
Louisiana	Gasoline	LDGV	Light-Duty Vehicles (Passanger Cars)	0.249	0.002	3.619	0.319	0.006	0.006	335.802	0.024
	Gasoline	LDGT	Light-Duty Trucks (0-8,500 lbs)	0.438	0.003	5.294	0.416	0.008	0.007	432.787	0.025
	Gasoline	HDGV	Heavy Duty Vehicles (8,501+ lbs)	1.091	0.005	16.259	0.827	0.019	0.017	780.615	0.045
	Diesel	LDDV	Light-Duty Vehicles (Passanger Cars)	0.139	0.003	2.719	0.099	0.004	0.004	328.600	0.008
	Diesel	LDDT	Light-Duty Trucks (0-8,500 lbs)	0.423	0.004	4.983	0.264	0.007	0.006	471.467	0.008
	Diesel	HDDV	Heavy Duty Vehicles (8,501+ lbs)	5.131	0.013	1.888	0.531	0.192	0.177	1538.729	0.029
	NA	MC	Motorcycles	0.675	0.003	13.218	2.798	0.027	0.024	393.466	0.053
Maine	Gasoline	LDGV	Light-Duty Vehicles (Passanger Cars)	0.275	0.002	3.614	0.365	0.011	0.010	320.553	0.023
	Gasoline	LDGT	Light-Duty Trucks (0-8,500 lbs)	0.463	0.003	4.852	0.428	0.013	0.012	412.795	0.025
	Gasoline	HDGV	Heavy Duty Vehicles (8,501+ lbs)	1.157	0.005	14.991	0.715	0.029	0.025	733.249	0.044
	Diesel	LDDV	Light-Duty Vehicles (Passanger Cars)	0.143	0.003	2.292	0.145	0.004	0.004	308.722	0.008
	Diesel	LDDT	Light-Duty Trucks (0-8,500 lbs)	0.429	0.004	4.151	0.299	0.007	0.006	444.050	0.008
	Diesel	HDDV	Heavy Duty Vehicles (8,501+ lbs)	5.957	0.013	1.977	0.601	0.188	0.173	1475.012	0.029
	NA	MC	Motorcycles	0.827	0.003	13.599	2.073	0.028	0.025	397.587	0.055
Maryland	Gasoline	LDGV	Light-Duty Vehicles (Passanger Cars)	0.239	0.002	3.223	0.291	0.008	0.007	331.287	0.024
	Gasoline	LDGT	Light-Duty Trucks (0-8,500 lbs)	0.422	0.003	4.558	0.368	0.010	0.009	428.368	0.025
	Gasoline	HDGV	Heavy Duty Vehicles (8,501+ lbs)	1.175	0.005	16.543	0.774	0.025	0.022	769.991	0.045
	Diesel	LDDV	Light-Duty Vehicles (Passanger Cars)	0.140	0.003	2.519	0.118	0.004	0.004	321.979	0.008
	Diesel	LDDT	Light-Duty Trucks (0-8,500 lbs)	0.433	0.004	4.661	0.289	0.007	0.007	463.398	0.008
	Diesel	HDDV	Heavy Duty Vehicles (8,501+ lbs)	4.913	0.013	1.666	0.443	0.187	0.172	1482.134	0.027
	NA	MC	Motorcycles	0.756	0.003	12.923	2.361	0.027	0.024	396.996	0.053
Massachuesetts	Gasoline	LDGV	Light-Duty Vehicles (Passanger Cars)	0.241	0.002	3.267	0.303	0.009	0.008	330.346	0.024
	Gasoline	LDGT	Light-Duty Trucks (0-8,500 lbs)	0.424	0.003	4.591	0.384	0.012	0.011	426.959	0.025
	Gasoline	HDGV	Heavy Duty Vehicles (8,501+ lbs)	1.201	0.005	16.822	0.756	0.028	0.025	764.288	0.045
	Diesel	LDDV	Light-Duty Vehicles (Passanger Cars)	0.140	0.003	2.417	0.129	0.004	0.004	319.755	0.008
	Diesel	LDDT	Light-Duty Trucks (0-8,500 lbs)	0.433	0.004	4.478	0.301	0.007	0.007	460.219	0.008
	Diesel	HDDV	Heavy Duty Vehicles (8,501+ lbs)	5.051	0.012	1.682	0.457	0.188	0.173	1470.912	0.027
	NA	MC	Motorcycles	0.791	0.003	13.058	2.224	0.028	0.025	398.361	0.053
Michigan	Gasoline	LDGV	Light-Duty Vehicles (Passanger Cars)	0.273	0.002	3.828	0.346	0.010	0.009	333.856	0.024
	Gasoline	LDGT	Light-Duty Trucks (0-8,500 lbs)	0.474	0.003	5.365	0.443	0.013	0.011	429.920	0.025
	Gasoline	HDGV	Heavy Duty Vehicles (8,501+ lbs)	1.188	0.005	16.714	0.784	0.029	0.025	766.281	0.045
	Diesel	LDDV	Light-Duty Vehicles (Passanger Cars)	0.139	0.003	2.393	0.133	0.004	0.004	322.710	0.008
	Diesel	LDDT	Light-Duty Trucks (0-8,500 lbs)	0.428	0.004	4.417	0.303	0.007	0.007	463.311	0.008
	Diesel	HDDV	Heavy Duty Vehicles (8,501+ lbs)	5.489	0.013	1.857	0.534	0.193	0.178	1495.123	0.028
	NA	MC	Motorcycles	0.787	0.003	13.697	2.312	0.029	0.025	397.714	0.053
Minnesota	Gasoline	LDGV	Light-Duty Vehicles (Passanger Cars)	0.277	0.002	3.945	0.370	0.012	0.011	330.361	0.024
	Gasoline	LDGT	Light-Duty Trucks (0-8,500 lbs)	0.471	0.003	5.361	0.451	0.015	0.013	425.009	0.025
	Gasoline	HDGV	Heavy Duty Vehicles (8,501+ lbs)	1.184	0.005	16.607	0.792	0.032	0.028	752.987	0.045
	Diesel	LDDV	Light-Duty Vehicles (Passanger Cars)	0.140	0.003	2.350	0.142	0.004	0.004	318.247	0.008
	Diesel	LDDT	Light-Duty Trucks (0-8,500 lbs)	0.427	0.004	4.306	0.307	0.007	0.006	456.905	0.008
	Diesel	HDDV	Heavy Duty Vehicles (8,501+ lbs)	5.084	0.012	1.686	0.467	0.186	0.171	1458.177	0.027
	NA	MC	Motorcycles	0.803	0.003	14.008	2.295	0.029	0.026	398.110	0.054
Mississippi	Gasoline	LDGV	Light-Duty Vehicles (Passanger Cars)	0.257	0.002	3.549	0.327	0.007	0.006	329.434	0.023
	Gasoline	LDGT	Light-Duty Trucks (0-8,500 lbs)	0.444	0.003	5.116	0.413	0.008	0.007	424.072	0.025
	Gasoline	HDGV	Heavy Duty Vehicles (8,501+ lbs)	1.093	0.005	15.797	0.794	0.018	0.016	758.527	0.044
	Diesel	LDDV	Light-Duty Vehicles (Passanger Cars)	0.139	0.003	2.570	0.105	0.004	0.004	321.760	0.008
	Diesel	LDDT	Light-Duty Trucks (0-8,500 lbs)	0.419	0.004	4.674	0.263	0.007	0.006	461.664	0.008
	Diesel	HDDV	Heavy Duty Vehicles (8,501+ lbs)	4.959	0.013	1.774	0.488	0.186	0.171	1497.386	0.028
	NA	MC	Motorcycles	0.706	0.003	13.288	2.676	0.026	0.023	392.847	0.054

Table 5-24. On-Road Vehicle Emission Factors – 2019 (cont.)

State	Fuel Type	Vehicle Type		Emission Factors (g/mi)							
				Criteria Pollutants and Ozone Precursors							
				NO_x	SO_2	CO	VOC	PM_{10}	$PM_{2.5}$	CO_2	NH_3
Missouri	Gasoline	LDGV	Light-Duty Vehicles (Passanger Cars)	0.261	0.002	3.653	0.323	0.008	0.007	323.052	0.023
	Gasoline	LDGT	Light-Duty Trucks (0-8,500 lbs)	0.456	0.003	5.157	0.406	0.010	0.009	418.254	0.025
	Gasoline	HDGV	Heavy Duty Vehicles (8,501+ lbs)	1.146	0.005	16.271	0.741	0.025	0.022	754.039	0.044
	Diesel	LDDV	Light-Duty Vehicles (Passanger Cars)	0.143	0.003	2.543	0.122	0.004	0.004	313.771	0.008
	Diesel	LDDT	Light-Duty Trucks (0-8,500 lbs)	0.436	0.004	4.651	0.285	0.007	0.007	452.156	0.008
	Diesel	HDDV	Heavy Duty Vehicles (8,501+ lbs)	5.383	0.013	1.834	0.528	0.185	0.170	1488.940	0.028
	NA	MC	Motorcycles	0.770	0.003	13.180	2.362	0.027	0.024	397.251	0.055
Montana	Gasoline	LDGV	Light-Duty Vehicles (Passanger Cars)	0.269	0.002	3.505	0.320	0.009	0.008	317.300	0.023
	Gasoline	LDGT	Light-Duty Trucks (0-8,500 lbs)	0.465	0.003	4.852	0.383	0.011	0.010	409.774	0.025
	Gasoline	HDGV	Heavy Duty Vehicles (8,501+ lbs)	1.154	0.005	14.427	0.656	0.026	0.023	735.376	0.044
	Diesel	LDDV	Light-Duty Vehicles (Passanger Cars)	0.137	0.003	2.202	0.117	0.004	0.004	307.540	0.008
	Diesel	LDDT	Light-Duty Trucks (0-8,500 lbs)	0.420	0.004	4.021	0.256	0.007	0.006	443.017	0.008
	Diesel	HDDV	Heavy Duty Vehicles (8,501+ lbs)	6.441	0.013	2.086	0.653	0.192	0.177	1498.931	0.030
	NA	MC	Motorcycles	0.867	0.003	13.630	2.217	0.028	0.024	395.125	0.055
Nebraska	Gasoline	LDGV	Light-Duty Vehicles (Passanger Cars)	0.282	0.002	3.945	0.361	0.010	0.009	327.595	0.024
	Gasoline	LDGT	Light-Duty Trucks (0-8,500 lbs)	0.484	0.003	5.433	0.441	0.012	0.011	422.284	0.025
	Gasoline	HDGV	Heavy Duty Vehicles (8,501+ lbs)	1.177	0.005	16.303	0.749	0.028	0.025	757.194	0.044
	Diesel	LDDV	Light-Duty Vehicles (Passanger Cars)	0.143	0.003	2.458	0.133	0.004	0.004	316.870	0.008
	Diesel	LDDT	Light-Duty Trucks (0-8,500 lbs)	0.436	0.004	4.495	0.296	0.007	0.006	455.294	0.008
	Diesel	HDDV	Heavy Duty Vehicles (8,501+ lbs)	6.175	0.013	2.102	0.648	0.194	0.179	1520.752	0.030
	NA	MC	Motorcycles	0.802	0.003	13.658	2.400	0.028	0.024	397.732	0.054
Nevada	Gasoline	LDGV	Light-Duty Vehicles (Passanger Cars)	0.253	0.002	3.321	0.312	0.007	0.006	342.201	0.024
	Gasoline	LDGT	Light-Duty Trucks (0-8,500 lbs)	0.448	0.003	4.742	0.394	0.009	0.008	440.768	0.025
	Gasoline	HDGV	Heavy Duty Vehicles (8,501+ lbs)	1.274	0.005	17.556	0.854	0.021	0.019	791.461	0.045
	Diesel	LDDV	Light-Duty Vehicles (Passanger Cars)	0.144	0.003	2.574	0.109	0.004	0.004	333.704	0.008
	Diesel	LDDT	Light-Duty Trucks (0-8,500 lbs)	0.449	0.004	4.771	0.280	0.007	0.007	478.798	0.008
	Diesel	HDDV	Heavy Duty Vehicles (8,501+ lbs)	5.689	0.013	1.886	0.525	0.200	0.184	1539.795	0.028
	NA	MC	Motorcycles	0.826	0.003	13.394	3.028	0.027	0.023	394.486	0.052
New Hampshire	Gasoline	LDGV	Light-Duty Vehicles (Passanger Cars)	0.242	0.002	3.274	0.321	0.010	0.009	327.830	0.023
	Gasoline	LDGT	Light-Duty Trucks (0-8,500 lbs)	0.416	0.003	4.461	0.387	0.013	0.011	421.877	0.025
	Gasoline	HDGV	Heavy Duty Vehicles (8,501+ lbs)	1.185	0.005	16.190	0.738	0.027	0.024	748.368	0.045
	Diesel	LDDV	Light-Duty Vehicles (Passanger Cars)	0.140	0.003	2.334	0.137	0.004	0.004	316.533	0.008
	Diesel	LDDT	Light-Duty Trucks (0-8,500 lbs)	0.427	0.004	4.269	0.299	0.007	0.006	454.531	0.008
	Diesel	HDDV	Heavy Duty Vehicles (8,501+ lbs)	5.213	0.012	1.730	0.484	0.186	0.171	1459.723	0.028
	NA	MC	Motorcycles	0.809	0.003	13.260	2.150	0.027	0.024	397.169	0.054
New Jersey	Gasoline	LDGV	Light-Duty Vehicles (Passanger Cars)	0.242	0.002	3.235	0.291	0.008	0.007	322.322	0.024
	Gasoline	LDGT	Light-Duty Trucks (0-8,500 lbs)	0.405	0.003	4.416	0.343	0.011	0.009	417.038	0.025
	Gasoline	HDGV	Heavy Duty Vehicles (8,501+ lbs)	1.150	0.005	15.498	0.691	0.026	0.023	755.546	0.044
	Diesel	LDDV	Light-Duty Vehicles (Passanger Cars)	0.144	0.003	2.492	0.124	0.004	0.004	312.766	0.008
	Diesel	LDDT	Light-Duty Trucks (0-8,500 lbs)	0.440	0.004	4.560	0.285	0.007	0.007	450.453	0.008
	Diesel	HDDV	Heavy Duty Vehicles (8,501+ lbs)	6.620	0.013	2.266	0.720	0.197	0.181	1541.636	0.031
	NA	MC	Motorcycles	0.793	0.003	12.903	2.150	0.027	0.024	397.855	0.055
New Mexico	Gasoline	LDGV	Light-Duty Vehicles (Passanger Cars)	0.276	0.002	3.606	0.341	0.008	0.007	327.673	0.024
	Gasoline	LDGT	Light-Duty Trucks (0-8,500 lbs)	0.479	0.003	5.058	0.417	0.010	0.009	422.313	0.025
	Gasoline	HDGV	Heavy Duty Vehicles (8,501+ lbs)	1.216	0.005	16.278	0.763	0.023	0.020	757.706	0.044
	Diesel	LDDV	Light-Duty Vehicles (Passanger Cars)	0.146	0.003	2.471	0.119	0.004	0.004	318.451	0.008
	Diesel	LDDT	Light-Duty Trucks (0-8,500 lbs)	0.445	0.004	4.517	0.281	0.007	0.006	457.336	0.008
	Diesel	HDDV	Heavy Duty Vehicles (8,501+ lbs)	6.194	0.013	2.048	0.617	0.194	0.178	1518.660	0.030
	NA	MC	Motorcycles	0.843	0.003	13.455	2.776	0.027	0.023	395.655	0.054
New York	Gasoline	LDGV	Light-Duty Vehicles (Passanger Cars)	0.222	0.002	3.116	0.290	0.009	0.008	333.797	0.024
	Gasoline	LDGT	Light-Duty Trucks (0-8,500 lbs)	0.381	0.003	4.191	0.342	0.012	0.010	430.416	0.025
	Gasoline	HDGV	Heavy Duty Vehicles (8,501+ lbs)	1.195	0.005	16.701	0.784	0.027	0.023	767.520	0.045
	Diesel	LDDV	Light-Duty Vehicles (Passanger Cars)	0.138	0.003	2.399	0.127	0.004	0.004	323.295	0.008
	Diesel	LDDT	Light-Duty Trucks (0-8,500 lbs)	0.427	0.004	4.439	0.298	0.007	0.007	464.591	0.008
	Diesel	HDDV	Heavy Duty Vehicles (8,501+ lbs)	4.897	0.012	1.648	0.437	0.189	0.174	1471.623	0.027
	NA	MC	Motorcycles	0.775	0.003	13.286	2.299	0.028	0.025	397.148	0.053

Table 5-24. On-Road Vehicle Emission Factors – 2019 (cont.)

State	Fuel Type	Vehicle Type		Emission Factors (g/mi)							
				Criteria Pollutants and Ozone Precursors							
				NO_x	SO_2	CO	VOC	PM_{10}	$PM_{2.5}$	CO_2	NH_3
North Carolina	Gasoline	LDGV	Light-Duty Vehicles (Passanger Cars)	0.256	0.002	3.469	0.319	0.007	0.007	332.158	0.024
	Gasoline	LDGT	Light-Duty Trucks (0-8,500 lbs)	0.448	0.003	5.008	0.414	0.009	0.008	427.796	0.025
	Gasoline	HDGV	Heavy Duty Vehicles (8,501+ lbs)	1.141	0.005	16.133	0.803	0.021	0.018	764.478	0.045
	Diesel	LDDV	Light-Duty Vehicles (Passanger Cars)	0.138	0.003	2.501	0.111	0.004	0.004	323.592	0.008
	Diesel	LDDT	Light-Duty Trucks (0-8,500 lbs)	0.423	0.004	4.586	0.275	0.007	0.006	464.444	0.008
	Diesel	HDDV	Heavy Duty Vehicles (8,501+ lbs)	4.801	0.013	1.668	0.440	0.187	0.172	1481.751	0.027
	NA	MC	Motorcycles	0.730	0.003	13.342	2.609	0.027	0.024	394.312	0.053
North Dakota	Gasoline	LDGV	Light-Duty Vehicles (Passanger Cars)	0.288	0.002	4.179	0.410	0.014	0.012	324.021	0.023
	Gasoline	LDGT	Light-Duty Trucks (0-8,500 lbs)	0.484	0.003	5.516	0.475	0.016	0.015	416.590	0.025
	Gasoline	HDGV	Heavy Duty Vehicles (8,501+ lbs)	1.170	0.005	15.853	0.749	0.034	0.030	738.422	0.044
	Diesel	LDDV	Light-Duty Vehicles (Passanger Cars)	0.144	0.003	2.318	0.154	0.004	0.004	310.895	0.008
	Diesel	LDDT	Light-Duty Trucks (0-8,500 lbs)	0.433	0.004	4.199	0.309	0.007	0.006	446.740	0.008
	Diesel	HDDV	Heavy Duty Vehicles (8,501+ lbs)	6.047	0.013	2.001	0.615	0.189	0.174	1482.948	0.029
	NA	MC	Motorcycles	0.839	0.003	14.119	2.183	0.029	0.026	398.696	0.055
Ohio	Gasoline	LDGV	Light-Duty Vehicles (Passanger Cars)	0.249	0.002	3.519	0.319	0.009	0.008	336.004	0.024
	Gasoline	LDGT	Light-Duty Trucks (0-8,500 lbs)	0.431	0.003	4.910	0.401	0.011	0.010	432.284	0.025
	Gasoline	HDGV	Heavy Duty Vehicles (8,501+ lbs)	1.180	0.005	16.935	0.804	0.025	0.022	769.246	0.045
	Diesel	LDDV	Light-Duty Vehicles (Passanger Cars)	0.137	0.003	2.401	0.126	0.004	0.004	325.557	0.008
	Diesel	LDDT	Light-Duty Trucks (0-8,500 lbs)	0.423	0.004	4.430	0.295	0.007	0.006	467.070	0.008
	Diesel	HDDV	Heavy Duty Vehicles (8,501+ lbs)	5.061	0.013	1.732	0.473	0.192	0.177	1485.889	0.027
	NA	MC	Motorcycles	0.764	0.003	13.645	2.428	0.028	0.025	396.253	0.053
Oklahoma	Gasoline	LDGV	Light-Duty Vehicles (Passanger Cars)	0.268	0.002	3.762	0.333	0.007	0.006	333.282	0.024
	Gasoline	LDGT	Light-Duty Trucks (0-8,500 lbs)	0.465	0.003	5.365	0.423	0.009	0.008	429.137	0.025
	Gasoline	HDGV	Heavy Duty Vehicles (8,501+ lbs)	1.156	0.005	16.842	0.797	0.021	0.018	769.199	0.045
	Diesel	LDDV	Light-Duty Vehicles (Passanger Cars)	0.140	0.003	2.566	0.112	0.004	0.004	324.697	0.008
	Diesel	LDDT	Light-Duty Trucks (0-8,500 lbs)	0.428	0.004	4.700	0.276	0.007	0.006	465.838	0.008
	Diesel	HDDV	Heavy Duty Vehicles (8,501+ lbs)	5.283	0.013	1.850	0.522	0.191	0.176	1512.578	0.028
	NA	MC	Motorcycles	0.745	0.003	13.398	2.685	0.026	0.023	394.536	0.053
Oregon	Gasoline	LDGV	Light-Duty Vehicles (Passanger Cars)	0.262	0.002	3.376	0.311	0.008	0.007	325.242	0.024
	Gasoline	LDGT	Light-Duty Trucks (0-8,500 lbs)	0.445	0.003	4.710	0.385	0.010	0.009	419.000	0.025
	Gasoline	HDGV	Heavy Duty Vehicles (8,501+ lbs)	1.195	0.005	16.376	0.749	0.023	0.020	746.678	0.044
	Diesel	LDDV	Light-Duty Vehicles (Passanger Cars)	0.141	0.003	2.332	0.126	0.004	0.004	315.331	0.008
	Diesel	LDDT	Light-Duty Trucks (0-8,500 lbs)	0.429	0.004	4.265	0.288	0.007	0.006	453.004	0.008
	Diesel	HDDV	Heavy Duty Vehicles (8,501+ lbs)	5.535	0.013	1.839	0.528	0.189	0.174	1473.089	0.028
	NA	MC	Motorcycles	0.832	0.003	13.607	2.302	0.027	0.024	396.032	0.054
Pacific Islands	Gasoline	LDGV	Light-Duty Vehicles (Passanger Cars)	0.247	0.002	3.381	0.304	0.008	0.007	331.904	0.024
	Gasoline	LDGT	Light-Duty Trucks (0-8,500 lbs)	0.432	0.003	4.807	0.387	0.010	0.009	428.054	0.025
	Gasoline	HDGV	Heavy Duty Vehicles (8,501+ lbs)	1.162	0.005	16.594	0.784	0.022	0.020	767.372	0.045
	Diesel	LDDV	Light-Duty Vehicles (Passanger Cars)	0.139	0.003	2.478	0.115	0.004	0.004	322.877	0.008
	Diesel	LDDT	Light-Duty Trucks (0-8,500 lbs)	0.429	0.004	4.567	0.282	0.007	0.007	463.838	0.008
	Diesel	HDDV	Heavy Duty Vehicles (8,501+ lbs)	5.276	0.013	1.812	0.506	0.191	0.176	1498.294	0.028
	NA	MC	Motorcycles	0.758	0.003	13.179	2.492	0.027	0.024	395.677	0.053
Pennsylvania	Gasoline	LDGV	Light-Duty Vehicles (Passanger Cars)	0.242	0.002	3.299	0.304	0.009	0.008	333.712	0.024
	Gasoline	LDGT	Light-Duty Trucks (0-8,500 lbs)	0.423	0.003	4.637	0.384	0.011	0.010	429.894	0.025
	Gasoline	HDGV	Heavy Duty Vehicles (8,501+ lbs)	1.179	0.005	16.407	0.779	0.026	0.023	768.096	0.045
	Diesel	LDDV	Light-Duty Vehicles (Passanger Cars)	0.139	0.003	2.422	0.126	0.004	0.004	323.382	0.008
	Diesel	LDDT	Light-Duty Trucks (0-8,500 lbs)	0.428	0.004	4.470	0.295	0.007	0.007	464.298	0.008
	Diesel	HDDV	Heavy Duty Vehicles (8,501+ lbs)	5.517	0.013	1.886	0.543	0.194	0.179	1503.157	0.029
	NA	MC	Motorcycles	0.769	0.003	13.411	2.366	0.028	0.025	396.915	0.053
Puerto Rico	Gasoline	LDGV	Light-Duty Vehicles (Passanger Cars)	0.236	0.002	4.079	0.318	0.006	0.005	353.186	0.024
	Gasoline	LDGT	Light-Duty Trucks (0-8,500 lbs)	0.425	0.003	6.082	0.440	0.007	0.006	455.882	0.025
	Gasoline	HDGV	Heavy Duty Vehicles (8,501+ lbs)	1.069	0.005	18.807	0.941	0.017	0.015	827.739	0.046
	Diesel	LDDV	Light-Duty Vehicles (Passanger Cars)	0.133	0.003	3.030	0.081	0.004	0.004	347.242	0.008
	Diesel	LDDT	Light-Duty Trucks (0-8,500 lbs)	0.414	0.004	5.610	0.254	0.007	0.007	498.655	0.008
	Diesel	HDDV	Heavy Duty Vehicles (8,501+ lbs)	3.935	0.013	1.585	0.366	0.194	0.178	1570.197	0.026
	NA	MC	Motorcycles	0.604	0.003	13.193	3.145	0.026	0.023	391.995	0.052

Table 5-24. On-Road Vehicle Emission Factors – 2019 (cont.)

State	Fuel Type	Vehicle Type		Emission Factors (g/mi)							
				Criteria Pollutants and Ozone Precursors							
				NO_x	SO_2	CO	VOC	PM_{10}	$PM_{2.5}$	CO_2	NH_3
Rhode Island	Gasoline	LDGV	Light-Duty Vehicles (Passanger Cars)	0.226	0.002	3.218	0.291	0.009	0.008	335.732	0.024
	Gasoline	LDGT	Light-Duty Trucks (0-8,500 lbs)	0.397	0.003	4.436	0.352	0.012	0.010	433.913	0.025
	Gasoline	HDGV	Heavy Duty Vehicles (8,501+ lbs)	1.208	0.005	17.201	0.783	0.028	0.024	777.384	0.045
	Diesel	LDDV	Light-Duty Vehicles (Passanger Cars)	0.138	0.003	2.427	0.126	0.004	0.004	325.316	0.008
	Diesel	LDDT	Light-Duty Trucks (0-8,500 lbs)	0.429	0.004	4.526	0.301	0.007	0.007	468.195	0.008
	Diesel	HDDV	Heavy Duty Vehicles (8,501+ lbs)	5.044	0.013	1.707	0.460	0.193	0.177	1488.872	0.027
	NA	MC	Motorcycles	0.770	0.003	13.024	2.307	0.028	0.025	398.001	0.052
South Carolina	Gasoline	LDGV	Light-Duty Vehicles (Passanger Cars)	0.259	0.002	3.599	0.324	0.007	0.006	332.471	0.024
	Gasoline	LDGT	Light-Duty Trucks (0-8,500 lbs)	0.455	0.003	5.234	0.421	0.009	0.008	428.500	0.025
	Gasoline	HDGV	Heavy Duty Vehicles (8,501+ lbs)	1.119	0.005	15.934	0.801	0.020	0.018	771.782	0.044
	Diesel	LDDV	Light-Duty Vehicles (Passanger Cars)	0.140	0.003	2.598	0.107	0.004	0.004	324.460	0.008
	Diesel	LDDT	Light-Duty Trucks (0-8,500 lbs)	0.427	0.004	4.764	0.271	0.007	0.006	465.668	0.008
	Diesel	HDDV	Heavy Duty Vehicles (8,501+ lbs)	5.628	0.013	2.011	0.592	0.195	0.179	1536.389	0.029
	NA	MC	Motorcycles	0.714	0.003	13.310	2.698	0.027	0.024	394.497	0.054
South Dakota	Gasoline	LDGV	Light-Duty Vehicles (Passanger Cars)	0.285	0.002	3.989	0.377	0.011	0.010	322.454	0.023
	Gasoline	LDGT	Light-Duty Trucks (0-8,500 lbs)	0.485	0.003	5.460	0.452	0.014	0.012	415.971	0.025
	Gasoline	HDGV	Heavy Duty Vehicles (8,501+ lbs)	1.162	0.005	15.678	0.737	0.031	0.027	745.239	0.044
	Diesel	LDDV	Light-Duty Vehicles (Passanger Cars)	0.145	0.003	2.408	0.143	0.004	0.004	310.799	0.008
	Diesel	LDDT	Light-Duty Trucks (0-8,500 lbs)	0.439	0.004	4.375	0.301	0.007	0.006	447.254	0.008
	Diesel	HDDV	Heavy Duty Vehicles (8,501+ lbs)	6.428	0.013	2.154	0.678	0.193	0.177	1512.801	0.030
	NA	MC	Motorcycles	0.824	0.003	13.907	2.312	0.029	0.026	398.664	0.055
Tennessee	Gasoline	LDGV	Light-Duty Vehicles (Passanger Cars)	0.251	0.002	3.474	0.312	0.008	0.007	332.918	0.024
	Gasoline	LDGT	Light-Duty Trucks (0-8,500 lbs)	0.441	0.003	4.990	0.403	0.010	0.009	429.209	0.025
	Gasoline	HDGV	Heavy Duty Vehicles (8,501+ lbs)	1.144	0.005	16.356	0.798	0.023	0.020	771.063	0.045
	Diesel	LDDV	Light-Duty Vehicles (Passanger Cars)	0.139	0.003	2.539	0.114	0.004	0.004	324.100	0.008
	Diesel	LDDT	Light-Duty Trucks (0-8,500 lbs)	0.428	0.004	4.671	0.280	0.007	0.007	465.377	0.008
	Diesel	HDDV	Heavy Duty Vehicles (8,501+ lbs)	5.475	0.013	1.918	0.553	0.193	0.178	1518.912	0.029
	NA	MC	Motorcycles	0.735	0.003	13.413	2.605	0.028	0.024	395.489	0.053
Texas	Gasoline	LDGV	Light-Duty Vehicles (Passanger Cars)	0.232	0.002	3.373	0.293	0.006	0.006	334.712	0.024
	Gasoline	LDGT	Light-Duty Trucks (0-8,500 lbs)	0.411	0.003	4.906	0.379	0.008	0.007	432.402	0.025
	Gasoline	HDGV	Heavy Duty Vehicles (8,501+ lbs)	1.114	0.005	16.546	0.809	0.019	0.017	782.129	0.045
	Diesel	LDDV	Light-Duty Vehicles (Passanger Cars)	0.140	0.003	2.745	0.099	0.004	0.004	327.514	0.008
	Diesel	LDDT	Light-Duty Trucks (0-8,500 lbs)	0.432	0.004	5.046	0.267	0.007	0.007	470.697	0.008
	Diesel	HDDV	Heavy Duty Vehicles (8,501+ lbs)	4.936	0.013	1.768	0.479	0.189	0.174	1524.069	0.028
	NA	MC	Motorcycles	0.695	0.003	12.718	2.758	0.026	0.023	394.263	0.053
Utah	Gasoline	LDGV	Light-Duty Vehicles (Passanger Cars)	0.257	0.002	3.564	0.324	0.009	0.008	337.185	0.024
	Gasoline	LDGT	Light-Duty Trucks (0-8,500 lbs)	0.453	0.003	5.020	0.407	0.012	0.011	435.187	0.025
	Gasoline	HDGV	Heavy Duty Vehicles (8,501+ lbs)	1.264	0.005	17.583	0.820	0.028	0.025	779.127	0.045
	Diesel	LDDV	Light-Duty Vehicles (Passanger Cars)	0.142	0.003	2.462	0.127	0.004	0.004	326.688	0.008
	Diesel	LDDT	Light-Duty Trucks (0-8,500 lbs)	0.443	0.004	4.574	0.301	0.007	0.007	469.634	0.008
	Diesel	HDDV	Heavy Duty Vehicles (8,501+ lbs)	5.440	0.013	1.784	0.495	0.194	0.179	1502.397	0.028
	NA	MC	Motorcycles	0.837	0.003	13.762	2.668	0.029	0.025	397.639	0.052
Vermont	Gasoline	LDGV	Light-Duty Vehicles (Passanger Cars)	0.250	0.002	3.368	0.347	0.011	0.010	321.253	0.023
	Gasoline	LDGT	Light-Duty Trucks (0-8,500 lbs)	0.425	0.003	4.514	0.403	0.014	0.012	413.787	0.025
	Gasoline	HDGV	Heavy Duty Vehicles (8,501+ lbs)	1.159	0.005	15.124	0.722	0.030	0.026	736.089	0.044
	Diesel	LDDV	Light-Duty Vehicles (Passanger Cars)	0.143	0.003	2.317	0.146	0.004	0.004	309.323	0.008
	Diesel	LDDT	Light-Duty Trucks (0-8,500 lbs)	0.431	0.004	4.199	0.300	0.007	0.006	444.925	0.008
	Diesel	HDDV	Heavy Duty Vehicles (8,501+ lbs)	6.040	0.013	2.010	0.616	0.189	0.174	1482.684	0.030
	NA	MC	Motorcycles	0.825	0.003	13.727	2.140	0.028	0.025	397.907	0.055
Virgin Islands	Gasoline	LDGV	Light-Duty Vehicles (Passanger Cars)	0.240	0.002	3.859	0.333	0.005	0.004	335.160	0.023
	Gasoline	LDGT	Light-Duty Trucks (0-8,500 lbs)	0.407	0.003	5.582	0.408	0.006	0.005	431.111	0.025
	Gasoline	HDGV	Heavy Duty Vehicles (8,501+ lbs)	0.985	0.005	17.154	0.841	0.011	0.010	767.356	0.045
	Diesel	LDDV	Light-Duty Vehicles (Passanger Cars)	0.136	0.003	2.851	0.083	0.004	0.004	330.128	0.007
	Diesel	LDDT	Light-Duty Trucks (0-8,500 lbs)	0.402	0.004	5.162	0.232	0.006	0.006	473.392	0.008
	Diesel	HDDV	Heavy Duty Vehicles (8,501+ lbs)	3.383	0.013	1.339	0.283	0.171	0.157	1482.759	0.025
	NA	MC	Motorcycles	0.625	0.003	13.170	2.634	0.023	0.021	388.114	0.054

Table 5-24. On-Road Vehicle Emission Factors – 2019 (cont.)

State	Fuel Type	Vehicle Type		Emission Factors (g/mi)							
				Criteria Pollutants and Ozone Precursors							
				NO_x	SO_2	CO	VOC	PM_{10}	$PM_{2.5}$	CO_2	NH_3
Virginia	Gasoline	LDGV	Light-Duty Vehicles (Passanger Cars)	0.253	0.002	3.459	0.311	0.008	0.007	332.067	0.024
	Gasoline	LDGT	Light-Duty Trucks (0-8,500 lbs)	0.444	0.003	4.945	0.398	0.010	0.009	428.427	0.025
	Gasoline	HDGV	Heavy Duty Vehicles (8,501+ lbs)	1.156	0.005	16.212	0.775	0.023	0.021	769.281	0.045
	Diesel	LDDV	Light-Duty Vehicles (Passanger Cars)	0.139	0.003	2.503	0.116	0.004	0.004	322.907	0.008
	Diesel	LDDT	Light-Duty Trucks (0-8,500 lbs)	0.429	0.004	4.614	0.284	0.007	0.007	463.970	0.008
	Diesel	HDDV	Heavy Duty Vehicles (8,501+ lbs)	5.411	0.013	1.874	0.534	0.193	0.177	1508.250	0.028
	NA	MC	Motorcycles	0.744	0.003	13.080	2.442	0.027	0.024	396.130	0.053
Washington	Gasoline	LDGV	Light-Duty Vehicles (Passanger Cars)	0.251	0.002	3.454	0.305	0.009	0.008	328.916	0.024
	Gasoline	LDGT	Light-Duty Trucks (0-8,500 lbs)	0.437	0.003	4.890	0.389	0.011	0.010	425.057	0.025
	Gasoline	HDGV	Heavy Duty Vehicles (8,501+ lbs)	1.214	0.005	16.899	0.774	0.027	0.023	762.484	0.045
	Diesel	LDDV	Light-Duty Vehicles (Passanger Cars)	0.140	0.003	2.376	0.127	0.004	0.004	318.778	0.008
	Diesel	LDDT	Light-Duty Trucks (0-8,500 lbs)	0.434	0.004	4.404	0.297	0.007	0.007	458.731	0.008
	Diesel	HDDV	Heavy Duty Vehicles (8,501+ lbs)	5.618	0.013	1.874	0.540	0.193	0.177	1490.846	0.028
	NA	MC	Motorcycles	0.818	0.003	13.699	2.345	0.029	0.025	397.992	0.053
West Virginia	Gasoline	LDGV	Light-Duty Vehicles (Passanger Cars)	0.272	0.002	3.662	0.335	0.009	0.008	323.095	0.023
	Gasoline	LDGT	Light-Duty Trucks (0-8,500 lbs)	0.468	0.003	5.159	0.420	0.011	0.010	417.034	0.025
	Gasoline	HDGV	Heavy Duty Vehicles (8,501+ lbs)	1.142	0.005	15.723	0.744	0.025	0.022	747.445	0.044
	Diesel	LDDV	Light-Duty Vehicles (Passanger Cars)	0.142	0.003	2.427	0.126	0.004	0.004	313.289	0.008
	Diesel	LDDT	Light-Duty Trucks (0-8,500 lbs)	0.430	0.004	4.423	0.286	0.007	0.006	450.694	0.008
	Diesel	HDDV	Heavy Duty Vehicles (8,501+ lbs)	5.739	0.013	1.958	0.583	0.189	0.174	1493.658	0.029
	NA	MC	Motorcycles	0.780	0.003	13.555	2.368	0.028	0.025	396.587	0.054
Wisconsin	Gasoline	LDGV	Light-Duty Vehicles (Passanger Cars)	0.267	0.002	3.764	0.354	0.011	0.010	328.029	0.024
	Gasoline	LDGT	Light-Duty Trucks (0-8,500 lbs)	0.458	0.003	5.155	0.433	0.013	0.012	422.225	0.025
	Gasoline	HDGV	Heavy Duty Vehicles (8,501+ lbs)	1.167	0.005	16.227	0.757	0.029	0.026	750.537	0.044
	Diesel	LDDV	Light-Duty Vehicles (Passanger Cars)	0.141	0.003	2.358	0.140	0.004	0.004	316.379	0.008
	Diesel	LDDT	Light-Duty Trucks (0-8,500 lbs)	0.429	0.004	4.313	0.302	0.007	0.006	454.367	0.008
	Diesel	HDDV	Heavy Duty Vehicles (8,501+ lbs)	5.539	0.013	1.853	0.540	0.189	0.174	1477.555	0.028
	NA	MC	Motorcycles	0.800	0.003	13.592	2.216	0.028	0.025	397.895	0.054
Wyoming	Gasoline	LDGV	Light-Duty Vehicles (Passanger Cars)	0.297	0.002	4.074	0.383	0.011	0.010	324.007	0.023
	Gasoline	LDGT	Light-Duty Trucks (0-8,500 lbs)	0.504	0.003	5.515	0.454	0.014	0.012	417.765	0.025
	Gasoline	HDGV	Heavy Duty Vehicles (8,501+ lbs)	1.215	0.005	16.070	0.726	0.032	0.028	749.186	0.044
	Diesel	LDDV	Light-Duty Vehicles (Passanger Cars)	0.147	0.003	2.393	0.146	0.004	0.004	312.083	0.008
	Diesel	LDDT	Light-Duty Trucks (0-8,500 lbs)	0.448	0.004	4.360	0.306	0.007	0.006	448.784	0.008
	Diesel	HDDV	Heavy Duty Vehicles (8,501+ lbs)	6.913	0.013	2.270	0.729	0.197	0.181	1528.568	0.031
	NA	MC	Motorcycles	0.877	0.003	13.942	2.359	0.029	0.025	399.249	0.055

Table 5-25. On-Road Vehicle Emission Factors – 2020

State	Fuel Type	Vehicle Type		Emission Factors (g/mi)							
				Criteria Pollutants and Ozone Precursors							
				NO_x	SO_2	CO	VOC	PM_{10}	$PM_{2.5}$	CO_2	NH_3
Alabama	Gasoline	LDGV	Light-Duty Vehicles (Passanger Cars)	0.221	0.002	3.372	0.294	0.006	0.006	324.955	0.023
	Gasoline	LDGT	Light-Duty Trucks (0-8,500 lbs)	0.388	0.003	4.775	0.375	0.008	0.007	417.799	0.024
	Gasoline	HDGV	Heavy Duty Vehicles (8,501+ lbs)	0.982	0.005	15.011	0.738	0.018	0.016	766.021	0.045
	Diesel	LDDV	Light-Duty Vehicles (Passanger Cars)	0.131	0.003	2.584	0.101	0.004	0.004	316.390	0.008
	Diesel	LDDT	Light-Duty Trucks (0-8,500 lbs)	0.371	0.004	4.394	0.236	0.007	0.006	448.251	0.008
	Diesel	HDDV	Heavy Duty Vehicles (8,501+ lbs)	4.584	0.013	1.678	0.457	0.166	0.153	1497.653	0.028
	NA	MC	Motorcycles	0.703	0.003	13.109	2.696	0.026	0.023	393.304	0.054
Alaska	Gasoline	LDGV	Light-Duty Vehicles (Passanger Cars)	0.248	0.002	3.925	0.369	0.013	0.011	322.311	0.023
	Gasoline	LDGT	Light-Duty Trucks (0-8,500 lbs)	0.418	0.003	4.995	0.423	0.016	0.014	414.045	0.024
	Gasoline	HDGV	Heavy Duty Vehicles (8,501+ lbs)	1.087	0.005	15.575	0.690	0.035	0.031	750.761	0.044
	Diesel	LDDV	Light-Duty Vehicles (Passanger Cars)	0.135	0.003	2.292	0.160	0.004	0.004	307.430	0.008
	Diesel	LDDT	Light-Duty Trucks (0-8,500 lbs)	0.384	0.004	3.914	0.299	0.007	0.006	436.084	0.008
	Diesel	HDDV	Heavy Duty Vehicles (8,501+ lbs)	5.739	0.013	1.925	0.592	0.170	0.157	1483.299	0.030
	NA	MC	Motorcycles	0.863	0.003	13.994	1.989	0.029	0.026	401.208	0.054
Arizona	Gasoline	LDGV	Light-Duty Vehicles (Passanger Cars)	0.212	0.002	3.338	0.282	0.006	0.005	331.601	0.023
	Gasoline	LDGT	Light-Duty Trucks (0-8,500 lbs)	0.379	0.003	4.686	0.351	0.007	0.006	427.791	0.024
	Gasoline	HDGV	Heavy Duty Vehicles (8,501+ lbs)	1.082	0.005	16.786	0.780	0.018	0.016	794.301	0.045
	Diesel	LDDV	Light-Duty Vehicles (Passanger Cars)	0.141	0.003	2.798	0.093	0.004	0.004	323.935	0.008
	Diesel	LDDT	Light-Duty Trucks (0-8,500 lbs)	0.407	0.004	4.810	0.236	0.007	0.006	459.736	0.008
	Diesel	HDDV	Heavy Duty Vehicles (8,501+ lbs)	5.309	0.013	1.823	0.512	0.172	0.158	1552.295	0.029
	NA	MC	Motorcycles	0.800	0.002	12.701	3.160	0.025	0.022	393.851	0.053
Arkansas	Gasoline	LDGV	Light-Duty Vehicles (Passanger Cars)	0.232	0.002	3.577	0.299	0.007	0.006	318.021	0.023
	Gasoline	LDGT	Light-Duty Trucks (0-8,500 lbs)	0.405	0.003	4.995	0.373	0.009	0.008	410.480	0.024
	Gasoline	HDGV	Heavy Duty Vehicles (8,501+ lbs)	1.000	0.005	15.332	0.702	0.020	0.017	757.770	0.044
	Diesel	LDDV	Light-Duty Vehicles (Passanger Cars)	0.135	0.003	2.608	0.107	0.004	0.004	309.119	0.008
	Diesel	LDDT	Light-Duty Trucks (0-8,500 lbs)	0.381	0.004	4.432	0.242	0.007	0.006	439.312	0.008
	Diesel	HDDV	Heavy Duty Vehicles (8,501+ lbs)	5.074	0.013	1.826	0.530	0.165	0.152	1504.829	0.029
	NA	MC	Motorcycles	0.742	0.003	13.209	2.571	0.026	0.023	395.170	0.055
Colorado	Gasoline	LDGV	Light-Duty Vehicles (Passanger Cars)	0.228	0.002	3.370	0.302	0.009	0.008	322.713	0.023
	Gasoline	LDGT	Light-Duty Trucks (0-8,500 lbs)	0.396	0.003	4.573	0.365	0.011	0.010	416.382	0.024
	Gasoline	HDGV	Heavy Duty Vehicles (8,501+ lbs)	1.093	0.005	15.974	0.718	0.026	0.023	763.061	0.045
	Diesel	LDDV	Light-Duty Vehicles (Passanger Cars)	0.135	0.003	2.440	0.125	0.004	0.004	311.479	0.008
	Diesel	LDDT	Light-Duty Trucks (0-8,500 lbs)	0.389	0.004	4.194	0.268	0.007	0.006	442.693	0.008
	Diesel	HDDV	Heavy Duty Vehicles (8,501+ lbs)	5.051	0.013	1.697	0.479	0.167	0.153	1479.339	0.028
	NA	MC	Motorcycles	0.833	0.003	13.588	2.639	0.029	0.025	398.006	0.054
Connecticut	Gasoline	LDGV	Light-Duty Vehicles (Passanger Cars)	0.195	0.002	3.043	0.261	0.008	0.007	322.434	0.023
	Gasoline	LDGT	Light-Duty Trucks (0-8,500 lbs)	0.348	0.003	4.190	0.318	0.011	0.010	417.706	0.024
	Gasoline	HDGV	Heavy Duty Vehicles (8,501+ lbs)	1.068	0.005	16.092	0.707	0.026	0.023	769.191	0.045
	Diesel	LDDV	Light-Duty Vehicles (Passanger Cars)	0.132	0.003	2.485	0.120	0.004	0.004	311.714	0.008
	Diesel	LDDT	Light-Duty Trucks (0-8,500 lbs)	0.384	0.004	4.312	0.268	0.007	0.007	444.295	0.008
	Diesel	HDDV	Heavy Duty Vehicles (8,501+ lbs)	4.146	0.012	1.407	0.352	0.161	0.148	1450.709	0.026
	NA	MC	Motorcycles	0.774	0.003	12.861	2.283	0.028	0.025	398.796	0.053
Delaware	Gasoline	LDGV	Light-Duty Vehicles (Passanger Cars)	0.207	0.002	2.968	0.265	0.007	0.006	326.984	0.023
	Gasoline	LDGT	Light-Duty Trucks (0-8,500 lbs)	0.361	0.003	4.030	0.322	0.009	0.008	419.840	0.024
	Gasoline	HDGV	Heavy Duty Vehicles (8,501+ lbs)	1.039	0.005	15.907	0.711	0.018	0.016	764.108	0.045
	Diesel	LDDV	Light-Duty Vehicles (Passanger Cars)	0.129	0.003	2.412	0.113	0.004	0.004	316.891	0.008
	Diesel	LDDT	Light-Duty Trucks (0-8,500 lbs)	0.366	0.004	4.112	0.251	0.007	0.006	448.814	0.008
	Diesel	HDDV	Heavy Duty Vehicles (8,501+ lbs)	3.671	0.013	1.280	0.291	0.162	0.149	1433.990	0.025
	NA	MC	Motorcycles	0.751	0.003	12.721	2.300	0.025	0.022	394.711	0.053
District of Columbia	Gasoline	LDGV	Light-Duty Vehicles (Passanger Cars)	0.190	0.002	2.972	0.253	0.007	0.006	340.195	0.023
	Gasoline	LDGT	Light-Duty Trucks (0-8,500 lbs)	0.334	0.003	4.078	0.314	0.009	0.008	438.244	0.024
	Gasoline	HDGV	Heavy Duty Vehicles (8,501+ lbs)	1.074	0.005	17.054	0.778	0.020	0.018	801.978	0.046
	Diesel	LDDV	Light-Duty Vehicles (Passanger Cars)	0.126	0.003	2.487	0.108	0.004	0.004	330.042	0.008
	Diesel	LDDT	Light-Duty Trucks (0-8,500 lbs)	0.366	0.004	4.317	0.258	0.007	0.006	468.758	0.008
	Diesel	HDDV	Heavy Duty Vehicles (8,501+ lbs)	3.836	0.013	1.396	0.319	0.176	0.162	1500.101	0.026
	NA	MC	Motorcycles	0.713	0.003	12.713	2.520	0.026	0.023	394.471	0.051

Table 5-25. On-Road Vehicle Emission Factors – 2020 (cont.)

State	Fuel Type	Vehicle Type		Emission Factors (g/mi)							
				Criteria Pollutants and Ozone Precursors							
				NO_x	SO_2	CO	VOC	PM_{10}	$PM_{2.5}$	CO_2	NH_3
Florida	Gasoline	LDGV	Light-Duty Vehicles (Passanger Cars)	0.207	0.002	3.544	0.288	0.006	0.005	341.308	0.023
	Gasoline	LDGT	Light-Duty Trucks (0-8,500 lbs)	0.372	0.003	5.134	0.389	0.007	0.006	438.887	0.024
	Gasoline	HDGV	Heavy Duty Vehicles (8,501+ lbs)	0.963	0.005	16.230	0.831	0.016	0.014	810.473	0.046
	Diesel	LDDV	Light-Duty Vehicles (Passanger Cars)	0.127	0.003	2.820	0.084	0.004	0.004	333.904	0.008
	Diesel	LDDT	Light-Duty Trucks (0-8,500 lbs)	0.364	0.004	4.845	0.227	0.007	0.006	472.877	0.008
	Diesel	HDDV	Heavy Duty Vehicles (8,501+ lbs)	4.174	0.013	1.653	0.422	0.174	0.160	1557.827	0.028
	NA	MC	Motorcycles	0.623	0.003	12.996	3.038	0.026	0.023	391.756	0.052
Georgia	Gasoline	LDGV	Light-Duty Vehicles (Passanger Cars)	0.210	0.002	3.165	0.275	0.007	0.006	320.377	0.023
	Gasoline	LDGT	Light-Duty Trucks (0-8,500 lbs)	0.371	0.003	4.486	0.351	0.009	0.008	413.284	0.024
	Gasoline	HDGV	Heavy Duty Vehicles (8,501+ lbs)	0.986	0.005	14.753	0.715	0.020	0.017	762.152	0.044
	Diesel	LDDV	Light-Duty Vehicles (Passanger Cars)	0.133	0.003	2.601	0.103	0.004	0.004	311.725	0.008
	Diesel	LDDT	Light-Duty Trucks (0-8,500 lbs)	0.378	0.004	4.432	0.240	0.007	0.006	442.736	0.008
	Diesel	HDDV	Heavy Duty Vehicles (8,501+ lbs)	4.838	0.013	1.748	0.493	0.165	0.152	1499.483	0.028
	NA	MC	Motorcycles	0.719	0.003	13.062	2.585	0.027	0.024	394.708	0.054
Hawaii	Gasoline	LDGV	Light-Duty Vehicles (Passanger Cars)	0.208	0.002	3.471	0.280	0.005	0.005	331.783	0.023
	Gasoline	LDGT	Light-Duty Trucks (0-8,500 lbs)	0.373	0.003	4.994	0.373	0.007	0.006	426.950	0.024
	Gasoline	HDGV	Heavy Duty Vehicles (8,501+ lbs)	0.970	0.005	16.647	0.800	0.015	0.013	785.403	0.046
	Diesel	LDDV	Light-Duty Vehicles (Passanger Cars)	0.127	0.003	2.705	0.078	0.004	0.004	324.862	0.008
	Diesel	LDDT	Light-Duty Trucks (0-8,500 lbs)	0.362	0.004	4.625	0.217	0.007	0.006	460.398	0.008
	Diesel	HDDV	Heavy Duty Vehicles (8,501+ lbs)	3.536	0.013	1.358	0.299	0.163	0.150	1489.145	0.026
	NA	MC	Motorcycles	0.673	0.003	13.045	2.846	0.025	0.022	391.266	0.052
Idaho	Gasoline	LDGV	Light-Duty Vehicles (Passanger Cars)	0.241	0.002	3.508	0.316	0.009	0.008	319.587	0.023
	Gasoline	LDGT	Light-Duty Trucks (0-8,500 lbs)	0.413	0.003	4.709	0.378	0.011	0.010	410.868	0.024
	Gasoline	HDGV	Heavy Duty Vehicles (8,501+ lbs)	1.079	0.005	15.452	0.691	0.024	0.021	748.861	0.044
	Diesel	LDDV	Light-Duty Vehicles (Passanger Cars)	0.136	0.003	2.379	0.130	0.004	0.004	308.053	0.008
	Diesel	LDDT	Light-Duty Trucks (0-8,500 lbs)	0.386	0.004	4.042	0.265	0.007	0.006	436.925	0.008
	Diesel	HDDV	Heavy Duty Vehicles (8,501+ lbs)	5.426	0.013	1.822	0.537	0.167	0.154	1480.635	0.029
	NA	MC	Motorcycles	0.853	0.003	13.626	2.430	0.027	0.024	396.902	0.054
Illinois	Gasoline	LDGV	Light-Duty Vehicles (Passanger Cars)	0.210	0.002	3.299	0.284	0.008	0.007	334.135	0.023
	Gasoline	LDGT	Light-Duty Trucks (0-8,500 lbs)	0.375	0.003	4.608	0.372	0.010	0.009	431.125	0.024
	Gasoline	HDGV	Heavy Duty Vehicles (8,501+ lbs)	1.056	0.005	16.615	0.758	0.024	0.021	788.948	0.046
	Diesel	LDDV	Light-Duty Vehicles (Passanger Cars)	0.128	0.003	2.463	0.119	0.004	0.004	323.055	0.008
	Diesel	LDDT	Light-Duty Trucks (0-8,500 lbs)	0.373	0.004	4.276	0.268	0.007	0.006	459.297	0.008
	Diesel	HDDV	Heavy Duty Vehicles (8,501+ lbs)	4.048	0.013	1.427	0.347	0.170	0.156	1480.111	0.026
	NA	MC	Motorcycles	0.732	0.003	12.819	2.464	0.026	0.023	396.864	0.052
Indiana	Gasoline	LDGV	Light-Duty Vehicles (Passanger Cars)	0.227	0.002	3.470	0.302	0.008	0.007	326.846	0.023
	Gasoline	LDGT	Light-Duty Trucks (0-8,500 lbs)	0.395	0.003	4.769	0.380	0.010	0.009	419.858	0.024
	Gasoline	HDGV	Heavy Duty Vehicles (8,501+ lbs)	1.033	0.005	15.646	0.723	0.022	0.020	765.203	0.045
	Diesel	LDDV	Light-Duty Vehicles (Passanger Cars)	0.130	0.003	2.420	0.121	0.004	0.004	315.910	0.008
	Diesel	LDDT	Light-Duty Trucks (0-8,500 lbs)	0.372	0.004	4.140	0.261	0.007	0.006	447.568	0.008
	Diesel	HDDV	Heavy Duty Vehicles (8,501+ lbs)	4.881	0.013	1.721	0.484	0.170	0.156	1488.585	0.028
	NA	MC	Motorcycles	0.758	0.003	13.371	2.425	0.027	0.024	395.914	0.053
Iowa	Gasoline	LDGV	Light-Duty Vehicles (Passanger Cars)	0.244	0.002	3.724215	0.334	0.009	0.008	318.858	0.023
	Gasoline	LDGT	Light-Duty Trucks (0-8,500 lbs)	0.416	0.003	4.958441	0.398	0.011	0.010	409.932	0.024
	Gasoline	HDGV	Heavy Duty Vehicles (8,501+ lbs)	1.033	0.005	15.24512	0.683	0.025	0.022	747.500	0.044
	Diesel	LDDV	Light-Duty Vehicles (Passanger Cars)	0.134	0.003	2.404963	0.131	0.004	0.004	307.181	0.008
	Diesel	LDDT	Light-Duty Trucks (0-8,500 lbs)	0.378	0.004	4.077141	0.264	0.007	0.006	435.770	0.008
	Diesel	HDDV	Heavy Duty Vehicles (8,501+ lbs)	5.321	0.013	1.852808	0.551	0.167	0.154	1484.846	0.029
	NA	MC	Motorcycles	0.795	0.003	13.51759	2.281	0.027	0.024	397.032	0.054
Kansas	Gasoline	LDGV	Light-Duty Vehicles (Passanger Cars)	0.238	0.002	3.613	0.311	0.008	0.007	319.800	0.023
	Gasoline	LDGT	Light-Duty Trucks (0-8,500 lbs)	0.412	0.003	4.963	0.385	0.010	0.009	412.097	0.024
	Gasoline	HDGV	Heavy Duty Vehicles (8,501+ lbs)	1.031	0.005	15.519	0.701	0.022	0.019	755.293	0.044
	Diesel	LDDV	Light-Duty Vehicles (Passanger Cars)	0.134	0.003	2.512	0.117	0.004	0.004	309.646	0.008
	Diesel	LDDT	Light-Duty Trucks (0-8,500 lbs)	0.380	0.004	4.273	0.254	0.007	0.006	439.709	0.008
	Diesel	HDDV	Heavy Duty Vehicles (8,501+ lbs)	4.819	0.013	1.685	0.473	0.163	0.150	1478.366	0.028
	NA	MC	Motorcycles	0.772	0.003	13.310	2.468	0.027	0.024	395.965	0.054

Table 5-25. On-Road Vehicle Emission Factors – 2020 (cont.)

State	Fuel Type	Vehicle Type		Emission Factors (g/mi)							
				Criteria Pollutants and Ozone Precursors							
				NO_x	SO_2	CO	VOC	PM_{10}	$PM_{2.5}$	CO_2	NH_3
Kentucky	Gasoline	LDGV	Light-Duty Vehicles (Passanger Cars)	0.232	0.002	3.519	0.298	0.007	0.006	316.754	0.023
	Gasoline	LDGT	Light-Duty Trucks (0-8,500 lbs)	0.406	0.003	4.902	0.374	0.009	0.008	408.952	0.024
	Gasoline	HDGV	Heavy Duty Vehicles (8,501+ lbs)	0.999	0.005	14.881	0.680	0.022	0.020	755.139	0.044
	Diesel	LDDV	Light-Duty Vehicles (Passanger Cars)	0.136	0.003	2.532	0.116	0.004	0.004	306.924	0.008
	Diesel	LDDT	Light-Duty Trucks (0-8,500 lbs)	0.384	0.004	4.312	0.252	0.007	0.006	436.358	0.008
	Diesel	HDDV	Heavy Duty Vehicles (8,501+ lbs)	5.540	0.013	1.965	0.593	0.169	0.155	1512.001	0.030
	NA	MC	Motorcycles	0.759	0.003	13.062	2.399	0.027	0.024	396.720	0.055
Louisiana	Gasoline	LDGV	Light-Duty Vehicles (Passanger Cars)	0.214	0.002	3.442	0.289	0.006	0.005	326.217	0.023
	Gasoline	LDGT	Light-Duty Trucks (0-8,500 lbs)	0.380	0.003	4.923	0.372	0.008	0.007	420.393	0.024
	Gasoline	HDGV	Heavy Duty Vehicles (8,501+ lbs)	0.961	0.005	15.168	0.753	0.018	0.016	777.203	0.045
	Diesel	LDDV	Light-Duty Vehicles (Passanger Cars)	0.132	0.003	2.739	0.095	0.004	0.004	318.373	0.008
	Diesel	LDDT	Light-Duty Trucks (0-8,500 lbs)	0.374	0.004	4.673	0.233	0.007	0.006	451.605	0.008
	Diesel	HDDV	Heavy Duty Vehicles (8,501+ lbs)	4.669	0.013	1.756	0.489	0.167	0.154	1525.368	0.028
	NA	MC	Motorcycles	0.673	0.003	13.056	2.783	0.027	0.024	393.562	0.054
Maine	Gasoline	LDGV	Light-Duty Vehicles (Passanger Cars)	0.239	0.002	3.413	0.333	0.010	0.009	311.538	0.022
	Gasoline	LDGT	Light-Duty Trucks (0-8,500 lbs)	0.403	0.003	4.499	0.387	0.013	0.011	401.108	0.024
	Gasoline	HDGV	Heavy Duty Vehicles (8,501+ lbs)	1.021	0.005	13.956	0.651	0.026	0.023	729.841	0.044
	Diesel	LDDV	Light-Duty Vehicles (Passanger Cars)	0.136	0.003	2.309	0.140	0.004	0.004	299.212	0.008
	Diesel	LDDT	Light-Duty Trucks (0-8,500 lbs)	0.380	0.004	3.890	0.268	0.007	0.006	425.441	0.008
	Diesel	HDDV	Heavy Duty Vehicles (8,501+ lbs)	5.448	0.012	1.849	0.556	0.164	0.151	1461.720	0.029
	NA	MC	Motorcycles	0.824	0.003	13.418	2.063	0.028	0.025	397.681	0.055
Maryland	Gasoline	LDGV	Light-Duty Vehicles (Passanger Cars)	0.205	0.002	3.056	0.264	0.008	0.007	321.881	0.023
	Gasoline	LDGT	Light-Duty Trucks (0-8,500 lbs)	0.364	0.003	4.227	0.330	0.010	0.009	416.166	0.024
	Gasoline	HDGV	Heavy Duty Vehicles (8,501+ lbs)	1.037	0.005	15.457	0.704	0.023	0.021	766.611	0.045
	Diesel	LDDV	Light-Duty Vehicles (Passanger Cars)	0.133	0.003	2.538	0.113	0.004	0.004	311.994	0.008
	Diesel	LDDT	Light-Duty Trucks (0-8,500 lbs)	0.383	0.004	4.370	0.257	0.007	0.007	443.966	0.008
	Diesel	HDDV	Heavy Duty Vehicles (8,501+ lbs)	4.434	0.012	1.537	0.405	0.162	0.149	1469.558	0.027
	NA	MC	Motorcycles	0.754	0.003	12.758	2.351	0.027	0.024	397.088	0.054
Massachuesetts	Gasoline	LDGV	Light-Duty Vehicles (Passanger Cars)	0.207	0.002	3.079	0.275	0.009	0.008	320.997	0.023
	Gasoline	LDGT	Light-Duty Trucks (0-8,500 lbs)	0.366	0.003	4.227	0.344	0.011	0.010	414.834	0.024
	Gasoline	HDGV	Heavy Duty Vehicles (8,501+ lbs)	1.061	0.005	15.728	0.688	0.026	0.023	760.899	0.045
	Diesel	LDDV	Light-Duty Vehicles (Passanger Cars)	0.133	0.003	2.436	0.124	0.004	0.004	309.865	0.008
	Diesel	LDDT	Light-Duty Trucks (0-8,500 lbs)	0.383	0.004	4.198	0.269	0.007	0.007	440.954	0.008
	Diesel	HDDV	Heavy Duty Vehicles (8,501+ lbs)	4.563	0.012	1.553	0.418	0.163	0.150	1458.393	0.027
	NA	MC	Motorcycles	0.789	0.003	12.888	2.215	0.028	0.025	398.452	0.054
Michigan	Gasoline	LDGV	Light-Duty Vehicles (Passanger Cars)	0.238	0.002	3.620	0.315	0.009	0.008	324.415	0.023
	Gasoline	LDGT	Light-Duty Trucks (0-8,500 lbs)	0.414	0.003	4.978	0.399	0.012	0.010	417.717	0.024
	Gasoline	HDGV	Heavy Duty Vehicles (8,501+ lbs)	1.049	0.005	15.574	0.713	0.026	0.023	762.856	0.045
	Diesel	LDDV	Light-Duty Vehicles (Passanger Cars)	0.132	0.003	2.412	0.129	0.004	0.004	312.741	0.008
	Diesel	LDDT	Light-Duty Trucks (0-8,500 lbs)	0.379	0.004	4.138	0.270	0.007	0.006	443.903	0.008
	Diesel	HDDV	Heavy Duty Vehicles (8,501+ lbs)	4.988	0.013	1.725	0.491	0.168	0.155	1482.202	0.028
	NA	MC	Motorcycles	0.784	0.003	13.517	2.313	0.029	0.025	397.804	0.053
Minnesota	Gasoline	LDGV	Light-Duty Vehicles (Passanger Cars)	0.241	0.002	3.718	0.337	0.011	0.010	321.052	0.023
	Gasoline	LDGT	Light-Duty Trucks (0-8,500 lbs)	0.411	0.003	4.963	0.407	0.014	0.012	412.976	0.024
	Gasoline	HDGV	Heavy Duty Vehicles (8,501+ lbs)	1.045	0.005	15.437	0.720	0.029	0.026	749.591	0.045
	Diesel	LDDV	Light-Duty Vehicles (Passanger Cars)	0.133	0.003	2.368	0.137	0.004	0.004	308.435	0.008
	Diesel	LDDT	Light-Duty Trucks (0-8,500 lbs)	0.378	0.004	4.035	0.275	0.007	0.006	437.771	0.008
	Diesel	HDDV	Heavy Duty Vehicles (8,501+ lbs)	4.596	0.012	1.558	0.428	0.161	0.148	1445.652	0.027
	NA	MC	Motorcycles	0.801	0.003	13.817	2.269	0.029	0.026	398.201	0.054
Mississippi	Gasoline	LDGV	Light-Duty Vehicles (Passanger Cars)	3.371	0.002	0.222	0.296	0.006	0.006	320.052	0.022
	Gasoline	LDGT	Light-Duty Trucks (0-8,500 lbs)	4.755	0.003	0.386	0.370	0.008	0.007	411.943	0.024
	Gasoline	HDGV	Heavy Duty Vehicles (8,501+ lbs)	14.740	0.005	0.964	0.723	0.017	0.015	755.160	0.044
	Diesel	LDDV	Light-Duty Vehicles (Passanger Cars)	2.590	0.003	0.132	0.101	0.004	0.004	311.761	0.008
	Diesel	LDDT	Light-Duty Trucks (0-8,500 lbs)	4.381	0.004	0.370	0.232	0.007	0.006	442.188	0.008
	Diesel	HDDV	Heavy Duty Vehicles (8,501+ lbs)	1.645	0.013	4.499	0.448	0.162	0.149	1484.364	0.028
	NA	MC	Motorcycles	13.123	0.003	0.704	2.663	0.026	0.023	392.944	0.054

Table 5-25. On-Road Vehicle Emission Factors – 2020 (cont.)

State	Fuel Type	Vehicle Type		Emission Factors (g/mi)							
				Criteria Pollutants and Ozone Precursors							
				NO_x	SO_2	CO	VOC	PM_{10}	$PM_{2.5}$	CO_2	NH_3
Missouri	Gasoline	LDGV	Light-Duty Vehicles (Passanger Cars)	0.226	0.002	3.467	0.293	0.007	0.007	313.902	0.023
	Gasoline	LDGT	Light-Duty Trucks (0-8,500 lbs)	0.397	0.003	4.792	0.365	0.010	0.009	406.354	0.024
	Gasoline	HDGV	Heavy Duty Vehicles (8,501+ lbs)	1.012	0.005	15.206	0.676	0.023	0.020	750.647	0.044
	Diesel	LDDV	Light-Duty Vehicles (Passanger Cars)	0.136	0.003	2.562	0.117	0.004	0.004	304.046	0.008
	Diesel	LDDT	Light-Duty Trucks (0-8,500 lbs)	0.387	0.004	4.364	0.254	0.007	0.006	433.198	0.008
	Diesel	HDDV	Heavy Duty Vehicles (8,501+ lbs)	4.899	0.012	1.707	0.486	0.161	0.148	1475.813	0.028
	NA	MC	Motorcycles	0.768	0.003	13.011	2.351	0.027	0.024	397.348	0.055
Montana	Gasoline	LDGV	Light-Duty Vehicles (Passanger Cars)	0.257	0.002	3.757	0.343	0.010	0.009	313.427	0.022
	Gasoline	LDGT	Light-Duty Trucks (0-8,500 lbs)	0.433	0.003	4.961	0.400	0.012	0.011	403.476	0.024
	Gasoline	HDGV	Heavy Duty Vehicles (8,501+ lbs)	1.063	0.005	14.909	0.656	0.026	0.023	736.593	0.044
	Diesel	LDDV	Light-Duty Vehicles (Passanger Cars)	0.139	0.003	2.351	0.141	0.004	0.004	301.076	0.008
	Diesel	LDDT	Light-Duty Trucks (0-8,500 lbs)	0.389	0.004	3.967	0.270	0.007	0.006	427.870	0.008
	Diesel	HDDV	Heavy Duty Vehicles (8,501+ lbs)	5.915	0.013	1.983	0.613	0.168	0.154	1486.384	0.030
	NA	MC	Motorcycles	0.871	0.003	13.720	2.263	0.028	0.024	398.021	0.055
Nebraska	Gasoline	LDGV	Light-Duty Vehicles (Passanger Cars)	0.246	0.002	3.742	0.329	0.009	0.008	318.342	0.023
	Gasoline	LDGT	Light-Duty Trucks (0-8,500 lbs)	0.423	0.003	5.056	0.398	0.011	0.010	410.297	0.024
	Gasoline	HDGV	Heavy Duty Vehicles (8,501+ lbs)	1.039	0.005	15.221	0.682	0.026	0.023	753.737	0.044
	Diesel	LDDV	Light-Duty Vehicles (Passanger Cars)	0.136	0.003	2.477	0.128	0.004	0.004	307.080	0.008
	Diesel	LDDT	Light-Duty Trucks (0-8,500 lbs)	0.386	0.004	4.215	0.264	0.007	0.006	436.223	0.008
	Diesel	HDDV	Heavy Duty Vehicles (8,501+ lbs)	5.662	0.013	1.971	0.601	0.169	0.156	1507.066	0.030
	NA	MC	Motorcycles	0.800	0.003	13.479	2.389	0.027	0.024	397.826	0.055
Nevada	Gasoline	LDGV	Light-Duty Vehicles (Passanger Cars)	0.216	0.002	3.155	0.284	0.007	0.006	332.444	0.023
	Gasoline	LDGT	Light-Duty Trucks (0-8,500 lbs)	0.386	0.003	4.401	0.353	0.009	0.008	428.167	0.024
	Gasoline	HDGV	Heavy Duty Vehicles (8,501+ lbs)	1.123	0.005	16.434	0.777	0.020	0.018	788.040	0.045
	Diesel	LDDV	Light-Duty Vehicles (Passanger Cars)	0.137	0.003	2.594	0.104	0.004	0.004	323.342	0.008
	Diesel	LDDT	Light-Duty Trucks (0-8,500 lbs)	0.396	0.004	4.470	0.248	0.007	0.006	458.665	0.008
	Diesel	HDDV	Heavy Duty Vehicles (8,501+ lbs)	5.163	0.013	1.749	0.482	0.174	0.160	1526.724	0.028
	NA	MC	Motorcycles	0.823	0.003	13.236	3.049	0.026	0.023	394.576	0.052
New Hampshire	Gasoline	LDGV	Light-Duty Vehicles (Passanger Cars)	0.208	0.002	3.083	0.291	0.009	0.008	318.576	0.023
	Gasoline	LDGT	Light-Duty Trucks (0-8,500 lbs)	0.360	0.003	4.110	0.346	0.012	0.010	409.911	0.024
	Gasoline	HDGV	Heavy Duty Vehicles (8,501+ lbs)	1.046	0.005	15.125	0.672	0.025	0.022	744.983	0.045
	Diesel	LDDV	Light-Duty Vehicles (Passanger Cars)	0.133	0.003	2.352	0.132	0.004	0.004	306.763	0.008
	Diesel	LDDT	Light-Duty Trucks (0-8,500 lbs)	0.377	0.004	3.999	0.267	0.007	0.006	435.473	0.008
	Diesel	HDDV	Heavy Duty Vehicles (8,501+ lbs)	4.722	0.012	1.602	0.444	0.162	0.149	1447.092	0.028
	NA	MC	Motorcycles	0.807	0.003	13.084	2.141	0.027	0.024	397.261	0.054
New Jersey	Gasoline	LDGV	Light-Duty Vehicles (Passanger Cars)	0.209	0.002	3.069	0.265	0.008	0.007	313.199	0.023
	Gasoline	LDGT	Light-Duty Trucks (0-8,500 lbs)	0.352	0.003	4.099	0.309	0.010	0.009	405.175	0.024
	Gasoline	HDGV	Heavy Duty Vehicles (8,501+ lbs)	1.015	0.005	14.452	0.629	0.024	0.021	752.072	0.044
	Diesel	LDDV	Light-Duty Vehicles (Passanger Cars)	0.137	0.003	2.510	0.119	0.004	0.004	303.079	0.008
	Diesel	LDDT	Light-Duty Trucks (0-8,500 lbs)	0.390	0.004	4.279	0.254	0.007	0.006	431.584	0.008
	Diesel	HDDV	Heavy Duty Vehicles (8,501+ lbs)	6.097	0.013	2.135	0.670	0.172	0.158	1527.482	0.031
	NA	MC	Motorcycles	0.791	0.003	12.737	2.141	0.027	0.024	397.952	0.055
New Mexico	Gasoline	LDGV	Light-Duty Vehicles (Passanger Cars)	0.239	0.002	3.425	0.310	0.007	0.006	318.380	0.023
	Gasoline	LDGT	Light-Duty Trucks (0-8,500 lbs)	0.417	0.003	4.703	0.375	0.009	0.008	410.282	0.024
	Gasoline	HDGV	Heavy Duty Vehicles (8,501+ lbs)	1.073	0.005	15.205	0.696	0.021	0.019	754.279	0.044
	Diesel	LDDV	Light-Duty Vehicles (Passanger Cars)	0.139	0.003	2.490	0.114	0.004	0.004	308.586	0.008
	Diesel	LDDT	Light-Duty Trucks (0-8,500 lbs)	0.394	0.004	4.234	0.250	0.007	0.006	438.126	0.008
	Diesel	HDDV	Heavy Duty Vehicles (8,501+ lbs)	5.669	0.013	1.917	0.571	0.169	0.155	1505.099	0.030
	NA	MC	Motorcycles	0.841	0.003	13.284	2.765	0.026	0.023	395.751	0.054
New York	Gasoline	LDGV	Light-Duty Vehicles (Passanger Cars)	0.193	0.002	2.955	0.265	0.008	0.007	324.339	0.023
	Gasoline	LDGT	Light-Duty Trucks (0-8,500 lbs)	0.332	0.003	3.906	0.310	0.011	0.010	418.180	0.024
	Gasoline	HDGV	Heavy Duty Vehicles (8,501+ lbs)	1.055	0.005	15.601	0.712	0.025	0.022	764.138	0.045
	Diesel	LDDV	Light-Duty Vehicles (Passanger Cars)	0.131	0.003	2.417	0.122	0.004	0.004	313.294	0.008
	Diesel	LDDT	Light-Duty Trucks (0-8,500 lbs)	0.377	0.004	4.159	0.266	0.007	0.006	445.114	0.008
	Diesel	HDDV	Heavy Duty Vehicles (8,501+ lbs)	4.412	0.012	1.518	0.398	0.164	0.151	1459.242	0.027
	NA	MC	Motorcycles	0.773	0.003	13.114	2.289	0.028	0.024	397.237	0.053

Table 5-25. On-Road Vehicle Emission Factors – 2020 (cont.)

State	Fuel Type	Vehicle Type		Emission Factors (g/mi)							
				Criteria Pollutants and Ozone Precursors							
				NO_x	SO_2	CO	VOC	PM_{10}	$PM_{2.5}$	CO_2	NH_3
North Carolina	Gasoline	LDGV	Light-Duty Vehicles (Passanger Cars)	0.221	0.002	3.291	0.289	0.007	0.006	322.708	0.023
	Gasoline	LDGT	Light-Duty Trucks (0-8,500 lbs)	0.390	0.003	4.649	0.371	0.009	0.008	415.581	0.024
	Gasoline	HDGV	Heavy Duty Vehicles (8,501+ lbs)	1.006	0.005	15.054	0.731	0.019	0.017	761.115	0.045
	Diesel	LDDV	Light-Duty Vehicles (Passanger Cars)	0.131	0.003	2.520	0.106	0.004	0.004	313.549	0.008
	Diesel	LDDT	Light-Duty Trucks (0-8,500 lbs)	0.373	0.004	4.297	0.244	0.007	0.006	444.897	0.008
	Diesel	HDDV	Heavy Duty Vehicles (8,501+ lbs)	4.332	0.012	1.538	0.402	0.163	0.150	1469.156	0.027
	NA	MC	Motorcycles	0.728	0.003	13.174	2.597	0.027	0.024	394.406	0.054
North Dakota	Gasoline	LDGV	Light-Duty Vehicles (Passanger Cars)	0.251	0.002	3.929	0.373	0.012	0.011	314.937	0.022
	Gasoline	LDGT	Light-Duty Trucks (0-8,500 lbs)	0.422	0.003	5.109	0.429	0.015	0.013	404.828	0.024
	Gasoline	HDGV	Heavy Duty Vehicles (8,501+ lbs)	1.033	0.005	14.714	0.683	0.031	0.028	734.985	0.044
	Diesel	LDDV	Light-Duty Vehicles (Passanger Cars)	0.137	0.003	2.335	0.149	0.004	0.004	301.338	0.008
	Diesel	LDDT	Light-Duty Trucks (0-8,500 lbs)	0.383	0.004	3.935	0.277	0.007	0.006	428.048	0.008
	Diesel	HDDV	Heavy Duty Vehicles (8,501+ lbs)	5.533	0.012	1.873	0.570	0.165	0.151	1469.573	0.029
	NA	MC	Motorcycles	0.836	0.003	13.922	2.158	0.029	0.026	398.790	0.055
Ohio	Gasoline	LDGV	Light-Duty Vehicles (Passanger Cars)	0.216	0.002	3.330	0.290	0.008	0.007	326.479	0.023
	Gasoline	LDGT	Light-Duty Trucks (0-8,500 lbs)	0.376	0.003	4.558	0.361	0.011	0.009	419.987	0.024
	Gasoline	HDGV	Heavy Duty Vehicles (8,501+ lbs)	1.042	0.005	15.794	0.731	0.023	0.021	765.850	0.045
	Diesel	LDDV	Light-Duty Vehicles (Passanger Cars)	0.130	0.003	2.419	0.121	0.004	0.004	315.487	0.008
	Diesel	LDDT	Light-Duty Trucks (0-8,500 lbs)	0.373	0.004	4.149	0.263	0.007	0.006	447.468	0.008
	Diesel	HDDV	Heavy Duty Vehicles (8,501+ lbs)	4.574	0.012	1.600	0.432	0.167	0.154	1473.301	0.027
	NA	MC	Motorcycles	0.762	0.003	13.469	2.433	0.028	0.025	396.342	0.053
Oklahoma	Gasoline	LDGV	Light-Duty Vehicles (Passanger Cars)	0.232	0.002	3.576	0.302	0.007	0.006	323.803	0.023
	Gasoline	LDGT	Light-Duty Trucks (0-8,500 lbs)	0.406	0.003	4.991	0.380	0.009	0.008	416.885	0.024
	Gasoline	HDGV	Heavy Duty Vehicles (8,501+ lbs)	1.021	0.005	15.751	0.726	0.019	0.017	765.797	0.045
	Diesel	LDDV	Light-Duty Vehicles (Passanger Cars)	0.133	0.003	2.586	0.108	0.004	0.004	314.620	0.008
	Diesel	LDDT	Light-Duty Trucks (0-8,500 lbs)	0.378	0.004	4.406	0.245	0.007	0.006	446.240	0.008
	Diesel	HDDV	Heavy Duty Vehicles (8,501+ lbs)	4.802	0.013	1.719	0.480	0.166	0.153	1499.452	0.028
	NA	MC	Motorcycles	0.743	0.003	13.229	2.672	0.026	0.023	394.630	0.054
Oregon	Gasoline	LDGV	Light-Duty Vehicles (Passanger Cars)	0.227	0.002	3.199	0.283	0.008	0.007	316.032	0.023
	Gasoline	LDGT	Light-Duty Trucks (0-8,500 lbs)	0.387	0.003	4.368	0.346	0.010	0.009	407.079	0.024
	Gasoline	HDGV	Heavy Duty Vehicles (8,501+ lbs)	1.055	0.005	15.287	0.682	0.021	0.019	743.300	0.044
	Diesel	LDDV	Light-Duty Vehicles (Passanger Cars)	0.134	0.003	2.350	0.121	0.004	0.004	305.576	0.008
	Diesel	LDDT	Light-Duty Trucks (0-8,500 lbs)	0.379	0.004	3.996	0.256	0.007	0.006	433.982	0.008
	Diesel	HDDV	Heavy Duty Vehicles (8,501+ lbs)	5.034	0.012	1.710	0.486	0.164	0.151	1460.193	0.028
	NA	MC	Motorcycles	0.830	0.003	13.439	2.308	0.027	0.024	396.125	0.054
Pacific Islands	Gasoline	LDGV	Light-Duty Vehicles (Passanger Cars)	0.214	0.002	3.209	0.276	0.007	0.006	322.472	0.023
	Gasoline	LDGT	Light-Duty Trucks (0-8,500 lbs)	0.376	0.003	4.466	0.348	0.009	0.008	415.846	0.024
	Gasoline	HDGV	Heavy Duty Vehicles (8,501+ lbs)	1.026	0.005	15.499	0.713	0.021	0.019	763.978	0.045
	Diesel	LDDV	Light-Duty Vehicles (Passanger Cars)	0.132	0.003	2.497	0.110	0.004	0.004	312.864	0.008
	Diesel	LDDT	Light-Duty Trucks (0-8,500 lbs)	0.379	0.004	4.280	0.251	0.007	0.006	444.356	0.008
	Diesel	HDDV	Heavy Duty Vehicles (8,501+ lbs)	4.788	0.013	1.681	0.464	0.166	0.153	1485.391	0.028
	NA	MC	Motorcycles	0.756	0.003	13.014	2.488	0.027	0.024	395.769	0.054
Pennsylvania	Gasoline	LDGV	Light-Duty Vehicles (Passanger Cars)	0.209	0.002	3.120	0.276	0.008	0.007	324.256	0.023
	Gasoline	LDGT	Light-Duty Trucks (0-8,500 lbs)	0.367	0.003	4.294	0.344	0.011	0.009	417.667	0.024
	Gasoline	HDGV	Heavy Duty Vehicles (8,501+ lbs)	1.040	0.005	15.302	0.709	0.024	0.021	764.676	0.045
	Diesel	LDDV	Light-Duty Vehicles (Passanger Cars)	0.132	0.003	2.440	0.122	0.004	0.004	313.378	0.008
	Diesel	LDDT	Light-Duty Trucks (0-8,500 lbs)	0.378	0.004	4.188	0.263	0.007	0.006	444.829	0.008
	Diesel	HDDV	Heavy Duty Vehicles (8,501+ lbs)	5.017	0.013	1.753	0.499	0.169	0.156	1490.143	0.028
	NA	MC	Motorcycles	0.767	0.003	13.237	2.356	0.028	0.025	397.006	0.053
Puerto Rico	Gasoline	LDGV	Light-Duty Vehicles (Passanger Cars)	0.203	0.002	3.889	0.287	0.005	0.005	343.046	0.023
	Gasoline	LDGT	Light-Duty Trucks (0-8,500 lbs)	0.369	0.003	5.666	0.394	0.007	0.006	442.771	0.024
	Gasoline	HDGV	Heavy Duty Vehicles (8,501+ lbs)	0.943	0.005	17.633	0.857	0.016	0.014	824.346	0.046
	Diesel	LDDV	Light-Duty Vehicles (Passanger Cars)	0.127	0.003	3.053	0.076	0.004	0.004	336.396	0.008
	Diesel	LDDT	Light-Duty Trucks (0-8,500 lbs)	0.366	0.004	5.262	0.222	0.007	0.006	477.629	0.008
	Diesel	HDDV	Heavy Duty Vehicles (8,501+ lbs)	3.522	0.013	1.448	0.329	0.168	0.155	1557.490	0.026
	NA	MC	Motorcycles	0.603	0.003	13.044	3.156	0.026	0.023	392.087	0.052

Table 5-25. On-Road Vehicle Emission Factors – 2020 (cont.)

State	Fuel Type	Vehicle Type		Emission Factors (g/mi)							
				Criteria Pollutants and Ozone Precursors							
				NO_x	SO_2	CO	VOC	PM_{10}	$PM_{2.5}$	CO_2	NH_3
Rhode Island	Gasoline	LDGV	Light-Duty Vehicles (Passanger Cars)	0.197	0.002	3.057	0.266	0.008	0.007	326.212	0.023
	Gasoline	LDGT	Light-Duty Trucks (0-8,500 lbs)	0.347	0.003	4.140	0.320	0.011	0.010	421.576	0.024
	Gasoline	HDGV	Heavy Duty Vehicles (8,501+ lbs)	1.067	0.005	16.087	0.712	0.025	0.023	773.985	0.045
	Diesel	LDDV	Light-Duty Vehicles (Passanger Cars)	0.131	0.003	2.446	0.121	0.004	0.004	315.248	0.008
	Diesel	LDDT	Light-Duty Trucks (0-8,500 lbs)	0.380	0.004	4.241	0.268	0.007	0.007	448.591	0.008
	Diesel	HDDV	Heavy Duty Vehicles (8,501+ lbs)	4.553	0.013	1.575	0.420	0.168	0.154	1476.363	0.027
	NA	MC	Motorcycles	0.768	0.003	12.856	2.298	0.028	0.024	398.090	0.053
South Carolina	Gasoline	LDGV	Light-Duty Vehicles (Passanger Cars)	0.224	0.002	3.420	0.293	0.007	0.006	323.003	0.023
	Gasoline	LDGT	Light-Duty Trucks (0-8,500 lbs)	0.396	0.003	4.866	0.377	0.008	0.007	416.252	0.024
	Gasoline	HDGV	Heavy Duty Vehicles (8,501+ lbs)	0.986	0.005	14.852	0.729	0.019	0.017	768.355	0.044
	Diesel	LDDV	Light-Duty Vehicles (Passanger Cars)	0.133	0.003	2.618	0.102	0.004	0.004	314.381	0.008
	Diesel	LDDT	Light-Duty Trucks (0-8,500 lbs)	0.378	0.004	4.466	0.240	0.007	0.006	446.079	0.008
	Diesel	HDDV	Heavy Duty Vehicles (8,501+ lbs)	5.142	0.013	1.878	0.546	0.170	0.156	1522.836	0.029
	NA	MC	Motorcycles	0.712	0.003	13.144	2.686	0.027	0.024	394.593	0.054
South Dakota	Gasoline	LDGV	Light-Duty Vehicles (Passanger Cars)	0.248	0.002	3.759	0.342	0.010	0.009	313.383	0.022
	Gasoline	LDGT	Light-Duty Trucks (0-8,500 lbs)	0.423	0.003	5.061	0.407	0.013	0.011	404.195	0.024
	Gasoline	HDGV	Heavy Duty Vehicles (8,501+ lbs)	1.025	0.005	14.542	0.672	0.029	0.025	741.779	0.044
	Diesel	LDDV	Light-Duty Vehicles (Passanger Cars)	0.138	0.003	2.426	0.138	0.004	0.004	301.218	0.008
	Diesel	LDDT	Light-Duty Trucks (0-8,500 lbs)	0.389	0.004	4.103	0.270	0.007	0.006	428.542	0.008
	Diesel	HDDV	Heavy Duty Vehicles (8,501+ lbs)	5.906	0.013	2.025	0.630	0.168	0.155	1498.981	0.030
	NA	MC	Motorcycles	0.821	0.003	13.720	2.283	0.029	0.025	398.760	0.055
Tennessee	Gasoline	LDGV	Light-Duty Vehicles (Passanger Cars)	0.217	0.002	3.294	0.283	0.007	0.006	323.453	0.023
	Gasoline	LDGT	Light-Duty Trucks (0-8,500 lbs)	0.382	0.003	4.630	0.361	0.009	0.008	416.963	0.024
	Gasoline	HDGV	Heavy Duty Vehicles (8,501+ lbs)	1.009	0.005	15.245	0.726	0.021	0.019	767.647	0.045
	Diesel	LDDV	Light-Duty Vehicles (Passanger Cars)	0.133	0.003	2.559	0.109	0.004	0.004	314.046	0.008
	Diesel	LDDT	Light-Duty Trucks (0-8,500 lbs)	0.378	0.004	4.379	0.249	0.007	0.006	445.826	0.008
	Diesel	HDDV	Heavy Duty Vehicles (8,501+ lbs)	4.987	0.013	1.786	0.509	0.168	0.155	1505.673	0.029
	NA	MC	Motorcycles	0.733	0.003	13.245	2.614	0.027	0.024	395.583	0.054
Texas	Gasoline	LDGV	Light-Duty Vehicles (Passanger Cars)	0.199	0.002	3.209	0.265	0.006	0.005	325.158	0.023
	Gasoline	LDGT	Light-Duty Trucks (0-8,500 lbs)	0.356	0.003	4.561	0.339	0.008	0.007	420.023	0.024
	Gasoline	HDGV	Heavy Duty Vehicles (8,501+ lbs)	0.982	0.005	15.468	0.736	0.018	0.016	778.735	0.045
	Diesel	LDDV	Light-Duty Vehicles (Passanger Cars)	0.134	0.003	2.765	0.095	0.004	0.004	317.317	0.008
	Diesel	LDDT	Light-Duty Trucks (0-8,500 lbs)	0.382	0.004	4.734	0.235	0.007	0.006	450.890	0.008
	Diesel	HDDV	Heavy Duty Vehicles (8,501+ lbs)	4.473	0.013	1.638	0.439	0.164	0.151	1511.000	0.028
	NA	MC	Motorcycles	0.693	0.003	12.562	2.745	0.026	0.023	394.358	0.054
Utah	Gasoline	LDGV	Light-Duty Vehicles (Passanger Cars)	0.223	0.002	3.377	0.296	0.009	0.008	327.627	0.023
	Gasoline	LDGT	Light-Duty Trucks (0-8,500 lbs)	0.394	0.003	4.663	0.368	0.011	0.010	422.814	0.024
	Gasoline	HDGV	Heavy Duty Vehicles (8,501+ lbs)	1.116	0.005	16.421	0.746	0.026	0.023	775.708	0.045
	Diesel	LDDV	Light-Duty Vehicles (Passanger Cars)	0.135	0.003	2.481	0.122	0.004	0.004	316.579	0.008
	Diesel	LDDT	Light-Duty Trucks (0-8,500 lbs)	0.392	0.004	4.286	0.268	0.007	0.006	449.962	0.008
	Diesel	HDDV	Heavy Duty Vehicles (8,501+ lbs)	4.925	0.013	1.651	0.454	0.169	0.155	1489.652	0.028
	NA	MC	Motorcycles	0.834	0.003	13.589	2.682	0.028	0.025	397.728	0.053
Vermont	Gasoline	LDGV	Light-Duty Vehicles (Passanger Cars)	0.216	0.002	3.167	0.314	0.010	0.009	312.221	0.022
	Gasoline	LDGT	Light-Duty Trucks (0-8,500 lbs)	0.367	0.003	4.160	0.361	0.013	0.011	402.077	0.024
	Gasoline	HDGV	Heavy Duty Vehicles (8,501+ lbs)	1.022	0.005	14.077	0.658	0.027	0.024	732.670	0.044
	Diesel	LDDV	Light-Duty Vehicles (Passanger Cars)	0.136	0.003	2.335	0.141	0.004	0.004	299.795	0.008
	Diesel	LDDT	Light-Duty Trucks (0-8,500 lbs)	0.382	0.004	3.936	0.269	0.007	0.006	426.289	0.008
	Diesel	HDDV	Heavy Duty Vehicles (8,501+ lbs)	5.529	0.012	1.882	0.570	0.165	0.151	1469.289	0.029
	NA	MC	Motorcycles	0.822	0.003	13.542	2.130	0.028	0.025	398.001	0.055
Virgin Islands	Gasoline	LDGV	Light-Duty Vehicles (Passanger Cars)	0.206	0.002	3.673	0.301	0.005	0.004	325.555	0.022
	Gasoline	LDGT	Light-Duty Trucks (0-8,500 lbs)	0.353	0.003	5.195	0.365	0.006	0.005	418.710	0.024
	Gasoline	HDGV	Heavy Duty Vehicles (8,501+ lbs)	0.869	0.005	16.101	0.768	0.010	0.009	764.047	0.045
	Diesel	LDDV	Light-Duty Vehicles (Passanger Cars)	0.129	0.003	2.873	0.078	0.004	0.004	319.813	0.007
	Diesel	LDDT	Light-Duty Trucks (0-8,500 lbs)	0.355	0.004	4.837	0.203	0.006	0.006	453.267	0.008
	Diesel	HDDV	Heavy Duty Vehicles (8,501+ lbs)	3.008	0.012	1.213	0.252	0.148	0.136	1470.336	0.025
	NA	MC	Motorcycles	0.623	0.003	13.018	2.637	0.023	0.021	388.214	0.054

Table 5-25. On-Road Vehicle Emission Factors – 2020 (cont.)

State	Fuel Type	Vehicle Type		Emission Factors (g/mi)							
				Criteria Pollutants and Ozone Precursors							
				NO_x	SO_2	CO	VOC	PM_{10}	$PM_{2.5}$	CO_2	NH_3
Virginia	Gasoline	LDGV	Light-Duty Vehicles (Passanger Cars)	0.219	0.002	3.284	0.282	0.007	0.006	322.634	0.023
	Gasoline	LDGT	Light-Duty Trucks (0-8,500 lbs)	0.387	0.003	4.597	0.358	0.009	0.008	416.215	0.024
	Gasoline	HDGV	Heavy Duty Vehicles (8,501+ lbs)	1.019	0.005	15.130	0.705	0.022	0.019	765.871	0.045
	Diesel	LDDV	Light-Duty Vehicles (Passanger Cars)	0.132	0.003	2.522	0.112	0.004	0.004	312.895	0.008
	Diesel	LDDT	Light-Duty Trucks (0-8,500 lbs)	0.379	0.004	4.325	0.253	0.007	0.006	444.495	0.008
	Diesel	HDDV	Heavy Duty Vehicles (8,501+ lbs)	4.921	0.013	1.742	0.492	0.168	0.154	1495.166	0.028
	NA	MC	Motorcycles	0.742	0.003	12.914	2.432	0.027	0.024	396.223	0.054
Washington	Gasoline	LDGV	Light-Duty Vehicles (Passanger Cars)	0.219	0.002	3.276	0.278	0.008	0.007	319.597	0.023
	Gasoline	LDGT	Light-Duty Trucks (0-8,500 lbs)	0.381	0.003	4.543	0.351	0.010	0.009	412.972	0.024
	Gasoline	HDGV	Heavy Duty Vehicles (8,501+ lbs)	1.072	0.005	15.769	0.705	0.025	0.022	759.076	0.045
	Diesel	LDDV	Light-Duty Vehicles (Passanger Cars)	0.133	0.003	2.394	0.122	0.004	0.004	308.914	0.008
	Diesel	LDDT	Light-Duty Trucks (0-8,500 lbs)	0.384	0.004	4.128	0.265	0.007	0.007	439.522	0.008
	Diesel	HDDV	Heavy Duty Vehicles (8,501+ lbs)	5.110	0.013	1.743	0.497	0.168	0.154	1477.901	0.028
	NA	MC	Motorcycles	0.816	0.003	13.530	2.351	0.028	0.025	398.083	0.054
West Virginia	Gasoline	LDGV	Light-Duty Vehicles (Passanger Cars)	0.236	0.002	3.469	0.305	0.008	0.007	313.953	0.022
	Gasoline	LDGT	Light-Duty Trucks (0-8,500 lbs)	0.408	0.003	4.792	0.378	0.010	0.009	405.175	0.024
	Gasoline	HDGV	Heavy Duty Vehicles (8,501+ lbs)	1.007	0.005	14.641	0.678	0.023	0.020	744.040	0.044
	Diesel	LDDV	Light-Duty Vehicles (Passanger Cars)	0.135	0.003	2.445	0.121	0.004	0.004	303.595	0.008
	Diesel	LDDT	Light-Duty Trucks (0-8,500 lbs)	0.381	0.004	4.147	0.255	0.007	0.006	431.782	0.008
	Diesel	HDDV	Heavy Duty Vehicles (8,501+ lbs)	5.243	0.013	1.829	0.539	0.165	0.152	1480.330	0.029
	NA	MC	Motorcycles	0.778	0.003	13.381	2.376	0.028	0.024	396.682	0.055
Wisconsin	Gasoline	LDGV	Light-Duty Vehicles (Passanger Cars)	0.232	0.002	3.546	0.321	0.010	0.009	318.780	0.023
	Gasoline	LDGT	Light-Duty Trucks (0-8,500 lbs)	0.399	0.003	4.767	0.390	0.012	0.011	410.261	0.024
	Gasoline	HDGV	Heavy Duty Vehicles (8,501+ lbs)	1.030	0.005	15.100	0.688	0.027	0.024	747.123	0.044
	Diesel	LDDV	Light-Duty Vehicles (Passanger Cars)	0.134	0.003	2.376	0.135	0.004	0.004	306.620	0.008
	Diesel	LDDT	Light-Duty Trucks (0-8,500 lbs)	0.379	0.004	4.041	0.271	0.007	0.006	435.335	0.008
	Diesel	HDDV	Heavy Duty Vehicles (8,501+ lbs)	5.040	0.012	1.724	0.498	0.164	0.151	1464.590	0.028
	NA	MC	Motorcycles	0.797	0.003	13.409	2.205	0.028	0.025	397.987	0.054
Wyoming	Gasoline	LDGV	Light-Duty Vehicles (Passanger Cars)	0.259	0.002	3.855	0.350	0.010	0.009	314.894	0.023
	Gasoline	LDGT	Light-Duty Trucks (0-8,500 lbs)	0.441	0.003	5.127	0.411	0.013	0.011	405.944	0.024
	Gasoline	HDGV	Heavy Duty Vehicles (8,501+ lbs)	1.072	0.005	14.966	0.662	0.029	0.026	745.693	0.044
	Diesel	LDDV	Light-Duty Vehicles (Passanger Cars)	0.140	0.003	2.411	0.141	0.004	0.004	302.468	0.008
	Diesel	LDDT	Light-Duty Trucks (0-8,500 lbs)	0.397	0.004	4.089	0.274	0.007	0.006	430.027	0.008
	Diesel	HDDV	Heavy Duty Vehicles (8,501+ lbs)	6.367	0.013	2.139	0.678	0.172	0.158	1514.501	0.031
	NA	MC	Motorcycles	0.875	0.003	13.761	2.371	0.028	0.025	399.344	0.055

Table 5-26 EMFAC County-Specific On-Road Vehicle Composite EFs – 2016 POV

County	Vehicle Type	Emission Factors (g/mi)							
		Criteria Pollutants and Ozone Precursors							
		NO_x	SO_2	CO	ROG	PM_{10}	$PM_{2.5}$	CO_2	NH_3[1]
ALAMEDA	All Vehicles	0.229	0.004	2.683	0.362	0.046	0.020	358.128	0.030
ALPINE	All Vehicles	0.326	0.003	3.444	0.426	0.046	0.020	334.827	0.030
AMADOR	All Vehicles	0.360	0.003	3.567	0.504	0.047	0.020	322.329	0.030
BUTTE	All Vehicles	0.346	0.004	3.530	0.498	0.047	0.020	364.402	0.030
CALAVERAS	All Vehicles	0.374	0.004	3.846	0.555	0.047	0.021	356.195	0.030
COLUSA	All Vehicles	0.269	0.004	2.826	0.397	0.046	0.020	352.128	0.030
CONTRA COSTA	All Vehicles	0.220	0.004	2.627	0.357	0.046	0.020	355.362	0.030
DEL NORTE	All Vehicles	0.454	0.004	4.185	0.570	0.048	0.022	375.692	0.030
EL DORADO	All Vehicles	0.243	0.004	2.987	0.439	0.046	0.020	361.046	0.030
FRESNO	All Vehicles	0.231	0.004	2.720	0.391	0.046	0.019	351.464	0.030
GLENN	All Vehicles	0.292	0.004	3.098	0.442	0.047	0.020	365.596	0.030
HUMBOLDT	All Vehicles	0.426	0.004	4.016	0.532	0.047	0.021	351.397	0.030
IMPERIAL	All Vehicles	0.405	0.004	3.919	0.506	0.046	0.019	347.364	0.030
INYO	All Vehicles	0.313	0.004	3.267	0.478	0.046	0.020	370.062	0.030
KERN	All Vehicles	0.228	0.004	2.705	0.380	0.046	0.020	379.997	0.030
KINGS	All Vehicles	0.266	0.004	2.817	0.391	0.046	0.020	351.862	0.030
LAKE	All Vehicles	0.411	0.004	4.091	0.599	0.047	0.021	361.638	0.030
LASSEN	All Vehicles	0.370	0.004	3.867	0.530	0.047	0.020	383.135	0.030
LOS ANGELES	All Vehicles	0.226	0.004	2.698	0.381	0.047	0.020	385.904	0.030
MADERA	All Vehicles	0.247	0.004	2.915	0.405	0.046	0.020	371.257	0.030
MARIN	All Vehicles	0.222	0.004	2.615	0.365	0.046	0.020	359.230	0.030
MARIPOSA	All Vehicles	0.427	0.004	4.250	0.605	0.048	0.021	371.581	0.030
MENDOCINO	All Vehicles	0.406	0.004	3.873	0.523	0.047	0.021	349.125	0.030
MERCED	All Vehicles	0.254	0.004	2.911	0.387	0.046	0.020	364.401	0.030
MODOC	All Vehicles	0.407	0.004	4.229	0.561	0.048	0.021	425.697	0.030
MONO	All Vehicles	0.342	0.004	3.626	0.460	0.047	0.020	359.408	0.030
MONTEREY	All Vehicles	0.325	0.004	3.288	0.421	0.047	0.020	382.996	0.030
NAPA	All Vehicles	0.236	0.004	2.753	0.367	0.046	0.020	343.647	0.030
NEVADA	All Vehicles	0.335	0.004	3.452	0.471	0.047	0.020	345.031	0.030
ORANGE	All Vehicles	0.191	0.004	2.340	0.342	0.046	0.020	362.248	0.030
PLACER	All Vehicles	0.220	0.003	2.676	0.366	0.046	0.019	349.344	0.030
PLUMAS	All Vehicles	0.414	0.004	4.290	0.582	0.047	0.021	402.245	0.030
RIVERSIDE	All Vehicles	0.209	0.004	2.477	0.360	0.046	0.020	350.353	0.030
SACRAMENTO	All Vehicles	0.237	0.004	2.782	0.394	0.046	0.020	360.399	0.030
SAN BENITO	All Vehicles	0.270	0.003	2.825	0.368	0.046	0.020	341.278	0.030
SAN BERNARDINO	All Vehicles	0.235	0.004	2.702	0.355	0.046	0.020	357.551	0.030
SAN DIEGO	All Vehicles	0.228	0.004	2.607	0.357	0.046	0.020	372.277	0.030
SAN FRANCISCO	All Vehicles	0.210	0.004	2.578	0.375	0.046	0.021	388.621	0.030
SAN JOAQUIN	All Vehicles	0.241	0.004	2.779	0.384	0.046	0.020	361.647	0.030
SAN LUIS OBISPO	All Vehicles	0.290	0.003	2.965	0.415	0.046	0.020	344.767	0.030
SAN MATEO	All Vehicles	0.193	0.003	2.261	0.311	0.046	0.020	342.097	0.030
SANTA BARBARA	All Vehicles	0.304	0.003	2.940	0.395	0.046	0.020	334.921	0.030
SANTA CLARA	All Vehicles	0.220	0.004	2.542	0.354	0.046	0.020	350.448	0.030
SANTA CRUZ	All Vehicles	0.356	0.004	3.541	0.482	0.047	0.021	371.036	0.030
SHASTA	All Vehicles	0.306	0.004	3.253	0.472	0.046	0.020	371.641	0.030
SIERRA	All Vehicles	0.373	0.004	3.902	0.518	0.047	0.021	409.975	0.030
SISKIYOU	All Vehicles	0.382	0.004	3.938	0.530	0.047	0.021	398.395	0.030
SOLANO	All Vehicles	0.228	0.004	2.702	0.362	0.046	0.020	370.812	0.030
SONOMA	All Vehicles	0.268	0.004	3.050	0.421	0.046	0.020	366.804	0.030
STANISLAUS	All Vehicles	0.250	0.004	2.971	0.427	0.046	0.020	369.576	0.030
SUTTER	All Vehicles	0.284	0.003	2.963	0.451	0.046	0.020	339.556	0.030
TEHAMA	All Vehicles	0.320	0.004	3.293	0.458	0.046	0.020	368.052	0.030
TRINITY	All Vehicles	0.493	0.004	4.852	0.655	0.049	0.023	439.383	0.030
TULARE	All Vehicles	0.251	0.004	2.844	0.420	0.046	0.020	351.087	0.030
TUOLUMNE	All Vehicles	0.431	0.004	4.285	0.593	0.047	0.021	373.533	0.030
VENTURA	All Vehicles	0.217	0.004	2.613	0.395	0.046	0.020	354.155	0.030
YOLO	All Vehicles	0.226	0.004	2.699	0.375	0.046	0.020	357.764	0.030
YUBA	All Vehicles	0.316	0.004	3.199	0.439	0.046	0.020	351.733	0.030

Table 5-27 EMFAC County-Specific On-Road Vehicle Composite EFs – 2017 POV

County	Vehicle Type	Emission Factors (g/mi)							
		Criteria Pollutants and Ozone Precursors							
		NO_x	SO_2	CO	ROG	PM_{10}	$PM_{2.5}$	CO_2	NH_3
ALAMEDA	All Vehicles	0.208	0.004	2.485	0.341	0.046	0.020	349.704	0.028
ALPINE	All Vehicles	0.295	0.003	3.184	0.404	0.046	0.020	326.797	0.028
AMADOR	All Vehicles	0.329	0.003	3.313	0.480	0.046	0.020	315.330	0.028
BUTTE	All Vehicles	0.310	0.004	3.239	0.465	0.047	0.020	356.249	0.028
CALAVERAS	All Vehicles	0.412	0.004	4.117	0.623	0.047	0.021	357.504	0.028
COLUSA	All Vehicles	0.241	0.003	2.598	0.372	0.046	0.020	343.336	0.028
CONTRA COSTA	All Vehicles	0.200	0.004	2.435	0.337	0.046	0.020	346.714	0.028
DEL NORTE	All Vehicles	0.412	0.004	3.875	0.542	0.048	0.021	368.258	0.028
EL DORADO	All Vehicles	0.223	0.004	2.797	0.422	0.046	0.020	352.262	0.028
FRESNO	All Vehicles	0.209	0.003	2.520	0.368	0.046	0.019	342.940	0.028
GLENN	All Vehicles	0.261	0.004	2.844	0.415	0.046	0.020	356.628	0.028
HUMBOLDT	All Vehicles	0.388	0.004	3.726	0.507	0.047	0.020	344.935	0.028
IMPERIAL	All Vehicles	0.376	0.003	3.688	0.481	0.046	0.019	338.622	0.028
INYO	All Vehicles	0.283	0.004	3.023	0.455	0.046	0.020	361.136	0.028
KERN	All Vehicles	0.206	0.004	2.504	0.358	0.046	0.020	370.185	0.028
KINGS	All Vehicles	0.238	0.003	2.592	0.367	0.046	0.019	343.176	0.028
LAKE	All Vehicles	0.372	0.004	3.779	0.568	0.047	0.020	354.325	0.028
LASSEN	All Vehicles	0.335	0.004	3.575	0.503	0.047	0.020	374.494	0.028
LOS ANGELES	All Vehicles	0.205	0.004	2.501	0.361	0.047	0.020	376.522	0.028
MADERA	All Vehicles	0.222	0.004	2.691	0.379	0.046	0.020	362.193	0.028
MARIN	All Vehicles	0.202	0.004	2.431	0.347	0.046	0.020	350.547	0.028
MARIPOSA	All Vehicles	0.389	0.004	3.935	0.573	0.048	0.021	363.410	0.028
MENDOCINO	All Vehicles	0.369	0.003	3.592	0.498	0.047	0.020	342.315	0.028
MERCED	All Vehicles	0.229	0.004	2.685	0.362	0.046	0.020	355.912	0.028
MODOC	All Vehicles	0.367	0.004	3.886	0.529	0.048	0.021	415.786	0.028
MONO	All Vehicles	0.309	0.004	3.364	0.438	0.046	0.020	350.671	0.028
MONTEREY	All Vehicles	0.294	0.004	3.023	0.395	0.047	0.020	374.527	0.028
NAPA	All Vehicles	0.214	0.003	2.546	0.345	0.046	0.020	335.536	0.028
NEVADA	All Vehicles	0.305	0.003	3.214	0.450	0.046	0.020	337.523	0.028
ORANGE	All Vehicles	0.175	0.004	2.186	0.327	0.046	0.020	352.941	0.028
PLACER	All Vehicles	0.201	0.003	2.498	0.350	0.046	0.019	340.521	0.028
PLUMAS	All Vehicles	0.376	0.004	3.966	0.553	0.047	0.021	393.311	0.028
RIVERSIDE	All Vehicles	0.189	0.003	2.305	0.343	0.046	0.019	341.359	0.028
SACRAMENTO	All Vehicles	0.216	0.004	2.584	0.374	0.046	0.020	351.965	0.028
SAN BENITO	All Vehicles	0.243	0.003	2.616	0.349	0.046	0.019	332.819	0.028
SAN BERNARDINO	All Vehicles	0.213	0.003	2.507	0.336	0.046	0.019	348.769	0.028
SAN DIEGO	All Vehicles	0.209	0.004	2.442	0.341	0.046	0.020	363.007	0.028
SAN FRANCISCO	All Vehicles	0.192	0.004	2.411	0.360	0.046	0.021	378.693	0.028
SAN JOAQUIN	All Vehicles	0.218	0.004	2.577	0.362	0.046	0.020	353.131	0.028
SAN LUIS OBISPO	All Vehicles	0.263	0.003	2.754	0.396	0.046	0.020	336.772	0.028
SAN MATEO	All Vehicles	0.176	0.003	2.106	0.294	0.046	0.020	333.003	0.028
SANTA BARBARA	All Vehicles	0.274	0.003	2.714	0.373	0.046	0.020	327.189	0.028
SANTA CLARA	All Vehicles	0.200	0.003	2.357	0.335	0.046	0.019	342.009	0.028
SANTA CRUZ	All Vehicles	0.322	0.004	3.265	0.455	0.047	0.020	363.166	0.028
SHASTA	All Vehicles	0.274	0.004	2.999	0.446	0.046	0.020	362.451	0.028
SIERRA	All Vehicles	0.338	0.004	3.609	0.492	0.047	0.021	400.540	0.028
SISKIYOU	All Vehicles	0.345	0.004	3.637	0.502	0.047	0.020	389.230	0.028
SOLANO	All Vehicles	0.207	0.004	2.509	0.343	0.046	0.020	361.706	0.028
SONOMA	All Vehicles	0.242	0.004	2.820	0.398	0.046	0.020	358.298	0.028
STANISLAUS	All Vehicles	0.226	0.004	2.749	0.402	0.046	0.020	361.000	0.028
SUTTER	All Vehicles	0.254	0.003	2.717	0.424	0.046	0.019	330.907	0.028
TEHAMA	All Vehicles	0.286	0.004	3.030	0.431	0.046	0.020	359.082	0.028
TRINITY	All Vehicles	0.448	0.004	4.490	0.621	0.049	0.022	430.371	0.028
TULARE	All Vehicles	0.226	0.003	2.620	0.393	0.046	0.020	342.724	0.028
TUOLUMNE	All Vehicles	0.393	0.004	3.972	0.562	0.047	0.021	365.594	0.028
VENTURA	All Vehicles	0.198	0.003	2.436	0.378	0.046	0.020	345.329	0.028
YOLO	All Vehicles	0.205	0.003	2.511	0.356	0.046	0.019	349.364	0.028
YUBA	All Vehicles	0.283	0.003	2.940	0.413	0.046	0.020	343.183	0.028

Table 5-28 EMFAC County Specific On-Road Vehicle Composite EFs – 2018 POV

County	Vehicle Type	Emission Factors (g/mi) Criteria Pollutants and Ozone Precursors							
		NO_x	SO_2	CO	ROG	PM_{10}	$PM_{2.5}$	CO_2	NH_3[1]
ALAMEDA	All Vehicles	0.190	0.003	2.317	0.324	0.046	0.020	341.055	0.027
ALPINE	All Vehicles	0.268	0.003	2.965	0.388	0.046	0.020	318.712	0.027
AMADOR	All Vehicles	0.302	0.003	3.093	0.461	0.046	0.020	308.066	0.027
BUTTE	All Vehicles	0.280	0.004	2.993	0.441	0.046	0.020	347.719	0.027
CALAVERAS	All Vehicles	0.312	0.003	3.327	0.510	0.047	0.020	340.309	0.027
COLUSA	All Vehicles	0.218	0.003	2.410	0.353	0.046	0.020	334.476	0.027
CONTRA COSTA	All Vehicles	0.183	0.003	2.274	0.322	0.046	0.019	337.829	0.027
DEL NORTE	All Vehicles	0.376	0.004	3.607	0.521	0.048	0.021	360.503	0.027
EL DORADO	All Vehicles	0.206	0.003	2.637	0.411	0.046	0.020	343.416	0.027
FRESNO	All Vehicles	0.190	0.003	2.355	0.351	0.046	0.019	335.287	0.027
GLENN	All Vehicles	0.236	0.004	2.632	0.395	0.046	0.020	347.516	0.027
HUMBOLDT	All Vehicles	0.355	0.003	3.477	0.489	0.047	0.020	338.158	0.027
IMPERIAL	All Vehicles	0.350	0.003	3.479	0.460	0.046	0.019	329.852	0.027
INYO	All Vehicles	0.257	0.004	2.816	0.438	0.046	0.020	352.162	0.027
KERN	All Vehicles	0.187	0.004	2.335	0.341	0.046	0.019	359.721	0.027
KINGS	All Vehicles	0.214	0.003	2.389	0.347	0.046	0.019	330.835	0.027
LAKE	All Vehicles	0.337	0.004	3.508	0.544	0.047	0.020	346.669	0.027
LASSEN	All Vehicles	0.304	0.004	3.328	0.484	0.047	0.020	365.710	0.027
LOS ANGELES	All Vehicles	0.187	0.004	2.338	0.346	0.047	0.020	367.169	0.027
MADERA	All Vehicles	0.203	0.004	2.535	0.363	0.046	0.020	359.972	0.027
MARIN	All Vehicles	0.186	0.003	2.279	0.333	0.046	0.020	341.723	0.027
MARIPOSA	All Vehicles	0.356	0.004	3.666	0.550	0.048	0.021	355.067	0.027
MENDOCINO	All Vehicles	0.337	0.003	3.351	0.479	0.047	0.020	335.274	0.027
MERCED	All Vehicles	0.208	0.004	2.500	0.343	0.046	0.020	349.520	0.027
MODOC	All Vehicles	0.332	0.004	3.598	0.504	0.047	0.021	405.722	0.027
MONO	All Vehicles	0.281	0.003	3.144	0.421	0.046	0.020	341.926	0.027
MONTEREY	All Vehicles	0.266	0.004	2.799	0.373	0.047	0.020	365.846	0.027
NAPA	All Vehicles	0.196	0.003	2.370	0.328	0.046	0.019	327.148	0.027
NEVADA	All Vehicles	0.279	0.003	3.012	0.435	0.046	0.020	329.818	0.027
ORANGE	All Vehicles	0.162	0.003	2.060	0.316	0.046	0.020	343.626	0.027
PLACER	All Vehicles	0.184	0.003	2.349	0.338	0.046	0.019	331.683	0.027
PLUMAS	All Vehicles	0.343	0.004	3.694	0.532	0.047	0.021	384.280	0.027
RIVERSIDE	All Vehicles	0.173	0.003	2.163	0.330	0.046	0.019	332.538	0.027
SACRAMENTO	All Vehicles	0.197	0.003	2.417	0.359	0.046	0.020	343.287	0.027
SAN BENITO	All Vehicles	0.221	0.003	2.441	0.334	0.046	0.019	324.298	0.027
SAN BERNARDINO	All Vehicles	0.194	0.003	2.342	0.322	0.046	0.019	339.885	0.027
SAN DIEGO	All Vehicles	0.193	0.004	2.302	0.330	0.046	0.020	353.604	0.027
SAN FRANCISCO	All Vehicles	0.177	0.004	2.274	0.349	0.046	0.021	368.766	0.027
SAN JOAQUIN	All Vehicles	0.198	0.003	2.399	0.345	0.046	0.019	343.228	0.027
SAN LUIS OBISPO	All Vehicles	0.240	0.003	2.569	0.372	0.046	0.020	328.475	0.027
SAN MATEO	All Vehicles	0.162	0.003	1.983	0.282	0.046	0.020	324.534	0.027
SANTA BARBARA	All Vehicles	0.249	0.003	2.526	0.356	0.046	0.020	319.386	0.027
SANTA CLARA	All Vehicles	0.183	0.003	2.203	0.320	0.046	0.019	333.410	0.027
SANTA CRUZ	All Vehicles	0.292	0.004	3.031	0.435	0.047	0.020	355.047	0.027
SHASTA	All Vehicles	0.247	0.004	2.787	0.428	0.046	0.020	353.091	0.027
SIERRA	All Vehicles	0.308	0.004	3.359	0.473	0.047	0.021	390.946	0.027
SISKIYOU	All Vehicles	0.313	0.004	3.381	0.481	0.047	0.020	379.874	0.027
SOLANO	All Vehicles	0.189	0.004	2.351	0.328	0.046	0.020	352.393	0.027
SONOMA	All Vehicles	0.220	0.003	2.625	0.380	0.046	0.020	349.470	0.027
STANISLAUS	All Vehicles	0.206	0.004	2.575	0.386	0.046	0.020	356.411	0.027
SUTTER	All Vehicles	0.228	0.003	2.514	0.404	0.046	0.019	322.122	0.027
TEHAMA	All Vehicles	0.258	0.004	2.810	0.411	0.046	0.020	349.921	0.027
TRINITY	All Vehicles	0.408	0.004	4.178	0.595	0.048	0.022	421.089	0.027
TULARE	All Vehicles	0.204	0.003	2.422	0.371	0.046	0.019	332.379	0.027
TUOLUMNE	All Vehicles	0.359	0.004	3.700	0.538	0.047	0.021	357.351	0.027
VENTURA	All Vehicles	0.182	0.003	2.288	0.365	0.046	0.020	336.376	0.027
YOLO	All Vehicles	0.188	0.003	2.352	0.341	0.046	0.019	340.735	0.027
YUBA	All Vehicles	0.255	0.003	2.722	0.394	0.046	0.020	334.388	0.027

Table 5-29 EMFAC County-Specific On-Road Vehicle Composite EFs – 2019 POV

County	Vehicle Type	Emission Factors (g/mi)							
		Criteria Pollutants and Ozone Precursors							
		NO_x	SO_2	CO	ROG	PM_{10}	$PM_{2.5}$	CO_2	NH_3
ALAMEDA	All Vehicles	0.175	0.003	2.172	0.310	0.046	0.020	332.181	0.025
ALPINE	All Vehicles	0.244	0.003	2.778	0.373	0.046	0.020	310.524	0.025
AMADOR	All Vehicles	0.277	0.003	2.896	0.445	0.046	0.020	300.537	0.025
BUTTE	All Vehicles	0.254	0.003	2.781	0.420	0.046	0.020	338.850	0.025
CALAVERAS	All Vehicles	0.286	0.003	3.114	0.493	0.047	0.020	332.062	0.025
COLUSA	All Vehicles	0.199	0.003	2.251	0.337	0.046	0.019	325.543	0.025
CONTRA COSTA	All Vehicles	0.169	0.003	2.136	0.308	0.046	0.019	328.751	0.025
DEL NORTE	All Vehicles	0.345	0.004	3.373	0.503	0.047	0.021	352.458	0.025
EL DORADO	All Vehicles	0.191	0.003	2.489	0.399	0.046	0.020	331.463	0.025
FRESNO	All Vehicles	0.174	0.003	2.210	0.336	0.046	0.019	326.427	0.025
GLENN	All Vehicles	0.214	0.003	2.453	0.378	0.046	0.020	338.303	0.025
HUMBOLDT	All Vehicles	0.377	0.004	3.720	0.532	0.047	0.020	349.509	0.025
IMPERIAL	All Vehicles	0.326	0.003	3.300	0.441	0.046	0.019	320.861	0.025
INYO	All Vehicles	0.235	0.003	2.638	0.423	0.046	0.020	343.099	0.025
KERN	All Vehicles	0.172	0.004	2.196	0.326	0.046	0.020	350.033	0.025
KINGS	All Vehicles	0.195	0.003	2.234	0.332	0.046	0.019	322.134	0.025
LAKE	All Vehicles	0.307	0.003	3.268	0.524	0.047	0.020	338.703	0.025
LASSEN	All Vehicles	0.278	0.004	3.117	0.467	0.047	0.020	356.782	0.025
LOS ANGELES	All Vehicles	0.172	0.004	2.196	0.332	0.047	0.020	356.518	0.025
MADERA	All Vehicles	0.186	0.004	2.370	0.346	0.046	0.020	350.357	0.025
MARIN	All Vehicles	0.172	0.003	2.150	0.320	0.046	0.020	332.762	0.025
MARIPOSA	All Vehicles	0.326	0.004	3.429	0.530	0.047	0.021	346.520	0.025
MENDOCINO	All Vehicles	0.309	0.003	3.140	0.463	0.047	0.020	327.967	0.025
MERCED	All Vehicles	0.189	0.003	2.331	0.325	0.046	0.020	340.343	0.025
MODOC	All Vehicles	0.302	0.004	3.353	0.483	0.047	0.021	395.516	0.025
MONO	All Vehicles	0.257	0.003	2.954	0.407	0.046	0.020	333.108	0.025
MONTEREY	All Vehicles	0.243	0.004	2.605	0.355	0.047	0.020	356.947	0.025
NAPA	All Vehicles	0.180	0.003	2.219	0.313	0.046	0.019	318.536	0.025
NEVADA	All Vehicles	0.256	0.003	2.838	0.423	0.046	0.020	321.898	0.025
ORANGE	All Vehicles	0.151	0.003	1.960	0.308	0.046	0.020	335.775	0.025
PLACER	All Vehicles	0.171	0.003	2.225	0.328	0.046	0.019	322.992	0.025
PLUMAS	All Vehicles	0.314	0.004	3.458	0.513	0.047	0.021	375.075	0.025
RIVERSIDE	All Vehicles	0.160	0.003	2.042	0.319	0.046	0.019	323.584	0.025
SACRAMENTO	All Vehicles	0.181	0.003	2.269	0.344	0.046	0.020	332.731	0.025
SAN BENITO	All Vehicles	0.202	0.003	2.291	0.321	0.046	0.019	315.727	0.025
SAN BERNARDINO	All Vehicles	0.178	0.003	2.192	0.308	0.046	0.019	329.505	0.025
SAN DIEGO	All Vehicles	0.180	0.003	2.182	0.319	0.046	0.020	344.064	0.025
SAN FRANCISCO	All Vehicles	0.164	0.004	2.160	0.340	0.046	0.021	358.866	0.025
SAN JOAQUIN	All Vehicles	0.181	0.003	2.251	0.330	0.046	0.019	334.305	0.025
SAN LUIS OBISPO	All Vehicles	0.222	0.003	2.427	0.370	0.046	0.020	320.450	0.025
SAN MATEO	All Vehicles	0.151	0.003	1.885	0.272	0.046	0.020	316.188	0.025
SANTA BARBARA	All Vehicles	0.228	0.003	2.365	0.341	0.046	0.020	311.466	0.025
SANTA CLARA	All Vehicles	0.169	0.003	2.073	0.308	0.046	0.019	324.649	0.025
SANTA CRUZ	All Vehicles	0.266	0.003	2.829	0.417	0.047	0.020	346.656	0.025
SHASTA	All Vehicles	0.224	0.003	2.608	0.412	0.046	0.020	343.616	0.025
SIERRA	All Vehicles	0.281	0.004	3.145	0.456	0.047	0.021	381.151	0.025
SISKIYOU	All Vehicles	0.285	0.004	3.161	0.463	0.047	0.020	370.334	0.025
SOLANO	All Vehicles	0.174	0.003	2.215	0.315	0.046	0.020	342.928	0.025
SONOMA	All Vehicles	0.201	0.003	2.456	0.363	0.046	0.020	340.382	0.025
STANISLAUS	All Vehicles	0.188	0.003	2.410	0.369	0.046	0.020	347.090	0.025
SUTTER	All Vehicles	0.207	0.003	2.344	0.386	0.046	0.019	313.097	0.025
TEHAMA	All Vehicles	0.234	0.003	2.622	0.393	0.046	0.020	340.603	0.025
TRINITY	All Vehicles	0.373	0.004	3.905	0.573	0.048	0.022	411.521	0.025
TULARE	All Vehicles	0.186	0.003	2.261	0.354	0.046	0.019	323.711	0.025
TUOLUMNE	All Vehicles	0.329	0.004	3.458	0.518	0.047	0.020	348.802	0.025
VENTURA	All Vehicles	0.168	0.003	2.166	0.355	0.046	0.020	328.350	0.025
YOLO	All Vehicles	0.173	0.003	2.211	0.328	0.046	0.019	330.564	0.025
YUBA	All Vehicles	0.231	0.003	2.524	0.375	0.046	0.020	322.431	0.025

Table 5-30 EMFAC County-Specific On-Road Vehicle Composite EFs – 2020 POV

County	Vehicle Type	Emission Factors (g/mi)							
		Criteria Pollutants and Ozone Precursors							
		NO_x	SO_2	CO	ROG	PM_{10}	$PM_{2.5}$	CO_2	NH_3[1]
ALAMEDA	All Vehicles	0.161	0.003	2.052	0.298	0.046	0.019	323.262	0.025
ALPINE	All Vehicles	0.225	0.003	2.622	0.361	0.046	0.019	302.405	0.025
AMADOR	All Vehicles	0.255	0.003	2.725	0.430	0.046	0.019	292.946	0.025
BUTTE	All Vehicles	0.232	0.003	2.604	0.403	0.046	0.020	329.933	0.025
CALAVERAS	All Vehicles	0.263	0.003	2.930	0.478	0.047	0.020	323.791	0.025
COLUSA	All Vehicles	0.182	0.003	2.122	0.323	0.046	0.019	316.734	0.025
CONTRA COSTA	All Vehicles	0.156	0.003	2.021	0.297	0.046	0.019	319.704	0.025
DEL NORTE	All Vehicles	0.316	0.004	3.173	0.488	0.047	0.021	344.329	0.025
EL DORADO	All Vehicles	0.178	0.003	2.376	0.391	0.046	0.020	322.764	0.025
FRESNO	All Vehicles	0.161	0.003	2.088	0.323	0.046	0.019	317.630	0.025
GLENN	All Vehicles	0.196	0.003	2.307	0.364	0.046	0.020	329.197	0.025
HUMBOLDT	All Vehicles	0.300	0.003	3.069	0.460	0.047	0.020	323.801	0.025
IMPERIAL	All Vehicles	0.306	0.003	3.146	0.426	0.046	0.019	312.184	0.025
INYO	All Vehicles	0.216	0.003	2.490	0.410	0.046	0.020	334.125	0.025
KERN	All Vehicles	0.159	0.003	2.083	0.315	0.046	0.020	340.570	0.025
KINGS	All Vehicles	0.180	0.003	2.108	0.319	0.046	0.019	313.565	0.025
LAKE	All Vehicles	0.280	0.003	3.061	0.507	0.047	0.020	330.605	0.025
LASSEN	All Vehicles	0.256	0.004	2.939	0.453	0.047	0.020	347.909	0.025
LOS ANGELES	All Vehicles	0.160	0.004	2.085	0.321	0.047	0.020	347.205	0.025
MADERA	All Vehicles	0.171	0.003	2.232	0.331	0.046	0.020	340.794	0.025
MARIN	All Vehicles	0.160	0.003	2.043	0.310	0.046	0.020	323.860	0.025
MARIPOSA	All Vehicles	0.299	0.003	3.224	0.513	0.047	0.021	337.958	0.025
MENDOCINO	All Vehicles	0.284	0.003	2.957	0.450	0.046	0.020	320.539	0.025
MERCED	All Vehicles	0.174	0.003	2.189	0.309	0.046	0.020	331.137	0.025
MODOC	All Vehicles	0.276	0.004	3.148	0.466	0.047	0.021	385.400	0.025
MONO	All Vehicles	0.236	0.003	2.795	0.394	0.046	0.020	324.390	0.025
MONTEREY	All Vehicles	0.222	0.004	2.442	0.339	0.047	0.020	348.001	0.025
NAPA	All Vehicles	0.166	0.003	2.093	0.300	0.046	0.019	309.901	0.025
NEVADA	All Vehicles	0.236	0.003	2.691	0.413	0.046	0.020	313.959	0.025
ORANGE	All Vehicles	0.141	0.003	1.875	0.300	0.046	0.020	326.573	0.025
PLACER	All Vehicles	0.159	0.003	2.119	0.320	0.046	0.019	314.190	0.025
PLUMAS	All Vehicles	0.289	0.004	3.257	0.498	0.047	0.020	365.930	0.025
RIVERSIDE	All Vehicles	0.149	0.003	1.942	0.309	0.046	0.019	314.831	0.025
SACRAMENTO	All Vehicles	0.168	0.003	2.148	0.333	0.046	0.020	323.854	0.025
SAN BENITO	All Vehicles	0.186	0.003	2.165	0.309	0.046	0.019	307.278	0.025
SAN BERNARDINO	All Vehicles	0.165	0.003	2.075	0.298	0.046	0.019	320.647	0.025
SAN DIEGO	All Vehicles	0.168	0.003	2.083	0.311	0.046	0.020	334.614	0.025
SAN FRANCISCO	All Vehicles	0.153	0.003	2.066	0.332	0.046	0.021	349.137	0.025
SAN JOAQUIN	All Vehicles	0.167	0.003	2.126	0.317	0.046	0.019	325.394	0.025
SAN LUIS OBISPO	All Vehicles	0.205	0.003	2.299	0.360	0.046	0.020	312.262	0.025
SAN MATEO	All Vehicles	0.141	0.003	1.806	0.265	0.046	0.020	308.054	0.025
SANTA BARBARA	All Vehicles	0.209	0.003	2.229	0.328	0.046	0.019	303.576	0.025
SANTA CLARA	All Vehicles	0.156	0.003	1.966	0.297	0.046	0.019	315.926	0.025
SANTA CRUZ	All Vehicles	0.244	0.003	2.657	0.402	0.046	0.020	338.172	0.025
SHASTA	All Vehicles	0.205	0.003	2.460	0.400	0.046	0.020	334.277	0.025
SIERRA	All Vehicles	0.258	0.004	2.963	0.442	0.047	0.020	371.386	0.025
SISKIYOU	All Vehicles	0.261	0.004	2.974	0.447	0.047	0.020	360.828	0.025
SOLANO	All Vehicles	0.161	0.003	2.101	0.304	0.046	0.020	333.533	0.025
SONOMA	All Vehicles	0.185	0.003	2.313	0.350	0.046	0.020	331.248	0.025
STANISLAUS	All Vehicles	0.173	0.003	2.271	0.355	0.046	0.020	337.741	0.025
SUTTER	All Vehicles	0.189	0.003	2.206	0.372	0.046	0.019	304.388	0.025
TEHAMA	All Vehicles	0.214	0.003	2.467	0.379	0.046	0.020	331.395	0.025
TRINITY	All Vehicles	0.343	0.004	3.670	0.554	0.048	0.021	401.881	0.025
TULARE	All Vehicles	0.171	0.003	2.128	0.339	0.046	0.019	315.104	0.025
TUOLUMNE	All Vehicles	0.302	0.003	3.249	0.500	0.047	0.020	340.189	0.025
VENTURA	All Vehicles	0.156	0.003	2.062	0.346	0.046	0.020	319.365	0.025
YOLO	All Vehicles	0.160	0.003	2.097	0.317	0.046	0.019	321.777	0.025
YUBA	All Vehicles	0.211	0.003	2.370	0.361	0.046	0.019	313.668	0.025

Table 5-31 EMFAC County-Specific On-Road Vehicle Composite EFs – 2016 GOV

County	Vehicle Type	Emission Factors (g/mi)							
		Criteria Pollutants and Ozone Precursors							
		NO_x	SO_2	CO	ROG	PM_{10}	$PM_{2.5}$	CO_2	NH_3
ALAMEDA	All Vehicles	1.601	0.006	1.491	0.222	0.090	0.049	662.922	0.027
ALPINE	All Vehicles	1.605	0.006	2.179	0.295	0.081	0.043	631.202	0.027
AMADOR	All Vehicles	1.808	0.005	2.567	0.416	0.092	0.054	516.273	0.027
BUTTE	All Vehicles	1.763	0.006	2.391	0.349	0.087	0.049	640.241	0.027
CALAVERAS	All Vehicles	1.823	0.006	2.839	0.446	0.092	0.054	562.800	0.027
COLUSA	All Vehicles	1.576	0.006	1.739	0.265	0.084	0.046	631.172	0.027
CONTRA COSTA	All Vehicles	1.556	0.006	1.434	0.213	0.092	0.049	627.356	0.027
DEL NORTE	All Vehicles	1.946	0.005	3.161	0.466	0.104	0.066	542.065	0.027
EL DORADO	All Vehicles	1.523	0.005	1.812	0.273	0.084	0.046	543.637	0.027
FRESNO	All Vehicles	1.580	0.007	1.587	0.261	0.083	0.045	673.566	0.027
GLENN	All Vehicles	1.640	0.006	2.013	0.307	0.087	0.049	632.845	0.027
HUMBOLDT	All Vehicles	1.934	0.006	2.800	0.414	0.093	0.055	584.130	0.027
IMPERIAL	All Vehicles	1.433	0.006	1.962	0.321	0.076	0.040	636.951	0.027
INYO	All Vehicles	1.613	0.006	2.135	0.344	0.086	0.046	634.090	0.027
KERN	All Vehicles	1.518	0.007	1.519	0.246	0.079	0.042	698.978	0.027
KINGS	All Vehicles	1.632	0.007	1.796	0.277	0.080	0.043	679.691	0.027
LAKE	All Vehicles	1.996	0.006	2.885	0.468	0.098	0.060	564.461	0.027
LASSEN	All Vehicles	1.757	0.005	2.655	0.401	0.089	0.051	551.289	0.027
LOS ANGELES	All Vehicles	1.449	0.006	1.704	0.219	0.089	0.048	656.806	0.027
MADERA	All Vehicles	1.617	0.007	1.870	0.288	0.082	0.044	675.985	0.027
MARIN	All Vehicles	1.680	0.006	1.481	0.230	0.107	0.060	619.973	0.027
MARIPOSA	All Vehicles	1.949	0.005	3.276	0.500	0.101	0.062	533.273	0.027
MENDOCINO	All Vehicles	1.914	0.006	2.810	0.417	0.092	0.054	610.642	0.027
MERCED	All Vehicles	1.643	0.007	1.813	0.274	0.082	0.044	691.762	0.027
MODOC	All Vehicles	1.852	0.006	2.972	0.423	0.088	0.050	606.197	0.027
MONO	All Vehicles	1.695	0.006	2.265	0.321	0.083	0.046	639.256	0.027
MONTEREY	All Vehicles	1.693	0.006	2.160	0.301	0.093	0.053	647.949	0.027
NAPA	All Vehicles	1.614	0.006	1.648	0.246	0.086	0.047	618.136	0.027
NEVADA	All Vehicles	1.755	0.006	2.194	0.316	0.084	0.047	612.734	0.027
ORANGE	All Vehicles	1.238	0.006	1.349	0.179	0.087	0.047	601.420	0.027
PLACER	All Vehicles	1.415	0.006	1.459	0.213	0.082	0.044	613.426	0.027
PLUMAS	All Vehicles	1.899	0.006	3.110	0.438	0.090	0.052	599.044	0.027
RIVERSIDE	All Vehicles	1.362	0.006	1.421	0.200	0.082	0.044	623.671	0.027
SACRAMENTO	All Vehicles	1.663	0.006	1.757	0.251	0.093	0.052	622.543	0.027
SAN BENITO	All Vehicles	1.619	0.006	1.699	0.258	0.079	0.043	664.193	0.027
SAN BERNARDINO	All Vehicles	1.384	0.006	1.580	0.217	0.080	0.042	630.768	0.027
SAN DIEGO	All Vehicles	1.495	0.006	1.505	0.223	0.089	0.049	644.029	0.027
SAN FRANCISCO	All Vehicles	1.775	0.007	1.532	0.228	0.118	0.067	683.243	0.027
SAN JOAQUIN	All Vehicles	1.572	0.006	1.601	0.248	0.084	0.046	652.243	0.027
SAN LUIS OBISPO	All Vehicles	1.683	0.006	1.887	0.281	0.090	0.051	573.768	0.027
SAN MATEO	All Vehicles	1.333	0.006	1.213	0.186	0.100	0.055	591.542	0.027
SANTA BARBARA	All Vehicles	1.696	0.006	1.930	0.291	0.098	0.055	598.628	0.027
SANTA CLARA	All Vehicles	1.545	0.006	1.492	0.223	0.090	0.050	629.338	0.027
SANTA CRUZ	All Vehicles	1.938	0.006	2.385	0.345	0.107	0.064	613.953	0.027
SHASTA	All Vehicles	1.727	0.006	2.054	0.316	0.085	0.048	646.722	0.027
SIERRA	All Vehicles	1.765	0.006	2.697	0.371	0.089	0.051	581.012	0.027
SISKIYOU	All Vehicles	1.775	0.007	2.646	0.386	0.086	0.049	689.437	0.027
SOLANO	All Vehicles	1.546	0.006	1.486	0.229	0.084	0.045	657.466	0.027
SONOMA	All Vehicles	1.572	0.006	1.832	0.279	0.090	0.051	607.808	0.027
STANISLAUS	All Vehicles	1.576	0.006	1.764	0.271	0.083	0.045	659.625	0.027
SUTTER	All Vehicles	1.562	0.006	1.881	0.291	0.080	0.044	630.798	0.027
TEHAMA	All Vehicles	1.732	0.006	2.144	0.321	0.085	0.048	657.035	0.027
TRINITY	All Vehicles	2.028	0.007	3.700	0.518	0.101	0.063	706.321	0.027
TULARE	All Vehicles	1.601	0.006	1.799	0.289	0.085	0.048	642.917	0.027
TUOLUMNE	All Vehicles	1.919	0.005	3.080	0.452	0.096	0.057	554.347	0.027
VENTURA	All Vehicles	1.393	0.006	1.485	0.207	0.084	0.046	582.068	0.027
YOLO	All Vehicles	1.360	0.006	1.455	0.221	0.085	0.046	621.829	0.027
YUBA	All Vehicles	1.757	0.005	2.237	0.331	0.092	0.052	557.717	0.027

Table 5-32 EMFAC County-Specific On-Road Vehicle Composite EFs – 2017 GOV

County	Vehicle Type	Emission Factors (g/mi)							
		Criteria Pollutants and Ozone Precursors							
		NO_x	SO_2	CO	ROG	PM_{10}	$PM_{2.5}$	CO_2	NH_3
ALAMEDA	All Vehicles	1.429	0.006	1.336	0.198	0.084	0.044	651.673	0.026
ALPINE	All Vehicles	1.458	0.006	1.968	0.271	0.076	0.038	624.215	0.026
AMADOR	All Vehicles	1.695	0.005	2.347	0.388	0.087	0.049	514.251	0.026
BUTTE	All Vehicles	1.604	0.006	2.147	0.314	0.081	0.043	634.516	0.026
CALAVERAS	All Vehicles	1.806	0.006	3.332	0.543	0.087	0.050	572.812	0.026
COLUSA	All Vehicles	1.427	0.006	1.544	0.236	0.078	0.041	624.481	0.026
CONTRA COSTA	All Vehicles	1.401	0.006	1.290	0.192	0.087	0.045	617.936	0.026
DEL NORTE	All Vehicles	1.836	0.005	2.899	0.436	0.099	0.061	538.413	0.026
EL DORADO	All Vehicles	1.430	0.005	1.662	0.256	0.081	0.044	540.549	0.026
FRESNO	All Vehicles	1.412	0.006	1.415	0.233	0.077	0.039	664.439	0.026
GLENN	All Vehicles	1.493	0.006	1.789	0.275	0.080	0.043	627.211	0.026
HUMBOLDT	All Vehicles	1.808	0.006	2.563	0.385	0.087	0.049	582.750	0.026
IMPERIAL	All Vehicles	1.267	0.006	1.766	0.295	0.072	0.035	628.357	0.026
INYO	All Vehicles	1.480	0.006	1.934	0.319	0.081	0.042	628.175	0.026
KERN	All Vehicles	1.362	0.007	1.351	0.219	0.074	0.037	689.646	0.026
KINGS	All Vehicles	1.458	0.007	1.589	0.245	0.074	0.037	670.940	0.026
LAKE	All Vehicles	1.840	0.006	2.612	0.432	0.092	0.053	562.908	0.026
LASSEN	All Vehicles	1.662	0.005	2.433	0.378	0.086	0.048	547.030	0.026
LOS ANGELES	All Vehicles	1.273	0.006	1.525	0.195	0.083	0.043	644.108	0.026
MADERA	All Vehicles	1.451	0.007	1.670	0.257	0.076	0.039	667.838	0.026
MARIN	All Vehicles	1.518	0.006	1.341	0.210	0.102	0.055	609.027	0.026
MARIPOSA	All Vehicles	1.845	0.005	3.002	0.468	0.095	0.057	529.389	0.026
MENDOCINO	All Vehicles	1.764	0.006	2.561	0.386	0.085	0.047	608.014	0.026
MERCED	All Vehicles	1.471	0.007	1.618	0.244	0.076	0.038	682.815	0.026
MODOC	All Vehicles	1.742	0.006	2.712	0.396	0.085	0.047	601.176	0.026
MONO	All Vehicles	1.546	0.006	2.056	0.297	0.078	0.041	632.955	0.026
MONTEREY	All Vehicles	1.538	0.006	1.948	0.271	0.088	0.047	640.939	0.026
NAPA	All Vehicles	1.471	0.006	1.488	0.223	0.081	0.043	611.645	0.026
NEVADA	All Vehicles	1.618	0.006	2.004	0.292	0.079	0.042	609.918	0.026
ORANGE	All Vehicles	1.097	0.006	1.224	0.163	0.083	0.043	591.400	0.026
PLACER	All Vehicles	1.278	0.006	1.315	0.193	0.077	0.040	606.535	0.026
PLUMAS	All Vehicles	1.792	0.006	2.865	0.412	0.086	0.049	598.725	0.026
RIVERSIDE	All Vehicles	1.176	0.006	1.244	0.177	0.074	0.037	611.501	0.026
SACRAMENTO	All Vehicles	1.500	0.006	1.590	0.228	0.088	0.048	615.393	0.026
SAN BENITO	All Vehicles	1.454	0.006	1.510	0.230	0.073	0.037	656.135	0.026
SAN BERNARDINO	All Vehicles	1.224	0.006	1.416	0.196	0.075	0.038	621.947	0.026
SAN DIEGO	All Vehicles	1.334	0.006	1.365	0.202	0.084	0.044	634.051	0.026
SAN FRANCISCO	All Vehicles	1.571	0.006	1.379	0.205	0.110	0.060	667.328	0.026
SAN JOAQUIN	All Vehicles	1.410	0.006	1.431	0.222	0.079	0.041	644.181	0.026
SAN LUIS OBISPO	All Vehicles	1.555	0.006	1.711	0.257	0.085	0.047	569.179	0.026
SAN MATEO	All Vehicles	1.168	0.006	1.086	0.166	0.094	0.050	577.817	0.026
SANTA BARBARA	All Vehicles	1.539	0.006	1.742	0.264	0.092	0.050	591.908	0.026
SANTA CLARA	All Vehicles	1.375	0.006	1.341	0.201	0.085	0.045	618.591	0.026
SANTA CRUZ	All Vehicles	1.775	0.006	2.156	0.313	0.101	0.058	606.918	0.026
SHASTA	All Vehicles	1.570	0.006	1.829	0.283	0.079	0.042	640.755	0.026
SIERRA	All Vehicles	1.660	0.006	2.472	0.348	0.086	0.048	576.479	0.026
SISKIYOU	All Vehicles	1.617	0.007	2.394	0.355	0.080	0.043	683.158	0.026
SOLANO	All Vehicles	1.390	0.006	1.334	0.206	0.079	0.040	648.647	0.026
SONOMA	All Vehicles	1.431	0.006	1.651	0.254	0.085	0.046	601.342	0.026
STANISLAUS	All Vehicles	1.417	0.006	1.583	0.243	0.078	0.040	652.586	0.026
SUTTER	All Vehicles	1.408	0.006	1.671	0.260	0.076	0.039	624.150	0.026
TEHAMA	All Vehicles	1.567	0.006	1.905	0.287	0.078	0.042	650.801	0.026
TRINITY	All Vehicles	1.862	0.007	3.375	0.478	0.092	0.055	701.995	0.026
TULARE	All Vehicles	1.437	0.006	1.597	0.257	0.079	0.042	635.916	0.026
TUOLUMNE	All Vehicles	1.804	0.005	2.831	0.423	0.091	0.052	550.996	0.026
VENTURA	All Vehicles	1.243	0.006	1.342	0.189	0.080	0.042	574.197	0.026
YOLO	All Vehicles	1.212	0.006	1.307	0.200	0.081	0.042	614.406	0.026
YUBA	All Vehicles	1.634	0.005	2.008	0.301	0.088	0.048	553.450	0.026

Table 5-33 EMFAC County-Specific On-Road Vehicle Composite EFs – 2018 GOV

County	Vehicle Type	Emission Factors (g/mi)							
		Criteria Pollutants and Ozone Precursors							
		NO_x	SO_2	CO	ROG	PM_{10}	$PM_{2.5}$	CO_2	NH_3
ALAMEDA	All Vehicles	1.296	0.006	1.211	0.181	0.080	0.041	640.444	0.025
ALPINE	All Vehicles	1.332	0.006	1.786	0.252	0.072	0.035	617.343	0.025
AMADOR	All Vehicles	1.594	0.005	2.154	0.366	0.083	0.045	512.673	0.025
BUTTE	All Vehicles	1.471	0.006	1.946	0.288	0.077	0.040	628.897	0.025
CALAVERAS	All Vehicles	1.610	0.005	2.377	0.392	0.082	0.045	558.690	0.025
COLUSA	All Vehicles	1.305	0.006	1.387	0.214	0.074	0.037	617.914	0.025
CONTRA COSTA	All Vehicles	1.274	0.006	1.172	0.176	0.084	0.042	608.629	0.025
DEL NORTE	All Vehicles	1.740	0.005	2.658	0.410	0.093	0.055	534.893	0.025
EL DORADO	All Vehicles	1.345	0.005	1.535	0.243	0.080	0.042	537.522	0.025
FRESNO	All Vehicles	1.283	0.006	1.280	0.213	0.074	0.036	656.220	0.025
GLENN	All Vehicles	1.372	0.006	1.607	0.251	0.076	0.039	621.789	0.025
HUMBOLDT	All Vehicles	1.701	0.006	2.366	0.365	0.083	0.045	581.650	0.025
IMPERIAL	All Vehicles	1.133	0.006	1.603	0.275	0.069	0.033	619.706	0.025
INYO	All Vehicles	1.366	0.006	1.759	0.298	0.077	0.038	622.281	0.025
KERN	All Vehicles	1.242	0.007	1.219	0.200	0.071	0.034	679.659	0.025
KINGS	All Vehicles	1.325	0.006	1.432	0.223	0.070	0.034	658.873	0.025
LAKE	All Vehicles	1.722	0.006	2.377	0.404	0.087	0.049	561.611	0.025
LASSEN	All Vehicles	1.580	0.005	2.233	0.357	0.083	0.044	542.912	0.025
LOS ANGELES	All Vehicles	1.133	0.006	1.379	0.177	0.080	0.040	631.834	0.025
MADERA	All Vehicles	1.324	0.006	1.530	0.235	0.073	0.036	666.094	0.025
MARIN	All Vehicles	1.383	0.006	1.225	0.194	0.097	0.051	598.322	0.025
MARIPOSA	All Vehicles	1.753	0.005	2.760	0.441	0.090	0.052	525.532	0.025
MENDOCINO	All Vehicles	1.642	0.006	2.353	0.364	0.080	0.043	605.547	0.025
MERCED	All Vehicles	1.340	0.007	1.467	0.222	0.073	0.035	675.986	0.025
MODOC	All Vehicles	1.646	0.006	2.474	0.371	0.081	0.044	596.434	0.025
MONO	All Vehicles	1.418	0.006	1.875	0.278	0.074	0.037	626.774	0.025
MONTEREY	All Vehicles	1.411	0.006	1.775	0.250	0.084	0.044	633.935	0.025
NAPA	All Vehicles	1.356	0.006	1.354	0.205	0.078	0.040	605.105	0.025
NEVADA	All Vehicles	1.497	0.006	1.842	0.273	0.075	0.039	607.222	0.025
ORANGE	All Vehicles	0.984	0.006	1.120	0.151	0.080	0.040	581.495	0.025
PLACER	All Vehicles	1.162	0.006	1.198	0.178	0.075	0.037	599.646	0.025
PLUMAS	All Vehicles	1.690	0.006	2.642	0.389	0.081	0.044	598.472	0.025
RIVERSIDE	All Vehicles	1.050	0.006	1.129	0.163	0.072	0.034	603.060	0.025
SACRAMENTO	All Vehicles	1.365	0.006	1.448	0.210	0.084	0.044	608.051	0.025
SAN BENITO	All Vehicles	1.323	0.006	1.365	0.210	0.070	0.034	648.169	0.025
SAN BERNARDINO	All Vehicles	1.091	0.006	1.281	0.179	0.072	0.035	613.154	0.025
SAN DIEGO	All Vehicles	1.204	0.006	1.248	0.187	0.081	0.041	624.072	0.025
SAN FRANCISCO	All Vehicles	1.409	0.006	1.256	0.188	0.104	0.056	652.007	0.025
SAN JOAQUIN	All Vehicles	1.284	0.006	1.296	0.203	0.075	0.038	635.057	0.025
SAN LUIS OBISPO	All Vehicles	1.438	0.005	1.549	0.232	0.081	0.044	562.366	0.025
SAN MATEO	All Vehicles	1.036	0.005	0.987	0.151	0.090	0.046	565.035	0.025
SANTA BARBARA	All Vehicles	1.408	0.006	1.590	0.244	0.088	0.046	585.389	0.025
SANTA CLARA	All Vehicles	1.241	0.006	1.218	0.184	0.081	0.041	608.041	0.025
SANTA CRUZ	All Vehicles	1.636	0.006	1.967	0.290	0.096	0.054	599.830	0.025
SHASTA	All Vehicles	1.438	0.006	1.649	0.260	0.075	0.039	634.966	0.025
SIERRA	All Vehicles	1.562	0.006	2.266	0.328	0.082	0.045	572.008	0.025
SISKIYOU	All Vehicles	1.484	0.007	2.183	0.332	0.076	0.039	676.762	0.025
SOLANO	All Vehicles	1.266	0.006	1.211	0.190	0.076	0.038	639.899	0.025
SONOMA	All Vehicles	1.314	0.006	1.498	0.234	0.082	0.043	594.683	0.025
STANISLAUS	All Vehicles	1.294	0.006	1.442	0.223	0.075	0.037	649.275	0.025
SUTTER	All Vehicles	1.287	0.006	1.499	0.237	0.072	0.036	617.636	0.025
TEHAMA	All Vehicles	1.429	0.006	1.713	0.262	0.074	0.038	644.608	0.025
TRINITY	All Vehicles	1.725	0.007	3.093	0.446	0.086	0.049	697.790	0.025
TULARE	All Vehicles	1.311	0.006	1.438	0.233	0.076	0.038	627.346	0.025
TUOLUMNE	All Vehicles	1.702	0.005	2.604	0.398	0.086	0.048	547.991	0.025
VENTURA	All Vehicles	1.120	0.005	1.222	0.174	0.077	0.039	566.230	0.025
YOLO	All Vehicles	1.094	0.006	1.184	0.183	0.078	0.039	606.842	0.025
YUBA	All Vehicles	1.526	0.005	1.809	0.276	0.084	0.044	549.476	0.025

Table 5-34 EMFAC County-Specific On-Road Vehicle Composite EFs – 2019 GOV

County	Vehicle Type	Emission Factors (g/mi)							
		Criteria Pollutants and Ozone Precursors							
		NO_x	SO_2	CO	ROG	PM_{10}	$PM_{2.5}$	CO_2	NH_3
ALAMEDA	All Vehicles	1.196	0.006	1.108	0.167	0.078	0.039	629.719	0.024
ALPINE	All Vehicles	1.225	0.006	1.637	0.238	0.070	0.033	610.079	0.024
AMADOR	All Vehicles	1.496	0.005	1.983	0.347	0.081	0.043	511.036	0.024
BUTTE	All Vehicles	1.359	0.006	1.769	0.266	0.075	0.037	622.969	0.024
CALAVERAS	All Vehicles	1.515	0.005	2.189	0.372	0.080	0.043	556.639	0.024
COLUSA	All Vehicles	1.207	0.006	1.259	0.197	0.072	0.035	611.123	0.024
CONTRA COSTA	All Vehicles	1.178	0.006	1.075	0.163	0.082	0.040	599.315	0.024
DEL NORTE	All Vehicles	1.650	0.005	2.452	0.390	0.090	0.052	531.281	0.024
EL DORADO	All Vehicles	1.256	0.005	1.416	0.229	0.078	0.040	531.646	0.024
FRESNO	All Vehicles	1.189	0.006	1.168	0.197	0.072	0.035	646.771	0.024
GLENN	All Vehicles	1.273	0.006	1.456	0.232	0.074	0.037	616.145	0.024
HUMBOLDT	All Vehicles	1.610	0.006	2.232	0.353	0.080	0.042	582.060	0.024
IMPERIAL	All Vehicles	1.026	0.006	1.471	0.259	0.068	0.032	610.780	0.024
INYO	All Vehicles	1.264	0.006	1.613	0.282	0.075	0.036	616.041	0.024
KERN	All Vehicles	1.155	0.007	1.114	0.185	0.070	0.033	670.090	0.024
KINGS	All Vehicles	1.232	0.006	1.302	0.206	0.069	0.033	650.016	0.024
LAKE	All Vehicles	1.610	0.005	2.173	0.381	0.084	0.046	560.149	0.024
LASSEN	All Vehicles	1.498	0.005	2.065	0.341	0.081	0.043	538.641	0.024
LOS ANGELES	All Vehicles	1.020	0.006	1.253	0.163	0.077	0.038	617.800	0.024
MADERA	All Vehicles	1.230	0.006	1.392	0.217	0.072	0.035	657.484	0.024
MARIN	All Vehicles	1.267	0.006	1.127	0.181	0.094	0.048	587.757	0.024
MARIPOSA	All Vehicles	1.660	0.005	2.547	0.419	0.087	0.049	521.602	0.024
MENDOCINO	All Vehicles	1.533	0.006	2.170	0.345	0.077	0.040	602.760	0.024
MERCED	All Vehicles	1.245	0.006	1.336	0.204	0.071	0.034	666.522	0.024
MODOC	All Vehicles	1.549	0.006	2.276	0.351	0.080	0.042	591.415	0.024
MONO	All Vehicles	1.308	0.006	1.724	0.264	0.072	0.035	620.142	0.024
MONTEREY	All Vehicles	1.301	0.006	1.624	0.231	0.081	0.041	626.761	0.024
NAPA	All Vehicles	1.264	0.006	1.242	0.191	0.076	0.038	598.355	0.024
NEVADA	All Vehicles	1.389	0.006	1.702	0.259	0.073	0.037	604.035	0.024
ORANGE	All Vehicles	0.897	0.005	1.038	0.142	0.078	0.039	573.903	0.024
PLACER	All Vehicles	1.066	0.006	1.106	0.166	0.073	0.036	592.706	0.024
PLUMAS	All Vehicles	1.589	0.006	2.448	0.371	0.079	0.042	597.911	0.024
RIVERSIDE	All Vehicles	0.952	0.006	1.036	0.152	0.070	0.033	594.438	0.024
SACRAMENTO	All Vehicles	1.248	0.006	1.327	0.194	0.081	0.042	598.952	0.024
SAN BENITO	All Vehicles	1.221	0.006	1.246	0.195	0.068	0.032	639.907	0.024
SAN BERNARDINO	All Vehicles	0.983	0.006	1.161	0.166	0.071	0.034	601.974	0.024
SAN DIEGO	All Vehicles	1.101	0.006	1.149	0.174	0.078	0.039	614.126	0.024
SAN FRANCISCO	All Vehicles	1.273	0.006	1.157	0.173	0.099	0.052	637.481	0.024
SAN JOAQUIN	All Vehicles	1.187	0.006	1.181	0.187	0.074	0.036	626.823	0.024
SAN LUIS OBISPO	All Vehicles	1.351	0.005	1.443	0.224	0.079	0.041	560.296	0.024
SAN MATEO	All Vehicles	0.927	0.005	0.909	0.139	0.087	0.044	553.261	0.024
SANTA BARBARA	All Vehicles	1.296	0.006	1.459	0.227	0.085	0.044	578.874	0.024
SANTA CLARA	All Vehicles	1.136	0.006	1.117	0.171	0.079	0.039	597.672	0.024
SANTA CRUZ	All Vehicles	1.502	0.006	1.796	0.268	0.092	0.050	592.592	0.024
SHASTA	All Vehicles	1.331	0.006	1.496	0.241	0.073	0.036	628.966	0.024
SIERRA	All Vehicles	1.462	0.006	2.090	0.311	0.080	0.043	567.402	0.024
SISKIYOU	All Vehicles	1.368	0.007	2.001	0.313	0.073	0.037	669.816	0.024
SOLANO	All Vehicles	1.170	0.006	1.109	0.176	0.074	0.036	631.001	0.024
SONOMA	All Vehicles	1.217	0.006	1.367	0.217	0.079	0.041	587.924	0.024
STANISLAUS	All Vehicles	1.199	0.006	1.315	0.206	0.073	0.036	641.722	0.024
SUTTER	All Vehicles	1.191	0.006	1.350	0.218	0.071	0.034	610.769	0.024
TEHAMA	All Vehicles	1.319	0.006	1.551	0.242	0.072	0.036	638.040	0.024
TRINITY	All Vehicles	1.604	0.007	2.848	0.421	0.082	0.046	693.026	0.024
TULARE	All Vehicles	1.216	0.006	1.303	0.213	0.074	0.036	620.178	0.024
TUOLUMNE	All Vehicles	1.600	0.005	2.406	0.377	0.084	0.045	544.898	0.024
VENTURA	All Vehicles	1.021	0.005	1.124	0.163	0.076	0.038	559.406	0.024
YOLO	All Vehicles	1.000	0.006	1.079	0.169	0.076	0.038	597.873	0.024
YUBA	All Vehicles	1.429	0.005	1.642	0.255	0.082	0.042	542.956	0.024

Table 5-35 EMFAC County-Specific On-Road Vehicle Composite EFs – 2020 GOV

County	Vehicle Type	Emission Factors (g/mi)							
		Criteria Pollutants and Ozone Precursors							
		NO_x	SO_2	CO	ROG	PM_{10}	$PM_{2.5}$	CO_2	NH_3
ALAMEDA	All Vehicles	1.078	0.006	1.015	0.153	0.075	0.036	618.263	0.024
ALPINE	All Vehicles	1.130	0.006	1.508	0.226	0.069	0.032	601.515	0.024
AMADOR	All Vehicles	1.372	0.005	1.823	0.327	0.077	0.039	508.853	0.024
BUTTE	All Vehicles	1.241	0.006	1.613	0.246	0.072	0.035	615.917	0.024
CALAVERAS	All Vehicles	1.395	0.005	2.013	0.350	0.077	0.039	553.603	0.024
COLUSA	All Vehicles	1.106	0.006	1.149	0.182	0.070	0.033	603.169	0.024
CONTRA COSTA	All Vehicles	1.062	0.006	0.987	0.149	0.079	0.037	589.309	0.024
DEL NORTE	All Vehicles	1.539	0.005	2.262	0.368	0.086	0.048	526.910	0.024
EL DORADO	All Vehicles	1.145	0.005	1.308	0.215	0.075	0.038	528.190	0.024
FRESNO	All Vehicles	1.081	0.006	1.066	0.181	0.070	0.033	636.644	0.024
GLENN	All Vehicles	1.168	0.006	1.327	0.214	0.071	0.034	609.293	0.024
HUMBOLDT	All Vehicles	1.485	0.006	2.020	0.329	0.076	0.039	577.929	0.024
IMPERIAL	All Vehicles	0.920	0.006	1.351	0.243	0.067	0.030	600.980	0.024
INYO	All Vehicles	1.166	0.006	1.485	0.268	0.073	0.035	608.349	0.024
KERN	All Vehicles	1.059	0.006	1.023	0.171	0.068	0.031	659.731	0.024
KINGS	All Vehicles	1.136	0.006	1.190	0.191	0.068	0.031	640.378	0.024
LAKE	All Vehicles	1.457	0.005	1.979	0.355	0.079	0.041	558.048	0.024
LASSEN	All Vehicles	1.399	0.005	1.911	0.325	0.079	0.041	534.070	0.024
LOS ANGELES	All Vehicles	0.893	0.006	1.147	0.148	0.074	0.035	605.751	0.024
MADERA	All Vehicles	1.128	0.006	1.271	0.200	0.070	0.033	647.895	0.024
MARIN	All Vehicles	1.132	0.006	1.037	0.166	0.089	0.045	576.784	0.024
MARIPOSA	All Vehicles	1.543	0.005	2.346	0.395	0.084	0.045	517.749	0.024
MENDOCINO	All Vehicles	1.410	0.006	2.000	0.325	0.074	0.037	598.582	0.024
MERCED	All Vehicles	1.145	0.006	1.219	0.188	0.069	0.032	656.197	0.024
MODOC	All Vehicles	1.444	0.006	2.100	0.333	0.078	0.040	585.611	0.024
MONO	All Vehicles	1.206	0.006	1.591	0.250	0.071	0.034	612.052	0.024
MONTEREY	All Vehicles	1.174	0.006	1.486	0.212	0.078	0.038	618.663	0.024
NAPA	All Vehicles	1.147	0.006	1.137	0.175	0.073	0.035	590.695	0.024
NEVADA	All Vehicles	1.275	0.006	1.574	0.244	0.071	0.034	599.398	0.024
ORANGE	All Vehicles	0.778	0.005	0.957	0.131	0.075	0.036	563.878	0.024
PLACER	All Vehicles	0.961	0.006	1.018	0.154	0.071	0.033	584.870	0.024
PLUMAS	All Vehicles	1.471	0.006	2.269	0.352	0.076	0.039	596.694	0.024
RIVERSIDE	All Vehicles	0.843	0.006	0.953	0.141	0.068	0.031	584.814	0.024
SACRAMENTO	All Vehicles	1.110	0.006	1.214	0.177	0.077	0.038	590.799	0.024
SAN BENITO	All Vehicles	1.118	0.006	1.143	0.181	0.066	0.030	630.787	0.024
SAN BERNARDINO	All Vehicles	0.874	0.006	1.063	0.153	0.069	0.032	592.276	0.024
SAN DIEGO	All Vehicles	0.980	0.006	1.059	0.160	0.075	0.036	603.583	0.024
SAN FRANCISCO	All Vehicles	1.109	0.006	1.063	0.156	0.093	0.047	623.217	0.024
SAN JOAQUIN	All Vehicles	1.074	0.006	1.077	0.171	0.071	0.034	617.679	0.024
SAN LUIS OBISPO	All Vehicles	1.228	0.005	1.326	0.207	0.076	0.038	554.932	0.024
SAN MATEO	All Vehicles	0.798	0.005	0.840	0.126	0.082	0.040	541.924	0.024
SANTA BARBARA	All Vehicles	1.161	0.005	1.338	0.208	0.081	0.040	571.705	0.024
SANTA CLARA	All Vehicles	1.007	0.006	1.023	0.156	0.075	0.036	586.710	0.024
SANTA CRUZ	All Vehicles	1.334	0.006	1.634	0.244	0.086	0.045	585.037	0.024
SHASTA	All Vehicles	1.219	0.006	1.363	0.223	0.071	0.034	621.828	0.024
SIERRA	All Vehicles	1.342	0.005	1.930	0.293	0.077	0.040	561.811	0.024
SISKIYOU	All Vehicles	1.257	0.006	1.841	0.296	0.071	0.034	661.457	0.024
SOLANO	All Vehicles	1.064	0.006	1.018	0.163	0.072	0.034	621.158	0.024
SONOMA	All Vehicles	1.082	0.006	1.242	0.197	0.076	0.037	581.071	0.024
STANISLAUS	All Vehicles	1.086	0.006	1.199	0.188	0.070	0.033	633.232	0.024
SUTTER	All Vehicles	1.082	0.006	1.227	0.200	0.069	0.032	603.020	0.024
TEHAMA	All Vehicles	1.210	0.006	1.413	0.224	0.070	0.034	630.257	0.024
TRINITY	All Vehicles	1.483	0.007	2.628	0.397	0.079	0.042	686.655	0.024
TULARE	All Vehicles	1.103	0.006	1.182	0.194	0.071	0.034	612.055	0.024
TUOLUMNE	All Vehicles	1.477	0.005	2.221	0.356	0.081	0.042	541.466	0.024
VENTURA	All Vehicles	0.892	0.005	1.029	0.149	0.073	0.035	550.732	0.024
YOLO	All Vehicles	0.891	0.006	0.985	0.155	0.074	0.035	589.570	0.024
YUBA	All Vehicles	1.304	0.005	1.490	0.234	0.078	0.039	538.438	0.024

Table 5-36 EMFAC County-Specific On-Road Vehicle EFs – 2016

County	Fuel Type	Vehicle Type		Emission Factors (g/mi)							
				Criteria Pollutants and Ozone Precursors							
				NO_x	SO_x	CO	ROG	PM_{10}	$PM_{2.5}$	CO_2	NH_3[1]
Alameda	Gasoline	LDGV	Light-Duty Vehicles (Passenger Cars)	0.133	0.003	1.439	0.161	0.047	0.020	327.966	0.029
	Gasoline	LDGT	Light-Duty Trucks (0-8,500 lbs)	0.218	0.004	1.879	0.245	0.047	0.020	425.739	0.030
	Gasoline	HDGV	Heavy-Duty Vehicles (8,501 + lbs)	0.516	0.006	3.051	0.375	0.055	0.023	632.889	0.045
	Diesel	LDDV	Light-Duty Vehicles (Passenger Cars)	0.252	0.003	0.331	0.027	0.059	0.032	306.385	0.008
	Diesel	LDDT	Light-Duty Trucks (0-8,500 lbs)	0.156	0.004	0.227	0.027	0.057	0.030	375.490	0.008
	Diesel	HDDV	Heavy-Duty Vehicles (8,501 + lbs)	6.351	0.014	1.110	0.283	0.228	0.143	1477.411	0.027
	NA	MC	Motorcycles	1.276	0.002	26.345	4.026	0.018	0.008	181.010	0.051
Alpine	Gasoline	LDGV	Light-Duty Vehicles (Passenger Cars)	0.179	0.003	1.761	0.161	0.047	0.020	304.168	0.029
	Gasoline	LDGT	Light-Duty Trucks (0-8,500 lbs)	0.402	0.004	3.034	0.370	0.047	0.020	401.202	0.030
	Gasoline	HDGV	Heavy-Duty Vehicles (8,501 + lbs)	0.925	0.006	4.850	0.644	0.057	0.024	618.858	0.045
	Diesel	LDDV	Light-Duty Vehicles (Passenger Cars)	0.257	0.003	0.319	0.026	0.058	0.030	284.212	0.008
	Diesel	LDDT	Light-Duty Trucks (0-8,500 lbs)	0.191	0.003	0.252	0.031	0.059	0.032	348.965	0.008
	Diesel	HDDV	Heavy-Duty Vehicles (8,501 + lbs)	5.804	0.014	1.029	0.251	0.184	0.111	1417.972	0.027
	NA	MC	Motorcycles	1.397	0.002	30.025	4.452	0.018	0.008	171.533	0.051
Amador	Gasoline	LDGV	Light-Duty Vehicles (Passenger Cars)	0.194	0.003	1.869	0.202	0.047	0.020	293.584	0.029
	Gasoline	LDGT	Light-Duty Trucks (0-8,500 lbs)	0.475	0.004	3.594	0.548	0.047	0.020	388.736	0.030
	Gasoline	HDGV	Heavy-Duty Vehicles (8,501 + lbs)	1.004	0.006	5.373	0.839	0.058	0.025	606.606	0.045
	Diesel	LDDV	Light-Duty Vehicles (Passenger Cars)	0.410	0.003	0.325	0.027	0.061	0.033	271.693	0.008
	Diesel	LDDT	Light-Duty Trucks (0-8,500 lbs)	0.265	0.003	0.394	0.054	0.077	0.049	322.410	0.008
	Diesel	HDDV	Heavy-Duty Vehicles (8,501 + lbs)	6.465	0.009	1.279	0.320	0.221	0.149	957.459	0.027
	NA	MC	Motorcycles	1.317	0.002	26.942	4.257	0.018	0.008	157.725	0.051
Butte	Gasoline	LDGV	Light-Duty Vehicles (Passenger Cars)	0.178	0.003	1.828	0.198	0.047	0.020	330.327	0.029
	Gasoline	LDGT	Light-Duty Trucks (0-8,500 lbs)	0.465	0.004	3.465	0.471	0.048	0.021	441.228	0.030
	Gasoline	HDGV	Heavy-Duty Vehicles (8,501 + lbs)	0.751	0.007	4.266	0.574	0.056	0.024	645.137	0.045
	Diesel	LDDV	Light-Duty Vehicles (Passenger Cars)	0.330	0.003	0.362	0.031	0.062	0.034	302.947	0.008
	Diesel	LDDT	Light-Duty Trucks (0-8,500 lbs)	0.404	0.004	0.410	0.049	0.072	0.044	375.145	0.008
	Diesel	HDDV	Heavy-Duty Vehicles (8,501 + lbs)	6.283	0.013	1.161	0.287	0.199	0.127	1339.266	0.027
	NA	MC	Motorcycles	1.294	0.002	27.770	4.800	0.018	0.008	176.387	0.051
Calaveras	Gasoline	LDGV	Light-Duty Vehicles (Passenger Cars)	0.197	0.003	1.975	0.197	0.047	0.020	323.775	0.029
	Gasoline	LDGT	Light-Duty Trucks (0-8,500 lbs)	0.508	0.004	4.029	0.596	0.048	0.021	430.739	0.030
	Gasoline	HDGV	Heavy-Duty Vehicles (8,501 + lbs)	1.100	0.007	6.023	0.926	0.058	0.025	653.185	0.045
	Diesel	LDDV	Light-Duty Vehicles (Passenger Cars)	0.390	0.003	0.420	0.036	0.063	0.036	297.130	0.008
	Diesel	LDDT	Light-Duty Trucks (0-8,500 lbs)	0.261	0.003	0.497	0.075	0.087	0.058	361.514	0.008
	Diesel	HDDV	Heavy-Duty Vehicles (8,501 + lbs)	6.429	0.010	1.248	0.310	0.211	0.141	1023.993	0.027
	NA	MC	Motorcycles	1.314	0.002	28.315	5.059	0.018	0.009	177.145	0.051
Colusa	Gasoline	LDGV	Light-Duty Vehicles (Passenger Cars)	0.142	0.003	1.401	0.159	0.047	0.020	321.277	0.029
	Gasoline	LDGT	Light-Duty Trucks (0-8,500 lbs)	0.314	0.004	2.343	0.328	0.047	0.020	421.791	0.030
	Gasoline	HDGV	Heavy-Duty Vehicles (8,501 + lbs)	0.589	0.006	3.296	0.426	0.054	0.023	628.173	0.045
	Diesel	LDDV	Light-Duty Vehicles (Passenger Cars)	0.239	0.003	0.309	0.025	0.058	0.031	292.613	0.008
	Diesel	LDDT	Light-Duty Trucks (0-8,500 lbs)	0.251	0.003	0.365	0.045	0.070	0.042	361.392	0.008
	Diesel	HDDV	Heavy-Duty Vehicles (8,501 + lbs)	5.942	0.013	1.074	0.273	0.190	0.120	1358.042	0.027
	NA	MC	Motorcycles	1.291	0.002	26.377	4.190	0.018	0.008	175.837	0.051
Contra Costa	Gasoline	LDGV	Light-Duty Vehicles (Passenger Cars)	0.124	0.003	1.352	0.152	0.047	0.020	325.063	0.029
	Gasoline	LDGT	Light-Duty Trucks (0-8,500 lbs)	0.209	0.004	1.834	0.240	0.047	0.020	424.030	0.030
	Gasoline	HDGV	Heavy-Duty Vehicles (8,501 + lbs)	0.473	0.006	2.887	0.350	0.054	0.023	623.422	0.045
	Diesel	LDDV	Light-Duty Vehicles (Passenger Cars)	0.194	0.003	0.286	0.024	0.058	0.030	301.643	0.008
	Diesel	LDDT	Light-Duty Trucks (0-8,500 lbs)	0.149	0.004	0.210	0.025	0.057	0.029	373.730	0.008
	Diesel	HDDV	Heavy-Duty Vehicles (8,501 + lbs)	6.197	0.013	1.043	0.269	0.238	0.144	1327.799	0.027
	NA	MC	Motorcycles	1.279	0.002	26.602	4.084	0.018	0.008	179.728	0.051
Del Norte	Gasoline	LDGV	Light-Duty Vehicles (Passenger Cars)	0.223	0.003	2.047	0.214	0.047	0.020	340.705	0.029
	Gasoline	LDGT	Light-Duty Trucks (0-8,500 lbs)	0.679	0.005	4.530	0.624	0.049	0.022	456.504	0.030
	Gasoline	HDGV	Heavy-Duty Vehicles (8,501 + lbs)	1.014	0.007	5.226	0.761	0.057	0.024	672.695	0.045
	Diesel	LDDV	Light-Duty Vehicles (Passenger Cars)	0.330	0.003	0.441	0.035	0.063	0.035	321.058	0.008
	Diesel	LDDT	Light-Duty Trucks (0-8,500 lbs)	0.737	0.004	1.372	0.199	0.170	0.138	399.771	0.008
	Diesel	HDDV	Heavy-Duty Vehicles (8,501 + lbs)	6.311	0.008	1.288	0.305	0.205	0.134	837.711	0.027
	NA	MC	Motorcycles	1.369	0.002	30.994	4.959	0.018	0.009	188.525	0.051

Table 5-36 EMFAC County-Specific On-Road Vehicle EFs – 2016 (cont.)

County	Fuel Type	Vehicle Type		Emission Factors (g/mi)							
				Criteria Pollutants and Ozone Precursors							
				NO_x	SO_x	CO	ROG	PM_{10}	$PM_{2.5}$	CO_2	NH_3[1]
El Dorado	Gasoline	LDGV	Light-Duty Vehicles (Passenger Cars)	0.118	0.003	1.340	0.137	0.047	0.020	327.693	0.029
	Gasoline	LDGT	Light-Duty Trucks (0-8,500 lbs)	0.270	0.004	2.430	0.338	0.047	0.020	437.593	0.030
	Gasoline	HDGV	Heavy-Duty Vehicles (8,501 + lbs)	0.586	0.006	3.708	0.508	0.054	0.023	638.545	0.045
	Diesel	LDDV	Light-Duty Vehicles (Passenger Cars)	0.275	0.003	0.331	0.027	0.059	0.031	302.247	0.008
	Diesel	LDDT	Light-Duty Trucks (0-8,500 lbs)	0.253	0.004	0.296	0.036	0.063	0.035	378.964	0.008
	Diesel	HDDV	Heavy-Duty Vehicles (8,501 + lbs)	5.806	0.009	1.133	0.272	0.197	0.125	915.694	0.027
	NA	MC	Motorcycles	1.355	0.002	30.004	5.306	0.018	0.009	184.429	0.051
Fresno	Gasoline	LDGV	Light-Duty Vehicles (Passenger Cars)	0.12	0.00	1.25	0.15	0.05	0.02	320.02	0.029
	Gasoline	LDGT	Light-Duty Trucks (0-8,500 lbs)	0.25	0.00	2.14	0.33	0.05	0.02	421.70	0.030
	Gasoline	HDGV	Heavy-Duty Vehicles (8,501 + lbs)	0.51	0.01	3.11	0.41	0.05	0.02	622.26	0.045
	Diesel	LDDV	Light-Duty Vehicles (Passenger Cars)	0.15	0.00	0.21	0.02	0.05	0.03	283.62	0.008
	Diesel	LDDT	Light-Duty Trucks (0-8,500 lbs)	0.17	0.00	0.25	0.03	0.06	0.03	360.89	0.008
	Diesel	HDDV	Heavy-Duty Vehicles (8,501 + lbs)	6.19	0.01	1.02	0.27	0.20	0.12	1550.86	0.027
	NA	MC	Motorcycles	1.29	0.00	27.54	4.05	0.02	0.01	171.11	0.051
Glenn	Gasoline	LDGV	Light-Duty Vehicles (Passenger Cars)	0.151	0.003	1.548	0.168	0.047	0.020	332.979	0.029
	Gasoline	LDGT	Light-Duty Trucks (0-8,500 lbs)	0.364	0.004	2.774	0.394	0.048	0.020	439.975	0.030
	Gasoline	HDGV	Heavy-Duty Vehicles (8,501 + lbs)	0.645	0.007	3.738	0.494	0.055	0.024	649.601	0.045
	Diesel	LDDV	Light-Duty Vehicles (Passenger Cars)	0.216	0.003	0.333	0.026	0.057	0.030	301.913	0.008
	Diesel	LDDT	Light-Duty Trucks (0-8,500 lbs)	0.288	0.004	0.474	0.065	0.081	0.052	369.089	0.008
	Diesel	HDDV	Heavy-Duty Vehicles (8,501 + lbs)	6.078	0.013	1.124	0.284	0.195	0.126	1310.984	0.027
	NA	MC	Motorcycles	1.286	0.002	27.135	4.555	0.018	0.008	181.107	0.051
Humboldt	Gasoline	LDGV	Light-Duty Vehicles (Passenger Cars)	0.233	0.003	2.130	0.221	0.047	0.020	319.549	0.029
	Gasoline	LDGT	Light-Duty Trucks (0-8,500 lbs)	0.582	0.004	4.034	0.547	0.048	0.021	423.206	0.030
	Gasoline	HDGV	Heavy-Duty Vehicles (8,501 + lbs)	1.030	0.006	5.246	0.772	0.056	0.024	630.741	0.045
	Diesel	LDDV	Light-Duty Vehicles (Passenger Cars)	0.692	0.003	0.582	0.052	0.075	0.047	308.842	0.008
	Diesel	LDDT	Light-Duty Trucks (0-8,500 lbs)	0.305	0.004	0.535	0.073	0.088	0.059	369.353	0.008
	Diesel	HDDV	Heavy-Duty Vehicles (8,501 + lbs)	6.745	0.011	1.272	0.319	0.215	0.143	1137.916	0.027
	NA	MC	Motorcycles	1.375	0.002	30.160	4.653	0.018	0.008	176.149	0.051
Imperial	Gasoline	LDGV	Light-Duty Vehicles (Passenger Cars)	0.365	0.003	3.259	0.277	0.046	0.019	316.560	0.029
	Gasoline	LDGT	Light-Duty Trucks (0-8,500 lbs)	0.357	0.004	2.772	0.486	0.047	0.020	418.176	0.030
	Gasoline	HDGV	Heavy-Duty Vehicles (8,501 + lbs)	0.703	0.006	3.916	0.552	0.054	0.023	607.373	0.045
	Diesel	LDDV	Light-Duty Vehicles (Passenger Cars)	0.168	0.003	0.216	0.018	0.055	0.028	271.430	0.008
	Diesel	LDDT	Light-Duty Trucks (0-8,500 lbs)	0.247	0.003	0.234	0.024	0.058	0.030	346.484	0.008
	Diesel	HDDV	Heavy-Duty Vehicles (8,501 + lbs)	5.126	0.013	0.603	0.135	0.168	0.099	1411.960	0.027
	NA	MC	Motorcycles	1.207	0.002	23.774	3.885	0.018	0.008	165.742	0.051
Inyo	Gasoline	LDGV	Light-Duty Vehicles (Passenger Cars)	0.168	0.003	1.632	0.188	0.047	0.020	337.105	0.029
	Gasoline	LDGT	Light-Duty Trucks (0-8,500 lbs)	0.392	0.004	2.910	0.445	0.047	0.020	445.204	0.030
	Gasoline	HDGV	Heavy-Duty Vehicles (8,501 + lbs)	0.892	0.007	4.724	0.734	0.058	0.025	671.458	0.045
	Diesel	LDDV	Light-Duty Vehicles (Passenger Cars)	0.254	0.003	0.356	0.028	0.059	0.031	303.768	0.008
	Diesel	LDDT	Light-Duty Trucks (0-8,500 lbs)	0.210	0.004	0.332	0.041	0.065	0.037	374.218	0.008
	Diesel	HDDV	Heavy-Duty Vehicles (8,501 + lbs)	5.858	0.012	1.111	0.266	0.202	0.123	1292.873	0.027
	NA	MC	Motorcycles	1.323	0.002	28.675	4.675	0.018	0.008	183.675	0.051
Kern	Gasoline	LDGV	Light-Duty Vehicles (Passenger Cars)	0.113	0.003	1.187	0.143	0.047	0.020	346.640	0.029
	Gasoline	LDGT	Light-Duty Trucks (0-8,500 lbs)	0.251	0.005	2.048	0.314	0.047	0.020	455.496	0.030
	Gasoline	HDGV	Heavy-Duty Vehicles (8,501 + lbs)	0.510	0.007	3.041	0.404	0.055	0.023	677.251	0.045
	Diesel	LDDV	Light-Duty Vehicles (Passenger Cars)	0.149	0.003	0.258	0.019	0.054	0.026	311.936	0.008
	Diesel	LDDT	Light-Duty Trucks (0-8,500 lbs)	0.144	0.004	0.229	0.026	0.056	0.029	394.411	0.008
	Diesel	HDDV	Heavy-Duty Vehicles (8,501 + lbs)	5.932	0.015	0.958	0.242	0.180	0.109	1541.842	0.027
	NA	MC	Motorcycles	1.296	0.002	28.929	4.129	0.018	0.008	184.188	0.051
Kings	Gasoline	LDGV	Light-Duty Vehicles (Passenger Cars)	0.127	0.003	1.282	0.145	0.047	0.019	320.063	0.029
	Gasoline	LDGT	Light-Duty Trucks (0-8,500 lbs)	0.334	0.004	2.552	0.370	0.047	0.020	422.653	0.030
	Gasoline	HDGV	Heavy-Duty Vehicles (8,501 + lbs)	0.555	0.006	3.193	0.413	0.054	0.023	628.430	0.045
	Diesel	LDDV	Light-Duty Vehicles (Passenger Cars)	0.152	0.003	0.252	0.019	0.054	0.027	282.680	0.008
	Diesel	LDDT	Light-Duty Trucks (0-8,500 lbs)	0.269	0.003	0.358	0.044	0.068	0.040	354.303	0.008
	Diesel	HDDV	Heavy-Duty Vehicles (8,501 + lbs)	6.161	0.015	0.970	0.248	0.174	0.105	1578.770	0.027
	NA	MC	Motorcycles	1.272	0.002	26.099	3.918	0.018	0.008	171.432	0.051

Table 5-36 EMFAC County-Specific On-Road Vehicle EFs – 2016 (cont.)

County	Fuel Type	Vehicle Type		Emission Factors (g/mi)							
				Criteria Pollutants and Ozone Precursors							
				NO_x	SO_x	CO	ROG	PM_{10}	$PM_{2.5}$	CO_2	NH_3[1]
Lake	Gasoline	LDGV	Light-Duty Vehicles (Passenger Cars)	0.240	0.003	2.306	0.261	0.047	0.020	330.982	0.029
	Gasoline	LDGT	Light-Duty Trucks (0-8,500 lbs)	0.527	0.004	3.919	0.593	0.048	0.021	433.814	0.030
	Gasoline	HDGV	Heavy-Duty Vehicles (8,501 + lbs)	1.178	0.007	6.344	1.017	0.059	0.026	659.389	0.045
	Diesel	LDDV	Light-Duty Vehicles (Passenger Cars)	0.425	0.003	0.451	0.039	0.066	0.038	303.755	0.008
	Diesel	LDDT	Light-Duty Trucks (0-8,500 lbs)	0.587	0.004	0.584	0.069	0.085	0.056	370.529	0.008
	Diesel	HDDV	Heavy-Duty Vehicles (8,501 + lbs)	6.889	0.010	1.422	0.368	0.242	0.168	1014.150	0.027
	NA	MC	Motorcycles	1.346	0.002	30.339	5.240	0.019	0.009	178.720	0.051
Lassen	Gasoline	LDGV	Light-Duty Vehicles (Passenger Cars)	0.205	0.004	1.990	0.202	0.047	0.020	348.287	0.029
	Gasoline	LDGT	Light-Duty Trucks (0-8,500 lbs)	0.478	0.005	3.625	0.510	0.048	0.021	464.720	0.030
	Gasoline	HDGV	Heavy-Duty Vehicles (8,501 + lbs)	1.111	0.007	5.983	0.914	0.058	0.025	690.270	0.045
	Diesel	LDDV	Light-Duty Vehicles (Passenger Cars)	0.317	0.003	0.434	0.034	0.061	0.033	316.831	0.008
	Diesel	LDDT	Light-Duty Trucks (0-8,500 lbs)	0.264	0.004	0.431	0.057	0.073	0.045	395.895	0.008
	Diesel	HDDV	Heavy-Duty Vehicles (8,501 + lbs)	6.193	0.008	1.321	0.306	0.210	0.135	856.554	0.027
	NA	MC	Motorcycles	1.380	0.003	31.740	5.107	0.018	0.008	192.042	0.051
Los Angeles	Gasoline	LDGV	Light-Duty Vehicles (Passenger Cars)	0.123	0.004	1.448	0.156	0.047	0.020	353.667	0.029
	Gasoline	LDGT	Light-Duty Trucks (0-8,500 lbs)	0.240	0.005	2.209	0.262	0.048	0.020	460.637	0.030
	Gasoline	HDGV	Heavy-Duty Vehicles (8,501 + lbs)	0.487	0.007	3.134	0.358	0.056	0.024	660.582	0.045
	Diesel	LDDV	Light-Duty Vehicles (Passenger Cars)	0.155	0.003	0.351	0.030	0.059	0.032	312.085	0.008
	Diesel	LDDT	Light-Duty Trucks (0-8,500 lbs)	0.169	0.004	0.272	0.034	0.058	0.031	395.245	0.008
	Diesel	HDDV	Heavy-Duty Vehicles (8,501 + lbs)	5.637	0.012	1.307	0.238	0.219	0.134	1346.572	0.027
	NA	MC	Motorcycles	1.227	0.002	23.976	4.393	0.018	0.008	197.726	0.051
Madera	Gasoline	LDGV	Light-Duty Vehicles (Passenger Cars)	0.121	0.003	1.397	0.150	0.047	0.020	337.719	0.029
	Gasoline	LDGT	Light-Duty Trucks (0-8,500 lbs)	0.289	0.005	2.587	0.379	0.048	0.020	447.618	0.030
	Gasoline	HDGV	Heavy-Duty Vehicles (8,501 + lbs)	0.567	0.007	3.636	0.462	0.055	0.024	660.953	0.045
	Diesel	LDDV	Light-Duty Vehicles (Passenger Cars)	0.217	0.003	0.350	0.028	0.058	0.030	299.416	0.008
	Diesel	LDDT	Light-Duty Trucks (0-8,500 lbs)	0.279	0.004	0.347	0.044	0.066	0.038	371.316	0.008
	Diesel	HDDV	Heavy-Duty Vehicles (8,501 + lbs)	6.172	0.014	1.040	0.259	0.183	0.112	1480.972	0.027
	NA	MC	Motorcycles	1.256	0.002	26.472	4.062	0.018	0.008	177.457	0.051
Marin	Gasoline	LDGV	Light-Duty Vehicles (Passenger Cars)	0.124	0.003	1.301	0.157	0.047	0.020	328.575	0.029
	Gasoline	LDGT	Light-Duty Trucks (0-8,500 lbs)	0.206	0.004	1.740	0.245	0.047	0.020	428.137	0.030
	Gasoline	HDGV	Heavy-Duty Vehicles (8,501 + lbs)	0.479	0.006	2.797	0.370	0.055	0.023	632.908	0.045
	Diesel	LDDV	Light-Duty Vehicles (Passenger Cars)	0.255	0.003	0.339	0.027	0.059	0.032	316.475	0.008
	Diesel	LDDT	Light-Duty Trucks (0-8,500 lbs)	0.122	0.004	0.205	0.023	0.055	0.028	393.329	0.008
	Diesel	HDDV	Heavy-Duty Vehicles (8,501 + lbs)	6.769	0.012	1.498	0.327	0.307	0.190	1267.059	0.027
	NA	MC	Motorcycles	1.307	0.002	27.686	4.151	0.018	0.008	183.538	0.051
Mariposa	Gasoline	LDGV	Light-Duty Vehicles (Passenger Cars)	0.205	0.003	2.035	0.216	0.047	0.020	336.698	0.029
	Gasoline	LDGT	Light-Duty Trucks (0-8,500 lbs)	0.633	0.005	4.761	0.679	0.049	0.022	452.807	0.030
	Gasoline	HDGV	Heavy-Duty Vehicles (8,501 + lbs)	1.110	0.007	6.049	0.935	0.058	0.025	672.044	0.045
	Diesel	LDDV	Light-Duty Vehicles (Passenger Cars)	0.475	0.003	0.514	0.046	0.069	0.041	313.525	0.008
	Diesel	LDDT	Light-Duty Trucks (0-8,500 lbs)	0.540	0.004	0.978	0.154	0.139	0.108	373.735	0.008
	Diesel	HDDV	Heavy-Duty Vehicles (8,501 + lbs)	6.520	0.008	1.301	0.313	0.211	0.138	826.526	0.027
	NA	MC	Motorcycles	1.351	0.002	30.741	5.272	0.018	0.009	184.753	0.051
Mendocino	Gasoline	LDGV	Light-Duty Vehicles (Passenger Cars)	0.204	0.003	1.920	0.199	0.047	0.020	316.018	0.029
	Gasoline	LDGT	Light-Duty Trucks (0-8,500 lbs)	0.568	0.004	4.064	0.557	0.048	0.021	421.918	0.030
	Gasoline	HDGV	Heavy-Duty Vehicles (8,501 + lbs)	1.041	0.006	5.397	0.788	0.057	0.025	636.937	0.045
	Diesel	LDDV	Light-Duty Vehicles (Passenger Cars)	0.727	0.003	0.579	0.051	0.074	0.046	307.570	0.008
	Diesel	LDDT	Light-Duty Trucks (0-8,500 lbs)	0.520	0.003	0.601	0.076	0.090	0.061	365.165	0.008
	Diesel	HDDV	Heavy-Duty Vehicles (8,501 + lbs)	6.529	0.012	1.204	0.311	0.207	0.138	1260.688	0.027
	NA	MC	Motorcycles	1.352	0.002	29.396	4.644	0.018	0.008	174.992	0.051
Merced	Gasoline	LDGV	Light-Duty Vehicles (Passenger Cars)	0.130	0.003	1.442	0.159	0.047	0.020	332.166	0.029
	Gasoline	LDGT	Light-Duty Trucks (0-8,500 lbs)	0.293	0.004	2.486	0.355	0.048	0.020	437.090	0.030
	Gasoline	HDGV	Heavy-Duty Vehicles (8,501 + lbs)	0.571	0.007	3.583	0.440	0.056	0.024	649.010	0.045
	Diesel	LDDV	Light-Duty Vehicles (Passenger Cars)	0.256	0.003	0.331	0.026	0.058	0.031	297.768	0.008
	Diesel	LDDT	Light-Duty Trucks (0-8,500 lbs)	0.261	0.004	0.350	0.042	0.067	0.039	373.322	0.008
	Diesel	HDDV	Heavy-Duty Vehicles (8,501 + lbs)	6.290	0.015	1.001	0.256	0.183	0.111	1577.690	0.027
	NA	MC	Motorcycles	1.260	0.002	26.584	3.769	0.018	0.008	174.120	0.051

Table 5-36 EMFAC County-Specific On-Road Vehicle EFs – 2016 (cont.)

County	Fuel Type	Vehicle Type		Emission Factors (g/mi)							
				Criteria Pollutants and Ozone Precursors							
				NO_x	SO_x	CO	ROG	PM_{10}	$PM_{2.5}$	CO_2	NH_3[1]
Modoc	Gasoline	LDGV	Light-Duty Vehicles (Passenger Cars)	0.226	0.004	2.217	0.215	0.048	0.021	387.330	0.029
	Gasoline	LDGT	Light-Duty Trucks (0-8,500 lbs)	0.541	0.005	4.088	0.531	0.049	0.022	515.443	0.030
	Gasoline	HDGV	Heavy-Duty Vehicles (8,501 + lbs)	1.265	0.008	6.932	1.047	0.059	0.026	746.264	0.045
	Diesel	LDDV	Light-Duty Vehicles (Passenger Cars)	0.305	0.003	0.571	0.046	0.064	0.036	352.277	0.008
	Diesel	LDDT	Light-Duty Trucks (0-8,500 lbs)	0.487	0.004	0.551	0.059	0.070	0.042	468.265	0.008
	Diesel	HDDV	Heavy-Duty Vehicles (8,501 + lbs)	6.264	0.009	1.281	0.307	0.204	0.132	912.261	0.027
	NA	MC	Motorcycles	1.395	0.003	33.138	5.463	0.018	0.009	214.279	0.051
Mono	Gasoline	LDGV	Light-Duty Vehicles (Passenger Cars)	0.179	0.003	1.684	0.162	0.047	0.020	324.987	0.029
	Gasoline	LDGT	Light-Duty Trucks (0-8,500 lbs)	0.426	0.004	3.081	0.402	0.047	0.020	433.991	0.030
	Gasoline	HDGV	Heavy-Duty Vehicles (8,501 + lbs)	0.956	0.007	5.063	0.702	0.058	0.025	650.759	0.045
	Diesel	LDDV	Light-Duty Vehicles (Passenger Cars)	0.320	0.003	0.410	0.034	0.062	0.035	307.419	0.008
	Diesel	LDDT	Light-Duty Trucks (0-8,500 lbs)	0.616	0.004	0.526	0.053	0.073	0.045	389.521	0.008
	Diesel	HDDV	Heavy-Duty Vehicles (8,501 + lbs)	5.835	0.013	1.055	0.261	0.184	0.114	1338.556	0.027
	NA	MC	Motorcycles	1.456	0.003	34.576	4.941	0.018	0.008	184.689	0.051
Monterey	Gasoline	LDGV	Light-Duty Vehicles (Passenger Cars)	0.179	0.004	1.792	0.188	0.047	0.020	347.779	0.029
	Gasoline	LDGT	Light-Duty Trucks (0-8,500 lbs)	0.416	0.005	3.002	0.380	0.048	0.021	462.953	0.030
	Gasoline	HDGV	Heavy-Duty Vehicles (8,501 + lbs)	0.709	0.007	3.931	0.465	0.057	0.024	679.755	0.045
	Diesel	LDDV	Light-Duty Vehicles (Passenger Cars)	0.275	0.003	0.447	0.038	0.063	0.035	320.229	0.008
	Diesel	LDDT	Light-Duty Trucks (0-8,500 lbs)	0.216	0.004	0.370	0.047	0.066	0.038	402.017	0.008
	Diesel	HDDV	Heavy-Duty Vehicles (8,501 + lbs)	6.225	0.012	1.246	0.301	0.234	0.149	1291.319	0.027
	NA	MC	Motorcycles	1.272	0.002	26.468	3.940	0.018	0.008	187.250	0.051
Napa	Gasoline	LDGV	Light-Duty Vehicles (Passenger Cars)	0.126	0.003	1.386	0.147	0.047	0.020	315.556	0.029
	Gasoline	LDGT	Light-Duty Trucks (0-8,500 lbs)	0.250	0.004	2.172	0.290	0.047	0.020	415.343	0.030
	Gasoline	HDGV	Heavy-Duty Vehicles (8,501 + lbs)	0.585	0.006	3.490	0.439	0.056	0.024	632.734	0.045
	Diesel	LDDV	Light-Duty Vehicles (Passenger Cars)	0.222	0.003	0.297	0.025	0.059	0.031	295.817	0.008
	Diesel	LDDT	Light-Duty Trucks (0-8,500 lbs)	0.119	0.004	0.180	0.021	0.054	0.027	369.292	0.008
	Diesel	HDDV	Heavy-Duty Vehicles (8,501 + lbs)	6.350	0.012	1.097	0.286	0.212	0.136	1309.977	0.027
	NA	MC	Motorcycles	1.284	0.002	26.428	3.991	0.018	0.008	173.556	0.051
Nevada	Gasoline	LDGV	Light-Duty Vehicles (Passenger Cars)	0.173	0.003	1.699	0.180	0.047	0.020	313.096	0.029
	Gasoline	LDGT	Light-Duty Trucks (0-8,500 lbs)	0.423	0.004	3.046	0.403	0.047	0.020	423.555	0.030
	Gasoline	HDGV	Heavy-Duty Vehicles (8,501 + lbs)	0.788	0.006	4.295	0.576	0.055	0.024	622.863	0.045
	Diesel	LDDV	Light-Duty Vehicles (Passenger Cars)	0.408	0.003	0.409	0.035	0.064	0.037	297.253	0.008
	Diesel	LDDT	Light-Duty Trucks (0-8,500 lbs)	0.595	0.004	0.497	0.052	0.074	0.046	376.587	0.008
	Diesel	HDDV	Heavy-Duty Vehicles (8,501 + lbs)	6.178	0.012	1.119	0.279	0.186	0.119	1267.685	0.027
	NA	MC	Motorcycles	1.390	0.002	31.091	5.002	0.018	0.009	173.526	0.051
Orange	Gasoline	LDGV	Light-Duty Vehicles (Passenger Cars)	0.102	0.003	1.204	0.136	0.047	0.020	330.036	0.029
	Gasoline	LDGT	Light-Duty Trucks (0-8,500 lbs)	0.178	0.004	1.687	0.208	0.047	0.020	429.796	0.030
	Gasoline	HDGV	Heavy-Duty Vehicles (8,501 + lbs)	0.436	0.006	2.788	0.328	0.055	0.023	629.010	0.045
	Diesel	LDDV	Light-Duty Vehicles (Passenger Cars)	0.118	0.003	0.264	0.021	0.055	0.027	295.668	0.008
	Diesel	LDDT	Light-Duty Trucks (0-8,500 lbs)	0.101	0.004	0.186	0.023	0.054	0.026	374.170	0.008
	Diesel	HDDV	Heavy-Duty Vehicles (8,501 + lbs)	4.896	0.011	1.068	0.194	0.219	0.135	1194.700	0.027
	NA	MC	Motorcycles	1.218	0.002	23.366	4.200	0.018	0.008	186.179	0.051
Placer	Gasoline	LDGV	Light-Duty Vehicles (Passenger Cars)	0.116	0.003	1.299	0.140	0.047	0.019	316.910	0.029
	Gasoline	LDGT	Light-Duty Trucks (0-8,500 lbs)	0.211	0.004	1.882	0.245	0.047	0.020	416.186	0.030
	Gasoline	HDGV	Heavy-Duty Vehicles (8,501 + lbs)	0.489	0.006	3.037	0.378	0.054	0.023	619.311	0.045
	Diesel	LDDV	Light-Duty Vehicles (Passenger Cars)	0.249	0.003	0.296	0.025	0.058	0.031	290.401	0.008
	Diesel	LDDT	Light-Duty Trucks (0-8,500 lbs)	0.214	0.003	0.245	0.029	0.059	0.031	361.114	0.008
	Diesel	HDDV	Heavy-Duty Vehicles (8,501 + lbs)	5.507	0.012	0.996	0.249	0.190	0.117	1293.130	0.027
	NA	MC	Motorcycles	1.325	0.002	28.091	4.405	0.018	0.008	174.267	0.051
Plumas	Gasoline	LDGV	Light-Duty Vehicles (Passenger Cars)	0.217	0.004	2.203	0.223	0.048	0.021	360.824	0.029
	Gasoline	LDGT	Light-Duty Trucks (0-8,500 lbs)	0.570	0.005	4.393	0.560	0.049	0.021	489.085	0.030
	Gasoline	HDGV	Heavy-Duty Vehicles (8,501 + lbs)	1.293	0.007	7.079	1.024	0.058	0.026	706.663	0.045
	Diesel	LDDV	Light-Duty Vehicles (Passenger Cars)	0.366	0.003	0.542	0.046	0.066	0.038	334.213	0.008
	Diesel	LDDT	Light-Duty Trucks (0-8,500 lbs)	0.229	0.004	0.413	0.052	0.066	0.038	422.562	0.008
	Diesel	HDDV	Heavy-Duty Vehicles (8,501 + lbs)	6.583	0.009	1.332	0.321	0.216	0.145	987.731	0.027
	NA	MC	Motorcycles	1.376	0.003	32.592	5.599	0.019	0.009	200.520	0.051

Table 5-36 EMFAC County-Specific On-Road Vehicle EFs – 2016 (cont.)

County	Fuel Type	Vehicle Type		Emission Factors (g/mi)							
				Criteria Pollutants and Ozone Precursors							
				NO_x	SO_x	CO	ROG	PM_{10}	$PM_{2.5}$	CO_2	NH_3[1]
Riverside	Gasoline	LDGV	Light-Duty Vehicles (Passenger Cars)	0.106	0.003	1.205	0.139	0.047	0.019	319.199	0.029
	Gasoline	LDGT	Light-Duty Trucks (0-8,500 lbs)	0.209	0.004	1.885	0.259	0.047	0.020	414.968	0.030
	Gasoline	HDGV	Heavy-Duty Vehicles (8,501 + lbs)	0.471	0.006	2.918	0.364	0.054	0.023	604.532	0.045
	Diesel	LDDV	Light-Duty Vehicles (Passenger Cars)	0.155	0.003	0.226	0.018	0.054	0.027	283.560	0.008
	Diesel	LDDT	Light-Duty Trucks (0-8,500 lbs)	0.305	0.004	0.410	0.049	0.074	0.045	375.993	0.008
	Diesel	HDDV	Heavy-Duty Vehicles (8,501 + lbs)	5.221	0.013	0.768	0.152	0.181	0.108	1335.871	0.027
	NA	MC	Motorcycles	1.237	0.002	24.830	4.152	0.018	0.008	174.635	0.051
Sacramento	Gasoline	LDGV	Light-Duty Vehicles (Passenger Cars)	0.127	0.003	1.472	0.163	0.047	0.020	327.768	0.029
	Gasoline	LDGT	Light-Duty Trucks (0-8,500 lbs)	0.235	0.004	2.148	0.286	0.047	0.020	428.596	0.030
	Gasoline	HDGV	Heavy-Duty Vehicles (8,501 + lbs)	0.548	0.007	3.402	0.421	0.056	0.024	648.669	0.045
	Diesel	LDDV	Light-Duty Vehicles (Passenger Cars)	0.216	0.003	0.307	0.027	0.059	0.031	292.093	0.008
	Diesel	LDDT	Light-Duty Trucks (0-8,500 lbs)	0.587	0.004	0.551	0.066	0.083	0.055	373.209	0.008
	Diesel	HDDV	Heavy-Duty Vehicles (8,501 + lbs)	6.272	0.012	1.378	0.283	0.221	0.137	1285.778	0.027
	NA	MC	Motorcycles	1.268	0.002	26.092	4.393	0.018	0.008	177.306	0.051
San Benito	Gasoline	LDGV	Light-Duty Vehicles (Passenger Cars)	0.140	0.003	1.378	0.135	0.047	0.020	308.271	0.029
	Gasoline	LDGT	Light-Duty Trucks (0-8,500 lbs)	0.312	0.004	2.321	0.322	0.047	0.020	406.405	0.030
	Gasoline	HDGV	Heavy-Duty Vehicles (8,501 + lbs)	0.621	0.006	3.450	0.439	0.054	0.023	611.611	0.045
	Diesel	LDDV	Light-Duty Vehicles (Passenger Cars)	0.344	0.003	0.349	0.028	0.059	0.032	293.520	0.008
	Diesel	LDDT	Light-Duty Trucks (0-8,500 lbs)	0.045	0.004	0.148	0.018	0.051	0.024	366.684	0.008
	Diesel	HDDV	Heavy-Duty Vehicles (8,501 + lbs)	6.271	0.015	1.054	0.276	0.186	0.118	1541.004	0.027
	NA	MC	Motorcycles	1.305	0.002	26.975	3.902	0.018	0.008	169.071	0.051
San Bernardino	Gasoline	LDGV	Light-Duty Vehicles (Passenger Cars)	0.121	0.003	1.311	0.142	0.047	0.019	325.615	0.029
	Gasoline	LDGT	Light-Duty Trucks (0-8,500 lbs)	0.260	0.004	2.187	0.290	0.047	0.020	425.050	0.030
	Gasoline	HDGV	Heavy-Duty Vehicles (8,501 + lbs)	0.526	0.006	3.141	0.382	0.054	0.023	619.255	0.045
	Diesel	LDDV	Light-Duty Vehicles (Passenger Cars)	0.147	0.003	0.242	0.019	0.054	0.027	288.537	0.008
	Diesel	LDDT	Light-Duty Trucks (0-8,500 lbs)	0.162	0.003	0.230	0.028	0.058	0.031	362.440	0.008
	Diesel	HDDV	Heavy-Duty Vehicles (8,501 + lbs)	5.291	0.013	0.877	0.169	0.183	0.109	1349.143	0.027
	NA	MC	Motorcycles	1.263	0.002	26.176	3.768	0.018	0.008	173.265	0.051
San Diego	Gasoline	LDGV	Light-Duty Vehicles (Passenger Cars)	0.134	0.003	1.354	0.147	0.047	0.020	337.124	0.029
	Gasoline	LDGT	Light-Duty Trucks (0-8,500 lbs)	0.213	0.004	1.850	0.254	0.047	0.020	444.052	0.030
	Gasoline	HDGV	Heavy-Duty Vehicles (8,501 + lbs)	0.452	0.007	2.727	0.343	0.055	0.023	651.442	0.045
	Diesel	LDDV	Light-Duty Vehicles (Passenger Cars)	0.163	0.003	0.289	0.023	0.056	0.029	315.374	0.008
	Diesel	LDDT	Light-Duty Trucks (0-8,500 lbs)	0.188	0.004	0.285	0.033	0.061	0.034	396.215	0.008
	Diesel	HDDV	Heavy-Duty Vehicles (8,501 + lbs)	5.889	0.012	1.336	0.280	0.221	0.136	1328.453	0.027
	NA	MC	Motorcycles	1.262	0.002	26.126	4.026	0.018	0.008	188.990	0.051
San Francisco	Gasoline	LDGV	Light-Duty Vehicles (Passenger Cars)	0.117	0.004	1.345	0.153	0.047	0.020	355.047	0.029
	Gasoline	LDGT	Light-Duty Trucks (0-8,500 lbs)	0.180	0.005	1.677	0.214	0.047	0.020	457.294	0.030
	Gasoline	HDGV	Heavy-Duty Vehicles (8,501 + lbs)	0.499	0.007	2.908	0.370	0.061	0.026	695.771	0.045
	Diesel	LDDV	Light-Duty Vehicles (Passenger Cars)	0.163	0.003	0.384	0.028	0.056	0.029	331.677	0.008
	Diesel	LDDT	Light-Duty Trucks (0-8,500 lbs)	0.179	0.004	0.298	0.035	0.058	0.030	413.640	0.008
	Diesel	HDDV	Heavy-Duty Vehicles (8,501 + lbs)	7.205	0.013	1.742	0.374	0.349	0.218	1442.002	0.027
	NA	MC	Motorcycles	1.284	0.003	26.873	4.656	0.018	0.008	200.187	0.051
San Joaquin	Gasoline	LDGV	Light-Duty Vehicles (Passenger Cars)	0.12	0.00	1.31	0.15	0.05	0.02	328.23	0.029
	Gasoline	LDGT	Light-Duty Trucks (0-8,500 lbs)	0.26	0.00	2.10	0.30	0.05	0.02	430.66	0.030
	Gasoline	HDGV	Heavy-Duty Vehicles (8,501 + lbs)	0.53	0.01	3.18	0.41	0.05	0.02	632.42	0.045
	Diesel	LDDV	Light-Duty Vehicles (Passenger Cars)	0.21	0.00	0.27	0.02	0.06	0.03	298.07	0.008
	Diesel	LDDT	Light-Duty Trucks (0-8,500 lbs)	0.25	0.00	0.29	0.03	0.06	0.03	370.86	0.008
	Diesel	HDDV	Heavy-Duty Vehicles (8,501 + lbs)	6.08	0.01	1.10	0.27	0.20	0.12	1421.36	0.027
	NA	MC	Motorcycles	1.31	0.00	28.53	4.17	0.02	0.01	178.09	0.051
San Luis Obispo	Gasoline	LDGV	Light-Duty Vehicles (Passenger Cars)	0.142	0.003	1.391	0.151	0.047	0.019	309.785	0.029
	Gasoline	LDGT	Light-Duty Trucks (0-8,500 lbs)	0.359	0.004	2.559	0.342	0.047	0.020	415.685	0.030
	Gasoline	HDGV	Heavy-Duty Vehicles (8,501 + lbs)	0.660	0.006	3.581	0.471	0.056	0.024	621.195	0.045
	Diesel	LDDV	Light-Duty Vehicles (Passenger Cars)	0.256	0.003	0.308	0.024	0.058	0.030	296.859	0.008
	Diesel	LDDT	Light-Duty Trucks (0-8,500 lbs)	0.232	0.003	0.331	0.041	0.067	0.039	366.218	0.008
	Diesel	HDDV	Heavy-Duty Vehicles (8,501 + lbs)	6.311	0.011	1.221	0.303	0.219	0.144	1114.095	0.027
	NA	MC	Motorcycles	1.340	0.002	28.043	4.575	0.018	0.008	174.267	0.051

Table 5-36 EMFAC County-Specific On-Road Vehicle EFs – 2016 (cont.)

County	Fuel Type	Vehicle Type		Emission Factors (g/mi)							
				Criteria Pollutants and Ozone Precursors							
				NO_x	SO_x	CO	ROG	PM_{10}	$PM_{2.5}$	CO_2	NH_3[1]
San Mateo	Gasoline	LDGV	Light-Duty Vehicles (Passenger Cars)	0.113	0.003	1.234	0.150	0.047	0.020	313.516	0.029
	Gasoline	LDGT	Light-Duty Trucks (0-8,500 lbs)	0.159	0.004	1.405	0.187	0.047	0.020	401.191	0.030
	Gasoline	HDGV	Heavy-Duty Vehicles (8,501 + lbs)	0.404	0.006	2.432	0.311	0.055	0.023	600.252	0.045
	Diesel	LDDV	Light-Duty Vehicles (Passenger Cars)	0.160	0.003	0.245	0.020	0.055	0.028	291.047	0.008
	Diesel	LDDT	Light-Duty Trucks (0-8,500 lbs)	0.081	0.003	0.139	0.017	0.051	0.024	361.344	0.008
	Diesel	HDDV	Heavy-Duty Vehicles (8,501 + lbs)	5.380	0.012	1.204	0.279	0.277	0.172	1234.244	0.027
	NA	MC	Motorcycles	1.241	0.002	23.470	3.494	0.018	0.008	178.416	0.051
Santa Barbara	Gasoline	LDGV	Light-Duty Vehicles (Passenger Cars)	0.157	0.003	1.516	0.171	0.047	0.020	300.835	0.029
	Gasoline	LDGT	Light-Duty Trucks (0-8,500 lbs)	0.379	0.004	2.632	0.367	0.047	0.020	403.091	0.030
	Gasoline	HDGV	Heavy-Duty Vehicles (8,501 + lbs)	0.671	0.006	3.619	0.467	0.061	0.026	613.768	0.045
	Diesel	LDDV	Light-Duty Vehicles (Passenger Cars)	0.229	0.003	0.272	0.022	0.057	0.029	288.046	0.008
	Diesel	LDDT	Light-Duty Trucks (0-8,500 lbs)	0.193	0.003	0.246	0.029	0.060	0.033	352.197	0.008
	Diesel	HDDV	Heavy-Duty Vehicles (8,501 + lbs)	6.350	0.012	1.281	0.301	0.260	0.166	1266.842	0.027
	NA	MC	Motorcycles	1.298	0.002	25.351	3.679	0.018	0.008	166.600	0.051
Santa Clara	Gasoline	LDGV	Light-Duty Vehicles (Passenger Cars)	0.118	0.003	1.319	0.149	0.047	0.020	317.461	0.029
	Gasoline	LDGT	Light-Duty Trucks (0-8,500 lbs)	0.218	0.004	1.915	0.251	0.047	0.020	417.579	0.030
	Gasoline	HDGV	Heavy-Duty Vehicles (8,501 + lbs)	0.497	0.006	3.041	0.379	0.055	0.023	612.905	0.045
	Diesel	LDDV	Light-Duty Vehicles (Passenger Cars)	0.163	0.003	0.247	0.019	0.055	0.027	291.580	0.008
	Diesel	LDDT	Light-Duty Trucks (0-8,500 lbs)	0.113	0.003	0.184	0.022	0.055	0.028	366.086	0.008
	Diesel	HDDV	Heavy-Duty Vehicles (8,501 + lbs)	6.144	0.013	1.117	0.284	0.231	0.146	1359.856	0.027
	NA	MC	Motorcycles	1.259	0.002	24.616	3.963	0.018	0.008	177.193	0.051
Santa Cruz	Gasoline	LDGV	Light-Duty Vehicles (Passenger Cars)	0.192	0.003	1.933	0.197	0.047	0.020	334.716	0.029
	Gasoline	LDGT	Light-Duty Trucks (0-8,500 lbs)	0.455	0.005	3.315	0.434	0.048	0.021	446.204	0.030
	Gasoline	HDGV	Heavy-Duty Vehicles (8,501 + lbs)	0.756	0.007	4.182	0.515	0.058	0.025	657.743	0.045
	Diesel	LDDV	Light-Duty Vehicles (Passenger Cars)	0.445	0.003	0.509	0.047	0.070	0.042	319.324	0.008
	Diesel	LDDT	Light-Duty Trucks (0-8,500 lbs)	0.272	0.004	0.346	0.043	0.065	0.037	378.781	0.008
	Diesel	HDDV	Heavy-Duty Vehicles (8,501 + lbs)	7.164	0.011	1.503	0.366	0.296	0.199	1200.315	0.027
	NA	MC	Motorcycles	1.319	0.002	28.046	4.746	0.018	0.009	184.225	0.051
Shasta	Gasoline	LDGV	Light-Duty Vehicles (Passenger Cars)	0.159	0.003	1.630	0.179	0.047	0.020	335.985	0.029
	Gasoline	LDGT	Light-Duty Trucks (0-8,500 lbs)	0.372	0.004	2.808	0.398	0.048	0.020	445.484	0.030
	Gasoline	HDGV	Heavy-Duty Vehicles (8,501 + lbs)	0.732	0.007	4.169	0.589	0.057	0.024	661.877	0.045
	Diesel	LDDV	Light-Duty Vehicles (Passenger Cars)	0.311	0.003	0.384	0.032	0.061	0.033	303.462	0.008
	Diesel	LDDT	Light-Duty Trucks (0-8,500 lbs)	0.323	0.004	0.418	0.053	0.073	0.045	376.345	0.008
	Diesel	HDDV	Heavy-Duty Vehicles (8,501 + lbs)	6.381	0.013	1.107	0.283	0.193	0.124	1348.904	0.027
	NA	MC	Motorcycles	1.329	0.002	29.414	5.032	0.018	0.008	182.705	0.051
Sierra	Gasoline	LDGV	Light-Duty Vehicles (Passenger Cars)	0.201	0.004	1.993	0.192	0.048	0.020	371.362	0.029
	Gasoline	LDGT	Light-Duty Trucks (0-8,500 lbs)	0.487	0.005	3.672	0.453	0.048	0.021	493.485	0.030
	Gasoline	HDGV	Heavy-Duty Vehicles (8,501 + lbs)	1.093	0.007	5.962	0.827	0.058	0.025	718.225	0.045
	Diesel	LDDV	Light-Duty Vehicles (Passenger Cars)	0.175	0.003	0.472	0.035	0.058	0.030	336.635	0.008
	Diesel	LDDT	Light-Duty Trucks (0-8,500 lbs)	0.303	0.004	0.604	0.090	0.091	0.062	416.081	0.008
	Diesel	HDDV	Heavy-Duty Vehicles (8,501 + lbs)	6.193	0.008	1.305	0.297	0.196	0.125	895.778	0.027
	NA	MC	Motorcycles	1.376	0.003	32.292	5.410	0.019	0.009	206.445	0.051
Siskiyou	Gasoline	LDGV	Light-Duty Vehicles (Passenger Cars)	0.204	0.004	1.968	0.195	0.047	0.020	359.628	0.029
	Gasoline	LDGT	Light-Duty Trucks (0-8,500 lbs)	0.500	0.005	3.700	0.499	0.048	0.021	477.956	0.030
	Gasoline	HDGV	Heavy-Duty Vehicles (8,501 + lbs)	1.065	0.007	5.827	0.844	0.058	0.025	698.864	0.045
	Diesel	LDDV	Light-Duty Vehicles (Passenger Cars)	0.348	0.003	0.506	0.041	0.064	0.036	332.483	0.008
	Diesel	LDDT	Light-Duty Trucks (0-8,500 lbs)	0.384	0.004	0.585	0.078	0.086	0.057	410.199	0.008
	Diesel	HDDV	Heavy-Duty Vehicles (8,501 + lbs)	6.151	0.014	1.089	0.274	0.185	0.116	1426.804	0.027
	NA	MC	Motorcycles	1.400	0.003	33.224	5.298	0.018	0.009	199.278	0.051
Solano	Gasoline	LDGV	Light-Duty Vehicles (Passenger Cars)	0.120	0.003	1.256	0.146	0.047	0.020	336.671	0.029
	Gasoline	LDGT	Light-Duty Trucks (0-8,500 lbs)	0.225	0.004	1.877	0.267	0.047	0.020	440.929	0.030
	Gasoline	HDGV	Heavy-Duty Vehicles (8,501 + lbs)	0.512	0.007	2.996	0.391	0.056	0.023	656.882	0.045
	Diesel	LDDV	Light-Duty Vehicles (Passenger Cars)	0.197	0.003	0.295	0.023	0.057	0.029	311.906	0.008
	Diesel	LDDT	Light-Duty Trucks (0-8,500 lbs)	0.237	0.004	0.291	0.031	0.061	0.033	386.481	0.008
	Diesel	HDDV	Heavy-Duty Vehicles (8,501 + lbs)	6.040	0.013	1.121	0.265	0.199	0.122	1400.296	0.027
	NA	MC	Motorcycles	1.307	0.002	29.262	4.039	0.018	0.008	185.025	0.051

Table 5-36 EMFAC County-Specific On-Road Vehicle EFs – 2016 (cont.)

County	Fuel Type	Vehicle Type		Emission Factors (g/mi)							
				Criteria Pollutants and Ozone Precursors							
				NO_x	SO_x	CO	ROG	PM_{10}	$PM_{2.5}$	CO_2	NH_3[1]
Sonoma	Gasoline	LDGV	Light-Duty Vehicles (Passenger Cars)	0.147	0.003	1.557	0.166	0.047	0.020	333.514	0.029
	Gasoline	LDGT	Light-Duty Trucks (0-8,500 lbs)	0.292	0.004	2.444	0.336	0.047	0.020	436.043	0.030
	Gasoline	HDGV	Heavy-Duty Vehicles (8,501 + lbs)	0.668	0.007	3.804	0.520	0.056	0.024	656.338	0.045
	Diesel	LDDV	Light-Duty Vehicles (Passenger Cars)	0.370	0.003	0.426	0.037	0.065	0.037	319.360	0.008
	Diesel	LDDT	Light-Duty Trucks (0-8,500 lbs)	0.163	0.004	0.290	0.038	0.064	0.037	382.058	0.008
	Diesel	HDDV	Heavy-Duty Vehicles (8,501 + lbs)	5.997	0.011	1.115	0.290	0.221	0.145	1192.487	0.027
	NA	MC	Motorcycles	1.310	0.002	28.689	4.558	0.018	0.008	184.200	0.051
Stanislaus	Gasoline	LDGV	Light-Duty Vehicles (Passenger Cars)	0.131	0.003	1.470	0.165	0.047	0.020	335.405	0.029
	Gasoline	LDGT	Light-Duty Trucks (0-8,500 lbs)	0.274	0.004	2.411	0.342	0.047	0.020	440.808	0.030
	Gasoline	HDGV	Heavy-Duty Vehicles (8,501 + lbs)	0.556	0.007	3.510	0.447	0.054	0.023	645.104	0.045
	Diesel	LDDV	Light-Duty Vehicles (Passenger Cars)	0.229	0.003	0.326	0.026	0.058	0.030	298.492	0.008
	Diesel	LDDT	Light-Duty Trucks (0-8,500 lbs)	0.189	0.004	0.282	0.034	0.061	0.033	374.442	0.008
	Diesel	HDDV	Heavy-Duty Vehicles (8,501 + lbs)	6.082	0.014	1.020	0.268	0.193	0.122	1424.177	0.027
	NA	MC	Motorcycles	1.297	0.002	28.330	4.659	0.018	0.008	180.532	0.051
Sutter	Gasoline	LDGV	Light-Duty Vehicles (Passenger Cars)	0.140	0.003	1.449	0.157	0.047	0.019	306.661	0.029
	Gasoline	LDGT	Light-Duty Trucks (0-8,500 lbs)	0.356	0.004	2.687	0.387	0.047	0.020	406.156	0.030
	Gasoline	HDGV	Heavy-Duty Vehicles (8,501 + lbs)	0.626	0.006	3.632	0.478	0.053	0.023	603.254	0.045
	Diesel	LDDV	Light-Duty Vehicles (Passenger Cars)	0.216	0.003	0.253	0.021	0.056	0.028	275.061	0.008
	Diesel	LDDT	Light-Duty Trucks (0-8,500 lbs)	0.166	0.003	0.243	0.033	0.063	0.035	332.656	0.008
	Diesel	HDDV	Heavy-Duty Vehicles (8,501 + lbs)	5.838	0.014	0.960	0.254	0.182	0.114	1421.322	0.027
	NA	MC	Motorcycles	1.310	0.002	26.313	4.953	0.018	0.008	171.654	0.051
Tehama	Gasoline	LDGV	Light-Duty Vehicles (Passenger Cars)	0.158	0.003	1.558	0.163	0.047	0.020	332.108	0.029
	Gasoline	LDGT	Light-Duty Trucks (0-8,500 lbs)	0.411	0.004	3.004	0.418	0.048	0.020	441.441	0.030
	Gasoline	HDGV	Heavy-Duty Vehicles (8,501 + lbs)	0.714	0.007	4.046	0.547	0.055	0.024	648.929	0.045
	Diesel	LDDV	Light-Duty Vehicles (Passenger Cars)	0.298	0.003	0.377	0.030	0.060	0.033	303.955	0.008
	Diesel	LDDT	Light-Duty Trucks (0-8,500 lbs)	0.391	0.004	0.523	0.066	0.082	0.053	376.407	0.008
	Diesel	HDDV	Heavy-Duty Vehicles (8,501 + lbs)	6.282	0.013	1.091	0.277	0.186	0.118	1409.002	0.027
	NA	MC	Motorcycles	1.345	0.002	29.684	4.769	0.018	0.008	182.929	0.051
Trinity	Gasoline	LDGV	Light-Duty Vehicles (Passenger Cars)	0.236	0.004	2.323	0.228	0.048	0.021	395.891	0.029
	Gasoline	LDGT	Light-Duty Trucks (0-8,500 lbs)	0.752	0.005	5.466	0.692	0.050	0.023	531.185	0.030
	Gasoline	HDGV	Heavy-Duty Vehicles (8,501 + lbs)	1.293	0.008	6.967	1.032	0.059	0.026	758.416	0.045
	Diesel	LDDV	Light-Duty Vehicles (Passenger Cars)	0.503	0.003	0.723	0.069	0.080	0.052	358.759	0.008
	Diesel	LDDT	Light-Duty Trucks (0-8,500 lbs)	0.551	0.004	1.179	0.192	0.159	0.127	439.057	0.008
	Diesel	HDDV	Heavy-Duty Vehicles (8,501 + lbs)	6.539	0.013	1.189	0.300	0.193	0.125	1338.485	0.027
	NA	MC	Motorcycles	1.378	0.003	35.114	6.092	0.019	0.009	215.539	0.051
Tulare	Gasoline	LDGV	Light-Duty Vehicles (Passenger Cars)	0.119	0.003	1.309	0.152	0.047	0.019	318.450	0.029
	Gasoline	LDGT	Light-Duty Trucks (0-8,500 lbs)	0.294	0.004	2.465	0.380	0.047	0.020	418.654	0.030
	Gasoline	HDGV	Heavy-Duty Vehicles (8,501 + lbs)	0.541	0.006	3.386	0.429	0.053	0.022	616.040	0.045
	Diesel	LDDV	Light-Duty Vehicles (Passenger Cars)	0.163	0.003	0.224	0.018	0.054	0.027	280.208	0.008
	Diesel	LDDT	Light-Duty Trucks (0-8,500 lbs)	0.342	0.003	0.427	0.052	0.075	0.047	351.297	0.008
	Diesel	HDDV	Heavy-Duty Vehicles (8,501 + lbs)	6.057	0.014	1.049	0.268	0.195	0.122	1428.123	0.027
	NA	MC	Motorcycles	1.295	0.002	27.147	4.375	0.018	0.008	172.068	0.051
Tuolumne	Gasoline	LDGV	Light-Duty Vehicles (Passenger Cars)	0.234	0.003	2.280	0.235	0.048	0.020	338.143	0.029
	Gasoline	LDGT	Light-Duty Trucks (0-8,500 lbs)	0.589	0.005	4.446	0.605	0.049	0.021	449.465	0.030
	Gasoline	HDGV	Heavy-Duty Vehicles (8,501 + lbs)	1.112	0.007	5.984	0.876	0.057	0.025	665.275	0.045
	Diesel	LDDV	Light-Duty Vehicles (Passenger Cars)	0.366	0.003	0.436	0.036	0.063	0.035	307.955	0.008
	Diesel	LDDT	Light-Duty Trucks (0-8,500 lbs)	0.550	0.004	0.633	0.084	0.093	0.064	382.052	0.008
	Diesel	HDDV	Heavy-Duty Vehicles (8,501 + lbs)	6.463	0.009	1.313	0.321	0.225	0.149	921.918	0.027
	NA	MC	Motorcycles	1.357	0.002	31.220	5.350	0.019	0.009	184.416	0.051
Ventura	Gasoline	LDGV	Light-Duty Vehicles (Passenger Cars)	0.114	0.003	1.291	0.143	0.047	0.020	322.107	0.029
	Gasoline	LDGT	Light-Duty Trucks (0-8,500 lbs)	0.213	0.004	1.937	0.256	0.047	0.020	420.368	0.030
	Gasoline	HDGV	Heavy-Duty Vehicles (8,501 + lbs)	0.493	0.006	3.034	0.379	0.055	0.023	616.321	0.045
	Diesel	LDDV	Light-Duty Vehicles (Passenger Cars)	0.175	0.003	0.298	0.025	0.057	0.030	297.413	0.008
	Diesel	LDDT	Light-Duty Trucks (0-8,500 lbs)	0.175	0.004	0.245	0.030	0.059	0.031	370.095	0.008
	Diesel	HDDV	Heavy-Duty Vehicles (8,501 + lbs)	5.434	0.011	0.999	0.197	0.202	0.127	1137.352	0.027
	NA	MC	Motorcycles	1.293	0.002	26.377	4.922	0.018	0.008	186.559	0.051

Table 5-36 EMFAC County-Specific On-Road Vehicle EFs – 2016 (cont.)

County	Fuel Type	Vehicle Type		Emission Factors (g/mi)							
				Criteria Pollutants and Ozone Precursors							
				NO_x	SO_x	CO	ROG	PM_{10}	$PM_{2.5}$	CO_2	NH_3[1]
Yolo	Gasoline	LDGV	Light-Duty Vehicles (Passenger Cars)	0.127	0.003	1.375	0.158	0.047	0.020	327.554	0.029
	Gasoline	LDGT	Light-Duty Trucks (0-8,500 lbs)	0.212	0.004	1.834	0.259	0.047	0.020	421.557	0.030
	Gasoline	HDGV	Heavy-Duty Vehicles (8,501 + lbs)	0.501	0.006	2.979	0.384	0.055	0.023	631.674	0.045
	Diesel	LDDV	Light-Duty Vehicles (Passenger Cars)	0.316	0.003	0.345	0.028	0.061	0.033	302.307	0.008
	Diesel	LDDT	Light-Duty Trucks (0-8,500 lbs)	0.254	0.004	0.279	0.030	0.061	0.033	370.106	0.008
	Diesel	HDDV	Heavy-Duty Vehicles (8,501 + lbs)	5.220	0.012	1.056	0.248	0.206	0.127	1305.258	0.027
	NA	MC	Motorcycles	1.300	0.002	28.013	4.253	0.018	0.008	176.127	0.051
Yuba	Gasoline	LDGV	Light-Duty Vehicles (Passenger Cars)	0.145	0.003	1.486	0.153	0.047	0.020	316.985	0.029
	Gasoline	LDGT	Light-Duty Trucks (0-8,500 lbs)	0.431	0.004	3.165	0.432	0.048	0.020	425.299	0.030
	Gasoline	HDGV	Heavy-Duty Vehicles (8,501 + lbs)	0.752	0.006	4.280	0.565	0.055	0.024	621.959	0.045
	Diesel	LDDV	Light-Duty Vehicles (Passenger Cars)	0.228	0.003	0.288	0.024	0.057	0.030	288.959	0.008
	Diesel	LDDT	Light-Duty Trucks (0-8,500 lbs)	0.236	0.003	0.261	0.032	0.061	0.033	344.741	0.008
	Diesel	HDDV	Heavy-Duty Vehicles (8,501 + lbs)	6.456	0.010	1.300	0.314	0.234	0.151	1036.241	0.027
	NA	MC	Motorcycles	1.301	0.002	27.287	4.370	0.018	0.008	171.916	0.051

Table 5-37 EMFAC County-Specific On-Road Vehicle EFs – 2017

County	Fuel Type	Vehicle Type		Emission Factors (g/mi)							
				Criteria Pollutants and Ozone Precursors							
				NO_x	SO_x	CO	ROG	PM_{10}	$PM_{2.5}$	CO_2	NH_3[1]
Alameda	Gasoline	LDGV	Light-Duty Vehicles (Passenger Cars)	0.117	0.003	1.286	0.145	0.047	0.020	319.833	0.027
	Gasoline	LDGT	Light-Duty Trucks (0-8,500 lbs)	0.190	0.004	1.674	0.222	0.047	0.020	415.560	0.028
	Gasoline	HDGV	Heavy-Duty Vehicles (8,501 + lbs)	0.473	0.006	2.823	0.356	0.055	0.023	621.532	0.045
	Diesel	LDDV	Light-Duty Vehicles (Passenger Cars)	0.209	0.003	0.305	0.024	0.057	0.030	298.081	0.008
	Diesel	LDDT	Light-Duty Trucks (0-8,500 lbs)	0.129	0.004	0.206	0.024	0.055	0.028	368.300	0.008
	Diesel	HDDV	Heavy-Duty Vehicles (8,501 + lbs)	5.685	0.014	0.979	0.238	0.203	0.120	1460.088	0.027
	NA	MC	Motorcycles	1.268	0.002	25.510	3.954	0.018	0.008	181.884	0.052
Alpine	Gasoline	LDGV	Light-Duty Vehicles (Passenger Cars)	0.157	0.003	1.564	0.145	0.047	0.020	296.021	0.027
	Gasoline	LDGT	Light-Duty Trucks (0-8,500 lbs)	0.354	0.004	2.718	0.342	0.047	0.020	392.008	0.028
	Gasoline	HDGV	Heavy-Duty Vehicles (8,501 + lbs)	0.871	0.006	4.582	0.634	0.057	0.024	609.356	0.045
	Diesel	LDDV	Light-Duty Vehicles (Passenger Cars)	0.211	0.003	0.298	0.023	0.056	0.028	276.006	0.008
	Diesel	LDDT	Light-Duty Trucks (0-8,500 lbs)	0.159	0.003	0.230	0.028	0.057	0.030	342.318	0.008
	Diesel	HDDV	Heavy-Duty Vehicles (8,501 + lbs)	5.294	0.014	0.905	0.211	0.165	0.093	1416.561	0.027
	NA	MC	Motorcycles	1.389	0.002	29.225	4.394	0.018	0.008	172.571	0.052
Amador	Gasoline	LDGV	Light-Duty Vehicles (Passenger Cars)	0.171	0.003	1.658	0.180	0.047	0.019	286.056	0.027
	Gasoline	LDGT	Light-Duty Trucks (0-8,500 lbs)	0.430	0.004	3.275	0.514	0.047	0.020	381.340	0.028
	Gasoline	HDGV	Heavy-Duty Vehicles (8,501 + lbs)	0.957	0.006	5.120	0.831	0.057	0.025	599.784	0.045
	Diesel	LDDV	Light-Duty Vehicles (Passenger Cars)	0.334	0.003	0.287	0.023	0.058	0.031	264.102	0.008
	Diesel	LDDT	Light-Duty Trucks (0-8,500 lbs)	0.205	0.003	0.316	0.043	0.070	0.042	316.208	0.008
	Diesel	HDDV	Heavy-Duty Vehicles (8,501 + lbs)	6.122	0.009	1.162	0.285	0.204	0.132	972.997	0.027
	NA	MC	Motorcycles	1.311	0.002	26.496	4.255	0.018	0.008	158.418	0.052
Butte	Gasoline	LDGV	Light-Duty Vehicles (Passenger Cars)	0.153	0.003	1.585	0.171	0.047	0.020	322.071	0.027
	Gasoline	LDGT	Light-Duty Trucks (0-8,500 lbs)	0.412	0.004	3.104	0.427	0.048	0.021	431.835	0.028
	Gasoline	HDGV	Heavy-Duty Vehicles (8,501 + lbs)	0.701	0.006	4.003	0.552	0.056	0.024	637.111	0.045
	Diesel	LDDV	Light-Duty Vehicles (Passenger Cars)	0.272	0.003	0.330	0.027	0.059	0.032	295.590	0.008
	Diesel	LDDT	Light-Duty Trucks (0-8,500 lbs)	0.337	0.004	0.360	0.043	0.068	0.040	367.861	0.008
	Diesel	HDDV	Heavy-Duty Vehicles (8,501 + lbs)	5.758	0.013	1.014	0.239	0.176	0.105	1343.806	0.027
	NA	MC	Motorcycles	1.289	0.002	27.245	4.777	0.018	0.008	177.080	0.052
Calaveras	Gasoline	LDGV	Light-Duty Vehicles (Passenger Cars)	0.173	0.003	1.750	0.176	0.047	0.020	315.390	0.027
	Gasoline	LDGT	Light-Duty Trucks (0-8,500 lbs)	0.664	0.005	5.240	0.827	0.049	0.021	448.611	0.028
	Gasoline	HDGV	Heavy-Duty Vehicles (8,501 + lbs)	1.048	0.007	5.738	0.918	0.058	0.025	645.572	0.045
	Diesel	LDDV	Light-Duty Vehicles (Passenger Cars)	0.330	0.003	0.394	0.032	0.061	0.033	289.732	0.008
	Diesel	LDDT	Light-Duty Trucks (0-8,500 lbs)	0.216	0.003	0.434	0.064	0.080	0.051	355.703	0.008
	Diesel	HDDV	Heavy-Duty Vehicles (8,501 + lbs)	6.092	0.010	1.139	0.277	0.195	0.125	1040.930	0.027
	NA	MC	Motorcycles	1.312	0.002	27.906	5.069	0.018	0.009	178.001	0.052
Colusa	Gasoline	LDGV	Light-Duty Vehicles (Passenger Cars)	0.124	0.003	1.235	0.140	0.047	0.020	312.578	0.027
	Gasoline	LDGT	Light-Duty Trucks (0-8,500 lbs)	0.272	0.004	2.066	0.295	0.047	0.020	411.311	0.028
	Gasoline	HDGV	Heavy-Duty Vehicles (8,501 + lbs)	0.550	0.006	3.100	0.414	0.054	0.023	619.627	0.045
	Diesel	LDDV	Light-Duty Vehicles (Passenger Cars)	0.196	0.003	0.281	0.022	0.056	0.029	284.193	0.008
	Diesel	LDDT	Light-Duty Trucks (0-8,500 lbs)	0.205	0.003	0.313	0.039	0.065	0.038	354.490	0.008
	Diesel	HDDV	Heavy-Duty Vehicles (8,501 + lbs)	5.422	0.013	0.932	0.226	0.167	0.098	1360.608	0.027
	NA	MC	Motorcycles	1.282	0.002	25.604	4.140	0.018	0.008	176.676	0.052
Contra Costa	Gasoline	LDGV	Light-Duty Vehicles (Passenger Cars)	0.109	0.003	1.204	0.136	0.047	0.020	316.465	0.027
	Gasoline	LDGT	Light-Duty Trucks (0-8,500 lbs)	0.183	0.004	1.637	0.218	0.047	0.020	413.902	0.028
	Gasoline	HDGV	Heavy-Duty Vehicles (8,501 + lbs)	0.437	0.006	2.697	0.338	0.054	0.023	613.472	0.045
	Diesel	LDDV	Light-Duty Vehicles (Passenger Cars)	0.158	0.003	0.262	0.021	0.056	0.028	293.043	0.008
	Diesel	LDDT	Light-Duty Trucks (0-8,500 lbs)	0.123	0.003	0.189	0.022	0.055	0.027	366.533	0.008
	Diesel	HDDV	Heavy-Duty Vehicles (8,501 + lbs)	5.596	0.012	0.932	0.230	0.219	0.125	1318.154	0.027
	NA	MC	Motorcycles	1.271	0.002	25.769	4.021	0.018	0.008	180.654	0.052
Del Norte	Gasoline	LDGV	Light-Duty Vehicles (Passenger Cars)	0.194	0.003	1.794	0.189	0.047	0.020	332.528	0.027
	Gasoline	LDGT	Light-Duty Trucks (0-8,500 lbs)	0.616	0.005	4.129	0.584	0.049	0.021	448.964	0.028
	Gasoline	HDGV	Heavy-Duty Vehicles (8,501 + lbs)	0.967	0.007	5.002	0.754	0.056	0.024	665.152	0.045
	Diesel	LDDV	Light-Duty Vehicles (Passenger Cars)	0.284	0.003	0.417	0.032	0.060	0.033	314.730	0.008
	Diesel	LDDT	Light-Duty Trucks (0-8,500 lbs)	0.622	0.004	1.174	0.170	0.150	0.119	391.758	0.008
	Diesel	HDDV	Heavy-Duty Vehicles (8,501 + lbs)	6.058	0.008	1.235	0.286	0.196	0.125	847.938	0.027
	NA	MC	Motorcycles	1.366	0.002	30.472	4.969	0.018	0.009	189.497	0.052

Table 5-37 EMFAC County-Specific On-Road Vehicle EFs – 2017 (cont.)

County	Fuel Type	Vehicle Type		Emission Factors (g/mi)							
				Criteria Pollutants and Ozone Precursors							
				NO_x	SO_x	CO	ROG	PM_{10}	$PM_{2.5}$	CO_2	NH_3[1]
El Dorado	Gasoline	LDGV	Light-Duty Vehicles (Passenger Cars)	0.104	0.003	1.188	0.122	0.047	0.020	318.453	0.027
	Gasoline	LDGT	Light-Duty Trucks (0-8,500 lbs)	0.241	0.004	2.207	0.315	0.047	0.020	427.930	0.028
	Gasoline	HDGV	Heavy-Duty Vehicles (8,501 + lbs)	0.551	0.006	3.509	0.501	0.054	0.023	629.313	0.045
	Diesel	LDDV	Light-Duty Vehicles (Passenger Cars)	0.219	0.003	0.303	0.024	0.057	0.029	293.437	0.008
	Diesel	LDDT	Light-Duty Trucks (0-8,500 lbs)	0.210	0.004	0.265	0.032	0.060	0.032	371.540	0.008
	Diesel	HDDV	Heavy-Duty Vehicles (8,501 + lbs)	5.497	0.009	1.061	0.250	0.188	0.116	933.427	0.027
	NA	MC	Motorcycles	1.353	0.002	29.469	5.311	0.018	0.009	185.570	0.052
Fresno	Gasoline	LDGV	Light-Duty Vehicles (Passenger Cars)	0.10	0.00	1.11	0.13	0.05	0.02	311.40	0.027
	Gasoline	LDGT	Light-Duty Trucks (0-8,500 lbs)	0.22	0.00	1.90	0.30	0.05	0.02	411.91	0.028
	Gasoline	HDGV	Heavy-Duty Vehicles (8,501 + lbs)	0.47	0.01	2.93	0.40	0.05	0.02	614.63	0.045
	Diesel	LDDV	Light-Duty Vehicles (Passenger Cars)	0.12	0.00	0.19	0.01	0.05	0.02	275.06	0.008
	Diesel	LDDT	Light-Duty Trucks (0-8,500 lbs)	0.14	0.00	0.21	0.03	0.06	0.03	354.07	0.008
	Diesel	HDDV	Heavy-Duty Vehicles (8,501 + lbs)	5.54	0.01	0.88	0.22	0.17	0.10	1540.70	0.027
	NA	MC	Motorcycles	1.28	0.00	26.81	4.03	0.02	0.01	171.98	0.052
Glenn	Gasoline	LDGV	Light-Duty Vehicles (Passenger Cars)	0.131	0.003	1.356	0.147	0.047	0.020	324.137	0.027
	Gasoline	LDGT	Light-Duty Trucks (0-8,500 lbs)	0.316	0.004	2.450	0.355	0.047	0.020	429.165	0.028
	Gasoline	HDGV	Heavy-Duty Vehicles (8,501 + lbs)	0.604	0.006	3.523	0.482	0.055	0.023	641.634	0.045
	Diesel	LDDV	Light-Duty Vehicles (Passenger Cars)	0.178	0.003	0.313	0.024	0.056	0.028	293.925	0.008
	Diesel	LDDT	Light-Duty Trucks (0-8,500 lbs)	0.234	0.003	0.404	0.054	0.074	0.046	362.040	0.008
	Diesel	HDDV	Heavy-Duty Vehicles (8,501 + lbs)	5.583	0.013	0.974	0.236	0.171	0.103	1318.864	0.027
	NA	MC	Motorcycles	1.281	0.002	26.473	4.531	0.018	0.008	182.018	0.052
Humboldt	Gasoline	LDGV	Light-Duty Vehicles (Passenger Cars)	0.203	0.003	1.867	0.195	0.047	0.020	312.248	0.027
	Gasoline	LDGT	Light-Duty Trucks (0-8,500 lbs)	0.530	0.004	3.696	0.515	0.048	0.021	416.921	0.028
	Gasoline	HDGV	Heavy-Duty Vehicles (8,501 + lbs)	0.978	0.006	4.991	0.763	0.056	0.024	622.885	0.045
	Diesel	LDDV	Light-Duty Vehicles (Passenger Cars)	0.598	0.003	0.529	0.046	0.071	0.043	302.648	0.008
	Diesel	LDDT	Light-Duty Trucks (0-8,500 lbs)	0.253	0.003	0.462	0.062	0.081	0.052	363.647	0.008
	Diesel	HDDV	Heavy-Duty Vehicles (8,501 + lbs)	6.357	0.011	1.129	0.275	0.193	0.121	1153.909	0.027
	NA	MC	Motorcycles	1.373	0.002	29.722	4.673	0.018	0.008	177.059	0.052
Imperial	Gasoline	LDGV	Light-Duty Vehicles (Passenger Cars)	0.348	0.003	3.102	0.259	0.046	0.019	307.830	0.027
	Gasoline	LDGT	Light-Duty Trucks (0-8,500 lbs)	0.312	0.004	2.464	0.447	0.047	0.020	407.941	0.028
	Gasoline	HDGV	Heavy-Duty Vehicles (8,501 + lbs)	0.663	0.006	3.719	0.547	0.054	0.023	600.135	0.045
	Diesel	LDDV	Light-Duty Vehicles (Passenger Cars)	0.130	0.003	0.190	0.015	0.053	0.026	262.960	0.008
	Diesel	LDDT	Light-Duty Trucks (0-8,500 lbs)	0.201	0.003	0.202	0.021	0.056	0.028	339.255	0.008
	Diesel	HDDV	Heavy-Duty Vehicles (8,501 + lbs)	4.532	0.013	0.501	0.108	0.149	0.081	1405.283	0.027
	NA	MC	Motorcycles	1.198	0.002	23.049	3.849	0.018	0.008	166.560	0.052
Inyo	Gasoline	LDGV	Light-Duty Vehicles (Passenger Cars)	0.147	0.003	1.443	0.168	0.047	0.020	327.871	0.027
	Gasoline	LDGT	Light-Duty Trucks (0-8,500 lbs)	0.346	0.004	2.613	0.414	0.047	0.020	435.218	0.028
	Gasoline	HDGV	Heavy-Duty Vehicles (8,501 + lbs)	0.842	0.007	4.465	0.726	0.058	0.025	661.992	0.045
	Diesel	LDDV	Light-Duty Vehicles (Passenger Cars)	0.205	0.003	0.327	0.025	0.057	0.029	294.668	0.008
	Diesel	LDDT	Light-Duty Trucks (0-8,500 lbs)	0.171	0.004	0.291	0.036	0.061	0.034	366.965	0.008
	Diesel	HDDV	Heavy-Duty Vehicles (8,501 + lbs)	5.413	0.012	0.999	0.230	0.184	0.106	1298.629	0.027
	NA	MC	Motorcycles	1.318	0.002	27.971	4.664	0.018	0.008	184.713	0.052
Kern	Gasoline	LDGV	Light-Duty Vehicles (Passenger Cars)	0.099	0.003	1.054	0.127	0.047	0.020	336.685	0.027
	Gasoline	LDGT	Light-Duty Trucks (0-8,500 lbs)	0.216	0.004	1.802	0.281	0.047	0.020	444.211	0.028
	Gasoline	HDGV	Heavy-Duty Vehicles (8,501 + lbs)	0.475	0.007	2.863	0.394	0.055	0.023	668.071	0.045
	Diesel	LDDV	Light-Duty Vehicles (Passenger Cars)	0.120	0.003	0.240	0.017	0.053	0.025	302.742	0.008
	Diesel	LDDT	Light-Duty Trucks (0-8,500 lbs)	0.120	0.004	0.208	0.023	0.055	0.027	387.115	0.008
	Diesel	HDDV	Heavy-Duty Vehicles (8,501 + lbs)	5.347	0.015	0.832	0.200	0.158	0.088	1535.142	0.027
	NA	MC	Motorcycles	1.289	0.002	28.055	4.099	0.018	0.008	185.396	0.052
Kings	Gasoline	LDGV	Light-Duty Vehicles (Passenger Cars)	0.111	0.003	1.131	0.128	0.047	0.019	311.280	0.027
	Gasoline	LDGT	Light-Duty Trucks (0-8,500 lbs)	0.288	0.004	2.241	0.331	0.047	0.020	412.656	0.028
	Gasoline	HDGV	Heavy-Duty Vehicles (8,501 + lbs)	0.520	0.006	3.016	0.405	0.054	0.023	620.948	0.045
	Diesel	LDDV	Light-Duty Vehicles (Passenger Cars)	0.118	0.003	0.232	0.017	0.053	0.025	274.111	0.008
	Diesel	LDDT	Light-Duty Trucks (0-8,500 lbs)	0.215	0.003	0.304	0.037	0.064	0.036	347.635	0.008
	Diesel	HDDV	Heavy-Duty Vehicles (8,501 + lbs)	5.536	0.015	0.831	0.201	0.151	0.083	1570.599	0.027
	NA	MC	Motorcycles	1.265	0.002	25.453	3.905	0.018	0.008	172.334	0.052

Table 5-37 EMFAC County-Specific On-Road Vehicle EFs – 2017 (cont.)

County	Fuel Type	Vehicle Type		Emission Factors (g/mi)							
				Criteria Pollutants and Ozone Precursors							
				NO_x	SO_x	CO	ROG	PM_{10}	$PM_{2.5}$	CO_2	NH_3[1]
Lake	Gasoline	LDGV	Light-Duty Vehicles (Passenger Cars)	0.210	0.003	2.037	0.231	0.047	0.020	323.332	0.027
	Gasoline	LDGT	Light-Duty Trucks (0-8,500 lbs)	0.471	0.004	3.530	0.550	0.048	0.021	425.758	0.028
	Gasoline	HDGV	Heavy-Duty Vehicles (8,501 + lbs)	1.121	0.007	6.023	1.001	0.059	0.025	651.658	0.045
	Diesel	LDDV	Light-Duty Vehicles (Passenger Cars)	0.356	0.003	0.411	0.034	0.063	0.035	295.980	0.008
	Diesel	LDDT	Light-Duty Trucks (0-8,500 lbs)	0.466	0.003	0.481	0.057	0.076	0.048	361.987	0.008
	Diesel	HDDV	Heavy-Duty Vehicles (8,501 + lbs)	6.428	0.010	1.265	0.319	0.218	0.145	1035.219	0.027
	NA	MC	Motorcycles	1.343	0.002	29.896	5.258	0.019	0.009	179.536	0.052
Lassen	Gasoline	LDGV	Light-Duty Vehicles (Passenger Cars)	0.178	0.003	1.742	0.178	0.047	0.020	338.994	0.027
	Gasoline	LDGT	Light-Duty Trucks (0-8,500 lbs)	0.427	0.005	3.272	0.475	0.048	0.021	455.595	0.028
	Gasoline	HDGV	Heavy-Duty Vehicles (8,501 + lbs)	1.060	0.007	5.699	0.909	0.058	0.025	682.527	0.045
	Diesel	LDDV	Light-Duty Vehicles (Passenger Cars)	0.258	0.003	0.406	0.031	0.059	0.031	307.708	0.008
	Diesel	LDDT	Light-Duty Trucks (0-8,500 lbs)	0.217	0.004	0.385	0.050	0.068	0.040	388.691	0.008
	Diesel	HDDV	Heavy-Duty Vehicles (8,501 + lbs)	5.937	0.008	1.262	0.286	0.201	0.126	867.266	0.027
	NA	MC	Motorcycles	1.378	0.003	31.154	5.103	0.018	0.008	193.042	0.052
Los Angeles	Gasoline	LDGV	Light-Duty Vehicles (Passenger Cars)	0.109	0.003	1.307	0.142	0.047	0.020	344.484	0.027
	Gasoline	LDGT	Light-Duty Trucks (0-8,500 lbs)	0.208	0.005	1.964	0.236	0.048	0.020	449.497	0.028
	Gasoline	HDGV	Heavy-Duty Vehicles (8,501 + lbs)	0.443	0.007	2.891	0.338	0.055	0.024	649.384	0.045
	Diesel	LDDV	Light-Duty Vehicles (Passenger Cars)	0.128	0.003	0.333	0.027	0.057	0.029	302.235	0.008
	Diesel	LDDT	Light-Duty Trucks (0-8,500 lbs)	0.143	0.004	0.256	0.031	0.057	0.029	388.093	0.008
	Diesel	HDDV	Heavy-Duty Vehicles (8,501 + lbs)	4.957	0.012	1.156	0.198	0.197	0.113	1325.019	0.027
	NA	MC	Motorcycles	1.224	0.002	23.336	4.329	0.018	0.008	198.623	0.052
Madera	Gasoline	LDGV	Light-Duty Vehicles (Passenger Cars)	0.105	0.003	1.235	0.132	0.047	0.020	328.616	0.027
	Gasoline	LDGT	Light-Duty Trucks (0-8,500 lbs)	0.252	0.004	2.292	0.341	0.048	0.020	437.063	0.028
	Gasoline	HDGV	Heavy-Duty Vehicles (8,501 + lbs)	0.528	0.007	3.416	0.447	0.055	0.024	652.799	0.045
	Diesel	LDDV	Light-Duty Vehicles (Passenger Cars)	0.173	0.003	0.328	0.025	0.056	0.028	290.534	0.008
	Diesel	LDDT	Light-Duty Trucks (0-8,500 lbs)	0.223	0.003	0.307	0.038	0.062	0.034	364.204	0.008
	Diesel	HDDV	Heavy-Duty Vehicles (8,501 + lbs)	5.571	0.014	0.909	0.215	0.162	0.091	1477.322	0.027
	NA	MC	Motorcycles	1.251	0.002	25.854	4.031	0.018	0.008	178.377	0.052
Marin	Gasoline	LDGV	Light-Duty Vehicles (Passenger Cars)	0.109	0.003	1.163	0.142	0.047	0.020	319.892	0.027
	Gasoline	LDGT	Light-Duty Trucks (0-8,500 lbs)	0.180	0.004	1.559	0.225	0.047	0.020	418.047	0.028
	Gasoline	HDGV	Heavy-Duty Vehicles (8,501 + lbs)	0.438	0.006	2.584	0.354	0.055	0.023	620.865	0.045
	Diesel	LDDV	Light-Duty Vehicles (Passenger Cars)	0.217	0.003	0.315	0.024	0.058	0.030	308.835	0.008
	Diesel	LDDT	Light-Duty Trucks (0-8,500 lbs)	0.109	0.004	0.196	0.022	0.054	0.027	387.832	0.008
	Diesel	HDDV	Heavy-Duty Vehicles (8,501 + lbs)	6.129	0.012	1.369	0.290	0.283	0.170	1250.032	0.027
	NA	MC	Motorcycles	1.299	0.002	26.794	4.094	0.018	0.008	184.570	0.052
Mariposa	Gasoline	LDGV	Light-Duty Vehicles (Passenger Cars)	0.177	0.003	1.776	0.189	0.047	0.020	327.606	0.027
	Gasoline	LDGT	Light-Duty Trucks (0-8,500 lbs)	0.576	0.005	4.350	0.636	0.049	0.021	444.690	0.028
	Gasoline	HDGV	Heavy-Duty Vehicles (8,501 + lbs)	1.056	0.007	5.752	0.921	0.058	0.025	664.559	0.045
	Diesel	LDDV	Light-Duty Vehicles (Passenger Cars)	0.403	0.003	0.478	0.041	0.065	0.038	305.746	0.008
	Diesel	LDDT	Light-Duty Trucks (0-8,500 lbs)	0.436	0.004	0.813	0.127	0.121	0.090	366.704	0.008
	Diesel	HDDV	Heavy-Duty Vehicles (8,501 + lbs)	6.281	0.008	1.225	0.290	0.200	0.126	836.479	0.027
	NA	MC	Motorcycles	1.348	0.002	30.278	5.264	0.018	0.009	185.559	0.052
Mendocino	Gasoline	LDGV	Light-Duty Vehicles (Passenger Cars)	0.177	0.003	1.683	0.176	0.047	0.020	308.262	0.027
	Gasoline	LDGT	Light-Duty Trucks (0-8,500 lbs)	0.516	0.004	3.711	0.522	0.048	0.021	415.481	0.028
	Gasoline	HDGV	Heavy-Duty Vehicles (8,501 + lbs)	0.993	0.006	5.147	0.780	0.057	0.024	629.402	0.045
	Diesel	LDDV	Light-Duty Vehicles (Passenger Cars)	0.636	0.003	0.529	0.045	0.071	0.043	301.083	0.008
	Diesel	LDDT	Light-Duty Trucks (0-8,500 lbs)	0.416	0.003	0.497	0.062	0.081	0.052	356.921	0.008
	Diesel	HDDV	Heavy-Duty Vehicles (8,501 + lbs)	6.070	0.012	1.054	0.264	0.184	0.115	1273.265	0.027
	NA	MC	Motorcycles	1.348	0.002	28.947	4.661	0.018	0.008	175.890	0.052
Merced	Gasoline	LDGV	Light-Duty Vehicles (Passenger Cars)	0.114	0.003	1.274	0.139	0.047	0.020	323.765	0.027
	Gasoline	LDGT	Light-Duty Trucks (0-8,500 lbs)	0.255	0.004	2.204	0.318	0.047	0.020	427.036	0.028
	Gasoline	HDGV	Heavy-Duty Vehicles (8,501 + lbs)	0.534	0.006	3.380	0.425	0.056	0.024	642.197	0.045
	Diesel	LDDV	Light-Duty Vehicles (Passenger Cars)	0.203	0.003	0.302	0.023	0.056	0.029	288.963	0.008
	Diesel	LDDT	Light-Duty Trucks (0-8,500 lbs)	0.217	0.004	0.311	0.037	0.063	0.036	366.771	0.008
	Diesel	HDDV	Heavy-Duty Vehicles (8,501 + lbs)	5.652	0.015	0.861	0.209	0.160	0.089	1568.353	0.027
	NA	MC	Motorcycles	1.254	0.002	25.918	3.733	0.018	0.008	174.943	0.052

Table 5-37 EMFAC County-Specific On-Road Vehicle EFs – 2017 (cont.)

County	Fuel Type	Vehicle Type		Emission Factors (g/mi)							
				Criteria Pollutants and Ozone Precursors							
				NO_x	SO_x	CO	ROG	PM_{10}	$PM_{2.5}$	CO_2	NH_3[1]
Modoc	Gasoline	LDGV	Light-Duty Vehicles (Passenger Cars)	0.196	0.004	1.942	0.189	0.048	0.021	377.017	0.027
	Gasoline	LDGT	Light-Duty Trucks (0-8,500 lbs)	0.479	0.005	3.661	0.489	0.049	0.021	504.406	0.028
	Gasoline	HDGV	Heavy-Duty Vehicles (8,501 + lbs)	1.202	0.007	6.598	1.035	0.058	0.026	738.048	0.045
	Diesel	LDDV	Light-Duty Vehicles (Passenger Cars)	0.254	0.003	0.550	0.042	0.061	0.034	342.545	0.008
	Diesel	LDDT	Light-Duty Trucks (0-8,500 lbs)	0.422	0.004	0.519	0.055	0.067	0.039	459.270	0.008
	Diesel	HDDV	Heavy-Duty Vehicles (8,501 + lbs)	5.981	0.009	1.221	0.285	0.195	0.122	925.289	0.027
	NA	MC	Motorcycles	1.394	0.003	32.355	5.412	0.019	0.009	215.326	0.052
Mono	Gasoline	LDGV	Light-Duty Vehicles (Passenger Cars)	0.156	0.003	1.484	0.144	0.047	0.020	315.885	0.027
	Gasoline	LDGT	Light-Duty Trucks (0-8,500 lbs)	0.378	0.004	2.779	0.375	0.047	0.020	424.346	0.028
	Gasoline	HDGV	Heavy-Duty Vehicles (8,501 + lbs)	0.907	0.006	4.816	0.696	0.057	0.024	642.337	0.045
	Diesel	LDDV	Light-Duty Vehicles (Passenger Cars)	0.262	0.003	0.377	0.030	0.060	0.032	298.707	0.008
	Diesel	LDDT	Light-Duty Trucks (0-8,500 lbs)	0.512	0.004	0.461	0.047	0.069	0.041	381.275	0.008
	Diesel	HDDV	Heavy-Duty Vehicles (8,501 + lbs)	5.369	0.013	0.938	0.222	0.166	0.096	1342.161	0.027
	NA	MC	Motorcycles	1.449	0.003	33.691	4.891	0.018	0.008	185.738	0.052
Monterey	Gasoline	LDGV	Light-Duty Vehicles (Passenger Cars)	0.156	0.003	1.577	0.166	0.047	0.020	339.254	0.027
	Gasoline	LDGT	Light-Duty Trucks (0-8,500 lbs)	0.368	0.005	2.689	0.346	0.048	0.021	453.114	0.028
	Gasoline	HDGV	Heavy-Duty Vehicles (8,501 + lbs)	0.667	0.007	3.714	0.453	0.056	0.024	671.872	0.045
	Diesel	LDDV	Light-Duty Vehicles (Passenger Cars)	0.228	0.003	0.422	0.034	0.060	0.033	311.610	0.008
	Diesel	LDDT	Light-Duty Trucks (0-8,500 lbs)	0.185	0.004	0.346	0.043	0.063	0.036	394.918	0.008
	Diesel	HDDV	Heavy-Duty Vehicles (8,501 + lbs)	5.678	0.012	1.103	0.253	0.211	0.127	1290.990	0.027
	NA	MC	Motorcycles	1.267	0.002	25.764	3.895	0.018	0.008	188.237	0.052
Napa	Gasoline	LDGV	Light-Duty Vehicles (Passenger Cars)	0.111	0.003	1.227	0.130	0.047	0.020	307.297	0.027
	Gasoline	LDGT	Light-Duty Trucks (0-8,500 lbs)	0.218	0.004	1.939	0.264	0.047	0.020	405.861	0.028
	Gasoline	HDGV	Heavy-Duty Vehicles (8,501 + lbs)	0.545	0.006	3.275	0.426	0.056	0.024	623.612	0.045
	Diesel	LDDV	Light-Duty Vehicles (Passenger Cars)	0.183	0.003	0.274	0.022	0.057	0.029	288.061	0.008
	Diesel	LDDT	Light-Duty Trucks (0-8,500 lbs)	0.103	0.003	0.171	0.020	0.053	0.026	363.150	0.008
	Diesel	HDDV	Heavy-Duty Vehicles (8,501 + lbs)	5.806	0.012	0.992	0.247	0.192	0.117	1310.812	0.027
	NA	MC	Motorcycles	1.276	0.002	25.663	3.931	0.018	0.008	174.444	0.052
Nevada	Gasoline	LDGV	Light-Duty Vehicles (Passenger Cars)	0.150	0.003	1.483	0.158	0.047	0.020	304.678	0.027
	Gasoline	LDGT	Light-Duty Trucks (0-8,500 lbs)	0.382	0.004	2.782	0.378	0.047	0.020	415.970	0.028
	Gasoline	HDGV	Heavy-Duty Vehicles (8,501 + lbs)	0.746	0.006	4.078	0.564	0.055	0.024	615.267	0.045
	Diesel	LDDV	Light-Duty Vehicles (Passenger Cars)	0.343	0.003	0.373	0.031	0.062	0.034	290.330	0.008
	Diesel	LDDT	Light-Duty Trucks (0-8,500 lbs)	0.513	0.004	0.440	0.046	0.070	0.042	369.210	0.008
	Diesel	HDDV	Heavy-Duty Vehicles (8,501 + lbs)	5.736	0.012	0.995	0.240	0.167	0.101	1281.332	0.027
	NA	MC	Motorcycles	1.387	0.002	30.616	5.019	0.018	0.009	174.443	0.052
Orange	Gasoline	LDGV	Light-Duty Vehicles (Passenger Cars)	0.091	0.003	1.087	0.123	0.047	0.020	320.758	0.027
	Gasoline	LDGT	Light-Duty Trucks (0-8,500 lbs)	0.155	0.004	1.517	0.192	0.047	0.020	419.091	0.028
	Gasoline	HDGV	Heavy-Duty Vehicles (8,501 + lbs)	0.404	0.006	2.606	0.318	0.055	0.023	618.740	0.045
	Diesel	LDDV	Light-Duty Vehicles (Passenger Cars)	0.097	0.003	0.252	0.019	0.053	0.026	286.485	0.008
	Diesel	LDDT	Light-Duty Trucks (0-8,500 lbs)	0.087	0.004	0.178	0.022	0.053	0.025	366.955	0.008
	Diesel	HDDV	Heavy-Duty Vehicles (8,501 + lbs)	4.337	0.011	0.962	0.165	0.201	0.118	1183.954	0.027
	NA	MC	Motorcycles	1.214	0.002	22.770	4.156	0.018	0.008	187.086	0.052
Placer	Gasoline	LDGV	Light-Duty Vehicles (Passenger Cars)	0.103	0.003	1.161	0.126	0.047	0.019	308.000	0.027
	Gasoline	LDGT	Light-Duty Trucks (0-8,500 lbs)	0.185	0.004	1.688	0.224	0.047	0.020	406.153	0.028
	Gasoline	HDGV	Heavy-Duty Vehicles (8,501 + lbs)	0.454	0.006	2.844	0.366	0.054	0.023	609.382	0.045
	Diesel	LDDV	Light-Duty Vehicles (Passenger Cars)	0.201	0.003	0.270	0.022	0.056	0.029	281.694	0.008
	Diesel	LDDT	Light-Duty Trucks (0-8,500 lbs)	0.172	0.003	0.216	0.025	0.057	0.029	353.694	0.008
	Diesel	HDDV	Heavy-Duty Vehicles (8,501 + lbs)	4.995	0.012	0.882	0.213	0.174	0.101	1294.867	0.027
	NA	MC	Motorcycles	1.319	0.002	27.424	4.389	0.018	0.008	175.259	0.052
Plumas	Gasoline	LDGV	Light-Duty Vehicles (Passenger Cars)	0.187	0.004	1.915	0.195	0.048	0.020	350.550	0.027
	Gasoline	LDGT	Light-Duty Trucks (0-8,500 lbs)	0.516	0.005	4.007	0.526	0.049	0.021	480.713	0.028
	Gasoline	HDGV	Heavy-Duty Vehicles (8,501 + lbs)	1.234	0.007	6.765	1.012	0.058	0.026	699.406	0.045
	Diesel	LDDV	Light-Duty Vehicles (Passenger Cars)	0.309	0.003	0.518	0.041	0.063	0.035	325.640	0.008
	Diesel	LDDT	Light-Duty Trucks (0-8,500 lbs)	0.209	0.004	0.404	0.049	0.064	0.036	418.235	0.008
	Diesel	HDDV	Heavy-Duty Vehicles (8,501 + lbs)	6.266	0.010	1.231	0.291	0.200	0.130	1012.473	0.027
	NA	MC	Motorcycles	1.376	0.003	32.045	5.588	0.019	0.009	201.535	0.052

Table 5-37 EMFAC County-Specific On-Road Vehicle EFs – 2017 (cont.)

County	Fuel Type	Vehicle Type		Emission Factors (g/mi)							
				Criteria Pollutants and Ozone Precursors							
				NO_x	SO_x	CO	ROG	PM_{10}	$PM_{2.5}$	CO_2	NH_3[1]
Riverside	Gasoline	LDGV	Light-Duty Vehicles (Passenger Cars)	0.095	0.003	1.086	0.126	0.047	0.019	310.553	0.027
	Gasoline	LDGT	Light-Duty Trucks (0-8,500 lbs)	0.182	0.004	1.683	0.236	0.047	0.020	404.687	0.028
	Gasoline	HDGV	Heavy-Duty Vehicles (8,501 + lbs)	0.439	0.006	2.743	0.356	0.054	0.023	595.237	0.045
	Diesel	LDDV	Light-Duty Vehicles (Passenger Cars)	0.125	0.003	0.208	0.016	0.053	0.025	274.979	0.008
	Diesel	LDDT	Light-Duty Trucks (0-8,500 lbs)	0.099	0.003	0.170	0.021	0.055	0.027	346.180	0.008
	Diesel	HDDV	Heavy-Duty Vehicles (8,501 + lbs)	4.613	0.012	0.665	0.123	0.161	0.090	1330.414	0.027
	NA	MC	Motorcycles	1.230	0.002	24.153	4.127	0.018	0.008	175.549	0.052
Sacramento	Gasoline	LDGV	Light-Duty Vehicles (Passenger Cars)	0.112	0.003	1.310	0.146	0.047	0.020	319.409	0.027
	Gasoline	LDGT	Light-Duty Trucks (0-8,500 lbs)	0.207	0.004	1.927	0.261	0.047	0.020	418.763	0.028
	Gasoline	HDGV	Heavy-Duty Vehicles (8,501 + lbs)	0.508	0.006	3.182	0.407	0.056	0.024	638.146	0.045
	Diesel	LDDV	Light-Duty Vehicles (Passenger Cars)	0.171	0.003	0.280	0.023	0.057	0.029	283.505	0.008
	Diesel	LDDT	Light-Duty Trucks (0-8,500 lbs)	0.496	0.004	0.482	0.057	0.078	0.049	367.089	0.008
	Diesel	HDDV	Heavy-Duty Vehicles (8,501 + lbs)	5.691	0.012	1.263	0.248	0.203	0.121	1285.077	0.027
	NA	MC	Motorcycles	1.263	0.002	25.488	4.366	0.018	0.008	178.206	0.052
San Benito	Gasoline	LDGV	Light-Duty Vehicles (Passenger Cars)	0.123	0.003	1.225	0.121	0.047	0.020	300.052	0.027
	Gasoline	LDGT	Light-Duty Trucks (0-8,500 lbs)	0.270	0.004	2.048	0.291	0.047	0.020	396.239	0.028
	Gasoline	HDGV	Heavy-Duty Vehicles (8,501 + lbs)	0.587	0.006	3.275	0.435	0.054	0.023	604.319	0.045
	Diesel	LDDV	Light-Duty Vehicles (Passenger Cars)	0.285	0.003	0.322	0.025	0.057	0.030	285.447	0.008
	Diesel	LDDT	Light-Duty Trucks (0-8,500 lbs)	0.041	0.003	0.145	0.017	0.050	0.023	359.490	0.008
	Diesel	HDDV	Heavy-Duty Vehicles (8,501 + lbs)	5.643	0.015	0.880	0.219	0.158	0.092	1536.477	0.027
	NA	MC	Motorcycles	1.300	0.002	26.401	3.895	0.018	0.008	170.066	0.052
San Bernardino	Gasoline	LDGV	Light-Duty Vehicles (Passenger Cars)	0.107	0.003	1.175	0.128	0.047	0.020	316.963	0.027
	Gasoline	LDGT	Light-Duty Trucks (0-8,500 lbs)	0.227	0.004	1.946	0.264	0.047	0.020	414.730	0.028
	Gasoline	HDGV	Heavy-Duty Vehicles (8,501 + lbs)	0.489	0.006	2.944	0.371	0.054	0.023	609.885	0.045
	Diesel	LDDV	Light-Duty Vehicles (Passenger Cars)	0.117	0.003	0.224	0.017	0.053	0.026	279.703	0.008
	Diesel	LDDT	Light-Duty Trucks (0-8,500 lbs)	0.134	0.003	0.206	0.025	0.056	0.029	355.645	0.008
	Diesel	HDDV	Heavy-Duty Vehicles (8,501 + lbs)	4.685	0.013	0.768	0.139	0.164	0.091	1342.145	0.027
	NA	MC	Motorcycles	1.256	0.002	25.454	3.748	0.018	0.008	174.300	0.052
San Diego	Gasoline	LDGV	Light-Duty Vehicles (Passenger Cars)	0.122	0.003	1.235	0.134	0.047	0.020	327.728	0.027
	Gasoline	LDGT	Light-Duty Trucks (0-8,500 lbs)	0.188	0.004	1.666	0.235	0.047	0.020	433.658	0.028
	Gasoline	HDGV	Heavy-Duty Vehicles (8,501 + lbs)	0.415	0.006	2.532	0.329	0.055	0.023	640.337	0.045
	Diesel	LDDV	Light-Duty Vehicles (Passenger Cars)	0.133	0.003	0.269	0.020	0.055	0.027	306.314	0.008
	Diesel	LDDT	Light-Duty Trucks (0-8,500 lbs)	0.161	0.004	0.260	0.030	0.059	0.032	388.853	0.008
	Diesel	HDDV	Heavy-Duty Vehicles (8,501 + lbs)	5.264	0.012	1.214	0.240	0.201	0.117	1317.678	0.027
	NA	MC	Motorcycles	1.256	0.002	25.427	4.002	0.018	0.008	189.944	0.052
San Francisco	Gasoline	LDGV	Light-Duty Vehicles (Passenger Cars)	0.104	0.003	1.207	0.139	0.047	0.020	345.248	0.027
	Gasoline	LDGT	Light-Duty Trucks (0-8,500 lbs)	0.156	0.004	1.501	0.196	0.047	0.020	445.872	0.028
	Gasoline	HDGV	Heavy-Duty Vehicles (8,501 + lbs)	0.451	0.007	2.654	0.347	0.060	0.026	678.713	0.045
	Diesel	LDDV	Light-Duty Vehicles (Passenger Cars)	0.138	0.003	0.375	0.027	0.055	0.028	322.986	0.008
	Diesel	LDDT	Light-Duty Trucks (0-8,500 lbs)	0.154	0.004	0.286	0.033	0.056	0.029	406.805	0.008
	Diesel	HDDV	Heavy-Duty Vehicles (8,501 + lbs)	6.381	0.013	1.557	0.322	0.316	0.192	1408.729	0.027
	NA	MC	Motorcycles	1.284	0.003	26.299	4.649	0.018	0.008	201.388	0.052
San Joaquin	Gasoline	LDGV	Light-Duty Vehicles (Passenger Cars)	0.109	0.003	1.166	0.135	0.047	0.020	319.805	0.027
	Gasoline	LDGT	Light-Duty Trucks (0-8,500 lbs)	0.222	0.004	1.865	0.271	0.047	0.020	420.729	0.028
	Gasoline	HDGV	Heavy-Duty Vehicles (8,501 + lbs)	0.492	0.006	2.987	0.397	0.053	0.023	624.001	0.045
	Diesel	LDDV	Light-Duty Vehicles (Passenger Cars)	0.168	0.003	0.235	0.018	0.055	0.027	289.128	0.008
	Diesel	LDDT	Light-Duty Trucks (0-8,500 lbs)	0.196	0.003	0.242	0.026	0.059	0.031	363.527	0.008
	Diesel	HDDV	Heavy-Duty Vehicles (8,501 + lbs)	5.478	0.013	0.964	0.228	0.178	0.104	1416.922	0.027
	NA	MC	Motorcycles	1.297	0.002	27.721	4.131	0.018	0.008	178.984	0.052
San Luis Obispo	Gasoline	LDGV	Light-Duty Vehicles (Passenger Cars)	0.124	0.003	1.226	0.134	0.047	0.019	301.499	0.027
	Gasoline	LDGT	Light-Duty Trucks (0-8,500 lbs)	0.318	0.004	2.303	0.315	0.047	0.020	406.842	0.028
	Gasoline	HDGV	Heavy-Duty Vehicles (8,501 + lbs)	0.618	0.006	3.368	0.459	0.056	0.024	612.127	0.045
	Diesel	LDDV	Light-Duty Vehicles (Passenger Cars)	0.214	0.003	0.286	0.022	0.056	0.029	289.710	0.008
	Diesel	LDDT	Light-Duty Trucks (0-8,500 lbs)	0.201	0.003	0.303	0.037	0.065	0.037	360.505	0.008
	Diesel	HDDV	Heavy-Duty Vehicles (8,501 + lbs)	5.870	0.011	1.104	0.263	0.199	0.125	1121.854	0.027
	NA	MC	Motorcycles	1.334	0.002	27.437	4.578	0.018	0.008	175.302	0.052

Table 5-37 EMFAC County-Specific On-Road Vehicle EFs – 2017 (cont.)

County	Fuel Type	Vehicle Type		Emission Factors (g/mi)							
				Criteria Pollutants and Ozone Precursors							
				NO_x	SO_x	CO	ROG	PM_{10}	$PM_{2.5}$	CO_2	NH_3[1]
San Mateo	Gasoline	LDGV	Light-Duty Vehicles (Passenger Cars)	0.101	0.003	1.121	0.138	0.047	0.020	304.481	0.027
	Gasoline	LDGT	Light-Duty Trucks (0-8,500 lbs)	0.137	0.004	1.245	0.168	0.047	0.020	390.834	0.028
	Gasoline	HDGV	Heavy-Duty Vehicles (8,501 + lbs)	0.361	0.006	2.206	0.290	0.055	0.023	587.551	0.045
	Diesel	LDDV	Light-Duty Vehicles (Passenger Cars)	0.133	0.003	0.228	0.018	0.054	0.026	281.430	0.008
	Diesel	LDDT	Light-Duty Trucks (0-8,500 lbs)	0.068	0.003	0.131	0.016	0.051	0.023	354.448	0.008
	Diesel	HDDV	Heavy-Duty Vehicles (8,501 + lbs)	4.720	0.011	1.083	0.242	0.253	0.151	1206.841	0.027
	NA	MC	Motorcycles	1.234	0.002	22.710	3.426	0.018	0.008	179.365	0.052
Santa Barbara	Gasoline	LDGV	Light-Duty Vehicles (Passenger Cars)	0.14	0.00	1.33	0.15	0.05	0.02	293.07	0.027
	Gasoline	LDGT	Light-Duty Trucks (0-8,500 lbs)	0.34	0.00	2.36	0.34	0.05	0.02	394.22	0.028
	Gasoline	HDGV	Heavy-Duty Vehicles (8,501 + lbs)	0.63	0.01	3.40	0.45	0.06	0.03	604.77	0.045
	Diesel	LDDV	Light-Duty Vehicles (Passenger Cars)	0.19	0.00	0.25	0.02	0.06	0.03	280.88	0.008
	Diesel	LDDT	Light-Duty Trucks (0-8,500 lbs)	0.16	0.00	0.22	0.03	0.06	0.03	346.32	0.008
	Diesel	HDDV	Heavy-Duty Vehicles (8,501 + lbs)	5.79	0.01	1.15	0.25	0.23	0.14	1265.12	0.027
	NA	MC	Motorcycles	1.29	0.00	24.79	3.67	0.02	0.01	167.46	0.052
Santa Clara	Gasoline	LDGV	Light-Duty Vehicles (Passenger Cars)	0.104	0.003	1.176	0.133	0.047	0.020	309.101	0.027
	Gasoline	LDGT	Light-Duty Trucks (0-8,500 lbs)	0.190	0.004	1.712	0.229	0.047	0.020	407.847	0.028
	Gasoline	HDGV	Heavy-Duty Vehicles (8,501 + lbs)	0.454	0.006	2.812	0.362	0.055	0.023	602.130	0.045
	Diesel	LDDV	Light-Duty Vehicles (Passenger Cars)	0.132	0.003	0.230	0.017	0.053	0.026	283.046	0.008
	Diesel	LDDT	Light-Duty Trucks (0-8,500 lbs)	0.096	0.003	0.171	0.021	0.054	0.026	359.656	0.008
	Diesel	HDDV	Heavy-Duty Vehicles (8,501 + lbs)	5.477	0.013	0.991	0.241	0.208	0.125	1343.193	0.027
	NA	MC	Motorcycles	1.252	0.002	23.907	3.908	0.018	0.008	178.095	0.052
Santa Cruz	Gasoline	LDGV	Light-Duty Vehicles (Passenger Cars)	0.168	0.003	1.698	0.174	0.047	0.020	326.956	0.027
	Gasoline	LDGT	Light-Duty Trucks (0-8,500 lbs)	0.404	0.004	2.982	0.398	0.048	0.021	436.937	0.028
	Gasoline	HDGV	Heavy-Duty Vehicles (8,501 + lbs)	0.705	0.007	3.916	0.496	0.057	0.025	648.289	0.045
	Diesel	LDDV	Light-Duty Vehicles (Passenger Cars)	0.388	0.003	0.482	0.043	0.067	0.039	313.249	0.008
	Diesel	LDDT	Light-Duty Trucks (0-8,500 lbs)	0.222	0.004	0.312	0.039	0.062	0.034	371.408	0.008
	Diesel	HDDV	Heavy-Duty Vehicles (8,501 + lbs)	6.608	0.011	1.353	0.318	0.270	0.174	1199.193	0.027
	NA	MC	Motorcycles	1.316	0.002	27.501	4.737	0.018	0.009	185.221	0.052
Shasta	Gasoline	LDGV	Light-Duty Vehicles (Passenger Cars)	0.137	0.003	1.423	0.156	0.047	0.020	326.978	0.027
	Gasoline	LDGT	Light-Duty Trucks (0-8,500 lbs)	0.324	0.004	2.486	0.360	0.047	0.020	434.536	0.028
	Gasoline	HDGV	Heavy-Duty Vehicles (8,501 + lbs)	0.683	0.007	3.910	0.570	0.057	0.024	652.853	0.045
	Diesel	LDDV	Light-Duty Vehicles (Passenger Cars)	0.248	0.003	0.349	0.028	0.058	0.031	294.546	0.008
	Diesel	LDDT	Light-Duty Trucks (0-8,500 lbs)	0.262	0.004	0.362	0.045	0.068	0.040	368.425	0.008
	Diesel	HDDV	Heavy-Duty Vehicles (8,501 + lbs)	5.851	0.013	0.957	0.235	0.170	0.101	1356.736	0.027
	NA	MC	Motorcycles	1.326	0.002	28.900	5.050	0.018	0.008	183.633	0.052
Sierra	Gasoline	LDGV	Light-Duty Vehicles (Passenger Cars)	0.175	0.004	1.758	0.171	0.048	0.020	361.280	0.027
	Gasoline	LDGT	Light-Duty Trucks (0-8,500 lbs)	0.435	0.005	3.320	0.423	0.048	0.021	483.585	0.028
	Gasoline	HDGV	Heavy-Duty Vehicles (8,501 + lbs)	1.032	0.007	5.643	0.813	0.057	0.025	708.861	0.045
	Diesel	LDDV	Light-Duty Vehicles (Passenger Cars)	0.145	0.003	0.461	0.033	0.056	0.028	326.711	0.008
	Diesel	LDDT	Light-Duty Trucks (0-8,500 lbs)	0.251	0.004	0.539	0.078	0.083	0.054	408.351	0.008
	Diesel	HDDV	Heavy-Duty Vehicles (8,501 + lbs)	5.900	0.009	1.252	0.280	0.188	0.117	908.134	0.027
	NA	MC	Motorcycles	1.374	0.003	31.506	5.362	0.019	0.009	207.609	0.052
Siskiyou	Gasoline	LDGV	Light-Duty Vehicles (Passenger Cars)	0.177	0.004	1.730	0.172	0.047	0.020	350.002	0.027
	Gasoline	LDGT	Light-Duty Trucks (0-8,500 lbs)	0.445	0.005	3.329	0.463	0.048	0.021	468.103	0.028
	Gasoline	HDGV	Heavy-Duty Vehicles (8,501 + lbs)	1.006	0.007	5.519	0.831	0.058	0.025	689.801	0.045
	Diesel	LDDV	Light-Duty Vehicles (Passenger Cars)	0.289	0.003	0.477	0.037	0.061	0.034	323.382	0.008
	Diesel	LDDT	Light-Duty Trucks (0-8,500 lbs)	0.326	0.004	0.522	0.068	0.079	0.050	402.903	0.008
	Diesel	HDDV	Heavy-Duty Vehicles (8,501 + lbs)	5.635	0.014	0.948	0.228	0.163	0.095	1430.686	0.027
	NA	MC	Motorcycles	1.396	0.003	32.454	5.262	0.018	0.009	200.327	0.052
Solano	Gasoline	LDGV	Light-Duty Vehicles (Passenger Cars)	0.106	0.003	1.121	0.132	0.047	0.020	327.660	0.027
	Gasoline	LDGT	Light-Duty Trucks (0-8,500 lbs)	0.196	0.004	1.671	0.242	0.047	0.020	430.288	0.028
	Gasoline	HDGV	Heavy-Duty Vehicles (8,501 + lbs)	0.474	0.007	2.801	0.379	0.056	0.023	646.484	0.045
	Diesel	LDDV	Light-Duty Vehicles (Passenger Cars)	0.158	0.003	0.268	0.020	0.055	0.028	302.553	0.008
	Diesel	LDDT	Light-Duty Trucks (0-8,500 lbs)	0.192	0.004	0.253	0.027	0.058	0.031	379.012	0.008
	Diesel	HDDV	Heavy-Duty Vehicles (8,501 + lbs)	5.452	0.013	1.000	0.226	0.179	0.103	1394.952	0.027
	NA	MC	Motorcycles	1.300	0.002	28.280	4.010	0.018	0.008	186.299	0.052

Table 5-37 EMFAC County-Specific On-Road Vehicle EFs – 2017 (cont.)

County	Fuel Type	Vehicle Type		Emission Factors (g/mi)							
				Criteria Pollutants and Ozone Precursors							
				NO_x	SO_x	CO	ROG	PM_{10}	$PM_{2.5}$	CO_2	NH_3[1]
Sonoma	Gasoline	LDGV	Light-Duty Vehicles (Passenger Cars)	0.128	0.003	1.373	0.147	0.047	0.020	325.091	0.027
	Gasoline	LDGT	Light-Duty Trucks (0-8,500 lbs)	0.256	0.004	2.181	0.306	0.047	0.020	426.093	0.028
	Gasoline	HDGV	Heavy-Duty Vehicles (8,501 + lbs)	0.625	0.007	3.573	0.505	0.056	0.024	646.879	0.045
	Diesel	LDDV	Light-Duty Vehicles (Passenger Cars)	0.312	0.003	0.390	0.033	0.063	0.035	311.329	0.008
	Diesel	LDDT	Light-Duty Trucks (0-8,500 lbs)	0.136	0.004	0.258	0.033	0.061	0.033	374.403	0.008
	Diesel	HDDV	Heavy-Duty Vehicles (8,501 + lbs)	5.486	0.011	1.007	0.252	0.202	0.126	1195.791	0.027
	NA	MC	Motorcycles	1.305	0.002	27.986	4.524	0.018	0.008	185.124	0.052
Stanislaus	Gasoline	LDGV	Light-Duty Vehicles (Passenger Cars)	0.114	0.003	1.296	0.144	0.047	0.020	326.804	0.027
	Gasoline	LDGT	Light-Duty Trucks (0-8,500 lbs)	0.239	0.004	2.145	0.309	0.047	0.020	430.940	0.028
	Gasoline	HDGV	Heavy-Duty Vehicles (8,501 + lbs)	0.521	0.006	3.318	0.436	0.054	0.023	637.945	0.045
	Diesel	LDDV	Light-Duty Vehicles (Passenger Cars)	0.180	0.003	0.298	0.023	0.056	0.028	289.769	0.008
	Diesel	LDDT	Light-Duty Trucks (0-8,500 lbs)	0.157	0.004	0.255	0.031	0.059	0.031	367.806	0.008
	Diesel	HDDV	Heavy-Duty Vehicles (8,501 + lbs)	5.491	0.014	0.895	0.225	0.172	0.101	1423.252	0.027
	NA	MC	Motorcycles	1.291	0.002	27.697	4.637	0.018	0.008	181.355	0.052
Sutter	Gasoline	LDGV	Light-Duty Vehicles (Passenger Cars)	0.121	0.003	1.263	0.136	0.047	0.019	298.426	0.027
	Gasoline	LDGT	Light-Duty Trucks (0-8,500 lbs)	0.307	0.004	2.358	0.346	0.047	0.020	395.431	0.028
	Gasoline	HDGV	Heavy-Duty Vehicles (8,501 + lbs)	0.590	0.006	3.443	0.469	0.053	0.022	596.086	0.045
	Diesel	LDDV	Light-Duty Vehicles (Passenger Cars)	0.169	0.003	0.228	0.018	0.054	0.027	267.049	0.008
	Diesel	LDDT	Light-Duty Trucks (0-8,500 lbs)	0.124	0.003	0.200	0.027	0.059	0.031	325.897	0.008
	Diesel	HDDV	Heavy-Duty Vehicles (8,501 + lbs)	5.306	0.014	0.852	0.217	0.164	0.096	1423.895	0.027
	NA	MC	Motorcycles	1.304	0.002	25.759	4.940	0.018	0.008	172.471	0.052
Tehama	Gasoline	LDGV	Light-Duty Vehicles (Passenger Cars)	0.137	0.003	1.364	0.143	0.047	0.020	323.294	0.027
	Gasoline	LDGT	Light-Duty Trucks (0-8,500 lbs)	0.358	0.004	2.657	0.377	0.048	0.020	430.777	0.028
	Gasoline	HDGV	Heavy-Duty Vehicles (8,501 + lbs)	0.665	0.006	3.797	0.530	0.055	0.023	640.457	0.045
	Diesel	LDDV	Light-Duty Vehicles (Passenger Cars)	0.239	0.003	0.344	0.027	0.058	0.030	295.118	0.008
	Diesel	LDDT	Light-Duty Trucks (0-8,500 lbs)	0.325	0.004	0.454	0.057	0.076	0.047	369.343	0.008
	Diesel	HDDV	Heavy-Duty Vehicles (8,501 + lbs)	5.728	0.013	0.933	0.226	0.161	0.094	1414.179	0.027
	NA	MC	Motorcycles	1.340	0.002	29.014	4.749	0.018	0.008	183.873	0.052
Trinity	Gasoline	LDGV	Light-Duty Vehicles (Passenger Cars)	0.205	0.004	2.035	0.200	0.048	0.021	385.799	0.027
	Gasoline	LDGT	Light-Duty Trucks (0-8,500 lbs)	0.682	0.005	4.985	0.644	0.050	0.023	522.514	0.028
	Gasoline	HDGV	Heavy-Duty Vehicles (8,501 + lbs)	1.229	0.008	6.623	1.014	0.059	0.026	750.084	0.045
	Diesel	LDDV	Light-Duty Vehicles (Passenger Cars)	0.425	0.003	0.680	0.062	0.075	0.047	349.098	0.008
	Diesel	LDDT	Light-Duty Trucks (0-8,500 lbs)	0.466	0.004	1.031	0.165	0.141	0.110	431.586	0.008
	Diesel	HDDV	Heavy-Duty Vehicles (8,501 + lbs)	6.037	0.013	1.042	0.253	0.170	0.104	1348.625	0.027
	NA	MC	Motorcycles	1.379	0.003	34.512	6.083	0.019	0.009	216.574	0.052
Tulare	Gasoline	LDGV	Light-Duty Vehicles (Passenger Cars)	0.104	0.003	1.152	0.133	0.047	0.019	310.156	0.027
	Gasoline	LDGT	Light-Duty Trucks (0-8,500 lbs)	0.254	0.004	2.171	0.339	0.047	0.020	408.874	0.028
	Gasoline	HDGV	Heavy-Duty Vehicles (8,501 + lbs)	0.507	0.006	3.205	0.418	0.053	0.022	609.690	0.045
	Diesel	LDDV	Light-Duty Vehicles (Passenger Cars)	0.125	0.003	0.200	0.015	0.053	0.025	271.790	0.008
	Diesel	LDDT	Light-Duty Trucks (0-8,500 lbs)	0.270	0.003	0.348	0.042	0.069	0.041	344.295	0.008
	Diesel	HDDV	Heavy-Duty Vehicles (8,501 + lbs)	5.478	0.014	0.918	0.224	0.173	0.101	1427.064	0.027
	NA	MC	Motorcycles	1.287	0.002	26.437	4.344	0.018	0.008	172.882	0.052
Tuolumne	Gasoline	LDGV	Light-Duty Vehicles (Passenger Cars)	0.203	0.003	1.999	0.207	0.047	0.020	329.401	0.027
	Gasoline	LDGT	Light-Duty Trucks (0-8,500 lbs)	0.537	0.004	4.072	0.567	0.049	0.021	441.626	0.028
	Gasoline	HDGV	Heavy-Duty Vehicles (8,501 + lbs)	1.061	0.007	5.708	0.864	0.057	0.025	658.162	0.045
	Diesel	LDDV	Light-Duty Vehicles (Passenger Cars)	0.302	0.003	0.408	0.032	0.060	0.032	299.897	0.008
	Diesel	LDDT	Light-Duty Trucks (0-8,500 lbs)	0.442	0.004	0.533	0.070	0.083	0.055	373.077	0.008
	Diesel	HDDV	Heavy-Duty Vehicles (8,501 + lbs)	6.167	0.009	1.220	0.292	0.211	0.135	934.907	0.027
	NA	MC	Motorcycles	1.355	0.002	30.757	5.332	0.019	0.009	185.152	0.052
Ventura	Gasoline	LDGV	Light-Duty Vehicles (Passenger Cars)	0.102	0.003	1.158	0.129	0.047	0.020	313.369	0.027
	Gasoline	LDGT	Light-Duty Trucks (0-8,500 lbs)	0.186	0.004	1.732	0.235	0.047	0.020	410.044	0.028
	Gasoline	HDGV	Heavy-Duty Vehicles (8,501 + lbs)	0.458	0.006	2.843	0.369	0.055	0.023	606.961	0.045
	Diesel	LDDV	Light-Duty Vehicles (Passenger Cars)	0.144	0.003	0.279	0.022	0.056	0.028	288.687	0.008
	Diesel	LDDT	Light-Duty Trucks (0-8,500 lbs)	0.150	0.003	0.227	0.027	0.057	0.029	363.479	0.008
	Diesel	HDDV	Heavy-Duty Vehicles (8,501 + lbs)	4.853	0.010	0.900	0.168	0.185	0.111	1134.486	0.027
	NA	MC	Motorcycles	1.288	0.002	25.730	4.890	0.018	0.008	187.491	0.052

Table 5-37 EMFAC County-Specific On-Road Vehicle EFs – 2017 (cont.)

County	Fuel Type	Vehicle Type		Emission Factors (g/mi)							
				Criteria Pollutants and Ozone Precursors							
				NO_x	SO_x	CO	ROG	PM_{10}	$PM_{2.5}$	CO_2	NH_3[1]
Yolo	Gasoline	LDGV	Light-Duty Vehicles (Passenger Cars)	0.112	0.003	1.225	0.141	0.047	0.020	319.412	0.027
	Gasoline	LDGT	Light-Duty Trucks (0-8,500 lbs)	0.186	0.004	1.637	0.235	0.047	0.020	411.459	0.028
	Gasoline	HDGV	Heavy-Duty Vehicles (8,501 + lbs)	0.466	0.006	2.795	0.373	0.055	0.023	622.228	0.045
	Diesel	LDDV	Light-Duty Vehicles (Passenger Cars)	0.259	0.003	0.309	0.025	0.059	0.031	294.054	0.008
	Diesel	LDDT	Light-Duty Trucks (0-8,500 lbs)	0.207	0.003	0.242	0.026	0.058	0.031	362.982	0.008
	Diesel	HDDV	Heavy-Duty Vehicles (8,501 + lbs)	4.664	0.012	0.934	0.211	0.188	0.110	1304.151	0.027
	NA	MC	Motorcycles	1.293	0.002	27.288	4.226	0.018	0.008	177.040	0.052
Yuba	Gasoline	LDGV	Light-Duty Vehicles (Passenger Cars)	0.125	0.003	1.294	0.133	0.047	0.019	308.564	0.027
	Gasoline	LDGT	Light-Duty Trucks (0-8,500 lbs)	0.377	0.004	2.805	0.391	0.048	0.020	415.094	0.028
	Gasoline	HDGV	Heavy-Duty Vehicles (8,501 + lbs)	0.704	0.006	4.029	0.548	0.055	0.024	614.594	0.045
	Diesel	LDDV	Light-Duty Vehicles (Passenger Cars)	0.181	0.003	0.262	0.020	0.055	0.028	280.643	0.008
	Diesel	LDDT	Light-Duty Trucks (0-8,500 lbs)	0.179	0.003	0.219	0.027	0.058	0.030	338.493	0.008
	Diesel	HDDV	Heavy-Duty Vehicles (8,501 + lbs)	6.084	0.010	1.192	0.280	0.217	0.135	1048.129	0.027
	NA	MC	Motorcycles	1.297	0.002	26.780	4.377	0.018	0.008	172.820	0.052

Table 5-38 EMFAC County-Specific On-Road Vehicle EFs – 2018

County	Fuel Type	Vehicle Type		Emission Factors (g/mi)							
				Criteria Pollutants and Ozone Precursors							
				NO_x	SO_x	CO	ROG	PM_{10}	$PM_{2.5}$	CO_2	NH_3[1]
Alameda	Gasoline	LDGV	Light-Duty Vehicles (Passenger Cars)	0.104	0.003	1.156	0.132	0.047	0.020	311.633	0.025
	Gasoline	LDGT	Light-Duty Trucks (0-8,500 lbs)	0.166	0.004	1.500	0.203	0.047	0.020	404.885	0.026
	Gasoline	HDGV	Heavy-Duty Vehicles (8,501 + lbs)	0.435	0.006	2.623	0.342	0.055	0.023	607.079	0.045
	Diesel	LDDV	Light-Duty Vehicles (Passenger Cars)	0.173	0.003	0.285	0.022	0.056	0.028	290.045	0.008
	Diesel	LDDT	Light-Duty Trucks (0-8,500 lbs)	0.109	0.003	0.191	0.022	0.054	0.027	360.821	0.008
	Diesel	HDDV	Heavy-Duty Vehicles (8,501 + lbs)	5.174	0.014	0.901	0.210	0.188	0.106	1445.226	0.027
	NA	MC	Motorcycles	1.262	0.002	24.799	3.906	0.018	0.008	182.771	0.053
Alpine	Gasoline	LDGV	Light-Duty Vehicles (Passenger Cars)	0.139	0.003	1.403	0.132	0.047	0.020	288.006	0.025
	Gasoline	LDGT	Light-Duty Trucks (0-8,500 lbs)	0.312	0.004	2.446	0.320	0.047	0.020	382.428	0.026
	Gasoline	HDGV	Heavy-Duty Vehicles (8,501 + lbs)	0.820	0.006	4.337	0.630	0.056	0.024	599.127	0.045
	Diesel	LDDV	Light-Duty Vehicles (Passenger Cars)	0.174	0.003	0.283	0.021	0.054	0.027	268.082	0.008
	Diesel	LDDT	Light-Duty Trucks (0-8,500 lbs)	0.133	0.003	0.214	0.026	0.055	0.028	335.531	0.008
	Diesel	HDDV	Heavy-Duty Vehicles (8,501 + lbs)	4.864	0.014	0.802	0.179	0.149	0.077	1416.784	0.027
	NA	MC	Motorcycles	1.384	0.002	28.554	4.366	0.018	0.008	173.663	0.053
Amador	Gasoline	LDGV	Light-Duty Vehicles (Passenger Cars)	0.151	0.003	1.483	0.163	0.047	0.019	278.357	0.025
	Gasoline	LDGT	Light-Duty Trucks (0-8,500 lbs)	0.389	0.004	2.989	0.486	0.047	0.020	373.430	0.026
	Gasoline	HDGV	Heavy-Duty Vehicles (8,501 + lbs)	0.914	0.006	4.894	0.831	0.057	0.024	592.328	0.045
	Diesel	LDDV	Light-Duty Vehicles (Passenger Cars)	0.272	0.002	0.256	0.020	0.056	0.029	256.540	0.008
	Diesel	LDDT	Light-Duty Trucks (0-8,500 lbs)	0.164	0.003	0.263	0.035	0.065	0.037	310.140	0.008
	Diesel	HDDV	Heavy-Duty Vehicles (8,501 + lbs)	5.811	0.009	1.056	0.255	0.190	0.118	991.762	0.027
	NA	MC	Motorcycles	1.306	0.002	26.071	4.280	0.018	0.008	159.303	0.053
Butte	Gasoline	LDGV	Light-Duty Vehicles (Passenger Cars)	0.132	0.003	1.388	0.149	0.047	0.020	313.531	0.025
	Gasoline	LDGT	Light-Duty Trucks (0-8,500 lbs)	0.365	0.004	2.789	0.391	0.048	0.020	421.818	0.026
	Gasoline	HDGV	Heavy-Duty Vehicles (8,501 + lbs)	0.655	0.006	3.763	0.537	0.056	0.024	628.063	0.045
	Diesel	LDDV	Light-Duty Vehicles (Passenger Cars)	0.224	0.003	0.305	0.024	0.057	0.030	288.103	0.008
	Diesel	LDDT	Light-Duty Trucks (0-8,500 lbs)	0.283	0.003	0.321	0.038	0.065	0.037	360.376	0.008
	Diesel	HDDV	Heavy-Duty Vehicles (8,501 + lbs)	5.326	0.013	0.936	0.213	0.164	0.093	1350.715	0.027
	NA	MC	Motorcycles	1.286	0.002	26.760	4.785	0.018	0.008	177.950	0.053
Calaveras	Gasoline	LDGV	Light-Duty Vehicles (Passenger Cars)	0.153	0.003	1.564	0.159	0.047	0.020	306.947	0.025
	Gasoline	LDGT	Light-Duty Trucks (0-8,500 lbs)	0.413	0.004	3.327	0.525	0.048	0.021	413.365	0.026
	Gasoline	HDGV	Heavy-Duty Vehicles (8,501 + lbs)	0.999	0.006	5.477	0.918	0.058	0.025	637.145	0.045
	Diesel	LDDV	Light-Duty Vehicles (Passenger Cars)	0.277	0.003	0.372	0.030	0.059	0.031	282.192	0.008
	Diesel	LDDT	Light-Duty Trucks (0-8,500 lbs)	0.182	0.003	0.386	0.056	0.074	0.046	349.516	0.008
	Diesel	HDDV	Heavy-Duty Vehicles (8,501 + lbs)	5.788	0.010	1.026	0.244	0.180	0.109	1061.150	0.027
	NA	MC	Motorcycles	1.311	0.002	27.518	5.110	0.018	0.009	179.078	0.053
Colusa	Gasoline	LDGV	Light-Duty Vehicles (Passenger Cars)	0.109	0.003	1.101	0.125	0.047	0.020	303.955	0.025
	Gasoline	LDGT	Light-Duty Trucks (0-8,500 lbs)	0.236	0.004	1.833	0.268	0.047	0.020	400.508	0.026
	Gasoline	HDGV	Heavy-Duty Vehicles (8,501 + lbs)	0.512	0.006	2.911	0.405	0.054	0.023	610.122	0.045
	Diesel	LDDV	Light-Duty Vehicles (Passenger Cars)	0.161	0.003	0.261	0.020	0.055	0.027	276.147	0.008
	Diesel	LDDT	Light-Duty Trucks (0-8,500 lbs)	0.169	0.003	0.274	0.033	0.062	0.034	347.425	0.008
	Diesel	HDDV	Heavy-Duty Vehicles (8,501 + lbs)	4.996	0.013	0.845	0.197	0.153	0.085	1364.828	0.027
	NA	MC	Motorcycles	1.276	0.002	24.943	4.115	0.018	0.008	177.552	0.053
Contra Costa	Gasoline	LDGV	Light-Duty Vehicles (Passenger Cars)	0.097	0.003	1.082	0.123	0.047	0.020	307.776	0.025
	Gasoline	LDGT	Light-Duty Trucks (0-8,500 lbs)	0.160	0.004	1.469	0.201	0.047	0.020	403.243	0.026
	Gasoline	HDGV	Heavy-Duty Vehicles (8,501 + lbs)	0.405	0.006	2.522	0.328	0.054	0.023	602.783	0.045
	Diesel	LDDV	Light-Duty Vehicles (Passenger Cars)	0.130	0.003	0.245	0.019	0.054	0.027	284.748	0.008
	Diesel	LDDT	Light-Duty Trucks (0-8,500 lbs)	0.103	0.003	0.174	0.020	0.054	0.026	359.067	0.008
	Diesel	HDDV	Heavy-Duty Vehicles (8,501 + lbs)	5.107	0.012	0.858	0.202	0.204	0.112	1310.585	0.027
	NA	MC	Motorcycles	1.265	0.002	25.051	3.979	0.018	0.008	181.596	0.053
Del Norte	Gasoline	LDGV	Light-Duty Vehicles (Passenger Cars)	0.169	0.003	1.585	0.169	0.047	0.020	324.110	0.025
	Gasoline	LDGT	Light-Duty Trucks (0-8,500 lbs)	0.558	0.004	3.773	0.552	0.049	0.021	440.879	0.026
	Gasoline	HDGV	Heavy-Duty Vehicles (8,501 + lbs)	0.924	0.007	4.800	0.757	0.056	0.024	657.162	0.045
	Diesel	LDDV	Light-Duty Vehicles (Passenger Cars)	0.241	0.003	0.398	0.030	0.059	0.031	307.963	0.008
	Diesel	LDDT	Light-Duty Trucks (0-8,500 lbs)	0.525	0.004	1.009	0.145	0.134	0.103	383.598	0.008
	Diesel	HDDV	Heavy-Duty Vehicles (8,501 + lbs)	5.846	0.008	1.144	0.258	0.183	0.112	860.236	0.027
	NA	MC	Motorcycles	1.365	0.003	29.981	5.008	0.019	0.009	190.683	0.053

Table 5-38 EMFAC County-Specific On-Road Vehicle EFs – 2018 (cont.)

County	Fuel Type	Vehicle Type		Emission Factors (g/mi)							
				Criteria Pollutants and Ozone Precursors							
				NO_x	SO_x	CO	ROG	PM_{10}	$PM_{2.5}$	CO_2	NH_3[1]
El Dorado	Gasoline	LDGV	Light-Duty Vehicles (Passenger Cars)	0.092	0.003	1.067	0.110	0.047	0.020	309.295	0.025
	Gasoline	LDGT	Light-Duty Trucks (0-8,500 lbs)	0.216	0.004	2.012	0.297	0.047	0.020	417.933	0.026
	Gasoline	HDGV	Heavy-Duty Vehicles (8,501 + lbs)	0.520	0.006	3.332	0.499	0.054	0.023	619.391	0.045
	Diesel	LDDV	Light-Duty Vehicles (Passenger Cars)	0.175	0.003	0.283	0.021	0.055	0.027	284.887	0.008
	Diesel	LDDT	Light-Duty Trucks (0-8,500 lbs)	0.176	0.003	0.242	0.029	0.058	0.030	364.042	0.008
	Diesel	HDDV	Heavy-Duty Vehicles (8,501 + lbs)	5.210	0.009	1.009	0.235	0.182	0.110	952.405	0.027
	NA	MC	Motorcycles	1.352	0.002	28.983	5.349	0.019	0.009	186.907	0.053
Fresno	Gasoline	LDGV	Light-Duty Vehicles (Passenger Cars)	0.09	0.00	1.00	0.12	0.05	0.02	303.68	0.025
	Gasoline	LDGT	Light-Duty Trucks (0-8,500 lbs)	0.19	0.00	1.69	0.27	0.05	0.02	403.00	0.026
	Gasoline	HDGV	Heavy-Duty Vehicles (8,501 + lbs)	0.44	0.01	2.77	0.39	0.05	0.02	607.75	0.045
	Diesel	LDDV	Light-Duty Vehicles (Passenger Cars)	0.09	0.00	0.18	0.01	0.05	0.02	267.93	0.008
	Diesel	LDDT	Light-Duty Trucks (0-8,500 lbs)	0.12	0.00	0.19	0.02	0.06	0.03	348.12	0.008
	Diesel	HDDV	Heavy-Duty Vehicles (8,501 + lbs)	5.06	0.01	0.80	0.19	0.16	0.09	1531.57	0.027
	NA	MC	Motorcycles	1.27	0.00	26.18	4.04	0.02	0.01	173.46	0.053
Glenn	Gasoline	LDGV	Light-Duty Vehicles (Passenger Cars)	0.115	0.003	1.202	0.131	0.047	0.020	315.280	0.025
	Gasoline	LDGT	Light-Duty Trucks (0-8,500 lbs)	0.275	0.004	2.175	0.324	0.047	0.020	417.960	0.026
	Gasoline	HDGV	Heavy-Duty Vehicles (8,501 + lbs)	0.566	0.006	3.321	0.474	0.055	0.023	632.732	0.045
	Diesel	LDDV	Light-Duty Vehicles (Passenger Cars)	0.146	0.003	0.298	0.021	0.054	0.027	286.035	0.008
	Diesel	LDDT	Light-Duty Trucks (0-8,500 lbs)	0.193	0.003	0.353	0.047	0.069	0.041	354.849	0.008
	Diesel	HDDV	Heavy-Duty Vehicles (8,501 + lbs)	5.175	0.013	0.882	0.206	0.156	0.089	1328.954	0.027
	NA	MC	Motorcycles	1.277	0.002	25.895	4.535	0.018	0.008	183.026	0.053
Humboldt	Gasoline	LDGV	Light-Duty Vehicles (Passenger Cars)	0.177	0.003	1.651	0.175	0.047	0.020	304.696	0.025
	Gasoline	LDGT	Light-Duty Trucks (0-8,500 lbs)	0.483	0.004	3.394	0.490	0.048	0.021	410.126	0.026
	Gasoline	HDGV	Heavy-Duty Vehicles (8,501 + lbs)	0.932	0.006	4.769	0.762	0.056	0.024	614.640	0.045
	Diesel	LDDV	Light-Duty Vehicles (Passenger Cars)	0.511	0.003	0.482	0.041	0.068	0.040	295.909	0.008
	Diesel	LDDT	Light-Duty Trucks (0-8,500 lbs)	0.212	0.003	0.403	0.054	0.075	0.046	357.723	0.008
	Diesel	HDDV	Heavy-Duty Vehicles (8,501 + lbs)	6.035	0.011	1.054	0.252	0.181	0.110	1172.602	0.027
	NA	MC	Motorcycles	1.371	0.002	29.306	4.721	0.018	0.008	178.198	0.053
Imperial	Gasoline	LDGV	Light-Duty Vehicles (Passenger Cars)	0.329	0.003	2.948	0.243	0.046	0.019	299.224	0.025
	Gasoline	LDGT	Light-Duty Trucks (0-8,500 lbs)	0.272	0.004	2.200	0.415	0.047	0.020	397.412	0.026
	Gasoline	HDGV	Heavy-Duty Vehicles (8,501 + lbs)	0.625	0.006	3.534	0.546	0.054	0.023	592.177	0.045
	Diesel	LDDV	Light-Duty Vehicles (Passenger Cars)	0.103	0.002	0.173	0.013	0.052	0.025	255.268	0.008
	Diesel	LDDT	Light-Duty Trucks (0-8,500 lbs)	0.166	0.003	0.178	0.019	0.054	0.027	331.996	0.008
	Diesel	HDDV	Heavy-Duty Vehicles (8,501 + lbs)	4.064	0.013	0.443	0.093	0.138	0.071	1399.177	0.027
	NA	MC	Motorcycles	1.192	0.002	22.446	3.837	0.018	0.008	167.364	0.053
Inyo	Gasoline	LDGV	Light-Duty Vehicles (Passenger Cars)	0.129	0.003	1.291	0.152	0.047	0.020	318.818	0.025
	Gasoline	LDGT	Light-Duty Trucks (0-8,500 lbs)	0.306	0.004	2.355	0.389	0.047	0.020	424.784	0.026
	Gasoline	HDGV	Heavy-Duty Vehicles (8,501 + lbs)	0.795	0.007	4.231	0.724	0.057	0.025	651.688	0.045
	Diesel	LDDV	Light-Duty Vehicles (Passenger Cars)	0.167	0.003	0.306	0.022	0.055	0.027	286.070	0.008
	Diesel	LDDT	Light-Duty Trucks (0-8,500 lbs)	0.141	0.003	0.261	0.032	0.059	0.031	359.657	0.008
	Diesel	HDDV	Heavy-Duty Vehicles (8,501 + lbs)	5.033	0.012	0.897	0.198	0.168	0.091	1305.686	0.027
	NA	MC	Motorcycles	1.314	0.002	27.350	4.678	0.018	0.008	185.823	0.053
Kern	Gasoline	LDGV	Light-Duty Vehicles (Passenger Cars)	0.088	0.003	0.950	0.115	0.047	0.020	326.272	0.025
	Gasoline	LDGT	Light-Duty Trucks (0-8,500 lbs)	0.186	0.004	1.599	0.255	0.047	0.020	431.915	0.026
	Gasoline	HDGV	Heavy-Duty Vehicles (8,501 + lbs)	0.442	0.007	2.695	0.387	0.055	0.023	656.833	0.045
	Diesel	LDDV	Light-Duty Vehicles (Passenger Cars)	0.098	0.003	0.227	0.015	0.052	0.024	293.373	0.008
	Diesel	LDDT	Light-Duty Trucks (0-8,500 lbs)	0.102	0.004	0.192	0.021	0.053	0.026	378.768	0.008
	Diesel	HDDV	Heavy-Duty Vehicles (8,501 + lbs)	4.898	0.015	0.763	0.176	0.147	0.077	1529.258	0.027
	NA	MC	Motorcycles	1.282	0.002	27.204	4.081	0.018	0.008	186.285	0.053
Kings	Gasoline	LDGV	Light-Duty Vehicles (Passenger Cars)	0.098	0.003	1.019	0.114	0.047	0.019	299.236	0.025
	Gasoline	LDGT	Light-Duty Trucks (0-8,500 lbs)	0.248	0.004	1.994	0.299	0.047	0.020	398.061	0.026
	Gasoline	HDGV	Heavy-Duty Vehicles (8,501 + lbs)	0.485	0.006	2.861	0.399	0.054	0.023	607.211	0.045
	Diesel	LDDV	Light-Duty Vehicles (Passenger Cars)	0.094	0.003	0.221	0.015	0.051	0.024	262.738	0.008
	Diesel	LDDT	Light-Duty Trucks (0-8,500 lbs)	0.173	0.003	0.260	0.032	0.060	0.033	336.566	0.008
	Diesel	HDDV	Heavy-Duty Vehicles (8,501 + lbs)	5.071	0.015	0.761	0.176	0.139	0.072	1563.579	0.027
	NA	MC	Motorcycles	1.254	0.002	24.306	3.882	0.018	0.008	171.460	0.053

Table 5-38 EMFAC County-Specific On-Road Vehicle EFs – 2018 (cont.)

County	Fuel Type	Vehicle Type		Emission Factors (g/mi)							
				Criteria Pollutants and Ozone Precursors							
				NO_x	SO_x	CO	ROG	PM_{10}	$PM_{2.5}$	CO_2	NH_3[1]
Lake	Gasoline	LDGV	Light-Duty Vehicles (Passenger Cars)	0.185	0.003	1.809	0.208	0.047	0.020	315.410	0.025
	Gasoline	LDGT	Light-Duty Trucks (0-8,500 lbs)	0.421	0.004	3.186	0.515	0.048	0.021	417.118	0.026
	Gasoline	HDGV	Heavy-Duty Vehicles (8,501 + lbs)	1.068	0.007	5.741	0.997	0.058	0.025	643.420	0.045
	Diesel	LDDV	Light-Duty Vehicles (Passenger Cars)	0.296	0.003	0.378	0.030	0.060	0.033	288.129	0.008
	Diesel	LDDT	Light-Duty Trucks (0-8,500 lbs)	0.373	0.003	0.405	0.047	0.070	0.042	353.818	0.008
	Diesel	HDDV	Heavy-Duty Vehicles (8,501 + lbs)	6.097	0.010	1.145	0.284	0.201	0.128	1058.630	0.027
	NA	MC	Motorcycles	1.341	0.002	29.478	5.313	0.019	0.009	180.611	0.053
Lassen	Gasoline	LDGV	Light-Duty Vehicles (Passenger Cars)	0.155	0.003	1.543	0.159	0.047	0.020	329.762	0.025
	Gasoline	LDGT	Light-Duty Trucks (0-8,500 lbs)	0.381	0.005	2.966	0.448	0.048	0.021	445.933	0.026
	Gasoline	HDGV	Heavy-Duty Vehicles (8,501 + lbs)	1.013	0.007	5.453	0.913	0.057	0.025	674.159	0.045
	Diesel	LDDV	Light-Duty Vehicles (Passenger Cars)	0.211	0.003	0.386	0.028	0.057	0.029	298.933	0.008
	Diesel	LDDT	Light-Duty Trucks (0-8,500 lbs)	0.180	0.004	0.350	0.044	0.064	0.036	381.291	0.008
	Diesel	HDDV	Heavy-Duty Vehicles (8,501 + lbs)	5.719	0.008	1.172	0.259	0.188	0.114	880.061	0.027
	NA	MC	Motorcycles	1.377	0.003	30.617	5.125	0.018	0.009	194.201	0.053
Los Angeles	Gasoline	LDGV	Light-Duty Vehicles (Passenger Cars)	0.098	0.003	1.189	0.130	0.047	0.020	335.572	0.025
	Gasoline	LDGT	Light-Duty Trucks (0-8,500 lbs)	0.181	0.004	1.757	0.216	0.048	0.020	437.966	0.026
	Gasoline	HDGV	Heavy-Duty Vehicles (8,501 + lbs)	0.404	0.006	2.672	0.322	0.055	0.024	637.356	0.045
	Diesel	LDDV	Light-Duty Vehicles (Passenger Cars)	0.108	0.003	0.322	0.025	0.055	0.028	293.534	0.008
	Diesel	LDDT	Light-Duty Trucks (0-8,500 lbs)	0.124	0.004	0.244	0.030	0.055	0.028	380.728	0.008
	Diesel	HDDV	Heavy-Duty Vehicles (8,501 + lbs)	4.420	0.012	1.049	0.170	0.181	0.100	1306.511	0.027
	NA	MC	Motorcycles	1.222	0.002	22.845	4.296	0.018	0.009	199.501	0.053
Madera	Gasoline	LDGV	Light-Duty Vehicles (Passenger Cars)	0.094	0.003	1.126	0.118	0.047	0.020	325.945	0.025
	Gasoline	LDGT	Light-Duty Trucks (0-8,500 lbs)	0.221	0.004	2.076	0.310	0.048	0.020	434.589	0.026
	Gasoline	HDGV	Heavy-Duty Vehicles (8,501 + lbs)	0.493	0.007	3.247	0.438	0.055	0.024	654.182	0.045
	Diesel	LDDV	Light-Duty Vehicles (Passenger Cars)	0.139	0.003	0.324	0.024	0.054	0.027	287.210	0.008
	Diesel	LDDT	Light-Duty Trucks (0-8,500 lbs)	0.180	0.003	0.284	0.035	0.059	0.032	363.574	0.008
	Diesel	HDDV	Heavy-Duty Vehicles (8,501 + lbs)	5.117	0.014	0.838	0.190	0.150	0.080	1475.440	0.027
	NA	MC	Motorcycles	1.246	0.002	25.470	4.100	0.018	0.008	182.930	0.053
Marin	Gasoline	LDGV	Light-Duty Vehicles (Passenger Cars)	0.097	0.003	1.051	0.130	0.047	0.020	311.234	0.025
	Gasoline	LDGT	Light-Duty Trucks (0-8,500 lbs)	0.159	0.004	1.405	0.209	0.047	0.020	407.522	0.026
	Gasoline	HDGV	Heavy-Duty Vehicles (8,501 + lbs)	0.402	0.006	2.398	0.342	0.055	0.023	608.397	0.045
	Diesel	LDDV	Light-Duty Vehicles (Passenger Cars)	0.183	0.003	0.295	0.022	0.056	0.029	301.056	0.008
	Diesel	LDDT	Light-Duty Trucks (0-8,500 lbs)	0.098	0.004	0.188	0.021	0.053	0.026	381.666	0.008
	Diesel	HDDV	Heavy-Duty Vehicles (8,501 + lbs)	5.599	0.012	1.269	0.262	0.264	0.154	1235.623	0.027
	NA	MC	Motorcycles	1.293	0.002	26.040	4.062	0.018	0.008	185.610	0.053
Mariposa	Gasoline	LDGV	Light-Duty Vehicles (Passenger Cars)	0.155	0.003	1.571	0.168	0.047	0.020	318.581	0.025
	Gasoline	LDGT	Light-Duty Trucks (0-8,500 lbs)	0.523	0.004	3.980	0.600	0.049	0.021	435.943	0.026
	Gasoline	HDGV	Heavy-Duty Vehicles (8,501 + lbs)	1.007	0.007	5.493	0.920	0.058	0.025	656.302	0.045
	Diesel	LDDV	Light-Duty Vehicles (Passenger Cars)	0.337	0.003	0.447	0.036	0.063	0.035	297.691	0.008
	Diesel	LDDT	Light-Duty Trucks (0-8,500 lbs)	0.356	0.003	0.688	0.106	0.106	0.077	359.632	0.008
	Diesel	HDDV	Heavy-Duty Vehicles (8,501 + lbs)	6.065	0.008	1.150	0.268	0.190	0.116	848.174	0.027
	NA	MC	Motorcycles	1.347	0.002	29.842	5.293	0.019	0.009	186.615	0.053
Mendocino	Gasoline	LDGV	Light-Duty Vehicles (Passenger Cars)	0.155	0.003	1.489	0.157	0.047	0.020	300.406	0.025
	Gasoline	LDGT	Light-Duty Trucks (0-8,500 lbs)	0.469	0.004	3.397	0.494	0.048	0.021	408.514	0.026
	Gasoline	HDGV	Heavy-Duty Vehicles (8,501 + lbs)	0.948	0.006	4.924	0.780	0.056	0.024	621.430	0.045
	Diesel	LDDV	Light-Duty Vehicles (Passenger Cars)	0.550	0.003	0.484	0.040	0.068	0.040	294.093	0.008
	Diesel	LDDT	Light-Duty Trucks (0-8,500 lbs)	0.337	0.003	0.420	0.052	0.074	0.046	349.115	0.008
	Diesel	HDDV	Heavy-Duty Vehicles (8,501 + lbs)	5.706	0.012	0.962	0.235	0.169	0.101	1287.553	0.027
	NA	MC	Motorcycles	1.346	0.002	28.520	4.704	0.018	0.008	176.994	0.053
Merced	Gasoline	LDGV	Light-Duty Vehicles (Passenger Cars)	0.100	0.003	1.140	0.124	0.047	0.020	317.361	0.025
	Gasoline	LDGT	Light-Duty Trucks (0-8,500 lbs)	0.223	0.004	1.972	0.288	0.047	0.020	419.382	0.026
	Gasoline	HDGV	Heavy-Duty Vehicles (8,501 + lbs)	0.499	0.006	3.204	0.414	0.056	0.024	638.097	0.045
	Diesel	LDDV	Light-Duty Vehicles (Passenger Cars)	0.162	0.003	0.288	0.021	0.054	0.027	282.213	0.008
	Diesel	LDDT	Light-Duty Trucks (0-8,500 lbs)	0.181	0.003	0.285	0.034	0.061	0.033	362.111	0.008
	Diesel	HDDV	Heavy-Duty Vehicles (8,501 + lbs)	5.176	0.015	0.788	0.183	0.147	0.077	1560.533	0.027
	NA	MC	Motorcycles	1.248	0.002	25.346	3.742	0.018	0.008	177.055	0.053

Table 5-38 EMFAC County-Specific On-Road Vehicle EFs – 2018 (cont.)

County	Fuel Type	Vehicle Type		Emission Factors (g/mi)							
				Criteria Pollutants and Ozone Precursors							
				NO_x	SO_x	CO	ROG	PM_{10}	$PM_{2.5}$	CO_2	NH_3[1]
Modoc	Gasoline	LDGV	Light-Duty Vehicles (Passenger Cars)	0.172	0.004	1.720	0.168	0.048	0.021	366.751	0.025
	Gasoline	LDGT	Light-Duty Trucks (0-8,500 lbs)	0.424	0.005	3.293	0.455	0.049	0.021	492.844	0.026
	Gasoline	HDGV	Heavy-Duty Vehicles (8,501 + lbs)	1.144	0.007	6.302	1.033	0.058	0.025	729.033	0.045
	Diesel	LDDV	Light-Duty Vehicles (Passenger Cars)	0.212	0.003	0.535	0.039	0.059	0.032	333.001	0.008
	Diesel	LDDT	Light-Duty Trucks (0-8,500 lbs)	0.363	0.004	0.491	0.052	0.064	0.037	449.801	0.008
	Diesel	HDDV	Heavy-Duty Vehicles (8,501 + lbs)	5.739	0.009	1.105	0.251	0.180	0.108	941.274	0.027
	NA	MC	Motorcycles	1.394	0.003	31.669	5.389	0.019	0.009	216.462	0.053
Mono	Gasoline	LDGV	Light-Duty Vehicles (Passenger Cars)	0.137	0.003	1.324	0.130	0.047	0.020	307.041	0.025
	Gasoline	LDGT	Light-Duty Trucks (0-8,500 lbs)	0.336	0.004	2.516	0.353	0.047	0.020	414.241	0.026
	Gasoline	HDGV	Heavy-Duty Vehicles (8,501 + lbs)	0.861	0.006	4.592	0.696	0.057	0.024	633.139	0.045
	Diesel	LDDV	Light-Duty Vehicles (Passenger Cars)	0.214	0.003	0.349	0.027	0.057	0.030	290.209	0.008
	Diesel	LDDT	Light-Duty Trucks (0-8,500 lbs)	0.426	0.004	0.407	0.042	0.065	0.038	372.804	0.008
	Diesel	HDDV	Heavy-Duty Vehicles (8,501 + lbs)	4.972	0.013	0.834	0.189	0.151	0.082	1347.633	0.027
	NA	MC	Motorcycles	1.444	0.003	32.910	4.868	0.018	0.008	186.871	0.053
Monterey	Gasoline	LDGV	Light-Duty Vehicles (Passenger Cars)	0.137	0.003	1.400	0.149	0.047	0.020	330.556	0.025
	Gasoline	LDGT	Light-Duty Trucks (0-8,500 lbs)	0.327	0.004	2.419	0.318	0.048	0.021	442.959	0.026
	Gasoline	HDGV	Heavy-Duty Vehicles (8,501 + lbs)	0.628	0.007	3.514	0.445	0.056	0.024	663.274	0.045
	Diesel	LDDV	Light-Duty Vehicles (Passenger Cars)	0.190	0.003	0.403	0.031	0.058	0.031	303.166	0.008
	Diesel	LDDT	Light-Duty Trucks (0-8,500 lbs)	0.160	0.004	0.327	0.040	0.061	0.033	387.592	0.008
	Diesel	HDDV	Heavy-Duty Vehicles (8,501 + lbs)	5.235	0.012	1.021	0.225	0.197	0.114	1291.809	0.027
	NA	MC	Motorcycles	1.263	0.002	25.139	3.865	0.018	0.008	189.218	0.053
Napa	Gasoline	LDGV	Light-Duty Vehicles (Passenger Cars)	0.098	0.003	1.097	0.117	0.047	0.020	298.962	0.025
	Gasoline	LDGT	Light-Duty Trucks (0-8,500 lbs)	0.191	0.004	1.736	0.242	0.047	0.020	395.713	0.026
	Gasoline	HDGV	Heavy-Duty Vehicles (8,501 + lbs)	0.509	0.006	3.080	0.416	0.056	0.024	613.689	0.045
	Diesel	LDDV	Light-Duty Vehicles (Passenger Cars)	0.151	0.003	0.256	0.020	0.055	0.028	280.362	0.008
	Diesel	LDDT	Light-Duty Trucks (0-8,500 lbs)	0.090	0.003	0.163	0.018	0.053	0.025	356.441	0.008
	Diesel	HDDV	Heavy-Duty Vehicles (8,501 + lbs)	5.375	0.012	0.924	0.221	0.178	0.104	1313.529	0.027
	NA	MC	Motorcycles	1.270	0.002	24.986	3.892	0.018	0.008	175.374	0.053
Nevada	Gasoline	LDGV	Light-Duty Vehicles (Passenger Cars)	0.131	0.003	1.308	0.140	0.047	0.020	296.193	0.025
	Gasoline	LDGT	Light-Duty Trucks (0-8,500 lbs)	0.345	0.004	2.549	0.358	0.047	0.020	407.913	0.026
	Gasoline	HDGV	Heavy-Duty Vehicles (8,501 + lbs)	0.708	0.006	3.884	0.558	0.055	0.023	607.199	0.045
	Diesel	LDDV	Light-Duty Vehicles (Passenger Cars)	0.285	0.003	0.343	0.028	0.060	0.032	283.080	0.008
	Diesel	LDDT	Light-Duty Trucks (0-8,500 lbs)	0.438	0.003	0.390	0.041	0.067	0.039	361.519	0.008
	Diesel	HDDV	Heavy-Duty Vehicles (8,501 + lbs)	5.349	0.012	0.904	0.211	0.154	0.088	1296.926	0.027
	NA	MC	Motorcycles	1.384	0.002	30.166	5.065	0.018	0.009	175.588	0.053
Orange	Gasoline	LDGV	Light-Duty Vehicles (Passenger Cars)	0.082	0.003	0.992	0.114	0.047	0.020	311.685	0.025
	Gasoline	LDGT	Light-Duty Trucks (0-8,500 lbs)	0.137	0.004	1.373	0.179	0.047	0.020	408.011	0.026
	Gasoline	HDGV	Heavy-Duty Vehicles (8,501 + lbs)	0.374	0.006	2.439	0.310	0.055	0.023	607.587	0.045
	Diesel	LDDV	Light-Duty Vehicles (Passenger Cars)	0.082	0.003	0.244	0.018	0.052	0.025	278.047	0.008
	Diesel	LDDT	Light-Duty Trucks (0-8,500 lbs)	0.076	0.003	0.172	0.021	0.052	0.025	359.512	0.008
	Diesel	HDDV	Heavy-Duty Vehicles (8,501 + lbs)	3.893	0.011	0.886	0.144	0.188	0.106	1174.896	0.027
	NA	MC	Motorcycles	1.212	0.002	22.303	4.140	0.018	0.008	187.991	0.053
Placer	Gasoline	LDGV	Light-Duty Vehicles (Passenger Cars)	0.091	0.003	1.047	0.114	0.047	0.020	299.209	0.025
	Gasoline	LDGT	Light-Duty Trucks (0-8,500 lbs)	0.164	0.004	1.524	0.207	0.047	0.020	395.864	0.026
	Gasoline	HDGV	Heavy-Duty Vehicles (8,501 + lbs)	0.421	0.006	2.668	0.358	0.054	0.023	598.619	0.045
	Diesel	LDDV	Light-Duty Vehicles (Passenger Cars)	0.162	0.003	0.249	0.019	0.055	0.027	273.436	0.008
	Diesel	LDDT	Light-Duty Trucks (0-8,500 lbs)	0.141	0.003	0.195	0.023	0.055	0.028	346.246	0.008
	Diesel	HDDV	Heavy-Duty Vehicles (8,501 + lbs)	4.563	0.012	0.808	0.189	0.163	0.091	1297.417	0.027
	NA	MC	Motorcycles	1.315	0.002	26.836	4.396	0.018	0.008	176.355	0.053
Plumas	Gasoline	LDGV	Light-Duty Vehicles (Passenger Cars)	0.162	0.003	1.688	0.173	0.048	0.020	340.498	0.025
	Gasoline	LDGT	Light-Duty Trucks (0-8,500 lbs)	0.467	0.005	3.665	0.499	0.048	0.021	471.685	0.026
	Gasoline	HDGV	Heavy-Duty Vehicles (8,501 + lbs)	1.180	0.007	6.491	1.011	0.058	0.025	691.637	0.045
	Diesel	LDDV	Light-Duty Vehicles (Passenger Cars)	0.261	0.003	0.500	0.038	0.061	0.033	316.896	0.008
	Diesel	LDDT	Light-Duty Trucks (0-8,500 lbs)	0.189	0.004	0.396	0.047	0.062	0.034	413.355	0.008
	Diesel	HDDV	Heavy-Duty Vehicles (8,501 + lbs)	5.954	0.010	1.104	0.254	0.182	0.112	1039.413	0.027
	NA	MC	Motorcycles	1.377	0.003	31.542	5.604	0.019	0.009	202.729	0.053

Table 5-38 EMFAC County-Specific On-Road Vehicle EFs – 2018 (cont.)

County	Fuel Type	Vehicle Type		Emission Factors (g/mi)							
				Criteria Pollutants and Ozone Precursors							
				NO_x	SO_x	CO	ROG	PM_{10}	$PM_{2.5}$	CO_2	NH_3[1]
Riverside	Gasoline	LDGV	Light-Duty Vehicles (Passenger Cars)	0.085	0.003	0.989	0.116	0.047	0.019	301.939	0.025
	Gasoline	LDGT	Light-Duty Trucks (0-8,500 lbs)	0.160	0.004	1.511	0.218	0.047	0.020	394.190	0.026
	Gasoline	HDGV	Heavy-Duty Vehicles (8,501 + lbs)	0.408	0.006	2.580	0.349	0.054	0.023	585.175	0.045
	Diesel	LDDV	Light-Duty Vehicles (Passenger Cars)	0.102	0.003	0.196	0.014	0.052	0.025	266.949	0.008
	Diesel	LDDT	Light-Duty Trucks (0-8,500 lbs)	0.084	0.003	0.156	0.019	0.053	0.026	339.182	0.008
	Diesel	HDDV	Heavy-Duty Vehicles (8,501 + lbs)	4.123	0.012	0.600	0.106	0.150	0.079	1325.831	0.027
	NA	MC	Motorcycles	1.225	0.002	23.576	4.122	0.018	0.008	176.481	0.053
Sacramento	Gasoline	LDGV	Light-Duty Vehicles (Passenger Cars)	0.099	0.003	1.176	0.132	0.047	0.020	310.878	0.025
	Gasoline	LDGT	Light-Duty Trucks (0-8,500 lbs)	0.182	0.004	1.737	0.241	0.047	0.020	408.520	0.026
	Gasoline	HDGV	Heavy-Duty Vehicles (8,501 + lbs)	0.471	0.006	2.978	0.396	0.056	0.024	626.651	0.045
	Diesel	LDDV	Light-Duty Vehicles (Passenger Cars)	0.137	0.003	0.262	0.020	0.055	0.027	275.416	0.008
	Diesel	LDDT	Light-Duty Trucks (0-8,500 lbs)	0.417	0.003	0.425	0.050	0.073	0.045	360.373	0.008
	Diesel	HDDV	Heavy-Duty Vehicles (8,501 + lbs)	5.212	0.012	1.170	0.222	0.190	0.109	1285.177	0.027
	NA	MC	Motorcycles	1.259	0.002	24.957	4.361	0.018	0.008	179.180	0.053
San Benito	Gasoline	LDGV	Light-Duty Vehicles (Passenger Cars)	0.109	0.003	1.100	0.110	0.047	0.020	291.746	0.025
	Gasoline	LDGT	Light-Duty Trucks (0-8,500 lbs)	0.235	0.004	1.821	0.266	0.047	0.020	386.046	0.026
	Gasoline	HDGV	Heavy-Duty Vehicles (8,501 + lbs)	0.553	0.006	3.111	0.433	0.054	0.023	596.223	0.045
	Diesel	LDDV	Light-Duty Vehicles (Passenger Cars)	0.236	0.003	0.300	0.022	0.056	0.028	277.340	0.008
	Diesel	LDDT	Light-Duty Trucks (0-8,500 lbs)	0.038	0.003	0.143	0.016	0.050	0.023	352.120	0.008
	Diesel	HDDV	Heavy-Duty Vehicles (8,501 + lbs)	5.150	0.015	0.798	0.189	0.144	0.078	1532.860	0.027
	NA	MC	Motorcycles	1.295	0.002	25.870	3.901	0.018	0.008	171.121	0.053
San Bernardino	Gasoline	LDGV	Light-Duty Vehicles (Passenger Cars)	0.095	0.003	1.062	0.117	0.047	0.020	308.309	0.025
	Gasoline	LDGT	Light-Duty Trucks (0-8,500 lbs)	0.198	0.004	1.742	0.242	0.047	0.020	404.110	0.026
	Gasoline	HDGV	Heavy-Duty Vehicles (8,501 + lbs)	0.454	0.006	2.762	0.362	0.054	0.023	599.739	0.045
	Diesel	LDDV	Light-Duty Vehicles (Passenger Cars)	0.096	0.003	0.212	0.015	0.052	0.025	271.593	0.008
	Diesel	LDDT	Light-Duty Trucks (0-8,500 lbs)	0.113	0.003	0.189	0.023	0.055	0.027	348.755	0.008
	Diesel	HDDV	Heavy-Duty Vehicles (8,501 + lbs)	4.185	0.012	0.694	0.120	0.152	0.080	1336.213	0.027
	NA	MC	Motorcycles	1.250	0.002	24.808	3.744	0.018	0.008	175.346	0.053
San Diego	Gasoline	LDGV	Light-Duty Vehicles (Passenger Cars)	0.111	0.003	1.137	0.124	0.047	0.020	318.470	0.025
	Gasoline	LDGT	Light-Duty Trucks (0-8,500 lbs)	0.165	0.004	1.506	0.220	0.047	0.020	422.652	0.026
	Gasoline	HDGV	Heavy-Duty Vehicles (8,501 + lbs)	0.382	0.006	2.354	0.318	0.055	0.023	628.334	0.045
	Diesel	LDDV	Light-Duty Vehicles (Passenger Cars)	0.109	0.003	0.254	0.018	0.053	0.026	297.644	0.008
	Diesel	LDDT	Light-Duty Trucks (0-8,500 lbs)	0.138	0.004	0.240	0.028	0.058	0.030	381.128	0.008
	Diesel	HDDV	Heavy-Duty Vehicles (8,501 + lbs)	4.760	0.012	1.127	0.211	0.186	0.104	1308.709	0.027
	NA	MC	Motorcycles	1.252	0.002	24.824	3.996	0.018	0.008	190.916	0.053
San Francisco	Gasoline	LDGV	Light-Duty Vehicles (Passenger Cars)	0.093	0.003	1.096	0.128	0.047	0.020	335.561	0.025
	Gasoline	LDGT	Light-Duty Trucks (0-8,500 lbs)	0.137	0.004	1.357	0.182	0.047	0.020	434.252	0.026
	Gasoline	HDGV	Heavy-Duty Vehicles (8,501 + lbs)	0.411	0.007	2.446	0.332	0.060	0.025	662.118	0.045
	Diesel	LDDV	Light-Duty Vehicles (Passenger Cars)	0.118	0.003	0.369	0.025	0.054	0.027	314.278	0.008
	Diesel	LDDT	Light-Duty Trucks (0-8,500 lbs)	0.133	0.004	0.277	0.032	0.055	0.028	399.330	0.008
	Diesel	HDDV	Heavy-Duty Vehicles (8,501 + lbs)	5.734	0.013	1.419	0.283	0.290	0.171	1378.789	0.027
	NA	MC	Motorcycles	1.284	0.003	25.804	4.663	0.018	0.008	202.619	0.053
San Joaquin	Gasoline	LDGV	Light-Duty Vehicles (Passenger Cars)	0.10	0.00	1.05	0.12	0.05	0.02	310.17	0.025
	Gasoline	LDGT	Light-Duty Trucks (0-8,500 lbs)	0.19	0.00	1.67	0.25	0.05	0.02	408.99	0.026
	Gasoline	HDGV	Heavy-Duty Vehicles (8,501 + lbs)	0.46	0.01	2.81	0.39	0.05	0.02	613.01	0.045
	Diesel	LDDV	Light-Duty Vehicles (Passenger Cars)	0.13	0.00	0.21	0.02	0.05	0.03	279.62	0.008
	Diesel	LDDT	Light-Duty Trucks (0-8,500 lbs)	0.16	0.00	0.21	0.02	0.06	0.03	354.84	0.008
	Diesel	HDDV	Heavy-Duty Vehicles (8,501 + lbs)	5.02	0.01	0.89	0.20	0.16	0.09	1413.76	0.027
	NA	MC	Motorcycles	1.29	0.00	26.81	4.10	0.02	0.01	179.35	0.053
San Luis Obispo	Gasoline	LDGV	Light-Duty Vehicles (Passenger Cars)	0.109	0.003	1.095	0.121	0.047	0.020	293.189	0.025
	Gasoline	LDGT	Light-Duty Trucks (0-8,500 lbs)	0.283	0.004	2.085	0.294	0.047	0.020	397.743	0.026
	Gasoline	HDGV	Heavy-Duty Vehicles (8,501 + lbs)	0.475	0.006	2.949	0.353	0.052	0.022	573.003	0.045
	Diesel	LDDV	Light-Duty Vehicles (Passenger Cars)	0.179	0.003	0.268	0.020	0.055	0.027	282.352	0.008
	Diesel	LDDT	Light-Duty Trucks (0-8,500 lbs)	0.174	0.003	0.278	0.034	0.063	0.035	354.445	0.008
	Diesel	HDDV	Heavy-Duty Vehicles (8,501 + lbs)	5.495	0.011	1.039	0.240	0.187	0.114	1131.469	0.027
	NA	MC	Motorcycles	1.325	0.002	26.731	4.386	0.018	0.008	176.077	0.053

Table 5-38 EMFAC County-Specific On-Road Vehicle EFs – 2018 (cont.)

County	Fuel Type	Vehicle Type		Emission Factors (g/mi)							
				Criteria Pollutants and Ozone Precursors							
				NO_x	SO_x	CO	ROG	PM_{10}	$PM_{2.5}$	CO_2	NH_3[1]
San Mateo	Gasoline	LDGV	Light-Duty Vehicles (Passenger Cars)	0.091	0.003	1.028	0.130	0.047	0.020	296.377	0.025
	Gasoline	LDGT	Light-Duty Trucks (0-8,500 lbs)	0.119	0.004	1.122	0.154	0.047	0.020	380.678	0.026
	Gasoline	HDGV	Heavy-Duty Vehicles (8,501 + lbs)	0.325	0.006	2.023	0.275	0.055	0.023	575.145	0.045
	Diesel	LDDV	Light-Duty Vehicles (Passenger Cars)	0.111	0.003	0.216	0.016	0.053	0.026	273.249	0.008
	Diesel	LDDT	Light-Duty Trucks (0-8,500 lbs)	0.059	0.003	0.126	0.015	0.050	0.023	347.378	0.008
	Diesel	HDDV	Heavy-Duty Vehicles (8,501 + lbs)	4.190	0.011	0.992	0.213	0.234	0.135	1182.954	0.027
	NA	MC	Motorcycles	1.229	0.002	22.153	3.387	0.018	0.008	180.223	0.053
Santa Barbara	Gasoline	LDGV	Light-Duty Vehicles (Passenger Cars)	0.120	0.003	1.187	0.137	0.047	0.020	285.288	0.025
	Gasoline	LDGT	Light-Duty Trucks (0-8,500 lbs)	0.297	0.004	2.125	0.312	0.047	0.020	385.182	0.026
	Gasoline	HDGV	Heavy-Duty Vehicles (8,501 + lbs)	0.587	0.006	3.200	0.445	0.061	0.026	595.188	0.045
	Diesel	LDDV	Light-Duty Vehicles (Passenger Cars)	0.162	0.003	0.235	0.017	0.054	0.027	273.670	0.008
	Diesel	LDDT	Light-Duty Trucks (0-8,500 lbs)	0.136	0.003	0.201	0.024	0.057	0.029	340.190	0.008
	Diesel	HDDV	Heavy-Duty Vehicles (8,501 + lbs)	5.319	0.012	1.080	0.226	0.219	0.129	1265.022	0.027
	NA	MC	Motorcycles	1.287	0.002	24.298	3.675	0.018	0.008	168.386	0.053
Santa Clara	Gasoline	LDGV	Light-Duty Vehicles (Passenger Cars)	0.093	0.003	1.059	0.121	0.047	0.020	300.736	0.025
	Gasoline	LDGT	Light-Duty Trucks (0-8,500 lbs)	0.167	0.004	1.539	0.212	0.047	0.020	397.650	0.026
	Gasoline	HDGV	Heavy-Duty Vehicles (8,501 + lbs)	0.417	0.006	2.609	0.348	0.055	0.023	590.900	0.045
	Diesel	LDDV	Light-Duty Vehicles (Passenger Cars)	0.109	0.003	0.217	0.016	0.052	0.025	274.975	0.008
	Diesel	LDDT	Light-Duty Trucks (0-8,500 lbs)	0.082	0.003	0.162	0.019	0.053	0.026	352.841	0.008
	Diesel	HDDV	Heavy-Duty Vehicles (8,501 + lbs)	4.953	0.013	0.910	0.212	0.192	0.110	1328.803	0.027
	NA	MC	Motorcycles	1.247	0.002	23.323	3.877	0.018	0.008	179.001	0.053
Santa Cruz	Gasoline	LDGV	Light-Duty Vehicles (Passenger Cars)	0.147	0.003	1.504	0.155	0.047	0.020	318.962	0.025
	Gasoline	LDGT	Light-Duty Trucks (0-8,500 lbs)	0.360	0.004	2.694	0.369	0.048	0.021	427.346	0.026
	Gasoline	HDGV	Heavy-Duty Vehicles (8,501 + lbs)	0.659	0.006	3.675	0.482	0.057	0.024	638.211	0.045
	Diesel	LDDV	Light-Duty Vehicles (Passenger Cars)	0.335	0.003	0.457	0.039	0.065	0.037	306.726	0.008
	Diesel	LDDT	Light-Duty Trucks (0-8,500 lbs)	0.183	0.003	0.288	0.035	0.060	0.032	364.007	0.008
	Diesel	HDDV	Heavy-Duty Vehicles (8,501 + lbs)	6.130	0.011	1.258	0.287	0.252	0.159	1198.833	0.027
	NA	MC	Motorcycles	1.315	0.002	27.011	4.750	0.019	0.009	186.329	0.053
Shasta	Gasoline	LDGV	Light-Duty Vehicles (Passenger Cars)	0.120	0.003	1.258	0.139	0.047	0.020	317.897	0.025
	Gasoline	LDGT	Light-Duty Trucks (0-8,500 lbs)	0.282	0.004	2.212	0.330	0.047	0.020	423.193	0.026
	Gasoline	HDGV	Heavy-Duty Vehicles (8,501 + lbs)	0.637	0.006	3.672	0.556	0.057	0.024	642.719	0.045
	Diesel	LDDV	Light-Duty Vehicles (Passenger Cars)	0.197	0.003	0.324	0.024	0.056	0.029	285.940	0.008
	Diesel	LDDT	Light-Duty Trucks (0-8,500 lbs)	0.215	0.003	0.320	0.040	0.064	0.036	360.555	0.008
	Diesel	HDDV	Heavy-Duty Vehicles (8,501 + lbs)	5.409	0.013	0.879	0.208	0.158	0.089	1366.557	0.027
	NA	MC	Motorcycles	1.324	0.002	28.432	5.099	0.018	0.008	184.743	0.053
Sierra	Gasoline	LDGV	Light-Duty Vehicles (Passenger Cars)	0.154	0.004	1.566	0.154	0.048	0.020	351.292	0.025
	Gasoline	LDGT	Light-Duty Trucks (0-8,500 lbs)	0.388	0.005	3.011	0.398	0.048	0.021	473.057	0.026
	Gasoline	HDGV	Heavy-Duty Vehicles (8,501 + lbs)	0.976	0.007	5.357	0.805	0.057	0.025	698.765	0.045
	Diesel	LDDV	Light-Duty Vehicles (Passenger Cars)	0.121	0.003	0.455	0.031	0.054	0.027	317.249	0.008
	Diesel	LDDT	Light-Duty Trucks (0-8,500 lbs)	0.210	0.004	0.489	0.069	0.076	0.048	400.372	0.008
	Diesel	HDDV	Heavy-Duty Vehicles (8,501 + lbs)	5.616	0.009	1.161	0.253	0.176	0.105	922.471	0.027
	NA	MC	Motorcycles	1.374	0.003	30.820	5.341	0.019	0.009	208.850	0.053
Siskiyou	Gasoline	LDGV	Light-Duty Vehicles (Passenger Cars)	0.155	0.003	1.535	0.154	0.047	0.020	340.387	0.025
	Gasoline	LDGT	Light-Duty Trucks (0-8,500 lbs)	0.396	0.005	3.007	0.433	0.048	0.021	457.682	0.026
	Gasoline	HDGV	Heavy-Duty Vehicles (8,501 + lbs)	0.950	0.007	5.241	0.825	0.058	0.025	679.954	0.045
	Diesel	LDDV	Light-Duty Vehicles (Passenger Cars)	0.240	0.003	0.455	0.034	0.059	0.031	314.339	0.008
	Diesel	LDDT	Light-Duty Trucks (0-8,500 lbs)	0.278	0.004	0.472	0.060	0.073	0.045	395.224	0.008
	Diesel	HDDV	Heavy-Duty Vehicles (8,501 + lbs)	5.207	0.014	0.864	0.200	0.150	0.082	1435.783	0.027
	NA	MC	Motorcycles	1.394	0.003	31.763	5.251	0.019	0.009	201.493	0.053
Solano	Gasoline	LDGV	Light-Duty Vehicles (Passenger Cars)	0.094	0.003	1.010	0.120	0.047	0.020	318.609	0.025
	Gasoline	LDGT	Light-Duty Trucks (0-8,500 lbs)	0.172	0.004	1.496	0.222	0.047	0.020	419.157	0.026
	Gasoline	HDGV	Heavy-Duty Vehicles (8,501 + lbs)	0.440	0.006	2.622	0.370	0.056	0.023	635.246	0.045
	Diesel	LDDV	Light-Duty Vehicles (Passenger Cars)	0.128	0.003	0.247	0.018	0.054	0.026	293.691	0.008
	Diesel	LDDT	Light-Duty Trucks (0-8,500 lbs)	0.158	0.004	0.225	0.024	0.056	0.029	371.289	0.008
	Diesel	HDDV	Heavy-Duty Vehicles (8,501 + lbs)	4.991	0.013	0.927	0.201	0.166	0.091	1391.423	0.027
	NA	MC	Motorcycles	1.294	0.002	27.558	3.991	0.018	0.008	187.249	0.053

Table 5-38 EMFAC County-Specific On-Road Vehicle EFs – 2018 (cont.)

County	Fuel Type	Vehicle Type		Emission Factors (g/mi)							
				Criteria Pollutants and Ozone Precursors							
				NO_x	SO_x	CO	ROG	PM_{10}	$PM_{2.5}$	CO_2	NH_3[1]
Sonoma	Gasoline	LDGV	Light-Duty Vehicles (Passenger Cars)	0.113	0.003	1.222	0.131	0.047	0.020	316.569	0.025
	Gasoline	LDGT	Light-Duty Trucks (0-8,500 lbs)	0.224	0.004	1.950	0.281	0.047	0.020	415.386	0.026
	Gasoline	HDGV	Heavy-Duty Vehicles (8,501 + lbs)	0.586	0.006	3.364	0.495	0.056	0.024	636.514	0.045
	Diesel	LDDV	Light-Duty Vehicles (Passenger Cars)	0.261	0.003	0.360	0.029	0.060	0.032	303.189	0.008
	Diesel	LDDT	Light-Duty Trucks (0-8,500 lbs)	0.115	0.003	0.234	0.030	0.059	0.031	366.525	0.008
	Diesel	HDDV	Heavy-Duty Vehicles (8,501 + lbs)	5.062	0.011	0.934	0.225	0.189	0.113	1200.333	0.027
	NA	MC	Motorcycles	1.301	0.002	27.342	4.509	0.018	0.008	186.139	0.053
Stanislaus	Gasoline	LDGV	Light-Duty Vehicles (Passenger Cars)	0.100	0.003	1.157	0.129	0.047	0.020	321.898	0.025
	Gasoline	LDGT	Light-Duty Trucks (0-8,500 lbs)	0.210	0.004	1.925	0.282	0.047	0.020	425.791	0.026
	Gasoline	HDGV	Heavy-Duty Vehicles (8,501 + lbs)	0.489	0.006	3.151	0.429	0.054	0.023	636.423	0.045
	Diesel	LDDV	Light-Duty Vehicles (Passenger Cars)	0.144	0.003	0.298	0.021	0.054	0.027	284.108	0.008
	Diesel	LDDT	Light-Duty Trucks (0-8,500 lbs)	0.132	0.003	0.248	0.029	0.057	0.029	364.332	0.008
	Diesel	HDDV	Heavy-Duty Vehicles (8,501 + lbs)	5.036	0.014	0.823	0.199	0.159	0.089	1423.742	0.027
	NA	MC	Motorcycles	1.288	0.002	27.303	4.697	0.018	0.008	184.487	0.053
Sutter	Gasoline	LDGV	Light-Duty Vehicles (Passenger Cars)	0.105	0.003	1.117	0.120	0.047	0.019	290.066	0.025
	Gasoline	LDGT	Light-Duty Trucks (0-8,500 lbs)	0.265	0.004	2.080	0.312	0.047	0.020	384.498	0.026
	Gasoline	HDGV	Heavy-Duty Vehicles (8,501 + lbs)	0.556	0.006	3.263	0.463	0.053	0.022	587.937	0.045
	Diesel	LDDV	Light-Duty Vehicles (Passenger Cars)	0.133	0.002	0.211	0.016	0.053	0.025	259.362	0.008
	Diesel	LDDT	Light-Duty Trucks (0-8,500 lbs)	0.098	0.003	0.175	0.023	0.056	0.029	319.478	0.008
	Diesel	HDDV	Heavy-Duty Vehicles (8,501 + lbs)	4.889	0.014	0.780	0.191	0.152	0.084	1427.631	0.027
	NA	MC	Motorcycles	1.300	0.002	25.280	4.958	0.018	0.008	173.447	0.053
Tehama	Gasoline	LDGV	Light-Duty Vehicles (Passenger Cars)	0.120	0.003	1.207	0.128	0.047	0.020	314.393	0.025
	Gasoline	LDGT	Light-Duty Trucks (0-8,500 lbs)	0.312	0.004	2.362	0.344	0.048	0.020	419.704	0.026
	Gasoline	HDGV	Heavy-Duty Vehicles (8,501 + lbs)	0.620	0.006	3.569	0.519	0.055	0.023	630.955	0.045
	Diesel	LDDV	Light-Duty Vehicles (Passenger Cars)	0.192	0.003	0.319	0.024	0.056	0.028	286.580	0.008
	Diesel	LDDT	Light-Duty Trucks (0-8,500 lbs)	0.271	0.003	0.400	0.050	0.071	0.043	362.041	0.008
	Diesel	HDDV	Heavy-Duty Vehicles (8,501 + lbs)	5.270	0.014	0.848	0.198	0.148	0.081	1420.945	0.027
	NA	MC	Motorcycles	1.336	0.002	28.415	4.756	0.018	0.008	184.939	0.053
Trinity	Gasoline	LDGV	Light-Duty Vehicles (Passenger Cars)	0.179	0.004	1.799	0.178	0.048	0.021	375.669	0.025
	Gasoline	LDGT	Light-Duty Trucks (0-8,500 lbs)	0.619	0.005	4.556	0.604	0.050	0.022	513.106	0.026
	Gasoline	HDGV	Heavy-Duty Vehicles (8,501 + lbs)	1.168	0.008	6.310	1.006	0.058	0.026	741.148	0.045
	Diesel	LDDV	Light-Duty Vehicles (Passenger Cars)	0.359	0.003	0.645	0.056	0.070	0.042	339.601	0.008
	Diesel	LDDT	Light-Duty Trucks (0-8,500 lbs)	0.396	0.004	0.912	0.144	0.126	0.095	423.727	0.008
	Diesel	HDDV	Heavy-Duty Vehicles (8,501 + lbs)	5.640	0.013	0.933	0.218	0.154	0.088	1361.345	0.027
	NA	MC	Motorcycles	1.380	0.003	33.936	6.101	0.019	0.009	217.804	0.053
Tulare	Gasoline	LDGV	Light-Duty Vehicles (Passenger Cars)	0.091	0.003	1.030	0.118	0.047	0.019	300.121	0.025
	Gasoline	LDGT	Light-Duty Trucks (0-8,500 lbs)	0.220	0.004	1.928	0.306	0.047	0.020	396.542	0.026
	Gasoline	HDGV	Heavy-Duty Vehicles (8,501 + lbs)	0.474	0.006	3.045	0.411	0.053	0.022	599.793	0.045
	Diesel	LDDV	Light-Duty Vehicles (Passenger Cars)	0.098	0.003	0.184	0.013	0.052	0.024	262.398	0.008
	Diesel	LDDT	Light-Duty Trucks (0-8,500 lbs)	0.217	0.003	0.288	0.035	0.064	0.036	335.330	0.008
	Diesel	HDDV	Heavy-Duty Vehicles (8,501 + lbs)	5.041	0.014	0.843	0.198	0.161	0.089	1427.507	0.027
	NA	MC	Motorcycles	1.277	0.002	25.500	4.322	0.018	0.008	172.899	0.053
Tuolumne	Gasoline	LDGV	Light-Duty Vehicles (Passenger Cars)	0.178	0.003	1.764	0.184	0.047	0.020	320.485	0.025
	Gasoline	LDGT	Light-Duty Trucks (0-8,500 lbs)	0.489	0.004	3.734	0.535	0.048	0.021	433.160	0.026
	Gasoline	HDGV	Heavy-Duty Vehicles (8,501 + lbs)	1.013	0.007	5.462	0.862	0.057	0.025	650.343	0.045
	Diesel	LDDV	Light-Duty Vehicles (Passenger Cars)	0.248	0.003	0.384	0.029	0.058	0.030	291.794	0.008
	Diesel	LDDT	Light-Duty Trucks (0-8,500 lbs)	0.358	0.003	0.460	0.060	0.076	0.048	364.566	0.008
	Diesel	HDDV	Heavy-Duty Vehicles (8,501 + lbs)	5.898	0.009	1.106	0.259	0.195	0.120	950.721	0.027
	NA	MC	Motorcycles	1.354	0.002	30.318	5.349	0.019	0.009	186.131	0.053
Ventura	Gasoline	LDGV	Light-Duty Vehicles (Passenger Cars)	0.091	0.003	1.050	0.118	0.047	0.020	304.712	0.025
	Gasoline	LDGT	Light-Duty Trucks (0-8,500 lbs)	0.163	0.004	1.557	0.217	0.047	0.020	399.223	0.026
	Gasoline	HDGV	Heavy-Duty Vehicles (8,501 + lbs)	0.426	0.006	2.664	0.360	0.055	0.023	596.597	0.045
	Diesel	LDDV	Light-Duty Vehicles (Passenger Cars)	0.120	0.003	0.266	0.020	0.054	0.027	280.380	0.008
	Diesel	LDDT	Light-Duty Trucks (0-8,500 lbs)	0.129	0.003	0.214	0.025	0.056	0.028	356.450	0.008
	Diesel	HDDV	Heavy-Duty Vehicles (8,501 + lbs)	4.387	0.010	0.832	0.147	0.173	0.099	1132.849	0.027
	NA	MC	Motorcycles	1.284	0.002	25.183	4.886	0.019	0.009	188.515	0.053

Table 5-38 EMFAC County-Specific On-Road Vehicle EFs – 2018 (cont.)

County	Fuel Type	Vehicle Type		Emission Factors (g/mi)							
				Criteria Pollutants and Ozone Precursors							
				NO_x	SO_x	CO	ROG	PM_{10}	$PM_{2.5}$	CO_2	NH_3[1]
Yolo	Gasoline	LDGV	Light-Duty Vehicles (Passenger Cars)	0.099	0.003	1.101	0.128	0.047	0.020	311.069	0.025
	Gasoline	LDGT	Light-Duty Trucks (0-8,500 lbs)	0.163	0.004	1.471	0.216	0.047	0.020	401.044	0.026
	Gasoline	HDGV	Heavy-Duty Vehicles (8,501 + lbs)	0.433	0.006	2.623	0.364	0.055	0.023	611.842	0.045
	Diesel	LDDV	Light-Duty Vehicles (Passenger Cars)	0.211	0.003	0.280	0.022	0.057	0.029	285.881	0.008
	Diesel	LDDT	Light-Duty Trucks (0-8,500 lbs)	0.171	0.003	0.215	0.023	0.056	0.029	355.740	0.008
	Diesel	HDDV	Heavy-Duty Vehicles (8,501 + lbs)	4.229	0.012	0.844	0.186	0.177	0.099	1303.548	0.027
	NA	MC	Motorcycles	1.287	0.002	26.637	4.221	0.018	0.008	178.042	0.053
Yuba	Gasoline	LDGV	Light-Duty Vehicles (Passenger Cars)	0.109	0.003	1.140	0.118	0.047	0.020	299.982	0.025
	Gasoline	LDGT	Light-Duty Trucks (0-8,500 lbs)	0.329	0.004	2.495	0.357	0.047	0.020	404.428	0.026
	Gasoline	HDGV	Heavy-Duty Vehicles (8,501 + lbs)	0.659	0.006	3.798	0.537	0.055	0.023	606.275	0.045
	Diesel	LDDV	Light-Duty Vehicles (Passenger Cars)	0.145	0.003	0.244	0.018	0.054	0.026	272.613	0.008
	Diesel	LDDT	Light-Duty Trucks (0-8,500 lbs)	0.140	0.003	0.192	0.023	0.055	0.028	332.218	0.008
	Diesel	HDDV	Heavy-Duty Vehicles (8,501 + lbs)	5.753	0.010	1.089	0.248	0.201	0.119	1062.681	0.027
	NA	MC	Motorcycles	1.294	0.002	26.310	4.406	0.018	0.008	173.872	0.053

Table 5-39 EMFAC County-Specific On-Road Vehicle EFs – 2019

County	Fuel Type	Vehicle Type		Emission Factors (g/mi)							
				Criteria Pollutants and Ozone Precursors							
				NO_x	SO_x	CO	ROG	PM_{10}	$PM_{2.5}$	CO_2	NH_3[1]
Alameda	Gasoline	LDGV	Light-Duty Vehicles (Passenger Cars)	0.093	0.003	1.047	0.120	0.047	0.020	303.116	0.024
	Gasoline	LDGT	Light-Duty Trucks (0-8,500 lbs)	0.146	0.004	1.348	0.186	0.047	0.020	394.003	0.025
	Gasoline	HDGV	Heavy-Duty Vehicles (8,501 + lbs)	0.399	0.006	2.431	0.327	0.055	0.023	597.427	0.045
	Diesel	LDDV	Light-Duty Vehicles (Passenger Cars)	0.144	0.003	0.269	0.020	0.054	0.027	282.002	0.008
	Diesel	LDDT	Light-Duty Trucks (0-8,500 lbs)	0.092	0.003	0.179	0.021	0.053	0.026	353.605	0.008
	Diesel	HDDV	Heavy-Duty Vehicles (8,501 + lbs)	4.798	0.014	0.862	0.194	0.179	0.099	1431.178	0.027
	NA	MC	Motorcycles	1.257	0.002	24.187	3.866	0.018	0.008	183.546	0.053
Alpine	Gasoline	LDGV	Light-Duty Vehicles (Passenger Cars)	0.124	0.003	1.271	0.121	0.047	0.020	279.935	0.024
	Gasoline	LDGT	Light-Duty Trucks (0-8,500 lbs)	0.275	0.004	2.206	0.299	0.047	0.020	372.663	0.025
	Gasoline	HDGV	Heavy-Duty Vehicles (8,501 + lbs)	0.769	0.006	4.098	0.624	0.056	0.024	588.300	0.045
	Diesel	LDDV	Light-Duty Vehicles (Passenger Cars)	0.143	0.002	0.271	0.019	0.053	0.026	260.311	0.008
	Diesel	LDDT	Light-Duty Trucks (0-8,500 lbs)	0.113	0.003	0.202	0.024	0.054	0.027	328.986	0.008
	Diesel	HDDV	Heavy-Duty Vehicles (8,501 + lbs)	4.500	0.014	0.759	0.164	0.142	0.072	1415.693	0.027
	NA	MC	Motorcycles	1.379	0.002	27.953	4.340	0.018	0.008	174.668	0.053
Amador	Gasoline	LDGV	Light-Duty Vehicles (Passenger Cars)	0.134	0.003	1.336	0.149	0.047	0.019	270.487	0.024
	Gasoline	LDGT	Light-Duty Trucks (0-8,500 lbs)	0.350	0.004	2.726	0.459	0.047	0.020	365.038	0.025
	Gasoline	HDGV	Heavy-Duty Vehicles (8,501 + lbs)	0.870	0.006	4.672	0.833	0.057	0.024	584.103	0.045
	Diesel	LDDV	Light-Duty Vehicles (Passenger Cars)	0.221	0.002	0.232	0.018	0.055	0.027	249.039	0.008
	Diesel	LDDT	Light-Duty Trucks (0-8,500 lbs)	0.134	0.003	0.224	0.029	0.061	0.034	304.316	0.008
	Diesel	HDDV	Heavy-Duty Vehicles (8,501 + lbs)	5.498	0.010	0.988	0.234	0.182	0.110	1011.413	0.027
	NA	MC	Motorcycles	1.302	0.002	25.648	4.310	0.018	0.008	160.213	0.053
Butte	Gasoline	LDGV	Light-Duty Vehicles (Passenger Cars)	0.115	0.003	1.228	0.131	0.047	0.020	304.731	0.024
	Gasoline	LDGT	Light-Duty Trucks (0-8,500 lbs)	0.323	0.004	2.509	0.360	0.048	0.020	411.270	0.025
	Gasoline	HDGV	Heavy-Duty Vehicles (8,501 + lbs)	0.611	0.006	3.531	0.522	0.056	0.024	617.986	0.045
	Diesel	LDDV	Light-Duty Vehicles (Passenger Cars)	0.183	0.003	0.284	0.022	0.056	0.028	280.488	0.008
	Diesel	LDDT	Light-Duty Trucks (0-8,500 lbs)	0.237	0.003	0.288	0.034	0.062	0.034	352.945	0.008
	Diesel	HDDV	Heavy-Duty Vehicles (8,501 + lbs)	4.967	0.013	0.878	0.194	0.155	0.085	1357.753	0.027
	NA	MC	Motorcycles	1.283	0.002	26.280	4.796	0.018	0.009	178.850	0.053
Calaveras	Gasoline	LDGV	Light-Duty Vehicles (Passenger Cars)	0.136	0.003	1.409	0.145	0.047	0.020	298.451	0.024
	Gasoline	LDGT	Light-Duty Trucks (0-8,500 lbs)	0.371	0.004	3.025	0.494	0.048	0.021	403.942	0.025
	Gasoline	HDGV	Heavy-Duty Vehicles (8,501 + lbs)	0.951	0.006	5.233	0.920	0.057	0.025	627.962	0.045
	Diesel	LDDV	Light-Duty Vehicles (Passenger Cars)	0.231	0.003	0.354	0.027	0.057	0.030	274.569	0.008
	Diesel	LDDT	Light-Duty Trucks (0-8,500 lbs)	0.156	0.003	0.350	0.049	0.070	0.041	343.300	0.008
	Diesel	HDDV	Heavy-Duty Vehicles (8,501 + lbs)	5.491	0.010	0.968	0.226	0.173	0.102	1081.890	0.027
	NA	MC	Motorcycles	1.310	0.002	27.129	5.154	0.018	0.009	180.180	0.053
Colusa	Gasoline	LDGV	Light-Duty Vehicles (Passenger Cars)	0.097	0.003	0.994	0.113	0.047	0.020	295.266	0.024
	Gasoline	LDGT	Light-Duty Trucks (0-8,500 lbs)	0.205	0.004	1.634	0.244	0.047	0.020	389.624	0.025
	Gasoline	HDGV	Heavy-Duty Vehicles (8,501 + lbs)	0.475	0.006	2.727	0.395	0.054	0.023	599.683	0.045
	Diesel	LDDV	Light-Duty Vehicles (Passenger Cars)	0.132	0.003	0.245	0.018	0.053	0.026	268.293	0.008
	Diesel	LDDT	Light-Duty Trucks (0-8,500 lbs)	0.142	0.003	0.245	0.030	0.059	0.032	340.603	0.008
	Diesel	HDDV	Heavy-Duty Vehicles (8,501 + lbs)	4.658	0.013	0.799	0.181	0.146	0.078	1368.389	0.027
	NA	MC	Motorcycles	1.270	0.002	24.358	4.095	0.018	0.008	178.345	0.053
Contra Costa	Gasoline	LDGV	Light-Duty Vehicles (Passenger Cars)	0.086	0.003	0.981	0.112	0.047	0.020	298.900	0.024
	Gasoline	LDGT	Light-Duty Trucks (0-8,500 lbs)	0.140	0.004	1.322	0.184	0.047	0.020	392.348	0.025
	Gasoline	HDGV	Heavy-Duty Vehicles (8,501 + lbs)	0.374	0.006	2.355	0.318	0.054	0.023	591.531	0.045
	Diesel	LDDV	Light-Duty Vehicles (Passenger Cars)	0.108	0.003	0.232	0.017	0.053	0.026	276.569	0.008
	Diesel	LDDT	Light-Duty Trucks (0-8,500 lbs)	0.087	0.003	0.163	0.019	0.053	0.025	351.827	0.008
	Diesel	HDDV	Heavy-Duty Vehicles (8,501 + lbs)	4.744	0.012	0.827	0.188	0.196	0.105	1303.566	0.027
	NA	MC	Motorcycles	1.260	0.002	24.425	3.942	0.018	0.008	182.416	0.053
Del Norte	Gasoline	LDGV	Light-Duty Vehicles (Passenger Cars)	0.149	0.003	1.417	0.153	0.047	0.020	315.524	0.024
	Gasoline	LDGT	Light-Duty Trucks (0-8,500 lbs)	0.504	0.004	3.445	0.522	0.048	0.021	432.252	0.025
	Gasoline	HDGV	Heavy-Duty Vehicles (8,501 + lbs)	0.882	0.007	4.611	0.760	0.056	0.024	648.310	0.045
	Diesel	LDDV	Light-Duty Vehicles (Passenger Cars)	0.204	0.003	0.381	0.028	0.057	0.030	300.819	0.008
	Diesel	LDDT	Light-Duty Trucks (0-8,500 lbs)	0.442	0.004	0.868	0.124	0.119	0.089	375.518	0.008
	Diesel	HDDV	Heavy-Duty Vehicles (8,501 + lbs)	5.637	0.008	1.118	0.249	0.180	0.108	873.569	0.027
	NA	MC	Motorcycles	1.364	0.003	29.520	5.054	0.019	0.009	191.885	0.053

Table 5-39 EMFAC County-Specific On-Road Vehicle EFs – 2019 (cont.)

County	Fuel Type	Vehicle Type		Emission Factors (g/mi)							
				Criteria Pollutants and Ozone Precursors							
				NO_x	SO_x	CO	ROG	PM_{10}	$PM_{2.5}$	CO_2	NH_3[1]
El Dorado	Gasoline	LDGV	Light-Duty Vehicles (Passenger Cars)	0.082	0.003	0.970	0.100	0.047	0.020	297.346	0.024
	Gasoline	LDGT	Light-Duty Trucks (0-8,500 lbs)	0.193	0.004	1.836	0.280	0.047	0.020	404.032	0.025
	Gasoline	HDGV	Heavy-Duty Vehicles (8,501 + lbs)	0.490	0.006	3.159	0.495	0.054	0.023	604.540	0.045
	Diesel	LDDV	Light-Duty Vehicles (Passenger Cars)	0.140	0.003	0.256	0.018	0.053	0.026	274.188	0.008
	Diesel	LDDT	Light-Duty Trucks (0-8,500 lbs)	0.149	0.003	0.218	0.025	0.056	0.028	354.011	0.008
	Diesel	HDDV	Heavy-Duty Vehicles (8,501 + lbs)	4.894	0.009	0.951	0.217	0.176	0.103	971.194	0.027
	NA	MC	Motorcycles	1.350	0.002	28.323	5.349	0.019	0.009	186.623	0.053
Fresno	Gasoline	LDGV	Light-Duty Vehicles (Passenger Cars)	0.08	0.00	0.90	0.11	0.05	0.02	294.86	0.024
	Gasoline	LDGT	Light-Duty Trucks (0-8,500 lbs)	0.17	0.00	1.52	0.25	0.05	0.02	392.57	0.025
	Gasoline	HDGV	Heavy-Duty Vehicles (8,501 + lbs)	0.41	0.01	2.60	0.38	0.05	0.02	598.33	0.045
	Diesel	LDDV	Light-Duty Vehicles (Passenger Cars)	0.07	0.00	0.17	0.01	0.05	0.02	260.47	0.008
	Diesel	LDDT	Light-Duty Trucks (0-8,500 lbs)	0.10	0.00	0.17	0.02	0.05	0.03	341.49	0.008
	Diesel	HDDV	Heavy-Duty Vehicles (8,501 + lbs)	4.72	0.01	0.76	0.18	0.15	0.08	1521.81	0.027
	NA	MC	Motorcycles	1.27	0.00	25.56	4.04	0.02	0.01	174.36	0.053
Glenn	Gasoline	LDGV	Light-Duty Vehicles (Passenger Cars)	0.101	0.003	1.077	0.117	0.047	0.020	306.350	0.024
	Gasoline	LDGT	Light-Duty Trucks (0-8,500 lbs)	0.239	0.004	1.938	0.296	0.047	0.020	406.603	0.025
	Gasoline	HDGV	Heavy-Duty Vehicles (8,501 + lbs)	0.528	0.006	3.124	0.466	0.055	0.023	622.653	0.045
	Diesel	LDDV	Light-Duty Vehicles (Passenger Cars)	0.121	0.003	0.286	0.020	0.053	0.026	278.235	0.008
	Diesel	LDDT	Light-Duty Trucks (0-8,500 lbs)	0.161	0.003	0.315	0.041	0.065	0.037	347.909	0.008
	Diesel	HDDV	Heavy-Duty Vehicles (8,501 + lbs)	4.848	0.013	0.832	0.189	0.148	0.081	1338.630	0.027
	NA	MC	Motorcycles	1.273	0.002	25.364	4.543	0.018	0.008	183.995	0.053
Humboldt	Gasoline	LDGV	Light-Duty Vehicles (Passenger Cars)	0.247	0.003	2.282	0.261	0.047	0.020	329.059	0.024
	Gasoline	LDGT	Light-Duty Trucks (0-8,500 lbs)	0.439	0.004	3.116	0.466	0.048	0.020	402.791	0.025
	Gasoline	HDGV	Heavy-Duty Vehicles (8,501 + lbs)	0.887	0.006	4.558	0.762	0.056	0.024	605.917	0.045
	Diesel	LDDV	Light-Duty Vehicles (Passenger Cars)	0.432	0.003	0.440	0.036	0.065	0.037	288.734	0.008
	Diesel	LDDT	Light-Duty Trucks (0-8,500 lbs)	0.179	0.003	0.358	0.047	0.070	0.042	351.782	0.008
	Diesel	HDDV	Heavy-Duty Vehicles (8,501 + lbs)	5.744	0.011	0.992	0.232	0.172	0.101	1191.595	0.027
	NA	MC	Motorcycles	1.370	0.002	28.917	4.776	0.018	0.008	179.363	0.053
Imperial	Gasoline	LDGV	Light-Duty Vehicles (Passenger Cars)	0.312	0.003	2.817	0.230	0.047	0.019	290.451	0.024
	Gasoline	LDGT	Light-Duty Trucks (0-8,500 lbs)	0.238	0.004	1.979	0.385	0.047	0.020	386.562	0.025
	Gasoline	HDGV	Heavy-Duty Vehicles (8,501 + lbs)	0.587	0.006	3.364	0.543	0.054	0.023	583.217	0.045
	Diesel	LDDV	Light-Duty Vehicles (Passenger Cars)	0.083	0.002	0.162	0.012	0.051	0.024	247.713	0.008
	Diesel	LDDT	Light-Duty Trucks (0-8,500 lbs)	0.137	0.003	0.160	0.017	0.053	0.026	324.705	0.008
	Diesel	HDDV	Heavy-Duty Vehicles (8,501 + lbs)	3.697	0.013	0.421	0.087	0.134	0.067	1392.933	0.027
	NA	MC	Motorcycles	1.185	0.002	21.851	3.833	0.018	0.008	167.987	0.053
Inyo	Gasoline	LDGV	Light-Duty Vehicles (Passenger Cars)	0.115	0.003	1.167	0.139	0.047	0.020	309.771	0.024
	Gasoline	LDGT	Light-Duty Trucks (0-8,500 lbs)	0.270	0.004	2.127	0.366	0.047	0.020	414.096	0.025
	Gasoline	HDGV	Heavy-Duty Vehicles (8,501 + lbs)	0.749	0.006	4.002	0.721	0.057	0.024	640.668	0.045
	Diesel	LDDV	Light-Duty Vehicles (Passenger Cars)	0.136	0.003	0.290	0.020	0.054	0.026	277.756	0.008
	Diesel	LDDT	Light-Duty Trucks (0-8,500 lbs)	0.118	0.003	0.240	0.029	0.057	0.029	352.651	0.008
	Diesel	HDDV	Heavy-Duty Vehicles (8,501 + lbs)	4.689	0.013	0.849	0.182	0.161	0.085	1311.758	0.027
	NA	MC	Motorcycles	1.310	0.002	26.779	4.695	0.018	0.008	186.864	0.053
Kern	Gasoline	LDGV	Light-Duty Vehicles (Passenger Cars)	0.078	0.003	0.867	0.105	0.047	0.020	316.601	0.024
	Gasoline	LDGT	Light-Duty Trucks (0-8,500 lbs)	0.162	0.004	1.429	0.232	0.047	0.020	420.542	0.025
	Gasoline	HDGV	Heavy-Duty Vehicles (8,501 + lbs)	0.410	0.006	2.528	0.378	0.055	0.023	645.770	0.045
	Diesel	LDDV	Light-Duty Vehicles (Passenger Cars)	0.081	0.003	0.218	0.014	0.051	0.024	284.954	0.008
	Diesel	LDDT	Light-Duty Trucks (0-8,500 lbs)	0.087	0.004	0.180	0.020	0.053	0.025	371.588	0.008
	Diesel	HDDV	Heavy-Duty Vehicles (8,501 + lbs)	4.585	0.014	0.737	0.166	0.142	0.073	1522.181	0.027
	NA	MC	Motorcycles	1.277	0.002	26.504	4.072	0.018	0.008	187.391	0.053
Kings	Gasoline	LDGV	Light-Duty Vehicles (Passenger Cars)	0.087	0.003	0.925	0.104	0.047	0.019	290.564	0.024
	Gasoline	LDGT	Light-Duty Trucks (0-8,500 lbs)	0.216	0.004	1.774	0.271	0.047	0.020	387.825	0.025
	Gasoline	HDGV	Heavy-Duty Vehicles (8,501 + lbs)	0.453	0.006	2.692	0.393	0.054	0.023	598.060	0.045
	Diesel	LDDV	Light-Duty Vehicles (Passenger Cars)	0.077	0.002	0.213	0.014	0.051	0.023	255.350	0.008
	Diesel	LDDT	Light-Duty Trucks (0-8,500 lbs)	0.143	0.003	0.234	0.028	0.058	0.030	330.279	0.008
	Diesel	HDDV	Heavy-Duty Vehicles (8,501 + lbs)	4.762	0.015	0.740	0.167	0.135	0.068	1555.681	0.027
	NA	MC	Motorcycles	1.249	0.002	23.795	3.889	0.018	0.008	172.345	0.053

Table 5-39 EMFAC County-Specific On-Road Vehicle EFs – 2019 (cont.)

County	Fuel Type	Vehicle Type		Emission Factors (g/mi)							
				Criteria Pollutants and Ozone Precursors							
				NO_x	SO_x	CO	ROG	PM_{10}	$PM_{2.5}$	CO_2	NH_3[1]
Lake	Gasoline	LDGV	Light-Duty Vehicles (Passenger Cars)	0.163	0.003	1.616	0.188	0.047	0.020	307.249	0.024
	Gasoline	LDGT	Light-Duty Trucks (0-8,500 lbs)	0.375	0.004	2.873	0.481	0.048	0.020	407.972	0.025
	Gasoline	HDGV	Heavy-Duty Vehicles (8,501 + lbs)	1.016	0.006	5.471	0.993	0.058	0.025	634.478	0.045
	Diesel	LDDV	Light-Duty Vehicles (Passenger Cars)	0.246	0.003	0.351	0.027	0.058	0.031	280.284	0.008
	Diesel	LDDT	Light-Duty Trucks (0-8,500 lbs)	0.299	0.003	0.348	0.040	0.065	0.037	346.055	0.008
	Diesel	HDDV	Heavy-Duty Vehicles (8,501 + lbs)	5.775	0.010	1.076	0.262	0.192	0.119	1082.382	0.027
	NA	MC	Motorcycles	1.340	0.002	29.080	5.377	0.019	0.009	181.726	0.053
Lassen	Gasoline	LDGV	Light-Duty Vehicles (Passenger Cars)	0.137	0.003	1.382	0.143	0.047	0.020	320.531	0.024
	Gasoline	LDGT	Light-Duty Trucks (0-8,500 lbs)	0.340	0.004	2.692	0.422	0.048	0.020	435.857	0.025
	Gasoline	HDGV	Heavy-Duty Vehicles (8,501 + lbs)	0.967	0.007	5.215	0.918	0.057	0.025	665.101	0.045
	Diesel	LDDV	Light-Duty Vehicles (Passenger Cars)	0.174	0.003	0.371	0.026	0.055	0.028	290.389	0.008
	Diesel	LDDT	Light-Duty Trucks (0-8,500 lbs)	0.152	0.004	0.324	0.040	0.061	0.034	374.148	0.008
	Diesel	HDDV	Heavy-Duty Vehicles (8,501 + lbs)	5.480	0.009	1.134	0.246	0.184	0.109	893.094	0.027
	NA	MC	Motorcycles	1.376	0.003	30.122	5.153	0.018	0.009	195.336	0.053
Los Angeles	Gasoline	LDGV	Light-Duty Vehicles (Passenger Cars)	0.088	0.003	1.087	0.120	0.047	0.020	325.438	0.024
	Gasoline	LDGT	Light-Duty Trucks (0-8,500 lbs)	0.158	0.004	1.576	0.198	0.048	0.020	424.925	0.025
	Gasoline	HDGV	Heavy-Duty Vehicles (8,501 + lbs)	0.368	0.006	2.460	0.306	0.055	0.024	622.715	0.045
	Diesel	LDDV	Light-Duty Vehicles (Passenger Cars)	0.092	0.003	0.313	0.023	0.054	0.027	284.354	0.008
	Diesel	LDDT	Light-Duty Trucks (0-8,500 lbs)	0.108	0.004	0.235	0.028	0.054	0.027	372.392	0.008
	Diesel	HDDV	Heavy-Duty Vehicles (8,501 + lbs)	3.989	0.012	0.975	0.152	0.173	0.092	1285.254	0.027
	NA	MC	Motorcycles	1.221	0.002	22.413	4.261	0.019	0.009	199.626	0.053
Madera	Gasoline	LDGV	Light-Duty Vehicles (Passenger Cars)	0.083	0.003	1.020	0.106	0.047	0.020	316.525	0.024
	Gasoline	LDGT	Light-Duty Trucks (0-8,500 lbs)	0.192	0.004	1.852	0.281	0.048	0.020	422.985	0.025
	Gasoline	HDGV	Heavy-Duty Vehicles (8,501 + lbs)	0.457	0.006	3.035	0.425	0.055	0.024	643.676	0.045
	Diesel	LDDV	Light-Duty Vehicles (Passenger Cars)	0.113	0.003	0.314	0.022	0.053	0.026	278.985	0.008
	Diesel	LDDT	Light-Duty Trucks (0-8,500 lbs)	0.148	0.003	0.263	0.032	0.057	0.030	356.513	0.008
	Diesel	HDDV	Heavy-Duty Vehicles (8,501 + lbs)	4.793	0.014	0.808	0.179	0.146	0.076	1472.766	0.027
	NA	MC	Motorcycles	1.243	0.002	24.924	4.085	0.018	0.008	183.885	0.053
Marin	Gasoline	LDGV	Light-Duty Vehicles (Passenger Cars)	0.087	0.003	0.959	0.120	0.047	0.020	302.453	0.024
	Gasoline	LDGT	Light-Duty Trucks (0-8,500 lbs)	0.140	0.004	1.273	0.194	0.047	0.020	396.834	0.025
	Gasoline	HDGV	Heavy-Duty Vehicles (8,501 + lbs)	0.368	0.006	2.227	0.330	0.055	0.023	595.772	0.045
	Diesel	LDDV	Light-Duty Vehicles (Passenger Cars)	0.154	0.003	0.278	0.020	0.055	0.027	293.019	0.008
	Diesel	LDDT	Light-Duty Trucks (0-8,500 lbs)	0.087	0.004	0.181	0.020	0.053	0.025	375.223	0.008
	Diesel	HDDV	Heavy-Duty Vehicles (8,501 + lbs)	5.143	0.011	1.199	0.240	0.248	0.142	1222.479	0.027
	NA	MC	Motorcycles	1.288	0.002	25.393	4.035	0.018	0.008	186.520	0.053
Mariposa	Gasoline	LDGV	Light-Duty Vehicles (Passenger Cars)	0.136	0.003	1.404	0.151	0.047	0.020	309.582	0.024
	Gasoline	LDGT	Light-Duty Trucks (0-8,500 lbs)	0.473	0.004	3.637	0.566	0.048	0.021	426.568	0.025
	Gasoline	HDGV	Heavy-Duty Vehicles (8,501 + lbs)	0.958	0.007	5.251	0.921	0.057	0.025	647.172	0.045
	Diesel	LDDV	Light-Duty Vehicles (Passenger Cars)	0.280	0.003	0.422	0.033	0.060	0.032	289.430	0.008
	Diesel	LDDT	Light-Duty Trucks (0-8,500 lbs)	0.295	0.003	0.594	0.090	0.095	0.066	352.727	0.008
	Diesel	HDDV	Heavy-Duty Vehicles (8,501 + lbs)	5.821	0.008	1.107	0.254	0.185	0.111	861.055	0.027
	NA	MC	Motorcycles	1.346	0.002	29.392	5.325	0.019	0.009	187.724	0.053
Mendocino	Gasoline	LDGV	Light-Duty Vehicles (Passenger Cars)	0.137	0.003	1.331	0.142	0.047	0.020	292.426	0.024
	Gasoline	LDGT	Light-Duty Trucks (0-8,500 lbs)	0.425	0.004	3.108	0.467	0.048	0.020	401.001	0.025
	Gasoline	HDGV	Heavy-Duty Vehicles (8,501 + lbs)	0.905	0.006	4.711	0.779	0.056	0.024	612.791	0.045
	Diesel	LDDV	Light-Duty Vehicles (Passenger Cars)	0.469	0.003	0.443	0.036	0.065	0.037	286.653	0.008
	Diesel	LDDT	Light-Duty Trucks (0-8,500 lbs)	0.276	0.003	0.362	0.045	0.069	0.041	341.769	0.008
	Diesel	HDDV	Heavy-Duty Vehicles (8,501 + lbs)	5.380	0.012	0.905	0.215	0.161	0.093	1301.515	0.027
	NA	MC	Motorcycles	1.344	0.002	28.115	4.752	0.018	0.008	178.103	0.053
Merced	Gasoline	LDGV	Light-Duty Vehicles (Passenger Cars)	0.088	0.003	1.023	0.111	0.047	0.020	308.384	0.024
	Gasoline	LDGT	Light-Duty Trucks (0-8,500 lbs)	0.194	0.004	1.757	0.261	0.047	0.020	408.319	0.025
	Gasoline	HDGV	Heavy-Duty Vehicles (8,501 + lbs)	0.464	0.006	3.010	0.402	0.056	0.024	629.346	0.045
	Diesel	LDDV	Light-Duty Vehicles (Passenger Cars)	0.130	0.003	0.273	0.019	0.053	0.026	274.072	0.008
	Diesel	LDDT	Light-Duty Trucks (0-8,500 lbs)	0.152	0.003	0.261	0.031	0.059	0.031	355.347	0.008
	Diesel	HDDV	Heavy-Duty Vehicles (8,501 + lbs)	4.852	0.015	0.764	0.173	0.143	0.073	1551.951	0.027
	NA	MC	Motorcycles	1.243	0.002	24.761	3.722	0.018	0.008	177.891	0.053

Table 5-39 EMFAC County-Specific On-Road Vehicle EFs – 2019 (cont.)

County	Fuel Type	Vehicle Type		Emission Factors (g/mi)							
				Criteria Pollutants and Ozone Precursors							
				NO_x	SO_x	CO	ROG	PM_{10}	$PM_{2.5}$	CO_2	NH_3[1]
Modoc	Gasoline	LDGV	Light-Duty Vehicles (Passenger Cars)	0.151	0.004	1.540	0.152	0.048	0.021	356.451	0.024
	Gasoline	LDGT	Light-Duty Trucks (0-8,500 lbs)	0.375	0.005	2.967	0.424	0.048	0.021	480.959	0.025
	Gasoline	HDGV	Heavy-Duty Vehicles (8,501 + lbs)	1.086	0.007	6.013	1.031	0.058	0.025	719.279	0.045
	Diesel	LDDV	Light-Duty Vehicles (Passenger Cars)	0.177	0.003	0.524	0.037	0.057	0.030	323.579	0.008
	Diesel	LDDT	Light-Duty Trucks (0-8,500 lbs)	0.312	0.004	0.467	0.049	0.062	0.034	439.856	0.008
	Diesel	HDDV	Heavy-Duty Vehicles (8,501 + lbs)	5.469	0.009	1.063	0.235	0.175	0.102	957.305	0.027
	NA	MC	Motorcycles	1.395	0.003	31.065	5.376	0.019	0.009	217.533	0.053
Mono	Gasoline	LDGV	Light-Duty Vehicles (Passenger Cars)	0.122	0.003	1.194	0.119	0.047	0.020	298.266	0.024
	Gasoline	LDGT	Light-Duty Trucks (0-8,500 lbs)	0.298	0.004	2.281	0.332	0.047	0.020	403.838	0.025
	Gasoline	HDGV	Heavy-Duty Vehicles (8,501 + lbs)	0.815	0.006	4.373	0.695	0.057	0.024	623.215	0.045
	Diesel	LDDV	Light-Duty Vehicles (Passenger Cars)	0.175	0.003	0.328	0.024	0.056	0.028	281.840	0.008
	Diesel	LDDT	Light-Duty Trucks (0-8,500 lbs)	0.353	0.003	0.362	0.037	0.062	0.035	364.484	0.008
	Diesel	HDDV	Heavy-Duty Vehicles (8,501 + lbs)	4.634	0.013	0.793	0.175	0.145	0.076	1351.845	0.027
	NA	MC	Motorcycles	1.440	0.003	32.194	4.850	0.018	0.009	187.938	0.053
Monterey	Gasoline	LDGV	Light-Duty Vehicles (Passenger Cars)	0.121	0.003	1.254	0.134	0.047	0.020	321.620	0.024
	Gasoline	LDGT	Light-Duty Trucks (0-8,500 lbs)	0.290	0.004	2.182	0.293	0.048	0.020	432.589	0.025
	Gasoline	HDGV	Heavy-Duty Vehicles (8,501 + lbs)	0.590	0.007	3.319	0.436	0.056	0.024	653.839	0.045
	Diesel	LDDV	Light-Duty Vehicles (Passenger Cars)	0.159	0.003	0.390	0.029	0.056	0.029	294.796	0.008
	Diesel	LDDT	Light-Duty Trucks (0-8,500 lbs)	0.139	0.004	0.311	0.038	0.059	0.032	380.413	0.008
	Diesel	HDDV	Heavy-Duty Vehicles (8,501 + lbs)	4.858	0.012	0.957	0.202	0.187	0.104	1292.565	0.027
	NA	MC	Motorcycles	1.260	0.002	24.569	3.839	0.018	0.008	190.117	0.053
Napa	Gasoline	LDGV	Light-Duty Vehicles (Passenger Cars)	0.087	0.003	0.990	0.105	0.047	0.020	290.491	0.024
	Gasoline	LDGT	Light-Duty Trucks (0-8,500 lbs)	0.168	0.004	1.557	0.222	0.047	0.020	385.166	0.025
	Gasoline	HDGV	Heavy-Duty Vehicles (8,501 + lbs)	0.475	0.006	2.893	0.407	0.056	0.024	603.045	0.045
	Diesel	LDDV	Light-Duty Vehicles (Passenger Cars)	0.126	0.003	0.242	0.018	0.054	0.027	272.648	0.008
	Diesel	LDDT	Light-Duty Trucks (0-8,500 lbs)	0.078	0.003	0.157	0.018	0.052	0.025	349.728	0.008
	Diesel	HDDV	Heavy-Duty Vehicles (8,501 + lbs)	5.040	0.012	0.893	0.205	0.171	0.097	1316.438	0.027
	NA	MC	Motorcycles	1.264	0.002	24.380	3.858	0.018	0.008	176.212	0.053
Nevada	Gasoline	LDGV	Light-Duty Vehicles (Passenger Cars)	0.115	0.003	1.167	0.126	0.047	0.020	287.614	0.024
	Gasoline	LDGT	Light-Duty Trucks (0-8,500 lbs)	0.312	0.004	2.337	0.339	0.047	0.020	399.412	0.025
	Gasoline	HDGV	Heavy-Duty Vehicles (8,501 + lbs)	0.671	0.006	3.702	0.553	0.055	0.023	598.589	0.045
	Diesel	LDDV	Light-Duty Vehicles (Passenger Cars)	0.236	0.003	0.318	0.025	0.058	0.030	275.543	0.008
	Diesel	LDDT	Light-Duty Trucks (0-8,500 lbs)	0.373	0.003	0.349	0.036	0.064	0.036	353.754	0.008
	Diesel	HDDV	Heavy-Duty Vehicles (8,501 + lbs)	5.004	0.012	0.851	0.193	0.148	0.081	1311.535	0.027
	NA	MC	Motorcycles	1.382	0.002	29.745	5.119	0.019	0.009	176.743	0.053
Orange	Gasoline	LDGV	Light-Duty Vehicles (Passenger Cars)	0.074	0.003	0.919	0.106	0.047	0.020	303.949	0.024
	Gasoline	LDGT	Light-Duty Trucks (0-8,500 lbs)	0.121	0.004	1.253	0.168	0.047	0.020	398.688	0.025
	Gasoline	HDGV	Heavy-Duty Vehicles (8,501 + lbs)	0.345	0.006	2.282	0.301	0.055	0.023	598.460	0.045
	Diesel	LDDV	Light-Duty Vehicles (Passenger Cars)	0.071	0.003	0.248	0.017	0.052	0.024	270.746	0.008
	Diesel	LDDT	Light-Duty Trucks (0-8,500 lbs)	0.068	0.003	0.174	0.020	0.051	0.024	353.422	0.008
	Diesel	HDDV	Heavy-Duty Vehicles (8,501 + lbs)	3.556	0.011	0.841	0.134	0.180	0.099	1170.409	0.027
	NA	MC	Motorcycles	1.211	0.002	21.946	4.154	0.018	0.009	189.586	0.053
Placer	Gasoline	LDGV	Light-Duty Vehicles (Passenger Cars)	0.082	0.003	0.961	0.105	0.047	0.020	290.580	0.024
	Gasoline	LDGT	Light-Duty Trucks (0-8,500 lbs)	0.145	0.004	1.395	0.193	0.047	0.020	385.702	0.025
	Gasoline	HDGV	Heavy-Duty Vehicles (8,501 + lbs)	0.390	0.006	2.509	0.349	0.054	0.023	587.347	0.045
	Diesel	LDDV	Light-Duty Vehicles (Passenger Cars)	0.131	0.003	0.235	0.018	0.054	0.026	265.312	0.008
	Diesel	LDDT	Light-Duty Trucks (0-8,500 lbs)	0.117	0.003	0.180	0.021	0.054	0.026	339.032	0.008
	Diesel	HDDV	Heavy-Duty Vehicles (8,501 + lbs)	4.205	0.012	0.756	0.172	0.157	0.084	1299.447	0.027
	NA	MC	Motorcycles	1.308	0.002	26.178	4.417	0.018	0.008	177.681	0.053
Plumas	Gasoline	LDGV	Light-Duty Vehicles (Passenger Cars)	0.142	0.003	1.504	0.155	0.048	0.020	330.520	0.024
	Gasoline	LDGT	Light-Duty Trucks (0-8,500 lbs)	0.421	0.005	3.352	0.473	0.048	0.021	462.065	0.025
	Gasoline	HDGV	Heavy-Duty Vehicles (8,501 + lbs)	1.128	0.007	6.225	1.009	0.057	0.025	683.098	0.045
	Diesel	LDDV	Light-Duty Vehicles (Passenger Cars)	0.219	0.003	0.484	0.035	0.058	0.031	307.982	0.008
	Diesel	LDDT	Light-Duty Trucks (0-8,500 lbs)	0.172	0.004	0.389	0.045	0.061	0.033	408.092	0.008
	Diesel	HDDV	Heavy-Duty Vehicles (8,501 + lbs)	5.637	0.010	1.034	0.231	0.172	0.103	1066.764	0.027
	NA	MC	Motorcycles	1.378	0.003	31.071	5.627	0.019	0.009	203.907	0.053

Table 5-39 EMFAC County-Specific On-Road Vehicle EFs – 2019 (cont.)

County	Fuel Type	Vehicle Type		Emission Factors (g/mi)							
				Criteria Pollutants and Ozone Precursors							
				NO_x	SO_x	CO	ROG	PM_{10}	$PM_{2.5}$	CO_2	NH_3[1]
Riverside	Gasoline	LDGV	Light-Duty Vehicles (Passenger Cars)	0.076	0.003	0.910	0.107	0.047	0.020	293.188	0.024
	Gasoline	LDGT	Light-Duty Trucks (0-8,500 lbs)	0.140	0.004	1.367	0.201	0.047	0.020	383.565	0.025
	Gasoline	HDGV	Heavy-Duty Vehicles (8,501 + lbs)	0.379	0.006	2.424	0.341	0.054	0.023	574.339	0.045
	Diesel	LDDV	Light-Duty Vehicles (Passenger Cars)	0.084	0.002	0.188	0.013	0.051	0.024	259.089	0.008
	Diesel	LDDT	Light-Duty Trucks (0-8,500 lbs)	0.072	0.003	0.146	0.017	0.052	0.025	332.319	0.008
	Diesel	HDDV	Heavy-Duty Vehicles (8,501 + lbs)	3.745	0.012	0.571	0.098	0.145	0.074	1320.916	0.027
	NA	MC	Motorcycles	1.219	0.002	23.016	4.120	0.018	0.008	177.265	0.053
Sacramento	Gasoline	LDGV	Light-Duty Vehicles (Passenger Cars)	0.088	0.003	1.070	0.120	0.047	0.020	300.607	0.024
	Gasoline	LDGT	Light-Duty Trucks (0-8,500 lbs)	0.161	0.004	1.578	0.222	0.047	0.020	396.043	0.025
	Gasoline	HDGV	Heavy-Duty Vehicles (8,501 + lbs)	0.435	0.006	2.786	0.383	0.056	0.023	611.950	0.045
	Diesel	LDDV	Light-Duty Vehicles (Passenger Cars)	0.111	0.003	0.245	0.018	0.054	0.026	266.224	0.008
	Diesel	LDDT	Light-Duty Trucks (0-8,500 lbs)	0.347	0.003	0.371	0.044	0.069	0.041	351.629	0.008
	Diesel	HDDV	Heavy-Duty Vehicles (8,501 + lbs)	4.804	0.012	1.098	0.203	0.181	0.101	1285.200	0.027
	NA	MC	Motorcycles	1.253	0.002	24.277	4.340	0.018	0.008	179.245	0.053
San Benito	Gasoline	LDGV	Light-Duty Vehicles (Passenger Cars)	0.097	0.003	0.996	0.100	0.047	0.020	283.304	0.024
	Gasoline	LDGT	Light-Duty Trucks (0-8,500 lbs)	0.206	0.004	1.628	0.243	0.047	0.020	375.965	0.025
	Gasoline	HDGV	Heavy-Duty Vehicles (8,501 + lbs)	0.522	0.006	2.951	0.429	0.054	0.023	587.285	0.045
	Diesel	LDDV	Light-Duty Vehicles (Passenger Cars)	0.193	0.003	0.280	0.020	0.054	0.027	269.163	0.008
	Diesel	LDDT	Light-Duty Trucks (0-8,500 lbs)	0.036	0.003	0.143	0.016	0.050	0.022	344.849	0.008
	Diesel	HDDV	Heavy-Duty Vehicles (8,501 + lbs)	4.773	0.015	0.751	0.171	0.136	0.071	1527.959	0.027
	NA	MC	Motorcycles	1.291	0.002	25.354	3.904	0.018	0.008	172.114	0.053
San Bernardino	Gasoline	LDGV	Light-Duty Vehicles (Passenger Cars)	0.085	0.003	0.964	0.107	0.047	0.020	298.274	0.024
	Gasoline	LDGT	Light-Duty Trucks (0-8,500 lbs)	0.173	0.004	1.557	0.222	0.047	0.020	391.714	0.025
	Gasoline	HDGV	Heavy-Duty Vehicles (8,501 + lbs)	0.420	0.006	2.571	0.351	0.054	0.023	586.559	0.045
	Diesel	LDDV	Light-Duty Vehicles (Passenger Cars)	0.079	0.003	0.200	0.014	0.051	0.024	262.974	0.008
	Diesel	LDDT	Light-Duty Trucks (0-8,500 lbs)	0.097	0.003	0.174	0.020	0.054	0.026	340.936	0.008
	Diesel	HDDV	Heavy-Duty Vehicles (8,501 + lbs)	3.783	0.012	0.648	0.108	0.147	0.075	1325.461	0.027
	NA	MC	Motorcycles	1.245	0.002	24.176	3.725	0.018	0.008	175.666	0.053
San Diego	Gasoline	LDGV	Light-Duty Vehicles (Passenger Cars)	0.102	0.003	1.057	0.115	0.047	0.020	309.155	0.024
	Gasoline	LDGT	Light-Duty Trucks (0-8,500 lbs)	0.146	0.004	1.364	0.205	0.047	0.020	411.361	0.025
	Gasoline	HDGV	Heavy-Duty Vehicles (8,501 + lbs)	0.350	0.006	2.183	0.306	0.055	0.023	615.760	0.045
	Diesel	LDDV	Light-Duty Vehicles (Passenger Cars)	0.091	0.003	0.243	0.017	0.052	0.025	289.092	0.008
	Diesel	LDDT	Light-Duty Trucks (0-8,500 lbs)	0.120	0.004	0.224	0.026	0.056	0.029	373.585	0.008
	Diesel	HDDV	Heavy-Duty Vehicles (8,501 + lbs)	4.370	0.012	1.076	0.193	0.178	0.097	1300.569	0.027
	NA	MC	Motorcycles	1.249	0.002	24.291	3.993	0.018	0.008	191.785	0.053
San Francisco	Gasoline	LDGV	Light-Duty Vehicles (Passenger Cars)	0.084	0.003	1.004	0.119	0.047	0.020	325.823	0.024
	Gasoline	LDGT	Light-Duty Trucks (0-8,500 lbs)	0.121	0.004	1.237	0.170	0.047	0.020	422.786	0.025
	Gasoline	HDGV	Heavy-Duty Vehicles (8,501 + lbs)	0.378	0.006	2.274	0.319	0.060	0.025	646.302	0.045
	Diesel	LDDV	Light-Duty Vehicles (Passenger Cars)	0.101	0.003	0.364	0.024	0.053	0.026	305.459	0.008
	Diesel	LDDT	Light-Duty Trucks (0-8,500 lbs)	0.115	0.004	0.269	0.030	0.054	0.027	391.757	0.008
	Diesel	HDDV	Heavy-Duty Vehicles (8,501 + lbs)	5.188	0.012	1.314	0.252	0.269	0.155	1351.878	0.027
	NA	MC	Motorcycles	1.285	0.003	25.370	4.677	0.019	0.009	203.723	0.053
San Joaquin	Gasoline	LDGV	Light-Duty Vehicles (Passenger Cars)	0.086	0.003	0.948	0.110	0.047	0.020	301.422	0.024
	Gasoline	LDGT	Light-Duty Trucks (0-8,500 lbs)	0.169	0.004	1.494	0.225	0.047	0.020	398.419	0.025
	Gasoline	HDGV	Heavy-Duty Vehicles (8,501 + lbs)	0.422	0.006	2.623	0.376	0.053	0.022	602.820	0.045
	Diesel	LDDV	Light-Duty Vehicles (Passenger Cars)	0.107	0.003	0.196	0.014	0.052	0.025	271.659	0.008
	Diesel	LDDT	Light-Duty Trucks (0-8,500 lbs)	0.131	0.003	0.186	0.020	0.055	0.027	347.948	0.008
	Diesel	HDDV	Heavy-Duty Vehicles (8,501 + lbs)	4.671	0.013	0.845	0.187	0.158	0.086	1410.257	0.027
	NA	MC	Motorcycles	1.282	0.002	26.151	4.089	0.018	0.008	180.224	0.053
San Luis Obispo	Gasoline	LDGV	Light-Duty Vehicles (Passenger Cars)	0.097	0.003	0.989	0.110	0.047	0.020	284.798	0.024
	Gasoline	LDGT	Light-Duty Trucks (0-8,500 lbs)	0.253	0.004	1.893	0.274	0.047	0.020	388.438	0.025
	Gasoline	HDGV	Heavy-Duty Vehicles (8,501 + lbs)	0.543	0.006	2.994	0.443	0.055	0.023	592.008	0.045
	Diesel	LDDV	Light-Duty Vehicles (Passenger Cars)	0.148	0.003	0.254	0.018	0.054	0.026	274.766	0.008
	Diesel	LDDT	Light-Duty Trucks (0-8,500 lbs)	0.150	0.003	0.255	0.031	0.060	0.033	348.320	0.008
	Diesel	HDDV	Heavy-Duty Vehicles (8,501 + lbs)	5.170	0.011	0.988	0.220	0.179	0.105	1141.518	0.027
	NA	MC	Motorcycles	1.326	0.002	26.380	4.635	0.018	0.009	177.582	0.053

Table 5-39 EMFAC County-Specific On-Road Vehicle EFs – 2019 (cont.)

County	Fuel Type	Vehicle Type		Emission Factors (g/mi)							
				Criteria Pollutants and Ozone Precursors							
				NO_x	SO_x	CO	ROG	PM_{10}	$PM_{2.5}$	CO_2	NH_3[1]
San Mateo	Gasoline	LDGV	Light-Duty Vehicles (Passenger Cars)	0.082	0.003	0.949	0.122	0.047	0.020	288.203	0.024
	Gasoline	LDGT	Light-Duty Trucks (0-8,500 lbs)	0.105	0.004	1.024	0.142	0.047	0.020	370.963	0.025
	Gasoline	HDGV	Heavy-Duty Vehicles (8,501 + lbs)	0.294	0.006	1.868	0.261	0.055	0.023	563.334	0.045
	Diesel	LDDV	Light-Duty Vehicles (Passenger Cars)	0.094	0.003	0.206	0.015	0.052	0.025	265.273	0.008
	Diesel	LDDT	Light-Duty Trucks (0-8,500 lbs)	0.052	0.003	0.123	0.014	0.050	0.023	340.674	0.008
	Diesel	HDDV	Heavy-Duty Vehicles (8,501 + lbs)	3.749	0.011	0.925	0.190	0.219	0.124	1162.169	0.027
	NA	MC	Motorcycles	1.227	0.002	21.734	3.363	0.018	0.008	180.930	0.053
Santa Barbara	Gasoline	LDGV	Light-Duty Vehicles (Passenger Cars)	0.11	0.00	1.07	0.12	0.05	0.02	277.38	0.024
	Gasoline	LDGT	Light-Duty Trucks (0-8,500 lbs)	0.26	0.00	1.92	0.29	0.05	0.02	376.03	0.025
	Gasoline	HDGV	Heavy-Duty Vehicles (8,501 + lbs)	0.55	0.01	3.01	0.44	0.06	0.03	585.11	0.045
	Diesel	LDDV	Light-Duty Vehicles (Passenger Cars)	0.14	0.00	0.22	0.02	0.05	0.03	266.37	0.008
	Diesel	LDDT	Light-Duty Trucks (0-8,500 lbs)	0.11	0.00	0.18	0.02	0.06	0.03	334.14	0.008
	Diesel	HDDV	Heavy-Duty Vehicles (8,501 + lbs)	4.92	0.01	1.03	0.20	0.21	0.12	1265.34	0.027
	NA	MC	Motorcycles	1.28	0.00	23.83	3.68	0.02	0.01	169.26	0.053
Santa Clara	Gasoline	LDGV	Light-Duty Vehicles (Passenger Cars)	0.083	0.003	0.964	0.111	0.047	0.020	292.237	0.024
	Gasoline	LDGT	Light-Duty Trucks (0-8,500 lbs)	0.147	0.004	1.389	0.196	0.047	0.020	387.220	0.025
	Gasoline	HDGV	Heavy-Duty Vehicles (8,501 + lbs)	0.382	0.006	2.422	0.334	0.055	0.023	579.419	0.045
	Diesel	LDDV	Light-Duty Vehicles (Passenger Cars)	0.090	0.003	0.209	0.014	0.052	0.024	267.104	0.008
	Diesel	LDDT	Light-Duty Trucks (0-8,500 lbs)	0.071	0.003	0.154	0.018	0.052	0.025	346.143	0.008
	Diesel	HDDV	Heavy-Duty Vehicles (8,501 + lbs)	4.553	0.012	0.867	0.195	0.182	0.102	1315.731	0.027
	NA	MC	Motorcycles	1.243	0.002	22.831	3.852	0.018	0.008	179.783	0.053
Santa Cruz	Gasoline	LDGV	Light-Duty Vehicles (Passenger Cars)	0.130	0.003	1.344	0.140	0.047	0.020	310.672	0.024
	Gasoline	LDGT	Light-Duty Trucks (0-8,500 lbs)	0.321	0.004	2.438	0.343	0.048	0.020	417.490	0.025
	Gasoline	HDGV	Heavy-Duty Vehicles (8,501 + lbs)	0.616	0.006	3.453	0.469	0.057	0.024	627.415	0.045
	Diesel	LDDV	Light-Duty Vehicles (Passenger Cars)	0.287	0.003	0.437	0.036	0.063	0.035	299.741	0.008
	Diesel	LDDT	Light-Duty Trucks (0-8,500 lbs)	0.152	0.003	0.269	0.032	0.058	0.030	356.863	0.008
	Diesel	HDDV	Heavy-Duty Vehicles (8,501 + lbs)	5.659	0.011	1.161	0.254	0.235	0.143	1198.530	0.027
	NA	MC	Motorcycles	1.313	0.002	26.539	4.764	0.019	0.009	187.395	0.053
Shasta	Gasoline	LDGV	Light-Duty Vehicles (Passenger Cars)	0.106	0.003	1.126	0.125	0.047	0.020	308.738	0.024
	Gasoline	LDGT	Light-Duty Trucks (0-8,500 lbs)	0.246	0.004	1.977	0.302	0.047	0.020	411.658	0.025
	Gasoline	HDGV	Heavy-Duty Vehicles (8,501 + lbs)	0.592	0.006	3.440	0.543	0.056	0.024	631.513	0.045
	Diesel	LDDV	Light-Duty Vehicles (Passenger Cars)	0.158	0.003	0.305	0.022	0.054	0.027	277.575	0.008
	Diesel	LDDT	Light-Duty Trucks (0-8,500 lbs)	0.178	0.003	0.288	0.035	0.061	0.033	352.904	0.008
	Diesel	HDDV	Heavy-Duty Vehicles (8,501 + lbs)	5.054	0.013	0.826	0.190	0.150	0.082	1376.081	0.027
	NA	MC	Motorcycles	1.322	0.002	27.971	5.150	0.018	0.009	185.875	0.053
Sierra	Gasoline	LDGV	Light-Duty Vehicles (Passenger Cars)	0.136	0.003	1.408	0.140	0.048	0.020	341.223	0.024
	Gasoline	LDGT	Light-Duty Trucks (0-8,500 lbs)	0.346	0.005	2.734	0.375	0.048	0.021	462.100	0.025
	Gasoline	HDGV	Heavy-Duty Vehicles (8,501 + lbs)	0.920	0.007	5.073	0.796	0.057	0.025	687.828	0.045
	Diesel	LDDV	Light-Duty Vehicles (Passenger Cars)	0.103	0.003	0.451	0.030	0.053	0.026	308.026	0.008
	Diesel	LDDT	Light-Duty Trucks (0-8,500 lbs)	0.178	0.004	0.452	0.062	0.071	0.043	392.623	0.008
	Diesel	HDDV	Heavy-Duty Vehicles (8,501 + lbs)	5.303	0.009	1.118	0.239	0.172	0.101	937.254	0.027
	NA	MC	Motorcycles	1.374	0.003	30.207	5.329	0.019	0.009	210.013	0.053
Siskiyou	Gasoline	LDGV	Light-Duty Vehicles (Passenger Cars)	0.137	0.003	1.376	0.139	0.047	0.020	330.703	0.024
	Gasoline	LDGT	Light-Duty Trucks (0-8,500 lbs)	0.351	0.005	2.718	0.406	0.048	0.021	446.876	0.025
	Gasoline	HDGV	Heavy-Duty Vehicles (8,501 + lbs)	0.896	0.007	4.973	0.818	0.058	0.025	669.344	0.045
	Diesel	LDDV	Light-Duty Vehicles (Passenger Cars)	0.199	0.003	0.437	0.031	0.057	0.029	305.329	0.008
	Diesel	LDDT	Light-Duty Trucks (0-8,500 lbs)	0.237	0.004	0.432	0.054	0.069	0.041	387.530	0.008
	Diesel	HDDV	Heavy-Duty Vehicles (8,501 + lbs)	4.835	0.014	0.814	0.182	0.142	0.075	1439.533	0.027
	NA	MC	Motorcycles	1.393	0.003	31.134	5.247	0.019	0.009	202.608	0.053
Solano	Gasoline	LDGV	Light-Duty Vehicles (Passenger Cars)	0.085	0.003	0.919	0.110	0.047	0.020	309.414	0.024
	Gasoline	LDGT	Light-Duty Trucks (0-8,500 lbs)	0.150	0.004	1.344	0.204	0.047	0.020	407.842	0.025
	Gasoline	HDGV	Heavy-Duty Vehicles (8,501 + lbs)	0.407	0.006	2.449	0.360	0.056	0.023	623.281	0.045
	Diesel	LDDV	Light-Duty Vehicles (Passenger Cars)	0.105	0.003	0.232	0.016	0.053	0.025	285.094	0.008
	Diesel	LDDT	Light-Duty Trucks (0-8,500 lbs)	0.132	0.003	0.204	0.022	0.055	0.027	363.842	0.008
	Diesel	HDDV	Heavy-Duty Vehicles (8,501 + lbs)	4.645	0.013	0.889	0.188	0.160	0.085	1387.693	0.027
	NA	MC	Motorcycles	1.289	0.002	26.894	3.974	0.018	0.008	188.124	0.053

Table 5-39 EMFAC County-Specific On-Road Vehicle EFs – 2019 (cont.)

County	Fuel Type	Vehicle Type		Emission Factors (g/mi)							
				Criteria Pollutants and Ozone Precursors							
				NO_x	SO_x	CO	ROG	PM_{10}	$PM_{2.5}$	CO_2	NH_3[1]
Sonoma	Gasoline	LDGV	Light-Duty Vehicles (Passenger Cars)	0.100	0.003	1.100	0.119	0.047	0.020	307.888	0.024
	Gasoline	LDGT	Light-Duty Trucks (0-8,500 lbs)	0.197	0.004	1.746	0.258	0.047	0.020	404.213	0.025
	Gasoline	HDGV	Heavy-Duty Vehicles (8,501 + lbs)	0.548	0.006	3.163	0.484	0.056	0.024	625.399	0.045
	Diesel	LDDV	Light-Duty Vehicles (Passenger Cars)	0.217	0.003	0.335	0.026	0.058	0.031	294.931	0.008
	Diesel	LDDT	Light-Duty Trucks (0-8,500 lbs)	0.099	0.003	0.215	0.027	0.057	0.029	358.903	0.008
	Diesel	HDDV	Heavy-Duty Vehicles (8,501 + lbs)	4.719	0.011	0.889	0.207	0.181	0.105	1205.532	0.027
	NA	MC	Motorcycles	1.297	0.002	26.741	4.495	0.018	0.009	187.073	0.053
Stanislaus	Gasoline	LDGV	Light-Duty Vehicles (Passenger Cars)	0.089	0.003	1.038	0.115	0.047	0.020	312.655	0.024
	Gasoline	LDGT	Light-Duty Trucks (0-8,500 lbs)	0.183	0.004	1.721	0.256	0.047	0.020	414.852	0.025
	Gasoline	HDGV	Heavy-Duty Vehicles (8,501 + lbs)	0.457	0.006	2.966	0.419	0.054	0.023	627.277	0.045
	Diesel	LDDV	Light-Duty Vehicles (Passenger Cars)	0.116	0.003	0.286	0.020	0.053	0.025	276.075	0.008
	Diesel	LDDT	Light-Duty Trucks (0-8,500 lbs)	0.112	0.003	0.233	0.027	0.055	0.028	357.609	0.008
	Diesel	HDDV	Heavy-Duty Vehicles (8,501 + lbs)	4.698	0.014	0.787	0.185	0.153	0.083	1423.664	0.027
	NA	MC	Motorcycles	1.285	0.002	26.734	4.698	0.018	0.008	185.415	0.053
Sutter	Gasoline	LDGV	Light-Duty Vehicles (Passenger Cars)	0.092	0.003	0.993	0.107	0.047	0.019	281.437	0.024
	Gasoline	LDGT	Light-Duty Trucks (0-8,500 lbs)	0.229	0.004	1.831	0.282	0.047	0.020	373.331	0.025
	Gasoline	HDGV	Heavy-Duty Vehicles (8,501 + lbs)	0.522	0.006	3.066	0.456	0.053	0.022	578.478	0.045
	Diesel	LDDV	Light-Duty Vehicles (Passenger Cars)	0.106	0.002	0.195	0.014	0.052	0.024	252.303	0.008
	Diesel	LDDT	Light-Duty Trucks (0-8,500 lbs)	0.080	0.003	0.156	0.020	0.054	0.027	313.767	0.008
	Diesel	HDDV	Heavy-Duty Vehicles (8,501 + lbs)	4.564	0.014	0.749	0.179	0.147	0.079	1430.274	0.027
	NA	MC	Motorcycles	1.299	0.002	24.999	4.966	0.018	0.008	174.298	0.053
Tehama	Gasoline	LDGV	Light-Duty Vehicles (Passenger Cars)	0.105	0.003	1.081	0.115	0.047	0.020	305.352	0.024
	Gasoline	LDGT	Light-Duty Trucks (0-8,500 lbs)	0.273	0.004	2.108	0.315	0.047	0.020	408.435	0.025
	Gasoline	HDGV	Heavy-Duty Vehicles (8,501 + lbs)	0.577	0.006	3.345	0.506	0.055	0.023	620.415	0.045
	Diesel	LDDV	Light-Duty Vehicles (Passenger Cars)	0.154	0.003	0.301	0.021	0.054	0.027	278.236	0.008
	Diesel	LDDT	Light-Duty Trucks (0-8,500 lbs)	0.228	0.003	0.358	0.044	0.067	0.039	354.837	0.008
	Diesel	HDDV	Heavy-Duty Vehicles (8,501 + lbs)	4.913	0.014	0.799	0.181	0.141	0.075	1426.781	0.027
	NA	MC	Motorcycles	1.333	0.002	27.847	4.766	0.018	0.009	185.979	0.053
Trinity	Gasoline	LDGV	Light-Duty Vehicles (Passenger Cars)	0.158	0.004	1.607	0.160	0.048	0.021	365.460	0.024
	Gasoline	LDGT	Light-Duty Trucks (0-8,500 lbs)	0.560	0.005	4.161	0.568	0.050	0.022	503.030	0.025
	Gasoline	HDGV	Heavy-Duty Vehicles (8,501 + lbs)	1.110	0.007	6.009	0.997	0.058	0.026	731.311	0.045
	Diesel	LDDV	Light-Duty Vehicles (Passenger Cars)	0.302	0.003	0.619	0.051	0.067	0.039	330.110	0.008
	Diesel	LDDT	Light-Duty Trucks (0-8,500 lbs)	0.336	0.004	0.814	0.126	0.113	0.083	415.825	0.008
	Diesel	HDDV	Heavy-Duty Vehicles (8,501 + lbs)	5.293	0.013	0.886	0.202	0.147	0.081	1373.339	0.027
	NA	MC	Motorcycles	1.382	0.003	33.393	6.127	0.019	0.009	219.037	0.053
Tulare	Gasoline	LDGV	Light-Duty Vehicles (Passenger Cars)	0.081	0.003	0.928	0.106	0.047	0.019	291.639	0.024
	Gasoline	LDGT	Light-Duty Trucks (0-8,500 lbs)	0.190	0.004	1.711	0.276	0.047	0.020	386.175	0.025
	Gasoline	HDGV	Heavy-Duty Vehicles (8,501 + lbs)	0.442	0.006	2.870	0.402	0.053	0.022	591.683	0.045
	Diesel	LDDV	Light-Duty Vehicles (Passenger Cars)	0.079	0.002	0.174	0.012	0.051	0.023	255.206	0.008
	Diesel	LDDT	Light-Duty Trucks (0-8,500 lbs)	0.178	0.003	0.248	0.030	0.061	0.033	328.844	0.008
	Diesel	HDDV	Heavy-Duty Vehicles (8,501 + lbs)	4.720	0.014	0.809	0.184	0.155	0.083	1427.175	0.027
	NA	MC	Motorcycles	1.271	0.002	24.919	4.318	0.018	0.008	173.760	0.053
Tuolumne	Gasoline	LDGV	Light-Duty Vehicles (Passenger Cars)	0.156	0.003	1.568	0.164	0.047	0.020	311.412	0.024
	Gasoline	LDGT	Light-Duty Trucks (0-8,500 lbs)	0.444	0.004	3.421	0.505	0.048	0.021	424.065	0.025
	Gasoline	HDGV	Heavy-Duty Vehicles (8,501 + lbs)	0.966	0.006	5.227	0.862	0.056	0.024	641.741	0.045
	Diesel	LDDV	Light-Duty Vehicles (Passenger Cars)	0.204	0.003	0.367	0.026	0.056	0.029	283.696	0.008
	Diesel	LDDT	Light-Duty Trucks (0-8,500 lbs)	0.294	0.003	0.406	0.052	0.071	0.043	356.541	0.008
	Diesel	HDDV	Heavy-Duty Vehicles (8,501 + lbs)	5.608	0.009	1.050	0.240	0.188	0.112	967.423	0.027
	NA	MC	Motorcycles	1.352	0.002	29.869	5.371	0.019	0.009	187.153	0.053
Ventura	Gasoline	LDGV	Light-Duty Vehicles (Passenger Cars)	0.082	0.003	0.964	0.109	0.047	0.020	296.919	0.024
	Gasoline	LDGT	Light-Duty Trucks (0-8,500 lbs)	0.143	0.004	1.407	0.201	0.047	0.020	389.491	0.025
	Gasoline	HDGV	Heavy-Duty Vehicles (8,501 + lbs)	0.395	0.006	2.492	0.350	0.055	0.023	587.077	0.045
	Diesel	LDDV	Light-Duty Vehicles (Passenger Cars)	0.101	0.003	0.262	0.019	0.053	0.026	272.889	0.008
	Diesel	LDDT	Light-Duty Trucks (0-8,500 lbs)	0.113	0.003	0.206	0.024	0.055	0.027	350.404	0.008
	Diesel	HDDV	Heavy-Duty Vehicles (8,501 + lbs)	4.012	0.010	0.793	0.136	0.167	0.093	1132.780	0.027
	NA	MC	Motorcycles	1.281	0.002	24.732	4.898	0.019	0.009	189.994	0.053

Table 5-39 EMFAC County-Specific On-Road Vehicle EFs – 2019 (cont.)

County	Fuel Type	Vehicle Type		Emission Factors (g/mi)							
				Criteria Pollutants and Ozone Precursors							
				NO_x	SO_x	CO	ROG	PM_{10}	$PM_{2.5}$	CO_2	NH_3[1]
Yolo	Gasoline	LDGV	Light-Duty Vehicles (Passenger Cars)	0.088	0.003	0.996	0.117	0.047	0.020	301.213	0.024
	Gasoline	LDGT	Light-Duty Trucks (0-8,500 lbs)	0.143	0.004	1.325	0.199	0.047	0.020	388.923	0.025
	Gasoline	HDGV	Heavy-Duty Vehicles (8,501 + lbs)	0.402	0.006	2.451	0.355	0.055	0.023	598.680	0.045
	Diesel	LDDV	Light-Duty Vehicles (Passenger Cars)	0.172	0.003	0.253	0.019	0.055	0.028	276.748	0.008
	Diesel	LDDT	Light-Duty Trucks (0-8,500 lbs)	0.141	0.003	0.191	0.021	0.055	0.027	347.354	0.008
	Diesel	HDDV	Heavy-Duty Vehicles (8,501 + lbs)	3.888	0.012	0.782	0.169	0.170	0.092	1302.487	0.027
	NA	MC	Motorcycles	1.281	0.002	25.979	4.201	0.018	0.008	178.320	0.053
Yuba	Gasoline	LDGV	Light-Duty Vehicles (Passenger Cars)	0.095	0.003	1.019	0.104	0.047	0.020	288.570	0.024
	Gasoline	LDGT	Light-Duty Trucks (0-8,500 lbs)	0.287	0.004	2.227	0.326	0.047	0.020	389.810	0.025
	Gasoline	HDGV	Heavy-Duty Vehicles (8,501 + lbs)	0.614	0.006	3.571	0.524	0.055	0.023	592.505	0.045
	Diesel	LDDV	Light-Duty Vehicles (Passenger Cars)	0.115	0.003	0.220	0.016	0.052	0.025	262.471	0.008
	Diesel	LDDT	Light-Duty Trucks (0-8,500 lbs)	0.113	0.003	0.168	0.020	0.054	0.026	323.354	0.008
	Diesel	HDDV	Heavy-Duty Vehicles (8,501 + lbs)	5.449	0.010	1.032	0.230	0.193	0.112	1078.755	0.027
	NA	MC	Motorcycles	1.287	0.002	25.549	4.400	0.018	0.008	173.381	0.053

Table 5-40 EMFAC County-Specific On-Road Vehicle EFs – 2020

County	Fuel Type	Vehicle Type		Emission Factors (g/mi)							
				Criteria Pollutants and Ozone Precursors							
				NO_x	SO_x	CO	ROG	PM_{10}	$PM_{2.5}$	CO_2	NH_3[1]
Alameda	Gasoline	LDGV	Light-Duty Vehicles (Passenger Cars)	0.083	0.003	0.956	0.110	0.047	0.020	294.659	0.023
	Gasoline	LDGT	Light-Duty Trucks (0-8,500 lbs)	0.128	0.004	1.223	0.172	0.047	0.020	382.963	0.024
	Gasoline	HDGV	Heavy-Duty Vehicles (8,501 + lbs)	0.366	0.006	2.258	0.313	0.055	0.023	584.806	0.045
	Diesel	LDDV	Light-Duty Vehicles (Passenger Cars)	0.120	0.003	0.257	0.018	0.053	0.026	274.263	0.008
	Diesel	LDDT	Light-Duty Trucks (0-8,500 lbs)	0.080	0.003	0.171	0.019	0.052	0.025	346.202	0.008
	Diesel	HDDV	Heavy-Duty Vehicles (8,501 + lbs)	4.329	0.013	0.798	0.168	0.166	0.087	1415.383	0.027
	NA	MC	Motorcycles	1.253	0.002	23.655	3.832	0.018	0.008	184.236	0.053
Alpine	Gasoline	LDGV	Light-Duty Vehicles (Passenger Cars)	0.111	0.003	1.164	0.113	0.047	0.020	272.102	0.023
	Gasoline	LDGT	Light-Duty Trucks (0-8,500 lbs)	0.243	0.004	2.003	0.281	0.047	0.020	362.755	0.024
	Gasoline	HDGV	Heavy-Duty Vehicles (8,501 + lbs)	0.719	0.006	3.864	0.616	0.056	0.024	576.802	0.045
	Diesel	LDDV	Light-Duty Vehicles (Passenger Cars)	0.119	0.002	0.263	0.018	0.052	0.025	252.914	0.008
	Diesel	LDDT	Light-Duty Trucks (0-8,500 lbs)	0.098	0.003	0.194	0.023	0.053	0.026	322.319	0.008
	Diesel	HDDV	Heavy-Duty Vehicles (8,501 + lbs)	4.176	0.013	0.726	0.153	0.138	0.068	1409.351	0.027
	NA	MC	Motorcycles	1.376	0.002	27.444	4.326	0.018	0.008	175.595	0.053
Amador	Gasoline	LDGV	Light-Duty Vehicles (Passenger Cars)	0.120	0.003	1.214	0.137	0.047	0.019	262.760	0.023
	Gasoline	LDGT	Light-Duty Trucks (0-8,500 lbs)	0.316	0.004	2.490	0.434	0.047	0.020	356.250	0.024
	Gasoline	HDGV	Heavy-Duty Vehicles (8,501 + lbs)	0.828	0.006	4.464	0.834	0.057	0.024	575.081	0.045
	Diesel	LDDV	Light-Duty Vehicles (Passenger Cars)	0.180	0.002	0.213	0.016	0.054	0.026	241.811	0.008
	Diesel	LDDT	Light-Duty Trucks (0-8,500 lbs)	0.111	0.003	0.196	0.025	0.059	0.031	298.471	0.008
	Diesel	HDDV	Heavy-Duty Vehicles (8,501 + lbs)	5.053	0.010	0.891	0.201	0.169	0.097	1029.710	0.027
	NA	MC	Motorcycles	1.298	0.002	25.263	4.342	0.018	0.008	161.086	0.053
Butte	Gasoline	LDGV	Light-Duty Vehicles (Passenger Cars)	0.102	0.003	1.103	0.118	0.047	0.020	296.088	0.023
	Gasoline	LDGT	Light-Duty Trucks (0-8,500 lbs)	0.287	0.004	2.269	0.332	0.047	0.020	400.369	0.024
	Gasoline	HDGV	Heavy-Duty Vehicles (8,501 + lbs)	0.569	0.006	3.307	0.507	0.056	0.024	606.791	0.045
	Diesel	LDDV	Light-Duty Vehicles (Passenger Cars)	0.150	0.003	0.269	0.020	0.054	0.027	273.039	0.008
	Diesel	LDDT	Light-Duty Trucks (0-8,500 lbs)	0.200	0.003	0.262	0.031	0.060	0.032	345.404	0.008
	Diesel	HDDV	Heavy-Duty Vehicles (8,501 + lbs)	4.564	0.013	0.811	0.171	0.146	0.076	1360.948	0.027
	NA	MC	Motorcycles	1.280	0.002	25.827	4.811	0.018	0.009	179.743	0.053
Calaveras	Gasoline	LDGV	Light-Duty Vehicles (Passenger Cars)	0.121	0.003	1.283	0.133	0.047	0.020	290.167	0.023
	Gasoline	LDGT	Light-Duty Trucks (0-8,500 lbs)	0.333	0.004	2.755	0.465	0.048	0.020	394.144	0.024
	Gasoline	HDGV	Heavy-Duty Vehicles (8,501 + lbs)	0.904	0.006	4.996	0.920	0.057	0.025	617.906	0.045
	Diesel	LDDV	Light-Duty Vehicles (Passenger Cars)	0.194	0.003	0.340	0.025	0.056	0.028	267.111	0.008
	Diesel	LDDT	Light-Duty Trucks (0-8,500 lbs)	0.134	0.003	0.321	0.044	0.066	0.038	336.809	0.008
	Diesel	HDDV	Heavy-Duty Vehicles (8,501 + lbs)	5.075	0.010	0.882	0.196	0.162	0.091	1099.464	0.027
	NA	MC	Motorcycles	1.309	0.002	26.779	5.202	0.019	0.009	181.237	0.053
Colusa	Gasoline	LDGV	Light-Duty Vehicles (Passenger Cars)	0.086	0.003	0.909	0.104	0.047	0.020	286.839	0.023
	Gasoline	LDGT	Light-Duty Trucks (0-8,500 lbs)	0.179	0.004	1.471	0.223	0.047	0.020	378.712	0.024
	Gasoline	HDGV	Heavy-Duty Vehicles (8,501 + lbs)	0.441	0.006	2.554	0.385	0.054	0.023	588.312	0.045
	Diesel	LDDV	Light-Duty Vehicles (Passenger Cars)	0.110	0.002	0.234	0.017	0.053	0.025	260.872	0.008
	Diesel	LDDT	Light-Duty Trucks (0-8,500 lbs)	0.120	0.003	0.223	0.027	0.057	0.030	333.664	0.008
	Diesel	HDDV	Heavy-Duty Vehicles (8,501 + lbs)	4.294	0.013	0.749	0.163	0.138	0.071	1367.158	0.027
	NA	MC	Motorcycles	1.265	0.002	23.847	4.081	0.018	0.008	179.059	0.053
Contra Costa	Gasoline	LDGV	Light-Duty Vehicles (Passenger Cars)	0.078	0.003	0.900	0.103	0.047	0.020	290.209	0.023
	Gasoline	LDGT	Light-Duty Trucks (0-8,500 lbs)	0.124	0.004	1.201	0.170	0.047	0.020	381.269	0.024
	Gasoline	HDGV	Heavy-Duty Vehicles (8,501 + lbs)	0.345	0.006	2.200	0.308	0.054	0.023	579.702	0.045
	Diesel	LDDV	Light-Duty Vehicles (Passenger Cars)	0.091	0.003	0.222	0.016	0.053	0.025	268.762	0.008
	Diesel	LDDT	Light-Duty Trucks (0-8,500 lbs)	0.075	0.003	0.155	0.018	0.052	0.025	344.415	0.008
	Diesel	HDDV	Heavy-Duty Vehicles (8,501 + lbs)	4.281	0.012	0.767	0.163	0.185	0.094	1294.104	0.027
	NA	MC	Motorcycles	1.255	0.002	23.876	3.910	0.018	0.008	183.147	0.053
Del Norte	Gasoline	LDGV	Light-Duty Vehicles (Passenger Cars)	0.133	0.003	1.282	0.141	0.047	0.020	307.097	0.023
	Gasoline	LDGT	Light-Duty Trucks (0-8,500 lbs)	0.456	0.004	3.150	0.494	0.048	0.021	423.151	0.024
	Gasoline	HDGV	Heavy-Duty Vehicles (8,501 + lbs)	0.842	0.006	4.429	0.762	0.056	0.024	638.862	0.045
	Diesel	LDDV	Light-Duty Vehicles (Passenger Cars)	0.173	0.003	0.369	0.026	0.056	0.028	293.656	0.008
	Diesel	LDDT	Light-Duty Trucks (0-8,500 lbs)	0.374	0.004	0.756	0.107	0.108	0.078	367.536	0.008
	Diesel	HDDV	Heavy-Duty Vehicles (8,501 + lbs)	5.311	0.008	1.062	0.227	0.172	0.100	884.606	0.027
	NA	MC	Motorcycles	1.363	0.003	29.109	5.106	0.019	0.009	193.049	0.053

Table 5-40 EMFAC County-Specific On-Road Vehicle EFs – 2020 (cont.)

County	Fuel Type	Vehicle Type		Emission Factors (g/mi)							
				Criteria Pollutants and Ozone Precursors							
				NO_x	SO_x	CO	ROG	PM_{10}	$PM_{2.5}$	CO_2	NH_3[1]
El Dorado	Gasoline	LDGV	Light-Duty Vehicles (Passenger Cars)	0.074	0.003	0.897	0.093	0.047	0.020	288.656	0.023
	Gasoline	LDGT	Light-Duty Trucks (0-8,500 lbs)	0.173	0.004	1.686	0.264	0.047	0.020	393.706	0.024
	Gasoline	HDGV	Heavy-Duty Vehicles (8,501 + lbs)	0.462	0.006	2.999	0.492	0.054	0.023	593.399	0.045
	Diesel	LDDV	Light-Duty Vehicles (Passenger Cars)	0.114	0.003	0.245	0.017	0.052	0.025	266.277	0.008
	Diesel	LDDT	Light-Duty Trucks (0-8,500 lbs)	0.127	0.003	0.204	0.023	0.055	0.027	346.575	0.008
	Diesel	HDDV	Heavy-Duty Vehicles (8,501 + lbs)	4.471	0.009	0.866	0.188	0.165	0.093	989.193	0.027
	NA	MC	Motorcycles	1.349	0.002	27.915	5.391	0.019	0.009	187.843	0.053
Fresno	Gasoline	LDGV	Light-Duty Vehicles (Passenger Cars)	0.07	0.00	0.83	0.10	0.05	0.02	286.26	0.023
	Gasoline	LDGT	Light-Duty Trucks (0-8,500 lbs)	0.15	0.00	1.37	0.23	0.05	0.02	382.01	0.024
	Gasoline	HDGV	Heavy-Duty Vehicles (8,501 + lbs)	0.38	0.01	2.43	0.37	0.05	0.02	587.87	0.045
	Diesel	LDDV	Light-Duty Vehicles (Passenger Cars)	0.06	0.00	0.16	0.01	0.05	0.02	253.51	0.008
	Diesel	LDDT	Light-Duty Trucks (0-8,500 lbs)	0.09	0.00	0.16	0.02	0.05	0.03	334.75	0.008
	Diesel	HDDV	Heavy-Duty Vehicles (8,501 + lbs)	4.30	0.01	0.70	0.15	0.14	0.07	1509.70	0.027
	NA	MC	Motorcycles	1.26	0.00	24.99	4.04	0.02	0.01	175.20	0.053
Glenn	Gasoline	LDGV	Light-Duty Vehicles (Passenger Cars)	0.090	0.003	0.980	0.107	0.047	0.020	297.681	0.023
	Gasoline	LDGT	Light-Duty Trucks (0-8,500 lbs)	0.209	0.004	1.742	0.272	0.047	0.020	395.173	0.024
	Gasoline	HDGV	Heavy-Duty Vehicles (8,501 + lbs)	0.492	0.006	2.935	0.457	0.055	0.023	611.498	0.045
	Diesel	LDDV	Light-Duty Vehicles (Passenger Cars)	0.101	0.003	0.278	0.019	0.052	0.025	270.788	0.008
	Diesel	LDDT	Light-Duty Trucks (0-8,500 lbs)	0.137	0.003	0.287	0.037	0.062	0.034	340.860	0.008
	Diesel	HDDV	Heavy-Duty Vehicles (8,501 + lbs)	4.477	0.013	0.775	0.169	0.140	0.073	1343.454	0.027
	NA	MC	Motorcycles	1.270	0.002	24.891	4.555	0.018	0.008	184.900	0.053
Humboldt	Gasoline	LDGV	Light-Duty Vehicles (Passenger Cars)	0.139	0.003	1.326	0.144	0.047	0.020	289.196	0.023
	Gasoline	LDGT	Light-Duty Trucks (0-8,500 lbs)	0.399	0.004	2.864	0.443	0.048	0.020	394.948	0.024
	Gasoline	HDGV	Heavy-Duty Vehicles (8,501 + lbs)	0.844	0.006	4.358	0.762	0.055	0.024	596.624	0.045
	Diesel	LDDV	Light-Duty Vehicles (Passenger Cars)	0.363	0.003	0.404	0.032	0.062	0.034	281.406	0.008
	Diesel	LDDT	Light-Duty Trucks (0-8,500 lbs)	0.153	0.003	0.322	0.041	0.066	0.039	345.741	0.008
	Diesel	HDDV	Heavy-Duty Vehicles (8,501 + lbs)	5.332	0.012	0.903	0.201	0.159	0.088	1207.293	0.027
	NA	MC	Motorcycles	1.369	0.002	28.565	4.836	0.018	0.009	180.500	0.053
Imperial	Gasoline	LDGV	Light-Duty Vehicles (Passenger Cars)	0.296	0.003	2.700	0.219	0.047	0.019	282.137	0.023
	Gasoline	LDGT	Light-Duty Trucks (0-8,500 lbs)	0.209	0.004	1.787	0.359	0.047	0.020	375.866	0.024
	Gasoline	HDGV	Heavy-Duty Vehicles (8,501 + lbs)	0.549	0.006	3.185	0.539	0.054	0.023	573.683	0.045
	Diesel	LDDV	Light-Duty Vehicles (Passenger Cars)	0.068	0.002	0.154	0.011	0.050	0.023	241.040	0.008
	Diesel	LDDT	Light-Duty Trucks (0-8,500 lbs)	0.115	0.003	0.146	0.016	0.052	0.025	317.712	0.008
	Diesel	HDDV	Heavy-Duty Vehicles (8,501 + lbs)	3.315	0.013	0.388	0.077	0.129	0.061	1382.307	0.027
	NA	MC	Motorcycles	1.180	0.002	21.419	3.831	0.018	0.008	168.606	0.053
Inyo	Gasoline	LDGV	Light-Duty Vehicles (Passenger Cars)	0.103	0.003	1.068	0.129	0.047	0.020	301.028	0.023
	Gasoline	LDGT	Light-Duty Trucks (0-8,500 lbs)	0.240	0.004	1.932	0.344	0.047	0.020	403.218	0.024
	Gasoline	HDGV	Heavy-Duty Vehicles (8,501 + lbs)	0.704	0.006	3.784	0.717	0.057	0.024	628.901	0.045
	Diesel	LDDV	Light-Duty Vehicles (Passenger Cars)	0.112	0.003	0.279	0.019	0.053	0.025	269.918	0.008
	Diesel	LDDT	Light-Duty Trucks (0-8,500 lbs)	0.101	0.003	0.224	0.026	0.055	0.028	345.541	0.008
	Diesel	HDDV	Heavy-Duty Vehicles (8,501 + lbs)	4.350	0.013	0.802	0.166	0.154	0.078	1311.989	0.027
	NA	MC	Motorcycles	1.307	0.002	26.281	4.715	0.018	0.009	187.811	0.053
Kern	Gasoline	LDGV	Light-Duty Vehicles (Passenger Cars)	0.071	0.003	0.802	0.097	0.047	0.020	307.322	0.023
	Gasoline	LDGT	Light-Duty Trucks (0-8,500 lbs)	0.142	0.004	1.291	0.213	0.047	0.020	409.215	0.024
	Gasoline	HDGV	Heavy-Duty Vehicles (8,501 + lbs)	0.379	0.006	2.367	0.369	0.055	0.023	633.675	0.045
	Diesel	LDDV	Light-Duty Vehicles (Passenger Cars)	0.068	0.003	0.212	0.014	0.050	0.023	277.023	0.008
	Diesel	LDDT	Light-Duty Trucks (0-8,500 lbs)	0.076	0.003	0.172	0.019	0.052	0.025	364.264	0.008
	Diesel	HDDV	Heavy-Duty Vehicles (8,501 + lbs)	4.221	0.014	0.695	0.149	0.135	0.066	1511.847	0.027
	NA	MC	Motorcycles	1.272	0.002	25.875	4.065	0.018	0.008	188.393	0.053
Kings	Gasoline	LDGV	Light-Duty Vehicles (Passenger Cars)	0.078	0.003	0.851	0.096	0.047	0.020	282.170	0.023
	Gasoline	LDGT	Light-Duty Trucks (0-8,500 lbs)	0.189	0.004	1.594	0.248	0.047	0.020	377.550	0.024
	Gasoline	HDGV	Heavy-Duty Vehicles (8,501 + lbs)	0.421	0.006	2.530	0.385	0.054	0.023	587.715	0.045
	Diesel	LDDV	Light-Duty Vehicles (Passenger Cars)	0.064	0.002	0.209	0.014	0.050	0.023	248.485	0.008
	Diesel	LDDT	Light-Duty Trucks (0-8,500 lbs)	0.120	0.003	0.215	0.026	0.056	0.029	323.949	0.008
	Diesel	HDDV	Heavy-Duty Vehicles (8,501 + lbs)	4.420	0.015	0.705	0.153	0.130	0.063	1544.751	0.027
	NA	MC	Motorcycles	1.245	0.002	23.326	3.896	0.018	0.008	173.166	0.053

Table 5-40 EMFAC County-Specific On-Road Vehicle EFs – 2020 (cont.)

County	Fuel Type	Vehicle Type		Emission Factors (g/mi)							
				Criteria Pollutants and Ozone Precursors							
				NO_x	SO_x	CO	ROG	PM_{10}	$PM_{2.5}$	CO_2	NH_3[1]
Lake	Gasoline	LDGV	Light-Duty Vehicles (Passenger Cars)	0.145	0.003	1.456	0.172	0.047	0.020	299.127	0.023
	Gasoline	LDGT	Light-Duty Trucks (0-8,500 lbs)	0.333	0.004	2.595	0.450	0.048	0.020	398.394	0.024
	Gasoline	HDGV	Heavy-Duty Vehicles (8,501 + lbs)	0.966	0.006	5.216	0.989	0.057	0.025	624.893	0.045
	Diesel	LDDV	Light-Duty Vehicles (Passenger Cars)	0.205	0.003	0.330	0.025	0.056	0.029	272.712	0.008
	Diesel	LDDT	Light-Duty Trucks (0-8,500 lbs)	0.242	0.003	0.305	0.035	0.061	0.034	338.522	0.008
	Diesel	HDDV	Heavy-Duty Vehicles (8,501 + lbs)	5.240	0.011	0.952	0.219	0.174	0.102	1104.221	0.027
	NA	MC	Motorcycles	1.339	0.002	28.709	5.445	0.019	0.009	182.821	0.053
Lassen	Gasoline	LDGV	Light-Duty Vehicles (Passenger Cars)	0.122	0.003	1.254	0.131	0.047	0.020	311.625	0.023
	Gasoline	LDGT	Light-Duty Trucks (0-8,500 lbs)	0.304	0.004	2.452	0.399	0.048	0.020	425.412	0.024
	Gasoline	HDGV	Heavy-Duty Vehicles (8,501 + lbs)	0.922	0.007	4.989	0.922	0.057	0.025	655.263	0.045
	Diesel	LDDV	Light-Duty Vehicles (Passenger Cars)	0.145	0.003	0.360	0.024	0.054	0.026	282.323	0.008
	Diesel	LDDT	Light-Duty Trucks (0-8,500 lbs)	0.130	0.004	0.305	0.037	0.059	0.031	366.903	0.008
	Diesel	HDDV	Heavy-Duty Vehicles (8,501 + lbs)	5.152	0.009	1.073	0.224	0.176	0.101	905.804	0.027
	NA	MC	Motorcycles	1.376	0.003	29.676	5.184	0.019	0.009	196.410	0.053
Los Angeles	Gasoline	LDGV	Light-Duty Vehicles (Passenger Cars)	0.079	0.003	1.006	0.112	0.047	0.020	316.614	0.023
	Gasoline	LDGT	Light-Duty Trucks (0-8,500 lbs)	0.140	0.004	1.434	0.183	0.048	0.020	413.369	0.024
	Gasoline	HDGV	Heavy-Duty Vehicles (8,501 + lbs)	0.335	0.006	2.275	0.291	0.055	0.023	609.698	0.045
	Diesel	LDDV	Light-Duty Vehicles (Passenger Cars)	0.080	0.003	0.309	0.022	0.053	0.026	276.777	0.008
	Diesel	LDDT	Light-Duty Trucks (0-8,500 lbs)	0.095	0.003	0.230	0.027	0.053	0.026	365.188	0.008
	Diesel	HDDV	Heavy-Duty Vehicles (8,501 + lbs)	3.486	0.012	0.887	0.128	0.160	0.081	1267.968	0.027
	NA	MC	Motorcycles	1.220	0.002	22.104	4.251	0.019	0.009	200.285	0.053
Madera	Gasoline	LDGV	Light-Duty Vehicles (Passenger Cars)	0.075	0.003	0.936	0.097	0.047	0.020	307.339	0.023
	Gasoline	LDGT	Light-Duty Trucks (0-8,500 lbs)	0.168	0.004	1.664	0.257	0.047	0.020	411.184	0.024
	Gasoline	HDGV	Heavy-Duty Vehicles (8,501 + lbs)	0.422	0.006	2.828	0.412	0.055	0.023	632.245	0.045
	Diesel	LDDV	Light-Duty Vehicles (Passenger Cars)	0.094	0.003	0.308	0.021	0.052	0.025	271.245	0.008
	Diesel	LDDT	Light-Duty Trucks (0-8,500 lbs)	0.124	0.003	0.249	0.030	0.056	0.028	349.370	0.008
	Diesel	HDDV	Heavy-Duty Vehicles (8,501 + lbs)	4.423	0.014	0.763	0.162	0.139	0.069	1466.453	0.027
	NA	MC	Motorcycles	1.240	0.002	24.405	4.070	0.018	0.008	184.790	0.053
Marin	Gasoline	LDGV	Light-Duty Vehicles (Passenger Cars)	0.079	0.003	0.885	0.112	0.047	0.020	293.886	0.023
	Gasoline	LDGT	Light-Duty Trucks (0-8,500 lbs)	0.124	0.004	1.163	0.181	0.047	0.020	385.997	0.024
	Gasoline	HDGV	Heavy-Duty Vehicles (8,501 + lbs)	0.338	0.006	2.074	0.319	0.055	0.023	582.923	0.045
	Diesel	LDDV	Light-Duty Vehicles (Passenger Cars)	0.131	0.003	0.265	0.019	0.054	0.027	285.043	0.008
	Diesel	LDDT	Light-Duty Trucks (0-8,500 lbs)	0.078	0.004	0.176	0.019	0.052	0.025	368.245	0.008
	Diesel	HDDV	Heavy-Duty Vehicles (8,501 + lbs)	4.594	0.011	1.102	0.208	0.229	0.126	1208.235	0.027
	NA	MC	Motorcycles	1.283	0.002	24.834	4.015	0.018	0.009	187.333	0.053
Mariposa	Gasoline	LDGV	Light-Duty Vehicles (Passenger Cars)	0.121	0.003	1.270	0.137	0.047	0.020	300.882	0.023
	Gasoline	LDGT	Light-Duty Trucks (0-8,500 lbs)	0.428	0.004	3.327	0.535	0.048	0.021	416.668	0.024
	Gasoline	HDGV	Heavy-Duty Vehicles (8,501 + lbs)	0.910	0.006	5.012	0.920	0.057	0.025	637.057	0.045
	Diesel	LDDV	Light-Duty Vehicles (Passenger Cars)	0.233	0.003	0.402	0.030	0.058	0.030	281.381	0.008
	Diesel	LDDT	Light-Duty Trucks (0-8,500 lbs)	0.246	0.003	0.520	0.077	0.087	0.058	345.720	0.008
	Diesel	HDDV	Heavy-Duty Vehicles (8,501 + lbs)	5.452	0.008	1.030	0.227	0.175	0.100	875.717	0.027
	NA	MC	Motorcycles	1.346	0.002	28.997	5.365	0.019	0.009	188.796	0.053
Mendocino	Gasoline	LDGV	Light-Duty Vehicles (Passenger Cars)	0.121	0.003	1.202	0.129	0.047	0.020	284.570	0.023
	Gasoline	LDGT	Light-Duty Trucks (0-8,500 lbs)	0.385	0.004	2.848	0.442	0.048	0.020	392.979	0.024
	Gasoline	HDGV	Heavy-Duty Vehicles (8,501 + lbs)	0.862	0.006	4.505	0.777	0.056	0.024	603.616	0.045
	Diesel	LDDV	Light-Duty Vehicles (Passenger Cars)	0.396	0.003	0.406	0.032	0.062	0.034	279.011	0.008
	Diesel	LDDT	Light-Duty Trucks (0-8,500 lbs)	0.228	0.003	0.318	0.039	0.065	0.037	334.661	0.008
	Diesel	HDDV	Heavy-Duty Vehicles (8,501 + lbs)	4.969	0.013	0.828	0.188	0.149	0.081	1310.321	0.027
	NA	MC	Motorcycles	1.343	0.002	27.746	4.802	0.018	0.008	179.176	0.053
Merced	Gasoline	LDGV	Light-Duty Vehicles (Passenger Cars)	0.079	0.003	0.929	0.100	0.047	0.020	299.520	0.023
	Gasoline	LDGT	Light-Duty Trucks (0-8,500 lbs)	0.170	0.004	1.576	0.237	0.047	0.020	397.025	0.024
	Gasoline	HDGV	Heavy-Duty Vehicles (8,501 + lbs)	0.431	0.006	2.823	0.389	0.056	0.024	619.289	0.045
	Diesel	LDDV	Light-Duty Vehicles (Passenger Cars)	0.106	0.003	0.262	0.018	0.052	0.025	266.435	0.008
	Diesel	LDDT	Light-Duty Trucks (0-8,500 lbs)	0.129	0.003	0.242	0.028	0.057	0.029	348.381	0.008
	Diesel	HDDV	Heavy-Duty Vehicles (8,501 + lbs)	4.488	0.015	0.725	0.157	0.136	0.067	1540.579	0.027
	NA	MC	Motorcycles	1.238	0.002	24.211	3.703	0.018	0.008	178.679	0.053

Table 5-40 EMFAC County-Specific On-Road Vehicle EFs – 2020 (cont.)

County	Fuel Type	Vehicle Type		Emission Factors (g/mi)							
				Criteria Pollutants and Ozone Precursors							
				NO_x	SO_x	CO	ROG	PM_{10}	$PM_{2.5}$	CO_2	NH_3[1]
Modoc	Gasoline	LDGV	Light-Duty Vehicles (Passenger Cars)	0.135	0.003	1.397	0.138	0.048	0.021	346.489	0.023
	Gasoline	LDGT	Light-Duty Trucks (0-8,500 lbs)	0.333	0.005	2.686	0.397	0.048	0.021	468.817	0.024
	Gasoline	HDGV	Heavy-Duty Vehicles (8,501 + lbs)	1.032	0.007	5.742	1.029	0.057	0.025	708.585	0.045
	Diesel	LDDV	Light-Duty Vehicles (Passenger Cars)	0.150	0.003	0.517	0.035	0.056	0.028	314.550	0.008
	Diesel	LDDT	Light-Duty Trucks (0-8,500 lbs)	0.269	0.004	0.448	0.047	0.060	0.033	429.697	0.008
	Diesel	HDDV	Heavy-Duty Vehicles (8,501 + lbs)	5.145	0.009	1.009	0.216	0.168	0.095	970.765	0.027
	NA	MC	Motorcycles	1.395	0.003	30.540	5.370	0.019	0.009	218.520	0.053
Mono	Gasoline	LDGV	Light-Duty Vehicles (Passenger Cars)	0.109	0.003	1.091	0.109	0.047	0.020	289.834	0.023
	Gasoline	LDGT	Light-Duty Trucks (0-8,500 lbs)	0.265	0.004	2.077	0.313	0.047	0.020	393.212	0.024
	Gasoline	HDGV	Heavy-Duty Vehicles (8,501 + lbs)	0.769	0.006	4.154	0.692	0.057	0.024	612.436	0.045
	Diesel	LDDV	Light-Duty Vehicles (Passenger Cars)	0.144	0.003	0.312	0.022	0.054	0.027	273.820	0.008
	Diesel	LDDT	Light-Duty Trucks (0-8,500 lbs)	0.293	0.003	0.326	0.034	0.060	0.032	356.044	0.008
	Diesel	HDDV	Heavy-Duty Vehicles (8,501 + lbs)	4.310	0.013	0.756	0.162	0.139	0.071	1350.309	0.027
	NA	MC	Motorcycles	1.436	0.003	31.566	4.837	0.019	0.009	188.909	0.053
Monterey	Gasoline	LDGV	Light-Duty Vehicles (Passenger Cars)	0.108	0.003	1.136	0.122	0.047	0.020	312.790	0.023
	Gasoline	LDGT	Light-Duty Trucks (0-8,500 lbs)	0.258	0.004	1.979	0.271	0.048	0.020	421.950	0.024
	Gasoline	HDGV	Heavy-Duty Vehicles (8,501 + lbs)	0.553	0.006	3.130	0.427	0.056	0.024	643.514	0.045
	Diesel	LDDV	Light-Duty Vehicles (Passenger Cars)	0.133	0.003	0.380	0.027	0.055	0.028	286.783	0.008
	Diesel	LDDT	Light-Duty Trucks (0-8,500 lbs)	0.121	0.004	0.300	0.035	0.058	0.030	373.095	0.008
	Diesel	HDDV	Heavy-Duty Vehicles (8,501 + lbs)	4.385	0.012	0.871	0.170	0.172	0.091	1290.141	0.027
	NA	MC	Motorcycles	1.257	0.002	24.048	3.815	0.018	0.008	190.945	0.053
Napa	Gasoline	LDGV	Light-Duty Vehicles (Passenger Cars)	0.078	0.003	0.906	0.097	0.047	0.020	282.206	0.023
	Gasoline	LDGT	Light-Duty Trucks (0-8,500 lbs)	0.148	0.004	1.406	0.204	0.047	0.020	374.302	0.024
	Gasoline	HDGV	Heavy-Duty Vehicles (8,501 + lbs)	0.442	0.006	2.714	0.396	0.056	0.024	591.494	0.045
	Diesel	LDDV	Light-Duty Vehicles (Passenger Cars)	0.106	0.003	0.232	0.017	0.053	0.026	265.187	0.008
	Diesel	LDDT	Light-Duty Trucks (0-8,500 lbs)	0.069	0.003	0.152	0.017	0.051	0.024	342.592	0.008
	Diesel	HDDV	Heavy-Duty Vehicles (8,501 + lbs)	4.581	0.012	0.827	0.176	0.158	0.084	1316.515	0.027
	NA	MC	Motorcycles	1.259	0.002	23.832	3.826	0.018	0.008	176.971	0.053
Nevada	Gasoline	LDGV	Light-Duty Vehicles (Passenger Cars)	0.102	0.003	1.057	0.114	0.047	0.020	279.282	0.023
	Gasoline	LDGT	Light-Duty Trucks (0-8,500 lbs)	0.282	0.004	2.147	0.321	0.047	0.020	390.505	0.024
	Gasoline	HDGV	Heavy-Duty Vehicles (8,501 + lbs)	0.637	0.006	3.527	0.546	0.054	0.023	589.454	0.045
	Diesel	LDDV	Light-Duty Vehicles (Passenger Cars)	0.195	0.003	0.298	0.023	0.056	0.029	268.000	0.008
	Diesel	LDDT	Light-Duty Trucks (0-8,500 lbs)	0.318	0.003	0.314	0.033	0.061	0.034	345.911	0.008
	Diesel	HDDV	Heavy-Duty Vehicles (8,501 + lbs)	4.611	0.013	0.788	0.171	0.139	0.073	1320.698	0.027
	NA	MC	Motorcycles	1.381	0.002	29.356	5.175	0.019	0.009	177.865	0.053
Orange	Gasoline	LDGV	Light-Duty Vehicles (Passenger Cars)	0.067	0.003	0.857	0.099	0.047	0.020	295.161	0.023
	Gasoline	LDGT	Light-Duty Trucks (0-8,500 lbs)	0.107	0.004	1.152	0.158	0.047	0.020	387.485	0.024
	Gasoline	HDGV	Heavy-Duty Vehicles (8,501 + lbs)	0.319	0.006	2.131	0.291	0.055	0.023	586.061	0.045
	Diesel	LDDV	Light-Duty Vehicles (Passenger Cars)	0.062	0.003	0.245	0.017	0.051	0.024	263.193	0.008
	Diesel	LDDT	Light-Duty Trucks (0-8,500 lbs)	0.061	0.003	0.172	0.020	0.051	0.024	346.091	0.008
	Diesel	HDDV	Heavy-Duty Vehicles (8,501 + lbs)	3.069	0.010	0.761	0.110	0.166	0.087	1161.335	0.027
	NA	MC	Motorcycles	1.210	0.002	21.639	4.152	0.019	0.009	190.272	0.053
Placer	Gasoline	LDGV	Light-Duty Vehicles (Passenger Cars)	0.074	0.003	0.887	0.097	0.047	0.020	281.973	0.023
	Gasoline	LDGT	Light-Duty Trucks (0-8,500 lbs)	0.129	0.004	1.279	0.180	0.047	0.020	375.253	0.024
	Gasoline	HDGV	Heavy-Duty Vehicles (8,501 + lbs)	0.361	0.006	2.347	0.340	0.054	0.023	575.134	0.045
	Diesel	LDDV	Light-Duty Vehicles (Passenger Cars)	0.108	0.002	0.224	0.016	0.053	0.025	257.631	0.008
	Diesel	LDDT	Light-Duty Trucks (0-8,500 lbs)	0.099	0.003	0.169	0.019	0.053	0.025	331.849	0.008
	Diesel	HDDV	Heavy-Duty Vehicles (8,501 + lbs)	3.795	0.012	0.690	0.149	0.148	0.076	1298.365	0.027
	NA	MC	Motorcycles	1.305	0.002	25.690	4.428	0.018	0.008	178.664	0.053
Plumas	Gasoline	LDGV	Light-Duty Vehicles (Passenger Cars)	0.126	0.003	1.359	0.141	0.048	0.020	320.995	0.023
	Gasoline	LDGT	Light-Duty Trucks (0-8,500 lbs)	0.380	0.005	3.070	0.449	0.048	0.021	451.900	0.024
	Gasoline	HDGV	Heavy-Duty Vehicles (8,501 + lbs)	1.077	0.007	5.973	1.007	0.057	0.025	673.924	0.045
	Diesel	LDDV	Light-Duty Vehicles (Passenger Cars)	0.185	0.003	0.473	0.033	0.057	0.029	299.226	0.008
	Diesel	LDDT	Light-Duty Trucks (0-8,500 lbs)	0.156	0.004	0.384	0.043	0.059	0.032	402.374	0.008
	Diesel	HDDV	Heavy-Duty Vehicles (8,501 + lbs)	5.229	0.010	0.950	0.203	0.160	0.092	1092.762	0.027
	NA	MC	Motorcycles	1.379	0.003	30.645	5.654	0.019	0.009	205.028	0.053

Table 5-40 EMFAC County-Specific On-Road Vehicle EFs – 2020 (cont.)

County	Fuel Type	Vehicle Type		Emission Factors (g/mi)							
				Criteria Pollutants and Ozone Precursors							
				NO_x	SO_x	CO	ROG	PM_{10}	$PM_{2.5}$	CO_2	NH_3[1]
Riverside	Gasoline	LDGV	Light-Duty Vehicles (Passenger Cars)	0.069	0.003	0.845	0.100	0.047	0.020	284.754	0.023
	Gasoline	LDGT	Light-Duty Trucks (0-8,500 lbs)	0.124	0.004	1.246	0.187	0.047	0.020	373.018	0.024
	Gasoline	HDGV	Heavy-Duty Vehicles (8,501 + lbs)	0.351	0.006	2.270	0.332	0.054	0.023	562.838	0.045
	Diesel	LDDV	Light-Duty Vehicles (Passenger Cars)	0.071	0.002	0.182	0.012	0.051	0.023	251.882	0.008
	Diesel	LDDT	Light-Duty Trucks (0-8,500 lbs)	0.064	0.003	0.139	0.016	0.052	0.024	325.582	0.008
	Diesel	HDDV	Heavy-Duty Vehicles (8,501 + lbs)	3.312	0.012	0.527	0.085	0.137	0.067	1311.404	0.027
	NA	MC	Motorcycles	1.215	0.002	22.571	4.117	0.018	0.008	177.990	0.053
Sacramento	Gasoline	LDGV	Light-Duty Vehicles (Passenger Cars)	0.079	0.003	0.980	0.110	0.047	0.020	291.971	0.023
	Gasoline	LDGT	Light-Duty Trucks (0-8,500 lbs)	0.143	0.004	1.439	0.206	0.047	0.020	385.459	0.024
	Gasoline	HDGV	Heavy-Duty Vehicles (8,501 + lbs)	0.402	0.006	2.597	0.371	0.055	0.023	598.824	0.045
	Diesel	LDDV	Light-Duty Vehicles (Passenger Cars)	0.093	0.002	0.236	0.017	0.053	0.025	258.883	0.008
	Diesel	LDDT	Light-Duty Trucks (0-8,500 lbs)	0.291	0.003	0.332	0.039	0.066	0.038	344.383	0.008
	Diesel	HDDV	Heavy-Duty Vehicles (8,501 + lbs)	4.277	0.012	0.997	0.170	0.166	0.088	1283.354	0.027
	NA	MC	Motorcycles	1.250	0.002	23.842	4.339	0.018	0.008	180.093	0.053
San Benito	Gasoline	LDGV	Light-Duty Vehicles (Passenger Cars)	0.088	0.003	0.912	0.092	0.047	0.020	275.090	0.023
	Gasoline	LDGT	Light-Duty Trucks (0-8,500 lbs)	0.181	0.004	1.469	0.224	0.047	0.020	365.897	0.024
	Gasoline	HDGV	Heavy-Duty Vehicles (8,501 + lbs)	0.490	0.006	2.789	0.424	0.054	0.023	577.358	0.045
	Diesel	LDDV	Light-Duty Vehicles (Passenger Cars)	0.158	0.002	0.266	0.019	0.053	0.026	261.293	0.008
	Diesel	LDDT	Light-Duty Trucks (0-8,500 lbs)	0.035	0.003	0.143	0.016	0.050	0.022	337.488	0.008
	Diesel	HDDV	Heavy-Duty Vehicles (8,501 + lbs)	4.384	0.014	0.703	0.153	0.128	0.063	1519.556	0.027
	NA	MC	Motorcycles	1.287	0.002	24.857	3.905	0.018	0.008	173.056	0.053
San Bernardino	Gasoline	LDGV	Light-Duty Vehicles (Passenger Cars)	0.077	0.003	0.889	0.099	0.047	0.020	289.760	0.023
	Gasoline	LDGT	Light-Duty Trucks (0-8,500 lbs)	0.153	0.004	1.412	0.205	0.047	0.020	380.980	0.024
	Gasoline	HDGV	Heavy-Duty Vehicles (8,501 + lbs)	0.388	0.006	2.404	0.341	0.054	0.023	574.997	0.045
	Diesel	LDDV	Light-Duty Vehicles (Passenger Cars)	0.067	0.002	0.195	0.013	0.051	0.023	255.808	0.008
	Diesel	LDDT	Light-Duty Trucks (0-8,500 lbs)	0.084	0.003	0.165	0.019	0.053	0.025	334.197	0.008
	Diesel	HDDV	Heavy-Duty Vehicles (8,501 + lbs)	3.359	0.012	0.598	0.094	0.140	0.068	1316.053	0.027
	NA	MC	Motorcycles	1.240	0.002	23.644	3.721	0.018	0.008	176.529	0.053
San Diego	Gasoline	LDGV	Light-Duty Vehicles (Passenger Cars)	0.095	0.003	0.993	0.108	0.047	0.020	300.145	0.023
	Gasoline	LDGT	Light-Duty Trucks (0-8,500 lbs)	0.129	0.004	1.246	0.192	0.047	0.020	399.853	0.024
	Gasoline	HDGV	Heavy-Duty Vehicles (8,501 + lbs)	0.321	0.006	2.028	0.294	0.055	0.023	602.620	0.045
	Diesel	LDDV	Light-Duty Vehicles (Passenger Cars)	0.077	0.003	0.236	0.016	0.052	0.024	280.917	0.008
	Diesel	LDDT	Light-Duty Trucks (0-8,500 lbs)	0.105	0.003	0.211	0.024	0.055	0.028	365.775	0.008
	Diesel	HDDV	Heavy-Duty Vehicles (8,501 + lbs)	3.886	0.012	1.000	0.164	0.164	0.085	1290.521	0.027
	NA	MC	Motorcycles	1.246	0.002	23.832	3.992	0.018	0.008	192.558	0.053
San Francisco	Gasoline	LDGV	Light-Duty Vehicles (Passenger Cars)	0.076	0.003	0.931	0.111	0.047	0.020	316.371	0.023
	Gasoline	LDGT	Light-Duty Trucks (0-8,500 lbs)	0.108	0.004	1.140	0.159	0.047	0.020	411.342	0.024
	Gasoline	HDGV	Heavy-Duty Vehicles (8,501 + lbs)	0.345	0.006	2.119	0.304	0.059	0.025	630.734	0.045
	Diesel	LDDV	Light-Duty Vehicles (Passenger Cars)	0.088	0.003	0.361	0.023	0.052	0.025	296.815	0.008
	Diesel	LDDT	Light-Duty Trucks (0-8,500 lbs)	0.100	0.004	0.264	0.029	0.053	0.026	383.744	0.008
	Diesel	HDDV	Heavy-Duty Vehicles (8,501 + lbs)	4.507	0.012	1.173	0.206	0.243	0.134	1326.246	0.027
	NA	MC	Motorcycles	1.285	0.003	24.978	4.691	0.019	0.009	204.718	0.053
San Joaquin	Gasoline	LDGV	Light-Duty Vehicles (Passenger Cars)	0.08	0.00	0.87	0.10	0.05	0.02	292.81	0.023
	Gasoline	LDGT	Light-Duty Trucks (0-8,500 lbs)	0.15	0.00	1.35	0.21	0.05	0.02	387.69	0.024
	Gasoline	HDGV	Heavy-Duty Vehicles (8,501 + lbs)	0.39	0.01	2.45	0.36	0.05	0.02	591.63	0.045
	Diesel	LDDV	Light-Duty Vehicles (Passenger Cars)	0.09	0.00	0.18	0.01	0.05	0.02	264.21	0.008
	Diesel	LDDT	Light-Duty Trucks (0-8,500 lbs)	0.11	0.00	0.17	0.02	0.05	0.03	341.05	0.008
	Diesel	HDDV	Heavy-Duty Vehicles (8,501 + lbs)	4.24	0.01	0.78	0.16	0.15	0.08	1403.32	0.027
	NA	MC	Motorcycles	1.28	0.00	25.55	4.08	0.02	0.01	181.03	0.053
San Luis Obispo	Gasoline	LDGV	Light-Duty Vehicles (Passenger Cars)	0.087	0.003	0.906	0.102	0.047	0.020	276.654	0.023
	Gasoline	LDGT	Light-Duty Trucks (0-8,500 lbs)	0.226	0.004	1.727	0.257	0.047	0.020	378.879	0.024
	Gasoline	HDGV	Heavy-Duty Vehicles (8,501 + lbs)	0.508	0.006	2.818	0.433	0.055	0.023	580.833	0.045
	Diesel	LDDV	Light-Duty Vehicles (Passenger Cars)	0.124	0.003	0.242	0.017	0.053	0.026	267.229	0.008
	Diesel	LDDT	Light-Duty Trucks (0-8,500 lbs)	0.130	0.003	0.237	0.028	0.059	0.031	341.937	0.008
	Diesel	HDDV	Heavy-Duty Vehicles (8,501 + lbs)	4.709	0.011	0.905	0.187	0.164	0.091	1148.546	0.027
	NA	MC	Motorcycles	1.322	0.002	25.892	4.661	0.019	0.009	178.636	0.053

Table 5-40 EMFAC County-Specific On-Road Vehicle EFs – 2020 (cont.)

County	Fuel Type	Vehicle Type		Emission Factors (g/mi)							
				Criteria Pollutants and Ozone Precursors							
				NO_x	SO_x	CO	ROG	PM_{10}	$PM_{2.5}$	CO_2	NH_3[1]
San Mateo	Gasoline	LDGV	Light-Duty Vehicles (Passenger Cars)	0.074	0.003	0.882	0.115	0.047	0.020	280.254	0.023
	Gasoline	LDGT	Light-Duty Trucks (0-8,500 lbs)	0.094	0.004	0.951	0.133	0.047	0.020	361.471	0.024
	Gasoline	HDGV	Heavy-Duty Vehicles (8,501 + lbs)	0.268	0.006	1.739	0.249	0.055	0.023	551.805	0.045
	Diesel	LDDV	Light-Duty Vehicles (Passenger Cars)	0.080	0.002	0.199	0.014	0.051	0.024	257.815	0.008
	Diesel	LDDT	Light-Duty Trucks (0-8,500 lbs)	0.047	0.003	0.121	0.014	0.050	0.022	333.831	0.008
	Diesel	HDDV	Heavy-Duty Vehicles (8,501 + lbs)	3.216	0.011	0.833	0.155	0.200	0.107	1142.791	0.027
	NA	MC	Motorcycles	1.225	0.002	21.414	3.350	0.018	0.008	181.542	0.053
Santa Barbara	Gasoline	LDGV	Light-Duty Vehicles (Passenger Cars)	0.095	0.003	0.970	0.114	0.047	0.020	269.645	0.023
	Gasoline	LDGT	Light-Duty Trucks (0-8,500 lbs)	0.235	0.004	1.748	0.271	0.047	0.020	366.707	0.024
	Gasoline	HDGV	Heavy-Duty Vehicles (8,501 + lbs)	0.512	0.006	2.829	0.426	0.061	0.026	574.232	0.045
	Diesel	LDDV	Light-Duty Vehicles (Passenger Cars)	0.114	0.002	0.211	0.015	0.052	0.025	259.229	0.008
	Diesel	LDDT	Light-Duty Trucks (0-8,500 lbs)	0.097	0.003	0.171	0.020	0.054	0.027	327.934	0.008
	Diesel	HDDV	Heavy-Duty Vehicles (8,501 + lbs)	4.412	0.012	0.945	0.168	0.190	0.102	1263.469	0.027
	NA	MC	Motorcycles	1.278	0.002	23.396	3.689	0.018	0.008	170.082	0.053
Santa Clara	Gasoline	LDGV	Light-Duty Vehicles (Passenger Cars)	0.074	0.003	0.886	0.103	0.047	0.020	283.922	0.023
	Gasoline	LDGT	Light-Duty Trucks (0-8,500 lbs)	0.130	0.004	1.264	0.182	0.047	0.020	376.620	0.024
	Gasoline	HDGV	Heavy-Duty Vehicles (8,501 + lbs)	0.351	0.006	2.253	0.321	0.055	0.023	567.597	0.045
	Diesel	LDDV	Light-Duty Vehicles (Passenger Cars)	0.076	0.002	0.203	0.014	0.051	0.024	259.656	0.008
	Diesel	LDDT	Light-Duty Trucks (0-8,500 lbs)	0.063	0.003	0.149	0.017	0.052	0.024	339.182	0.008
	Diesel	HDDV	Heavy-Duty Vehicles (8,501 + lbs)	4.031	0.012	0.792	0.164	0.167	0.088	1300.617	0.027
	NA	MC	Motorcycles	1.240	0.002	22.412	3.833	0.018	0.008	180.473	0.053
Santa Cruz	Gasoline	LDGV	Light-Duty Vehicles (Passenger Cars)	0.115	0.003	1.216	0.127	0.047	0.020	302.423	0.023
	Gasoline	LDGT	Light-Duty Trucks (0-8,500 lbs)	0.286	0.004	2.215	0.319	0.048	0.020	407.324	0.024
	Gasoline	HDGV	Heavy-Duty Vehicles (8,501 + lbs)	0.574	0.006	3.238	0.455	0.057	0.024	615.944	0.045
	Diesel	LDDV	Light-Duty Vehicles (Passenger Cars)	0.244	0.003	0.419	0.033	0.061	0.033	292.576	0.008
	Diesel	LDDT	Light-Duty Trucks (0-8,500 lbs)	0.127	0.003	0.254	0.030	0.056	0.029	349.708	0.008
	Diesel	HDDV	Heavy-Duty Vehicles (8,501 + lbs)	5.018	0.011	1.022	0.204	0.211	0.121	1197.707	0.027
	NA	MC	Motorcycles	1.312	0.002	26.090	4.778	0.019	0.009	188.426	0.053
Shasta	Gasoline	LDGV	Light-Duty Vehicles (Passenger Cars)	0.094	0.003	1.024	0.113	0.047	0.020	299.884	0.023
	Gasoline	LDGT	Light-Duty Trucks (0-8,500 lbs)	0.216	0.004	1.780	0.279	0.047	0.020	400.045	0.024
	Gasoline	HDGV	Heavy-Duty Vehicles (8,501 + lbs)	0.549	0.006	3.219	0.529	0.056	0.024	619.249	0.045
	Diesel	LDDV	Light-Duty Vehicles (Passenger Cars)	0.128	0.003	0.292	0.020	0.053	0.026	269.711	0.008
	Diesel	LDDT	Light-Duty Trucks (0-8,500 lbs)	0.149	0.003	0.264	0.032	0.059	0.031	345.302	0.008
	Diesel	HDDV	Heavy-Duty Vehicles (8,501 + lbs)	4.657	0.013	0.765	0.169	0.141	0.073	1380.934	0.027
	NA	MC	Motorcycles	1.321	0.002	27.536	5.202	0.018	0.009	186.980	0.053
Sierra	Gasoline	LDGV	Light-Duty Vehicles (Passenger Cars)	0.121	0.003	1.282	0.129	0.048	0.020	331.455	0.023
	Gasoline	LDGT	Light-Duty Trucks (0-8,500 lbs)	0.309	0.005	2.493	0.354	0.048	0.021	450.762	0.024
	Gasoline	HDGV	Heavy-Duty Vehicles (8,501 + lbs)	0.867	0.007	4.809	0.786	0.057	0.025	676.185	0.045
	Diesel	LDDV	Light-Duty Vehicles (Passenger Cars)	0.089	0.003	0.450	0.029	0.053	0.025	299.271	0.008
	Diesel	LDDT	Light-Duty Trucks (0-8,500 lbs)	0.153	0.004	0.424	0.056	0.067	0.039	384.746	0.008
	Diesel	HDDV	Heavy-Duty Vehicles (8,501 + lbs)	4.886	0.009	1.049	0.213	0.162	0.092	948.683	0.027
	NA	MC	Motorcycles	1.375	0.003	29.662	5.321	0.019	0.009	211.088	0.053
Siskiyou	Gasoline	LDGV	Light-Duty Vehicles (Passenger Cars)	0.122	0.003	1.249	0.127	0.047	0.020	321.311	0.023
	Gasoline	LDGT	Light-Duty Trucks (0-8,500 lbs)	0.313	0.004	2.468	0.381	0.048	0.021	435.741	0.024
	Gasoline	HDGV	Heavy-Duty Vehicles (8,501 + lbs)	0.844	0.007	4.718	0.811	0.057	0.025	657.978	0.045
	Diesel	LDDV	Light-Duty Vehicles (Passenger Cars)	0.166	0.003	0.425	0.029	0.055	0.028	296.636	0.008
	Diesel	LDDT	Light-Duty Trucks (0-8,500 lbs)	0.204	0.004	0.401	0.049	0.066	0.038	379.655	0.008
	Diesel	HDDV	Heavy-Duty Vehicles (8,501 + lbs)	4.471	0.014	0.765	0.165	0.135	0.068	1437.979	0.027
	NA	MC	Motorcycles	1.392	0.003	30.573	5.249	0.019	0.009	203.649	0.053
Solano	Gasoline	LDGV	Light-Duty Vehicles (Passenger Cars)	0.076	0.003	0.846	0.101	0.047	0.020	300.442	0.023
	Gasoline	LDGT	Light-Duty Trucks (0-8,500 lbs)	0.133	0.004	1.218	0.188	0.047	0.020	396.387	0.024
	Gasoline	HDGV	Heavy-Duty Vehicles (8,501 + lbs)	0.376	0.006	2.287	0.349	0.056	0.023	610.622	0.045
	Diesel	LDDV	Light-Duty Vehicles (Passenger Cars)	0.087	0.003	0.221	0.015	0.052	0.024	276.988	0.008
	Diesel	LDDT	Light-Duty Trucks (0-8,500 lbs)	0.111	0.003	0.188	0.020	0.053	0.026	356.248	0.008
	Diesel	HDDV	Heavy-Duty Vehicles (8,501 + lbs)	4.237	0.013	0.832	0.167	0.150	0.077	1380.312	0.027
	NA	MC	Motorcycles	1.284	0.002	26.266	3.960	0.018	0.008	188.958	0.053

Table 5-40 EMFAC County-Specific On-Road Vehicle EFs – 2020 (cont.)

County	Fuel Type	Vehicle Type		Emission Factors (g/mi)							
				Criteria Pollutants and Ozone Precursors							
				NO_x	SO_x	CO	ROG	PM_{10}	$PM_{2.5}$	CO_2	NH_3[1]
Sonoma	Gasoline	LDGV	Light-Duty Vehicles (Passenger Cars)	0.089	0.003	1.002	0.108	0.047	0.020	299.350	0.023
	Gasoline	LDGT	Light-Duty Trucks (0-8,500 lbs)	0.173	0.004	1.572	0.237	0.047	0.020	392.692	0.024
	Gasoline	HDGV	Heavy-Duty Vehicles (8,501 + lbs)	0.511	0.006	2.970	0.473	0.056	0.024	613.372	0.045
	Diesel	LDDV	Light-Duty Vehicles (Passenger Cars)	0.180	0.003	0.315	0.024	0.057	0.029	286.826	0.008
	Diesel	LDDT	Light-Duty Trucks (0-8,500 lbs)	0.087	0.003	0.202	0.025	0.056	0.028	351.144	0.008
	Diesel	HDDV	Heavy-Duty Vehicles (8,501 + lbs)	4.192	0.011	0.797	0.170	0.165	0.090	1211.430	0.027
	NA	MC	Motorcycles	1.294	0.002	26.176	4.481	0.018	0.009	187.949	0.053
Stanislaus	Gasoline	LDGV	Light-Duty Vehicles (Passenger Cars)	0.079	0.003	0.943	0.104	0.047	0.020	303.543	0.023
	Gasoline	LDGT	Light-Duty Trucks (0-8,500 lbs)	0.161	0.004	1.549	0.234	0.047	0.020	403.651	0.024
	Gasoline	HDGV	Heavy-Duty Vehicles (8,501 + lbs)	0.425	0.006	2.784	0.409	0.054	0.023	616.943	0.045
	Diesel	LDDV	Light-Duty Vehicles (Passenger Cars)	0.095	0.003	0.277	0.018	0.052	0.025	268.526	0.008
	Diesel	LDDT	Light-Duty Trucks (0-8,500 lbs)	0.097	0.003	0.223	0.025	0.054	0.027	350.746	0.008
	Diesel	HDDV	Heavy-Duty Vehicles (8,501 + lbs)	4.264	0.013	0.722	0.159	0.142	0.073	1420.426	0.027
	NA	MC	Motorcycles	1.281	0.002	26.195	4.700	0.018	0.008	186.301	0.053
Sutter	Gasoline	LDGV	Light-Duty Vehicles (Passenger Cars)	0.082	0.003	0.904	0.097	0.047	0.019	273.206	0.023
	Gasoline	LDGT	Light-Duty Trucks (0-8,500 lbs)	0.199	0.004	1.637	0.257	0.047	0.020	362.456	0.024
	Gasoline	HDGV	Heavy-Duty Vehicles (8,501 + lbs)	0.489	0.006	2.890	0.448	0.053	0.022	568.216	0.045
	Diesel	LDDV	Light-Duty Vehicles (Passenger Cars)	0.086	0.002	0.186	0.013	0.051	0.024	245.326	0.008
	Diesel	LDDT	Light-Duty Trucks (0-8,500 lbs)	0.068	0.003	0.145	0.018	0.053	0.026	307.725	0.008
	Diesel	HDDV	Heavy-Duty Vehicles (8,501 + lbs)	4.164	0.014	0.693	0.157	0.138	0.071	1428.807	0.027
	NA	MC	Motorcycles	1.295	0.002	24.570	4.982	0.018	0.009	175.182	0.053
Tehama	Gasoline	LDGV	Light-Duty Vehicles (Passenger Cars)	0.094	0.003	0.982	0.104	0.047	0.020	296.585	0.023
	Gasoline	LDGT	Light-Duty Trucks (0-8,500 lbs)	0.239	0.004	1.895	0.289	0.047	0.020	397.068	0.024
	Gasoline	HDGV	Heavy-Duty Vehicles (8,501 + lbs)	0.535	0.006	3.130	0.493	0.055	0.023	608.874	0.045
	Diesel	LDDV	Light-Duty Vehicles (Passenger Cars)	0.125	0.003	0.288	0.020	0.053	0.026	270.360	0.008
	Diesel	LDDT	Light-Duty Trucks (0-8,500 lbs)	0.193	0.003	0.325	0.040	0.064	0.036	347.525	0.008
	Diesel	HDDV	Heavy-Duty Vehicles (8,501 + lbs)	4.540	0.014	0.748	0.164	0.134	0.068	1427.745	0.027
	NA	MC	Motorcycles	1.330	0.002	27.327	4.779	0.019	0.009	186.964	0.053
Trinity	Gasoline	LDGV	Light-Duty Vehicles (Passenger Cars)	0.140	0.004	1.454	0.145	0.048	0.021	355.534	0.023
	Gasoline	LDGT	Light-Duty Trucks (0-8,500 lbs)	0.507	0.005	3.805	0.533	0.049	0.022	492.326	0.024
	Gasoline	HDGV	Heavy-Duty Vehicles (8,501 + lbs)	1.055	0.007	5.735	0.989	0.058	0.026	720.643	0.045
	Diesel	LDDV	Light-Duty Vehicles (Passenger Cars)	0.257	0.003	0.601	0.047	0.064	0.036	321.128	0.008
	Diesel	LDDT	Light-Duty Trucks (0-8,500 lbs)	0.289	0.004	0.737	0.111	0.103	0.073	407.819	0.008
	Diesel	HDDV	Heavy-Duty Vehicles (8,501 + lbs)	4.926	0.013	0.832	0.184	0.139	0.074	1379.749	0.027
	NA	MC	Motorcycles	1.384	0.003	32.902	6.161	0.019	0.009	220.220	0.053
Tulare	Gasoline	LDGV	Light-Duty Vehicles (Passenger Cars)	0.072	0.003	0.847	0.096	0.047	0.019	283.355	0.023
	Gasoline	LDGT	Light-Duty Trucks (0-8,500 lbs)	0.166	0.004	1.532	0.251	0.047	0.020	375.688	0.024
	Gasoline	HDGV	Heavy-Duty Vehicles (8,501 + lbs)	0.411	0.006	2.701	0.393	0.053	0.022	582.439	0.045
	Diesel	LDDV	Light-Duty Vehicles (Passenger Cars)	0.065	0.002	0.168	0.011	0.050	0.023	248.565	0.008
	Diesel	LDDT	Light-Duty Trucks (0-8,500 lbs)	0.148	0.003	0.219	0.026	0.058	0.031	322.402	0.008
	Diesel	HDDV	Heavy-Duty Vehicles (8,501 + lbs)	4.302	0.013	0.744	0.160	0.144	0.073	1423.140	0.027
	NA	MC	Motorcycles	1.266	0.002	24.385	4.315	0.018	0.008	174.565	0.053
Tuolumne	Gasoline	LDGV	Light-Duty Vehicles (Passenger Cars)	0.138	0.003	1.410	0.148	0.047	0.020	302.549	0.023
	Gasoline	LDGT	Light-Duty Trucks (0-8,500 lbs)	0.403	0.004	3.137	0.477	0.048	0.021	414.440	0.024
	Gasoline	HDGV	Heavy-Duty Vehicles (8,501 + lbs)	0.920	0.006	4.995	0.860	0.056	0.024	632.258	0.045
	Diesel	LDDV	Light-Duty Vehicles (Passenger Cars)	0.169	0.003	0.354	0.025	0.055	0.027	275.901	0.008
	Diesel	LDDT	Light-Duty Trucks (0-8,500 lbs)	0.244	0.003	0.365	0.046	0.067	0.039	348.800	0.008
	Diesel	HDDV	Heavy-Duty Vehicles (8,501 + lbs)	5.204	0.009	0.965	0.211	0.177	0.101	983.766	0.027
	NA	MC	Motorcycles	1.352	0.002	29.464	5.398	0.019	0.009	188.144	0.053
Ventura	Gasoline	LDGV	Light-Duty Vehicles (Passenger Cars)	0.074	0.003	0.893	0.101	0.047	0.020	288.427	0.023
	Gasoline	LDGT	Light-Duty Trucks (0-8,500 lbs)	0.127	0.004	1.281	0.187	0.047	0.020	378.358	0.024
	Gasoline	HDGV	Heavy-Duty Vehicles (8,501 + lbs)	0.365	0.006	2.324	0.339	0.055	0.023	575.032	0.045
	Diesel	LDDV	Light-Duty Vehicles (Passenger Cars)	0.087	0.003	0.255	0.018	0.053	0.025	265.203	0.008
	Diesel	LDDT	Light-Duty Trucks (0-8,500 lbs)	0.099	0.003	0.198	0.023	0.054	0.026	343.237	0.008
	Diesel	HDDV	Heavy-Duty Vehicles (8,501 + lbs)	3.491	0.010	0.719	0.112	0.154	0.081	1129.283	0.027
	NA	MC	Motorcycles	1.279	0.002	24.311	4.896	0.019	0.009	190.808	0.053

Table 5-40 EMFAC County-Specific On-Road Vehicle EFs – 2020 (cont.)

County	Fuel Type	Vehicle Type		Emission Factors (g/mi)							
				Criteria Pollutants and Ozone Precursors							
				NO_x	SO_x	CO	ROG	PM_{10}	$PM_{2.5}$	CO_2	NH_3[1]
Yolo	Gasoline	LDGV	Light-Duty Vehicles (Passenger Cars)	0.079	0.003	0.913	0.108	0.047	0.020	292.723	0.023
	Gasoline	LDGT	Light-Duty Trucks (0-8,500 lbs)	0.127	0.004	1.208	0.185	0.047	0.020	378.350	0.024
	Gasoline	HDGV	Heavy-Duty Vehicles (8,501 + lbs)	0.372	0.006	2.292	0.345	0.055	0.023	586.673	0.045
	Diesel	LDDV	Light-Duty Vehicles (Passenger Cars)	0.140	0.003	0.235	0.017	0.054	0.027	268.925	0.008
	Diesel	LDDT	Light-Duty Trucks (0-8,500 lbs)	0.118	0.003	0.175	0.019	0.054	0.026	340.101	0.008
	Diesel	HDDV	Heavy-Duty Vehicles (8,501 + lbs)	3.467	0.012	0.698	0.142	0.158	0.082	1299.532	0.027
	NA	MC	Motorcycles	1.277	0.002	25.429	4.199	0.018	0.008	179.195	0.053
Yuba	Gasoline	LDGV	Light-Duty Vehicles (Passenger Cars)	0.084	0.003	0.924	0.095	0.047	0.020	280.244	0.023
	Gasoline	LDGT	Light-Duty Trucks (0-8,500 lbs)	0.251	0.004	1.998	0.299	0.047	0.020	378.834	0.024
	Gasoline	HDGV	Heavy-Duty Vehicles (8,501 + lbs)	0.572	0.006	3.351	0.512	0.055	0.023	582.176	0.045
	Diesel	LDDV	Light-Duty Vehicles (Passenger Cars)	0.093	0.002	0.210	0.014	0.052	0.024	255.171	0.008
	Diesel	LDDT	Light-Duty Trucks (0-8,500 lbs)	0.093	0.003	0.156	0.019	0.053	0.025	317.308	0.008
	Diesel	HDDV	Heavy-Duty Vehicles (8,501 + lbs)	4.999	0.010	0.940	0.198	0.179	0.098	1091.997	0.027
	NA	MC	Motorcycles	1.285	0.002	25.124	4.430	0.018	0.008	174.400	0.053

1. The values in the NH_3 column for EMFAC Tables 5-26 through 5-40 reflect statewide values as calculated by MOVES2014a for the state of California.

Table 5-41. OCONUS On-Road Composite Vehicle Emission Factors - POV

Year	Vehicle Type	Emission Factors (g/mi)							
		Criteria Pollutants and Ozone Precursors							
		NO_x	SO_x	CO	VOC	PM_{10}	$PM_{2.5}$	CO_2	NH_3
2016	All Vehicles	0.628	0.008	5.686	0.605	0.014	0.012	402.094	0.029
2017	All Vehicles	0.469	0.003	5.179	0.535	0.012	0.011	392.895	0.028
2018	All Vehicles	0.410	0.003	4.865	0.491	0.012	0.010	382.659	0.026
2019	All Vehicles	0.358	0.003	4.561	0.450	0.011	0.009	372.584	0.025
2020	All Vehicles	0.392	0.002	4.245	0.418	0.010	0.009	362.797	0.024

Table 5-42. OCONUS On-Road Composite Vehicle Emission Factors - GOV

Year	Vehicle Type	Emission Factors (g/mi)							
		Criteria Pollutants and Ozone Precursors							
		NO_x	SO_x	CO	VOC	PM_{10}	$PM_{2.5}$	CO_2	NH_3
2016	All Vehicles	2.333	0.010	6.613	0.623	0.076	0.070	738.360	0.027
2017	All Vehicles	1.975	0.006	5.945	0.542	0.067	0.061	722.545	0.026
2018	All Vehicles	1.769	0.005	5.482	0.485	0.059	0.054	708.282	0.025
2019	All Vehicles	1.589	0.005	5.064	0.435	0.052	0.047	693.669	0.024
2020	All Vehicles	1.495	0.005	4.666	0.396	0.045	0.042	682.279	0.024

Table 5-43. On Road Vehicle Speciated VOC Weight Fractions

VOC	HAP	LDGV [1]	LDDV [2]	LDGT [1]	LDDT [2]	HDGV [1]	HDDV [2]	MC [3]
Acetylene		4.05%	8.02%	3.61%	8.52%	2.90%	---	---
Acetaldehyde	X	0.29%	---	1.64%	---	---	---	---
Acrolein	X	0.24%	---	0.40%	---	---	---	---
Alpha-pinene		0.06%	---	0.08%	---	---	---	---
Benzaldehyde		0.29%	---	1.19%	---	---	---	---
Benzene	X	5.89%	2.23%	5.61%	2.91%	1.91%	---	3.99%
Beta-pinene		0.03%	---	0.02%	---	---	---	---
1,3-Butadiene	X	0.57%	1.08%	0.62%	1.44%	---	---	---
Butane		0.37%	0.46%	0.41%	0.32%	24.42%	---	0.65%
1-Butene		2.22%	1.68%	2.47%	2.01%	1.21%	---	2.32%
cis-2-Butene		0.14%	0.61%	0.14%	0.77%	0.73%	---	0.48%
trans-2-Butene		0.35%	2.25%	0.30%	0.24%	0.97%	---	0.29%
Butylbenzene		---	---	---	---	0.23%	---	---
o-tert-Butyltoluene		---	---	---	0.19%	---	1.09%	---
tert-Butyl-m-Xylene		---	---	---	---	---	0.74%	---
Butyraldehyde		0.04%	---	0.42%	---	---	---	---
C6 olefin		---	2.80%	---	2.23%	---	---	---
Crotonaldehyde		0.02%	---	0.06%	---	---	---	---
Cyclohexane		0.50%	---	0.32%	---	---	1.72%	0.19%
Cyclohexene		0.07%	---	0.04%	---	1.72%	0.32%	---
Cyclopentadiene		---	0.53%	---	0.24%	---	---	---
Cyclopentane		0.22%	0.57%	0.20%	0.44%	0.52%	1.09%	1.09%
Cyclopentene		0.12%	0.53%	0.12%	0.39%	0.32%	0.51%	0.31%
Cyclopentylcyclopentane		---	---	---	---	0.50%	---	---
Decane		0.25%	1.30%	0.17%	1.65%	0.12%	1.39%	---
Diethylbenzene		---	0.31%	---	0.39%	---	1.46%	---
1,2-Diethylbenzene		0.09%	0.15%	0.05%	---	0.33%	---	---
1,3-Diethylbenzene		0.29%	---	0.30%	---	0.25%	---	---
1,4-Diethylbenzene		0.12%	---	0.07%	---	---	---	---
Dimethyl Ethylbenzene		---	0.23%	---	0.29%	---	2.30%	---
2,2-Dimethylbutane		0.55%	---	0.49%	---	0.24%	1.13%	1.70%
2,3-Dimethylbutane		0.88%	0.69%	0.87%	0.53%	1.07%	0.61%	1.78%
3,3-Dimethyl-1-butene		---	0.53%	---	---	---	---	---
1,1-Dimethylcyclohexane		0.06%	---	0.06%	---	---	---	---
cis-1,2-Dimethylcyclohexane		---	---	---	---	---	0.32%	---
trans-1,2-Dimethylcyclohexane		---	0.15%	---	0.39%	---	1.50%	---
cis-1,3-Dimethylcyclohexane		---	---	---	---	---	2.07%	---
Cis-1,4-Dimethylcyclohexane		---	---	---	---	0.09%	0.23%	---
cis-1,3-Dimethylcyclopentane		---	---	---	0.68%	---	0.72%	---
Dimethylheptane		0.08%	0.88%	0.08%	1.11%	0.09%	---	---
2,5-Dimethylheptane		---	0.15%	---	0.19%	---	---	---
2,6-Dimethylheptane		---	0.23%	---	0.58%	---	---	---
2,3-Dimethylheptane		---	---	---	---	---	0.65%	---
2,5-Dimethylheptane		0.19%	---	0.18%	---	0.14%	---	---
2,6-Dimethylheptane		---	---	---	---	---	---	---
3,3-Dimethylheptane		0.05%	---	0.04%	---	---	---	---

VOC	HAP	LDGV [1]	LDDV [2]	LDGT [1]	LDDT [2]	HDGV [1]	HDDV [2]	MC [3]
3,5-Dimethylheptane		---	---	---	---	---	2.18%	---
4,4-Dimethylheptane		---	0.08%	---	---	---	---	---
2,3-Dimethylhexane		0.29%	---	0.36%	---	---	0.38%	---
2,4-Dimethylhexane		0.58%	0.46%	0.68%	0.23%	0.46%	0.25%	---
2,5-Dimethylhexane		0.39%	---	0.45%	---	---	0.21%	---
3,3-Dimethylhexane		---	---	---	---	---	0.11%	---
Dimethyloctane		0.08%	0.31%	0.05%	0.39%	0.08%	---	---
2,2-Dimethyloctane		---	---	---	---	---	0.43%	---
2,3-Dimethyloctane		---	---	---	---	0.57%	---	---
2,4-Dimethyloctane		---	0.15%	---	0.19%	---	2.56%	---
2,4-Dimethylpentane		0.85%	0.08%	0.90%	---	0.70%	0.22%	2.29%
2,2-Dimethylpentane		---	0.08%	---	---	---	---	---
2,3-Dimethylpentane		1.25%	0.15%	1.32%	0.44%	---	1.36%	0.95%
3,3-Dimethylpentane		---	---	---	---	---	0.59%	---
2,2-Dimethylpropane		---	0.33%	---	0.68%	---	---	---
Dipente		0.42%	---	0.33%	---	---	---	---
Dodecane		0.48%	0.50%	0.22%	0.61%	---	3.01%	---
Ethene		---	28.13%	---	30.07%	---	---	---
Ethyl tert-butyl ether		---	---	---	0.39%	---	2.98%	---
Ethylbenzene	X	2.56%	0.38%	2.28%	0.48%	0.73%	1.29%	1.99%
Ethylcyclohexane		---	---	---	---	---	7.69%	---
Ethylene		7.39%	---	6.59%	---	4.74%	---	---
3-Ethylhexane		---	0.15%	---	0.29%	---	0.70%	---
cis-1-Ethyl-2-Methylcyclopentane		---	0.15%	---	---	---	---	---
3-Ethylpentane		0.31%	---	0.27%	---	---	---	---
3-Ethyltoluene		2.02%	---	1.71%	---	0.17%	---	---
Formaldehyde	X	1.06%	---	3.37%	---	---	---	---
Glyoxal		0.03%	---	0.01%	---	---	---	---
Heptane		1.11%	0.08%	1.06%	0.19%	0.79%	0.77%	2.19%
1-Heptene		0.16%	---	0.08%	---	---	---	---
cis-2-Heptene		---	0.15%	---	---	---	---	---
trans-2-Heptene		---	0.15%	---	---	---	---	---
Trans-3-Heptene		0.03%	---	0.04%	---	---	---	---
Hexaldehyde		0.09%	---	0.11%	---	---	---	---
Hexane	X	1.51%	---	1.83%	0.19%	1.67%	2.40%	1.42%
1-Hexene		0.16%	0.94%	0.16%	0.83%	0.30%	1.77%	---
cis-2-Hexene		0.08%	0.23%	0.08%	---	0.12%	---	0.06%
trans-2-Hexene		0.14%	0.46%	0.14%	---	---	---	0.10%
cis-3-Hexene		0.02%	---	0.02%	---	---	---	---
Hexyne		---	---	---	---	0.02%	---	---
Indan		0.24%	---	0.17%	---	0.35%	---	---
Isohexane		---	---	2.66%	---	3.06%	---	---
Isopropylcyclohexane		0.04%	---	0.02%	---	---	---	---
Methylbenzaldehyde		0.02%	---	0.17%	---	---	---	---
2-Methyl-1,3-Butadiene		---	0.54%	---	0.58%	0.11%	---	---
2-Methylbutane		0.27%	0.31%	0.24%	0.39%	12.02%	---	14.59%

Table 5-43. On Road Vehicle Speciated VOC Weight Fractions (cont.)

VOC	HAP	LDGV [1]	LDDV [2]	LDGT [1]	LDDT [2]	HDGV [1]	HDDV [2]	MC [3]
2-Methyl-1-Butene		1.71%	4.20%	1.53%	2.27%	---	---	---
2-Methyl-2-Butene		0.32%	0.23%	0.39%	---	0.12%	---	1.08%
3-Methyl-1-Butene		6.54%	---	5.86%	---	0.15%	---	0.14%
Methyl-tert-Butyl Ether	X	0.02%	---	0.05%	---	---	---	---
Methylcyclohexane		0.44%	0.28%	0.40%	0.43%	0.28%	1.62%	0.43%
Methylcyclooctane		---	---	---	---	0.36%	---	---
Methylcyclopentane		1.10%	0.08%	1.04%	0.10%	1.21%	0.44%	1.83%
1-Methylcyclopentene		---	0.23%	---	---	0.03%	---	---
2-Methyldecane		---	---	---	---	0.69%	---	---
Methylethylbenzene	X	0.19%	0.53%	0.15%	0.68%	---	2.39%	0.40%
1-Methyl-2-Ethylbenzene		0.75%	---	0.62%	---	---	---	---
cis-1-Methyl-3-Ethylcyclopentane		---	1.22%	---	0.74%	---	---	---
1-Methyl-4-Ethylbenzene		0.92%	---	0.78%	---	---	---	---
Methylethylketone		0.05%	---	0.07%	---	---	---	---
2-Methylheptane		0.67%	0.15%	0.53%	---	0.28%	0.44%	1.61%
3-Methylheptane		0.75%	---	0.69%	---	0.38%	0.44%	1.67%
4-Methylheptane		0.28%	0.08%	0.28%	---	0.27%	---	---
2-Methylhexane		1.39%	---	1.34%	---	---	0.52%	3.18%
3-Methylhexane		1.54%	0.61%	1.38%	---	---	1.72%	2.57%
3-Methyl-1-Hexene		---	---	---	0.58%	---	---	---
4-Methyl-1-Hexene		0.03%	---	0.03%	---	---	---	---
1-Methyl-2-Isopropylbenzene		0.03%	---	0.02%	---	---	---	---
1-Methyl-3-isopropylbenzene		0.09%	---	0.06%	---	---	---	---
1-Methyl-4-Isopropylbenzene		0.02%	---	0.02%	---	---	---	---
2-Methyloctane		0.38%	0.15%	0.23%	---	0.04%	0.92%	---
3-Methyloctane		0.34%	0.08%	0.29%	---	0.34%	1.81%	---
4-Methyloctane		---	---	---	---	0.42%	---	---
2-Methylpentane		2.68%	0.28%	---	0.32%	---	3.80%	5.81%
3-Methylpentane		1.85%	0.53%	1.80%	1.21%	1.68%	1.20%	3.48%
3-Methyl-cis-2-Pentene		0.09%	---	0.09%	---	---	---	---
2-Methyl-1-Pentene		0.11%	1.30%	0.11%	0.74%	---	---	0.22%
2-Methyl-2-Pentene		0.10%	0.08%	0.08%	---	0.37%	---	---
3-Methyl-trans-2-Pentene		0.10%	---	0.08%	---	---	0.23%	---
4-Methyl-1-Pentene		---	0.79%	---	0.90%	---	---	---
4-Methyl-trans-2-Pentene		---	---	---	---	---	2.62%	---
2-Methylpropane		0.30%	0.15%	0.31%	0.19%	3.74%	---	0.20%
2-Methyl-2-Propenal		0.04%	---	0.17%	---	---	---	---
2-Methylpropene		---	2.29%	---	2.01%	---	---	---
(1-methylpropyl)benzene		0.06%	---	0.04%	---	0.05%	---	---
(2-methylpropyl)benzene		0.06%	---	0.05%	---	---	---	---
1-Methyl-3-propylbenzene		0.16%	---	0.11%	---	0.17%	---	---
Methylpyrene		---	---	---	---	---	1.11%	---
Methylfluoranthene		---	---	---	---	---	---	---
Methylpyrene		---	---	---	---	---	---	---
Naphthalene	X	0.07%	---	0.03%	---	---	---	---

VOC	HAP	LDGV [1]	LDDV [2]	LDGT [1]	LDDT [2]	HDGV [1]	HDDV [2]	MC [3]
Nonanal		0.53%	---	0.29%	---	---	---	---
Nonane		0.33%	0.64%	0.24%	0.77%	0.12%	0.98%	0.56%
Nonene		---	0.73%	---	0.92%	---	---	---
1-Nonene		0.11%	0.69%	0.10%	0.29%	---	1.22%	---
trans-2-Nonene		---	---	---	---	0.19%	---	---
Octanal		0.03%	---	0.02%	---	---	---	---
Octane		0.60%	0.20%	0.51%	0.45%	0.26%	1.55%	0.89%
1-Octene		0.03%	---	0.05%	---	---	---	---
Pentane		0.06%	1.91%	0.08%	1.52%	5.29%	---	8.14%
1-Pentene		0.37%	2.98%	0.38%	3.23%	0.45%	---	0.27%
cis-2-Pentene		0.20%	0.15%	0.20%	---	1.06%	---	0.35%
trans-2-Pentene		0.39%	1.30%	0.37%	0.97%	0.89%	---	0.58%
Pentylbenzene		---	---	---	---	---	1.62%	---
Pentyne		---	---	---	---	0.21%	---	---
trans-1-Phenylbutene		---	---	---	---	0.25%	---	---
4-Phenyl-1-Butene		---	---	---	---	0.28%	---	---
1,2-Propadiene		---	---	---	---	0.12%	---	---
Propane		0.24%	0.31%	0.23%	3.00%	---	---	---
Propene		4.23%	9.08%	4.56%	8.79%	1.71%	---	1.11%
Propionaldehyde	X	0.04%	---	0.11%	---	---	---	---
Propylbenzene		0.59%	0.20%	0.49%	0.29%	0.34%	0.51%	0.65%
Propylcyclopentane		---	---	---	---	---	---	---
Propyltoluene		---	---	---	---	---	3.37%	---
Propyne		---	0.38%	---	0.10%	0.26%	---	---
Styrene	X	0.13%	0.84%	0.10%	---	---	2.04%	0.23%
Tetramethylbenzene		0.26%	0.27%	0.18%	0.42%	---	14.53%	---
1,2,3,4-Tetramethylbenzene		0.18%	---	0.09%	---	---	---	---
1,2,4,5-Tetramethylbenzene		0.20%	---	0.13%	---	---	---	---
Toluene	X	11.19%	1.62%	10.57%	2.06%	3.25%	---	12.52%
Trimethylbenzene		3.28%	0.31%	2.55%	0.39%	1.57%	4.27%	1.43%
1,2,3-Trimethylbenzene		0.34%	0.23%	0.30%	---	0.28%	---	---
1,3,5-Trimethylbenzene		0.89%	---	0.78%	0.39%	1.32%	---	1.99%
2,2,3-Trimethylbutane		0.03%	---	0.03%	---	---	0.23%	---
1,2,3-Trimethylcylcopentane		---	0.61%	---	---	---	---	---
2,2,5-Trimethylhexane		0.38%	0.15%	0.43%	---	0.26%	0.46%	---
2,3,5-Trimethylhexane		---	0.15%	---	0.19%	0.09%	---	---
2,2,4-Trimethylpentane	X	2.25%	0.94%	4.04%	0.77%	1.63%	0.24%	1.45%
2,3,3-Trimethylpentane		---	---	---	0.10%	0.46%	---	---
2,3,4-Trimethylpentane		0.67%	0.46%	0.92%	0.24%	0.28%	0.33%	0.71%
2,4,4-Trimethyl-1-pentene		0.02%	0.08%	0.04%	---	1.88%	---	---
2,4,4-Trimethyl-2-pentene		---	0.31%	---	---	---	---	---
Undecane		0.13%	1.11%	0.09%	1.40%	0.15%	2.64%	---
1-Undecene		---	---	---	---	0.15%	---	---
Valeraldehyde		0.01%	---	0.01%	---	---	---	---
Xylenes (Mixed Isomers)	X	9.50%	1.90%	8.20%	2.08%	3.02%	---	10.11%

1. SOURCE: Data provided by the EPA's SPECIATE database version 4.4.
2. SOURCE: *Diesel Unregulated Emissions Characterization*. CRC Report No. E-75-2, Coordinating Research Council, Inc., July 2010.
3. SOURCE: *Air Pollutant Emission Factors from New and In-Use Motorcycles*. Atmospheric Environment, April 2000.

"X" Indicates compound is a HAP

"---" Indicates No data available

Figure 5-2. Data Collection Form for Government Owned Vehicles (GOV's)

Installation Name:				Inventory Year:
Responsible Organization (Name and Office Symbol):				
POC (Name, Phone #, and e-mail):				
Vehicle Category: (Select from appropriate category listed below the table)[1]				
Vehicle Identification Number (VIN)[2]	Vehicle Description[3]	Bldg. Number[4]	Model Year	Miles Driven During Inventory Period (mi/yr)[5]

Figure 5-3. Example Data Collection Form for Privately Owned Vehicles (POVs)

Installation Name:	**Inventory Year:**
Responsible Organization (Name and Office Symbol):	
POC (Name, Phone #, and e-mail):	
Question	**Response**
Can you provide a listing of all registered vehicles on base? (Y/N)? If so, be sure to include all specific information (make/model, year, etc.) about the vehicles.	
What is the estimated average number of registered POVs at the installation during the inventory period?	
What is the estimated percentage of registered vehicles which actually travel on the installation during a typical weekday (Monday - Friday)	
What is the estimated percentage of registered vehicles which actually travel on the installation during a typical weekend day (Saturday and Sunday)	
What is the estimated distance the average POV travels on base during a typical weekday?	___ mi/day
What is the estimated distance the average POV travels on base during a typical weekend day?	___ mi/day
What is the estimated number of non-registered POVs which travel on base during a typical weekday?	
What is the estimated number of non-registered POVs which travel on base during a typical weekend day?	
What is the estimated average model year of all POVs driven on base during the inventory year? (NOTE: This is not required if the average model years are listed below for each vehicle category)	

Using registration information, provide an estimate of the percentage of registered POVs which fall under each of the 12 vehicle categories listed below. If possible, please provide the estimated model year for each vehicle category.

Vehicle Category	Category Description	Estimated % of Registered Vehicles	Average Model Year
LDGV	Light-Duty Gasoline Vehicles - All gasoline-powered passenger cars		
LDDV	Light-Duty Diesel Vehicles - All diesel powered-passenger cars		
LDGT	Light-Duty Gasoline Trucks - All smaller gasoline-powered trucks (0 - 8,500lbs GVWR)		
LDDT	Light-Duty Diesel Trucks - All smaller diesel-powered trucks (0 - 8,500lbs GVWR)		
HDGV	Heavy-Duty Gasoline Vehicles - All larger gasoline-powered vehicles (>8,500lbs)		
HDDV	Heavy-Duty Diesel Vehicles - All larger diesel-powered vehicles (>10,000lbs GVWR)		
MC	Motorcycles - All motorcycles (assumed to be gasoline-powered)		

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6 FUEL TRANSFER (FDSP, FLD)– EXCLUDES ON-ROAD VEHICLE REFUELING

- *Fugitive Source*
- *Mobile Source* – When fuel is dispensed to mobile equipment.
- *Stationary Source*– Fuel spills and when dispensed to stationary equipment.

The Air Force recommends that most emissions generated during the transfer (dispensing) of fuel into *on-road* vehicles be classified as mobile emissions. However, if the regulator insists this category be included as a stationary source, subtract those emissions from the Mobile AEI, and add them to the Stationary AEI to avoid duplicate reporting. This is accomplished by manually calculating emissions generated from on-road vehicle refueling using the procedures given in this section, then subtracting those values from the emissions generated by on-road vehicles covered in the previous section.

6.1 Introduction

Fuel transfer includes the dispensing of fuel into *non-road* engines and equipment, aircraft, and fuel trucks. **Note that the emissions from the refueling of *on-road engines* are not addressed here since those emissions are accounted for in the emission factors generated by the MOVES2014a model**. Emissions from fuel dispensing are the result of vapors displaced as fuel is added to the fuel tank. The amount of vapor released to the atmosphere is a function of the gas and fuel tank temperatures, the vapor pressure of the fuel, the dispensing rate, and the presence of vapor emission control devices. **The vapor that is emitted into the atmosphere is composed of both VOCs and HAPs and is considered fugitive in nature**.

Minor fuel spills are an inevitable consequence of fuel dispensing. Typically, these spills are individually insignificant though may collectively result in a substantial release of VOC and HAP emissions**. Emissions from minor spills are accounted for in the "Fuel Transfer" section of the Stationary Guide as a means to produce a conservative emissions calculation. Emissions from significant spills, which are those spills that are reported to the Environmental or Civil Engineering Environmental office, are not addressed here, but described in the "Fuel Spills" section of the Transitory Guide.** The vapor emissions of concern from fuel dispensing operations are described by the simple control volume given in Figure 6-1.

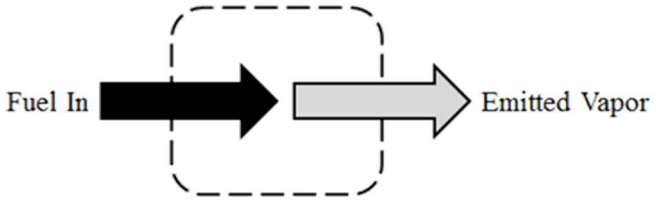


Figure 6-1. Simple Fuel Dispensing Control Volume

The loading method used in the fuel transfer process has a significant effect on the amount of vapor emissions generated during the transfer activity. There are two main fuel loading methods: splash loading and submerged loading. The splash loading method involves the lowering of the fill pipe into the tank above the liquid level. The loading of the fuel using the splash method results in significant turbulence, which increases the amount of vapor released into the atmosphere. The alternative method, submerged loading, may be further subdivided into two techniques: submerged fill pipe method and the bottom loading method. In the submerged fill pipe method, the fill pipe extends almost to the bottom of the storage tank, below the liquid level. In the bottom loading method, a fill pipe is permanently attached to the bottom of the storage tank. In both cases, the fill pipe is below the liquid level so turbulence is minimized and vapor emissions are greatly reduced when compared to the splash loading method. Each method is shown in Figure 6-2.

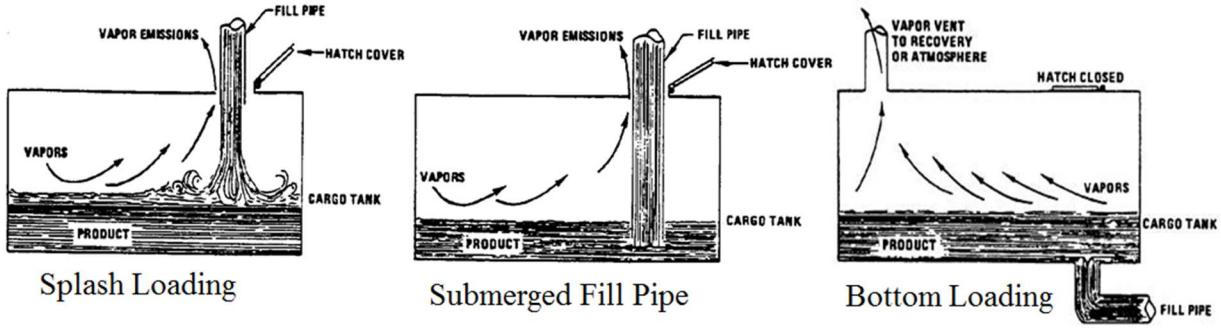


Figure 6-2 Splash Loading, Submerged Fill Pipe, and Bottom Loading Methods

There are several challenges to calculating evaporative emissions from fuel transfer activities. These challenges include the use of several different fuels used on base, such as gasoline, diesel, or JP-8 fuel, each with different vapor pressures. Furthermore, there are multiple destinations for fuels on base that may make it more difficult to gather data or determine what emissions are classified as mobile or stationary. In an effort to simplify how each base should calculate fuel transfer emissions, a diagram of the typical transfer methods and destinations of fuel on base is provided in Figure 6-3.

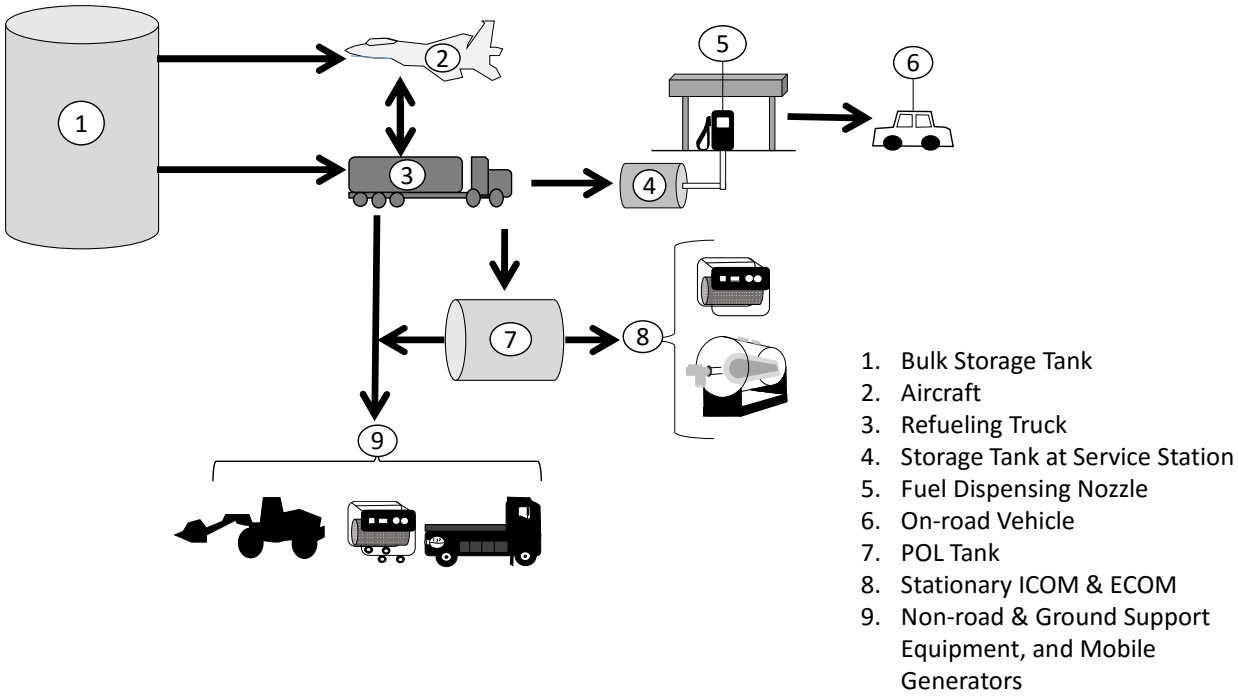
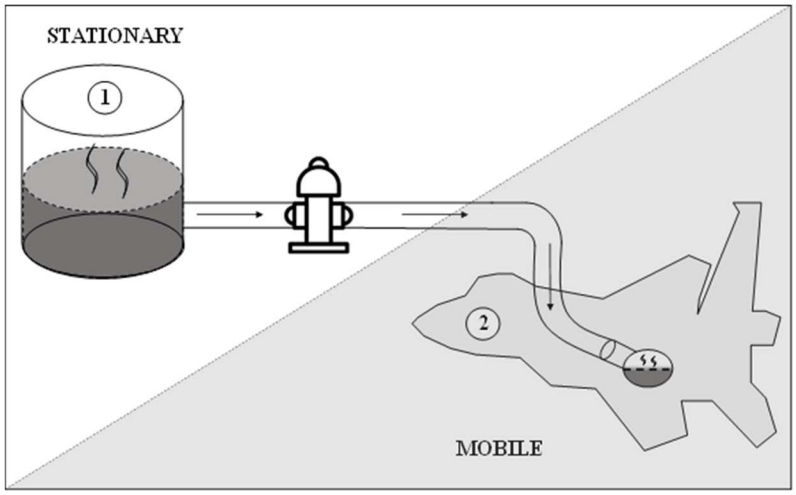
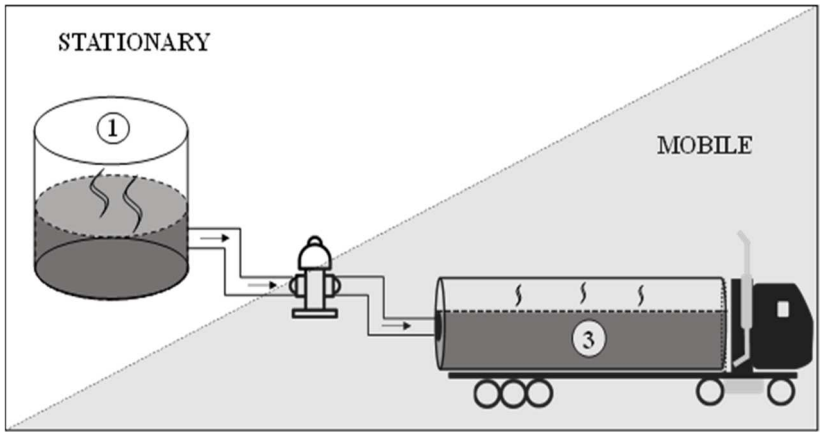


Figure 6-3. Typical On-Base Fuel Transfer Activities and Destinations.

Figure 6-3 shows the typical fuel transfer paths that fuel may go through at an Air Force installation. The transfer of the fuel into different equipment results in the generation and release of pollutant emissions. The classification (mobile vs. stationary) of these pieces of equipment, determines whether or not the emissions generated are regarded as mobile or stationary sources. It is important to note that **significant** fuel spills may occur at any point in the fuel transfer process, which will contribute to VOC and HAP emissions as the fuel evaporates. However, since these are uncommon occurrences, emissions from fuel spills are addressed in the Air Emissions Guide for Air Force Transitory Sources. The specific pathways illustrated in Figure 6-3 are described below and categorized as either mobile (shaded) or stationary (not shaded) sources of emissions.

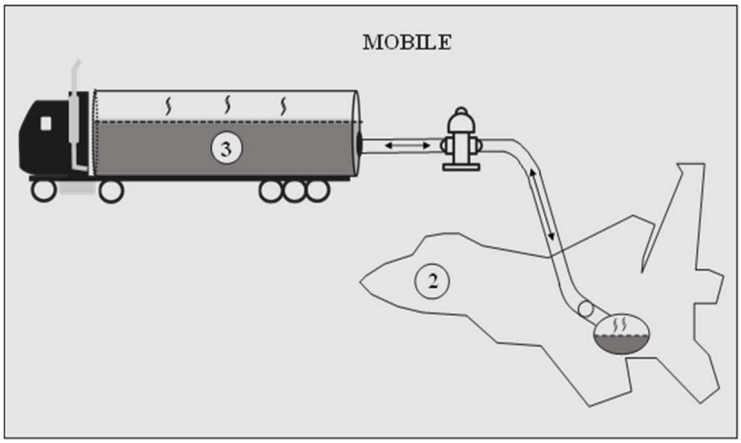


1 (Bulk Storage Tank) →2 (Aircraft) The figure illustrates fuel transferred in order to refuel an aircraft from a bulk storage tank via a hydrant system. The vapors displaced within the storage tank as the liquid level lowers or rises are known as "working losses" and vapors generated in the space above the stored liquid are known as "breathing losses". These emissions result in **stationary** emissions and are calculated using the equations provided in Chapter 7 of AP-42. **Mobile** emissions are generated from the displaced vapor in the aircraft fuel tank. The mobile emissions should be reported in the mobile AEI and are calculated as described later in this chapter.

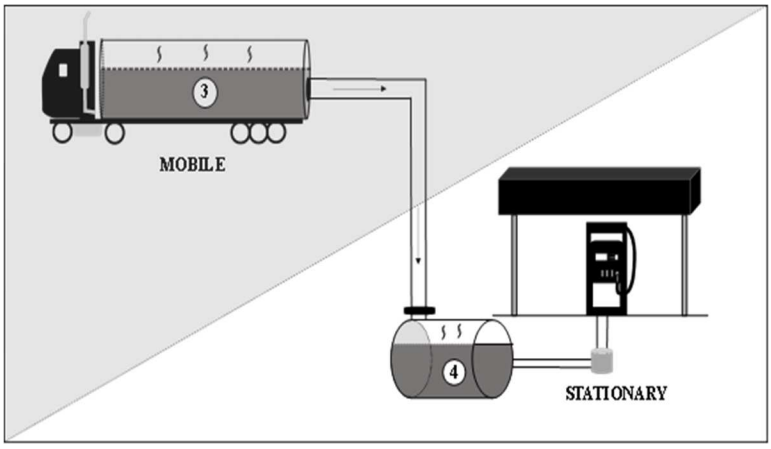


1 (Bulk Storage Tank) → 3 (Refueling Truck) The **stationary** source of emissions is the storage tank producing working losses and breathing losses from the liquid fuel. The methodology for calculating these emissions is provided in the Stationary Guide.

The **mobile** emissions from loading fuel into refueling trucks are generated from the displaced vapor in the fuel truck. The mobile emissions should be reported in the mobile AEI and are calculated as described later in this chapter.

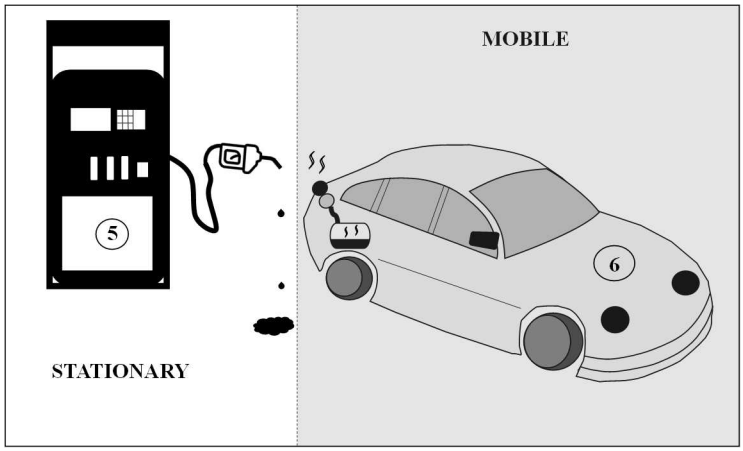


2 (Refueling Truck) ↔ 3 (Aircraft) The figure illustrates the fueling and defueling of aircraft via a refueling truck. Both pieces of equipment are **mobile,** therefore all emissions generated from these activities (which come from displaced vapors in the refueling truck and aircraft fuel tanks) should be reported in the mobile AEI and calculated as described later in this chapter.



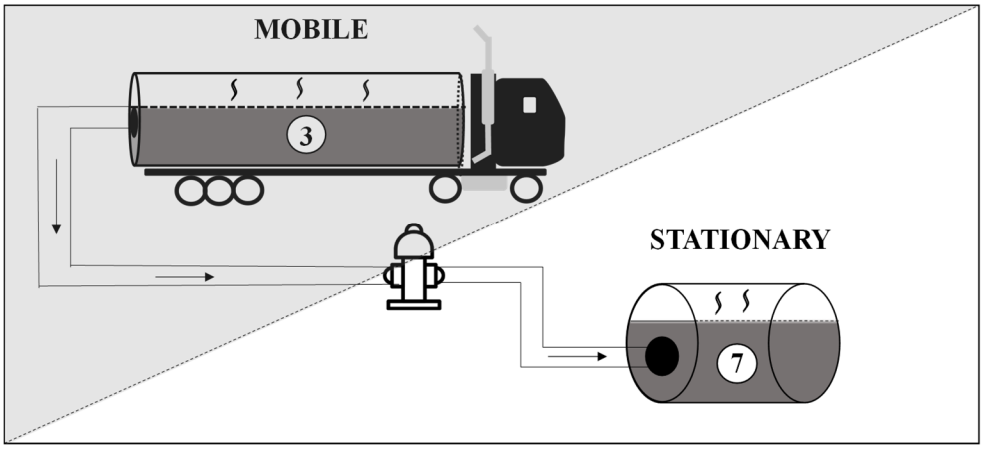
3 (Refueling Truck) → 4 (Storage Tank and Service Station) The figure illustrates the loading of fuel from a refueling truck into a storage tank at a fuel service station. The **stationary** emissions from the refilling of a storage tank at a fuel dispensing location include breathing and working losses from the storage tank. The methodology for calculating these emissions is provided in the Stationary Guide.

The only substantial **mobile** emissions from the fueling of the tank via the refueling truck are generated from any significant fuel spills which are addressed in the Transitory Guide.



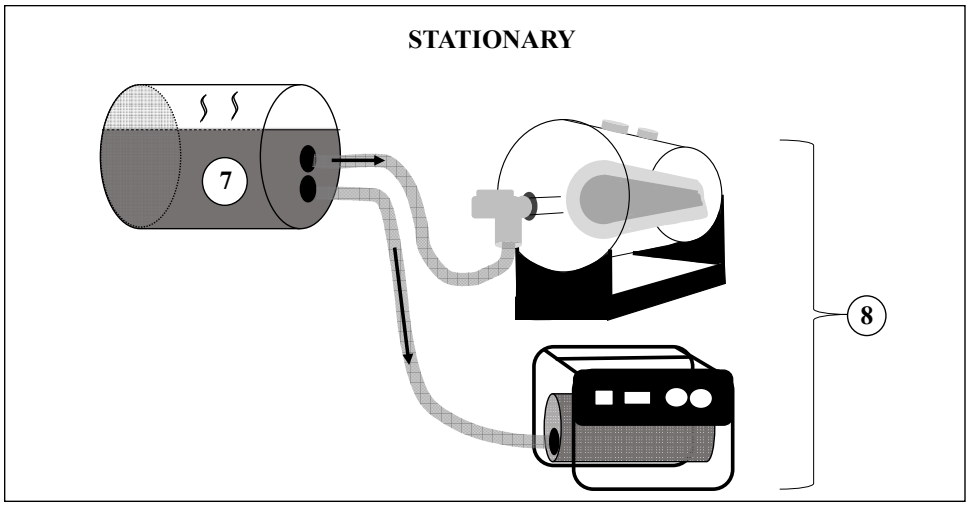
5 (Fuel Dispensing Nozzle) → 6 (On-Road Vehicle) The figure illustrates the refueling of a vehicle at a service station. The **stationary** emissions are the result of the evaporation of spilled fuel from the fuel nozzle whose calculations are described in the Stationary Guide.

The **mobile** emissions are generated from the displaced vapors in the vehicle fuel tank. The displaced vapor emissions should be included in a mobile AEI and are already calculated by the MOVES model used to determine on-road vehicle emissions. AP-42 states that the motor vehicle refueling emissions equation is incorporated into the MOBILE model, which has been integrated into the MOVES model. The MOVES2014a model is the current model used for estimating emissions for on-road vehicles. This version of the model allows for disabling of the refueling emissions calculation if these emissions are included in a stationary AEI, rather than in a mobile AEI. **This should only be done if the regulator insists this category be included as a stationary source, otherwise these emissions are already accounted for in the emission factors in the "On-Road Vehicles" chapter of this Guide.**

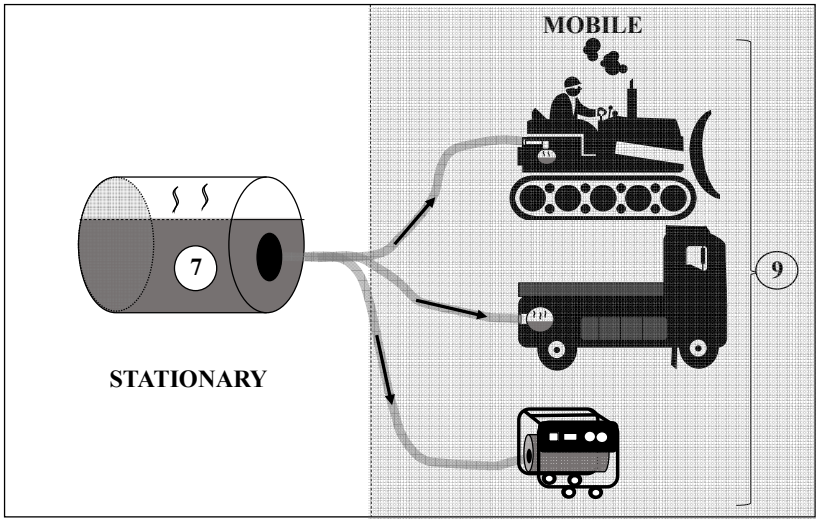


3 (Refueling Truck) → 7 (POL Tank) The fuel transfer pathway illustrates the loading of fuel from a refueling truck into a Petroleum, Oil, and Lubricants (POL) storage tank. The **stationary** emissions include the breathing and working losses from smaller storage tanks on base. The methodology for calculating these emissions is provided in the Stationary Guide.

Likely, the only emissions generated from the mobile source (refueling truck) are from any significant fuel spills which are addressed in the Transitory Guide.

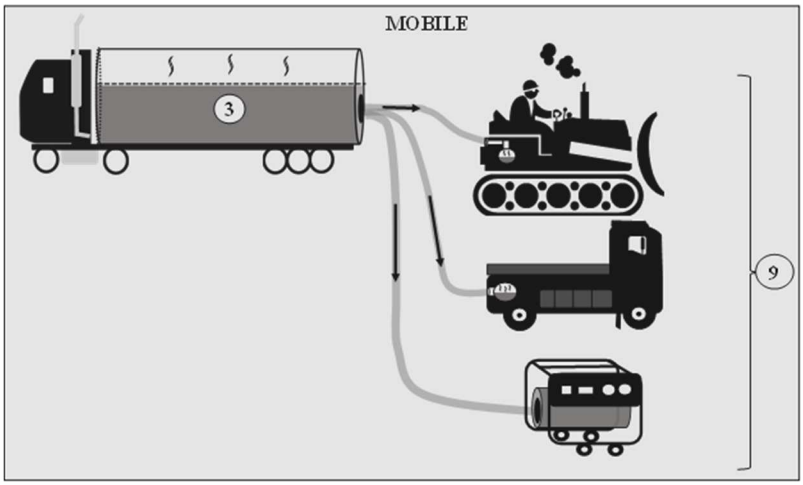


7 (POL Tank) → 8 (Stationary ICOM/ECOM) The figure illustrates the loading of fuel from a storage tank into a stationary Internal Combustion (ICOM) piece of equipment, such as a generator, or External Combustion (ECOM) equipment, such as a boiler. The **stationary** emissions from the fuel outlet (the storage tank) are the result of any significant fuel spills and breathing/working losses generated. The breathing/working losses are calculated using the calculations described in Chapter 7 of AP-42 while emissions from significant fuel spills are described in the Transitory Guide. The **stationary** emissions from the fuel loading inlet (the stationary ICOM or ECOM equipment) are generated from the displaced vapor in the fuel tanks. The methodology for calculating these emissions is provided in the Stationary Guide.



7 (POL Tank) → 9 (Non-Road & Ground Support Equipment and Mobile Generators) During this fuel transfer activity, fuel is moved from a storage tank to a mobile piece of equipment, such as non-road equipment, Ground Support Equipment (GSE), or a mobile generator. The **stationary** emissions from the storage tank are the result of any significant fuel spills and breathing/working losses generated. The methodology for calculating the breathing/working losses emissions is provided in Chapter 7 of AP-42 while fuel spill emissions are addressed in the Transitory Guide.

The **mobile** emissions from the fuel loading inlet (non-road and ground support equipment or mobile generator) are produced by the displaced vapor in the fuel tanks, and should be reported in the mobile AEI. Emissions are calculated as described later in this chapter.



3 (Refueling Trucks) → 9 (Non-Road & Ground Support Equipment and Mobile Generators) The figure illustrates the transfer of fuel from a **mobile** fuel loading outlet (refueling truck) into either non-road equipment, GSE, or a mobile generator, **all** of which are considered **mobile** sources. Emissions are calculated as described later in this chapter and should be reported in a mobile AEI.

6.2 Emission Factors

Section 5.2 of AP-42 describes both the emissions from the loading of fuel into fuel trucks and the evaporative emissions from the fueling of a gasoline vehicle. Since fueling gasoline vehicles is covered under the MOVES2014a model, the EFs for vehicle refueling are not provided here, but may be found in Table 5.2-7 of AP-42. For non-road engines and fuel trucks, the most appropriate method for calculating emissions from fuel dispensing is to calculate the loading loss. The loading loss is the primary source of evaporative emissions from the loading of fuel. These losses are the result of organic vapors within a fuel tank that are displaced to the atmosphere as the tank is loaded with fuel. To calculate these losses, which is described in the next section, the saturation factor, the vapor pressure of the fuel, the molecular weight of the vapors, and the temperature of the bulk liquid must be known.

The saturation factor refers to the ratio of the saturated value of the expelled vapor to the unsaturated value. These values vary based on the method of fuel loading. A tank that is filled with only one fuel, or fuels with similar characteristics, is said to be practicing "dedicated normal service." When loading vapors are returned back to the loading terminal after the fuel is unloaded to a storage tank, it is known as "dedicated vapor balance." Section 5.2 of AP-42 provides the saturation factors, which are given in Table 6-1.

Table 6-1. Fuel Loading Saturation Factors

Loading Method	Loading Parameters	S Factor
Submerged Loading	Clean Tank	0.50
	Dedicated Normal Service	0.60
	Dedicated Vapor Balance Service	1.00
Splash Loading	Clean Tank	1.45
	Dedicated Normal Service	1.45
	Dedicated Vapor Balance Service	1.00

SOURCE: U.S. EPA. "Transportation and Marketing of Petroleum Liquids." *Compilation of Air Pollutant Emission Factors - Volume I: Stationary Point and Area Sources*. Fifth Edition. 1995. Section 5.2.

The vapor emissions resulting from fuel transfer is a function of the vapor pressure of the fuel. The vapor pressure is indicative of the evaporation rate of a liquid. The vapor pressures for each fuel and their respective vapor molecular weights are provided in Table 6-2.

Table 6-2. Vapor Pressures for Various Fuels

Petroleum Liquid	Vapor Molecular Weight (lb/lb-Mol)	True Vapor Pressure (psia)						
		40°F	50°F	60°F	70°F	80°F	90°F	100°F
Crude Oil RVP 5[1]	50	1.80	2.30	2.80	3.40	4.00	4.80	5.70
Gas RVP 6	69	1.90	2.37	2.93	3.60	4.38	5.29	6.35
Gas RVP 7	68	2.30	2.90	3.50	4.30	5.20	6.20	7.40
Gas RVP 7.8	68	2.59	3.21	3.94	4.79	5.79	6.96	8.30
Gas RVP 8	68	2.67	3.30	4.04	4.92	5.94	7.13	8.50
Gas RVP 8.3	68	2.79	3.44	4.22	5.13	6.19	7.42	8.83
Gas RVP 9	67	3.06	3.77	4.61	5.59	6.74	8.06	9.58
Gas RVP 10	66	3.40	4.20	5.20	6.20	7.40	8.80	10.50
Gas RVP 11	65	3.87	4.75	5.77	6.96	8.34	9.92	11.74
Gas RVP 11.5	65	4.09	5.00	6.07	7.31	8.75	10.41	12.29
Gas RVP 12	64	4.29	5.24	6.36	7.65	9.15	10.86	12.82
Gas RVP 13	62	4.70	5.70	6.90	8.30	9.90	11.70	13.80
Gas RVP 13.5	62	4.93	6.01	7.26	8.71	10.38	12.29	14.46
Gas RVP 15	60	5.58	6.77	8.16	9.77	11.61	13.71	16.09
Diesel	130	3.10E-03	4.50E-03	6.50E-03	9.00E-03	1.20E-02	1.60E-02	2.20E-02
JP-8/Jet A[2]	130	1.58E-02	2.19E-02	3.01E-02	4.08E-02	5.48E-02	7.27E-02	9.54E-02

SOURCE (unless otherwise stated): Data taken from TANKS version 4.0.9d.

1. SOURCE: U.S. EPA. "Organic Liquid Storage Tanks." *Compilation of Air Pollutant Emission Factors - Volume I: Stationary Point and Area Sources*. Fifth Edition. 1997. Section 7.1.
2. SOURCE: USAF, Environmental Analysis Division. *JP-8 Volatility Study, IERA-RS-BR-SR-2001-0002*. San Antonio, 2001. Vapor pressures calculated using the composite data calculation, an average flash point temperature of 118.238°F, and atmospheric pressure of 760mm Hg. Flash point temperature the average provided by Defense Energy Support Center. "Petroleum Quality Information System." Defense Logistics Agency, 1996.

6.3 Control and Capture Efficiencies

Emissions from fuel dispensing may be controlled using a variety of techniques. Estimating emissions in which a control device is utilized is more challenging since the capture efficiency must also be taken into account. Additionally, since portions of fuel transfer are regarded as either stationary or mobile sources, using the control and capture efficiencies appropriately may be confusing. For example, in Step 1-2 in Figure 6-3 fuel is loaded from a loading terminal storage tank and into a fuel truck. The displaced vapor may be captured with a blower system and run through a vapor recovery unit before being returned to the storage tank. In this case, the capture efficiency of the truck and the control efficiency of the vapor recovery unit are used to determine the emissions from this process. The control efficiency is taken from the stationary unit, although the emissions are classified as mobile since the emissions are the result of displaced vapor in a

mobile fuel truck. Typical capture and control efficiencies are found in Table 6-3 and Table 6-4 respectively.

Table 6-3. Typical Fuel Truck Capture Efficiencies

Fuel Truck Capture System	Capture Efficiency (%)
Untested	70.0
EPA standards (NSPS Subpart XX) leak test	98.7
MACT-level annual leak test	99.2
Trucks with installed blower system	100.0(1)

SOURCE (Unless otherwise stated): U.S. EPA. "Transportation and Marketing of Petroleum Liquids." *Compilation of Air Pollutant Emission Factors - Volume I: Stationary Point and Area Sources*. Fifth Edition. 1995. Section 5.2.

1. SOURCE: TCEQ. "Tank Truck Loading of Crude Oil or Condensate." 2013. 14 December 2013. <http://www.tceq.texas.gov/assets/public/permitting/air/NewSourceReview/oilgas/tank-truck-load.pdf>.

Table 6-4. Typical Fuel Transfer Control Efficiencies

Control Techniques		Control Efficiency (%)
Flares[1]	Compounds ≤ 3 Carbon atoms	99.0
	Other Organic Compounds	98.0
Thermal Oxidizers[2]		99.0
Carbon Systems[3]		98.0
Vapor Recovery Units		100.0

SOURCE: TCEQ. "Tank Truck Loading of Crude Oil or Condensate." 2013. 14 December 2013. <http://www.tceq.texas.gov/assets/public/permitting/air/NewSourceReview/oilgas/tank-truck-load.pdf>.

1. Flares must meet 40 CFR 60.18 requirements of minimum heating value of waste gas and a maximum flare tip velocity.
2. Must be designed for the variability of the waste gas stream and basic monitoring which consists of a temperature monitor that indicates the device is achieving a satisfactory minimum temperature.
3. Must have an alarm system that will prevent break through.

Alternatively, emission factors for the loading of fuel trucks have been developed for several fuels likely to be distributed on base. These EFs are based on an assumed temperature of 60°F and may be used as an alternative to calculating the loading loss. Table 5.2-5 of AP-42 provides these emission factors, which have been reproduced here in Table 6-5.

Table 6-5. VOC Emission Factors for Fuel Dispensing/Loading

Loading Method	Loading Parameters	Emission Factors (lb/10^3 gal)		
		Gasoline[1]	Diesel/No. 2 Fuel Oil	JP-8/Jet A
Submerged Loading	Dedicated Normal Service	5	0.014	0.016
	Vapor Balance Service	8	---	---
Splash Loading	Dedicated Normal Service	12	0.03	0.04
	Vapor Balance Service	8	---	---

SOURCE: U.S. EPA. "Transportation and Marketing of Petroleum Liquids." *Compilation of Air Pollutant Emission Factors - Volume I: Stationary Point and Area Sources*. Fifth Edition. 1995. Section 5.2.

1. Gasoline has an RVP of 10 psia

"---" Indicates No data available

6.4 Emission Calculations

Emissions of concern from fuel dispensing operations are VOCs and HAPs. The volume of VOCs and HAPs emitted are directly related to the amount of VOC and HAP constituents within the fuel. Calculations of emissions of VOCs and HAPs from fuel dispensing are outlined below.

6.4.1 VOC Emissions Calculations (Preferred Method)

The preferred method for calculating VOC emissions from the dispensing of fuel is to use the fuel vapor pressure, saturation factor, temperature, and total throughput to estimate the loading loss. VOCs are calculated as follows:

$$\mathbf{E}(VOC) = \mathbf{Q} \times \frac{\mathbf{1}}{\mathbf{1000}} \times \mathbf{12.46} \times \frac{\boldsymbol{S} \times \boldsymbol{P} \times \boldsymbol{M}}{\boldsymbol{T}} \times \left\{\mathbf{1} - \left[\left(\frac{\boldsymbol{Cap}}{\mathbf{100}}\right) \times \left(\frac{\boldsymbol{CE}}{\mathbf{100}}\right)\right]\right\}$$

Equation 6-1

Where,

E(VOC) = Annual emissions of VOCs (lb/yr)
Q = Annual quantity of fuel transferred (gal/yr)
1000 = Factor converting gallons to 10^3 gallons (gal/10^3 gal)
12.46 = Equation constant (°R lb-mol/psia 10^3 gal)
S = Saturation factor. This is provided in Table 6-1
P = True vapor pressure of fuel (psia). This is provided in Table 6-2
M = Vapor molecular weight of the fuel (lb/lb-mol). This is provided in Table 6-2
T = Temperature of bulk liquid loaded (°R)
Cap = Capture efficiency of the loading terminal (%). This is provided in Table 6-3
CE = Efficiency of the control device (%). This is provided in Table 6-4
100 = Factor for converting a percent to a fraction (%)

A detailed control volume outlining the emissions from fuel transfer operations is provided in Figure 6-4.

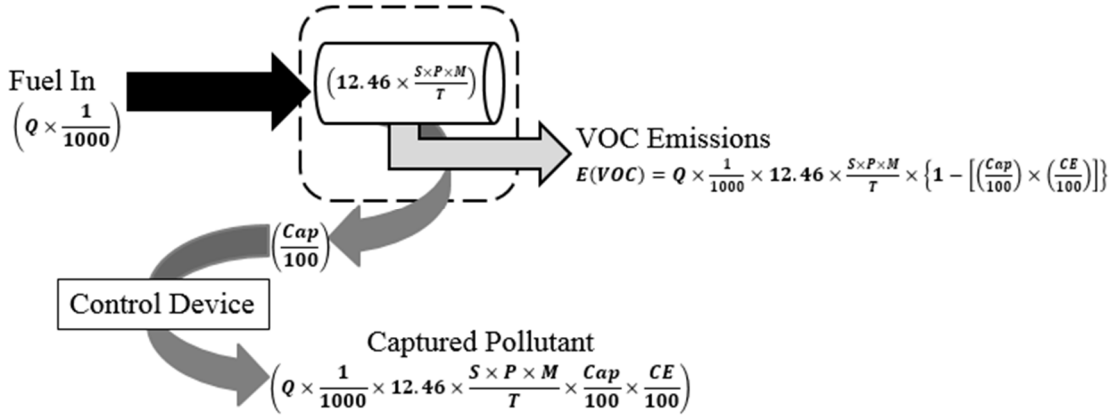


Figure 6-4. Fuel Transfer Control Volume – Preferred Method

6.4.2 VOC Emissions Calculations (Emission Factor Method)

Using the emission factor method, the appropriate EF selected from Table 6-5, and the total quantity of fuel transferred, the emissions are calculated as follows:

$$\mathbf{E}(\boldsymbol{VOC}) = \mathbf{Q} \times \frac{\mathbf{1}}{\mathbf{1000}} \times \mathbf{EF}(\boldsymbol{VOC}) \times \left\{\mathbf{1} - \left[\left(\frac{\boldsymbol{Cap}}{\mathbf{100}}\right) \times \left(\frac{\boldsymbol{CE}}{\mathbf{100}}\right)\right]\right\}$$

Equation 6-2

Where,

EF(VOC) = VOC emission factor as provided in Table 6-5 (lb/10^3 gal)

A detailed control volume is provided in Figure 6-5.

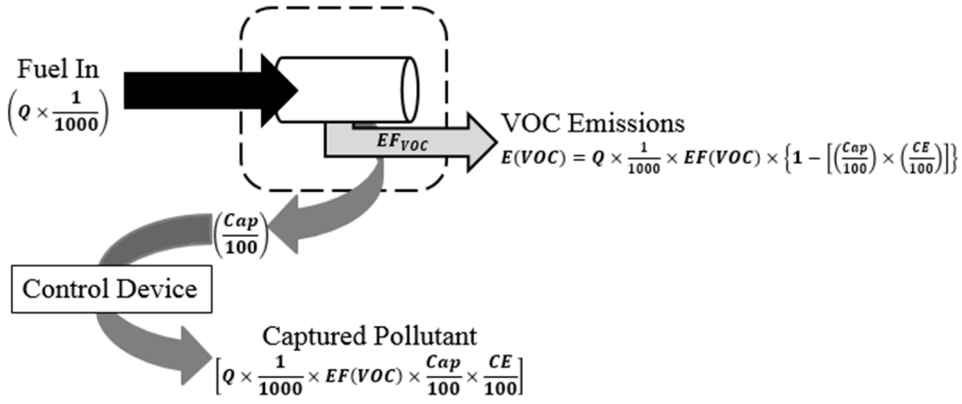


Figure 6-5. Fuel Transfer Control Volume – Emission Factor Method

6.4.3 HAP Emissions Calculation

The amount of HAPs released into the environment from fuel transfer operations may be estimated using the total VOCs emitted, as calculated above, and the weight percent of HAPs in the fuel itself (APIMS and ACAM automatically calculate these values). Contact the fuel supplier for specific information regarding the weight percent of HAPs in fuels commonly used at Air Force installations. In the absence of available data, Table 6-6 provides the typical weight percent of individual HAPs found in several fuels used at Air Force installations. Using the total VOCs and weight percent HAP in the fuel, the total HAP emissions from fuel transfer operations is calculated using Equation 6-3.

$$\mathbf{E}(\boldsymbol{HAP}) = \mathbf{E}(\boldsymbol{VOC}) \times \frac{\mathbf{WP}(\boldsymbol{HAP})}{\mathbf{100}}$$

Equation 6-3

Where,

E(HAP) = HAP emissions from fuel dispensing (lb/yr)
WP(HAP) = Weight Percent HAP in the fuel (%)

Table 6-6 Weight Percent of HAPs in Fuels commonly used at Air Force Installations

Compound	Typical Wt. %					
	In Diesel		In Gasoline		In JP-8/Jet A[1]	
	Liquid-Phase	Vapor-Phase[2]	Liquid-Phase	Vapor-Phase[2]	Liquid-Phase	Vapor-Phase[2]
Anthracene	2.83E-03[3]	---	---	---	---	---
Benzene	8.00E-04	1.96E-01	1.80E+00	6.18E-01	3.38E-02	1.58E+00
1,3-Butadiene	---	---	2.00E-04[3]	1.62E-03	---	---
Cumene (Isopropyl benzene)	---	---	5.00E-01	7.79E-03	1.81E-01	3.83E-01
Dibenzofuran	1.64E-02[3]	---	---	---	---	---
Ethylbenzene	1.30E-02	3.10E-01	1.40E+00	4.67E-02	1.59E-01	7.20E-01
Fluorene	2.94E-02[3]	---	---	---	3.44E-03	---
Hexane	1.00E-04	3.98E-02	1.00E+00	5.57E-01	---	---
Isooctane (2,2,4-Trimethyl Pentane)	---	---	4.00E+00	7.11E-01	1.23E-03	2.97E-02
Naphthalene	3.39E-01[3]	2.15E-01	1.74E-01[3]	1.54E-04	2.68E-01	3.23E-02
Phenanthrene	3.22E-02[3]	---	---	---	---	---
Phenylbenzene (1,1'-biphenyl)	---	---	---	---	6.78E-02	---
Pyrene	3.62E-02[3]	---	---	---	1.00E-05	---
Toluene	3.20E-02	2.30E+00	7.00E+00	7.05E-01	2.19E-01	3.00E+00
Xylenes (mixed isomers)	2.90E-01	7.19E+00	7.00E+00	2.43E-01	1.19E+00	5.61E-02

SOURCE (Unless otherwise stated): Data taken from USEPA 2005, TANKS, Version 4.09d, U.S. Environmental Protection Agency, October 2005.

1. SOURCE: "JP-8 Composition and Variability," Armstrong Laboratory, Environics Directorate, Environmental Research Division, May 1996. An average density of 6.67lb/gal was used for unit conversion.

2. The vapor phase speciation data was estimated using the liquid phase speciation data and equations found in Section 7.1.4 of AP-42, Fifth Edition, Volume I last updated November 2006. Physical properties for fuels used for calculations can be found below, in Table 6-7.

3. SOURCE: SPECIATE, Version 4.4, U.S. Environmental Protection Agency, February 2014.

"---" Indicates No Data Available

Table 6-7. Fuel Properties

Fuel	Liquid Molecular Weight	Vapor Molecular Weight	Vapor Pressure (psia)[2]
JP-8/Jet A	162	130	4.08E-02[(3)]
Diesel	188	130	9.00E-03
Gasoline[1]	92	66	6.20E+00

SOURCE (Unless otherwise stated): Data taken from USEPA 2005, TANKS, Version 4.09d, U.S. Environmental Protection Agency, October 2005.
1. Based on gasoline with a Reid Vapor Pressure of 10.
2. Based on Temperature of 70° F
3. SOURCE: "JP-8 Volatility Study," Southwest Research Institute (SWRI), March 2001. Vapor pressures calculated using the composite data calculation, an average flash point temperature of 118.238°F, and atmospheric pressure of 760mmHg. Flash point temperature average provided by "Petroleum Quality Information System Fuels Data (2005)," Defense Logistics Agency (DLA), Defense Energy Support Center, Technology and Standardization Division, 2006.

6.5 Information Resources

Information regarding the annual fuel throughput may be collected from the fuel service station supervisor. The supervisor may also be able to provide specific information regarding the fuel vapor pressure and HAP constituent data. If this information is unavailable, contact the fuel supplier to gather this data for more precise emissions calculations.

6.6 Example Problems

6.6.1 Problem 1 – Preferred Method

A total of 150,000 gal of gasoline and 85,000 gal of diesel were dispensed from a POL tank into non-road equipment during the previous year. Based on the location of the installation, the gasoline used had an average RVP of 10 and the average fuel temperature at the installation is 60°F. Calculate the total VOCs and xylene emissions.

Step 1 – Convert the temperature to the correct units. The temperature was given in terms of °F; however, in order to calculate the emission factors needed, the temperature must be converted to the correct units as follows:

$$T(°R) = T(°\text{F}) + 460.67$$

$$\boldsymbol{T(°R) = 60 + 460.67 = 520.67°R}$$

Step 2 – Record the vapor pressures and vapor molecular weights. These values are needed for emission factor calculations and are given in Table 6-2. For RVP 10 gasoline, the molecular

weight and vapor pressure at 60°F are given as **66 lb/lb-mol** and **5.20 psia,** respectively. Similarly, for diesel, the vapor molecular weight and vapor pressure at 60°F are given as **130 lb/lb-mol** and **6.50E-03 psia** respectively.

Step 3 – Select and record the saturation factor. The saturation factor is a function of the load method employed. Knowing that this fuel was loaded into non-road equipment from a POL tank, it may be assumed that the fuel was splash loaded without vapor balance. This gives a saturation factor of **1.45**.

Step 4 – Calculate emissions. Using the data from the previous steps and Equation 6-1, the total VOCs are calculated as follows:

$$\mathrm{E}(VOC) = \mathrm{Q} \times \frac{1}{1000} \times 12.46 \times \frac{S \times P \times M}{T} \times \left\{1 - \left[\left(\frac{Cap}{100}\right) \times \left(\frac{CE}{100}\right)\right]\right\}$$

For Gasoline:

$$\mathrm{E}(VOC) = 150{,}000 \frac{\cancel{gal}}{yr} \times \frac{1}{1000}\left(\frac{10^3 \mathrm{gal}}{\cancel{gal}}\right) \times 12.46 \left(\frac{^\circ R\ lb-mol}{psia\ 10^3 gal}\right) \times \frac{1.45 \times 5.20(psia) \times 66\left(\frac{lb}{lb-mol}\right)}{520.67^\circ R}\left\{1 - \left[\left(\frac{0\%}{100\%}\right) \times \left(\frac{0\%}{100\%}\right)\right]\right\}$$

$$\mathrm{E}(VOC) = 150\left(\frac{\cancel{10^3}\mathrm{gal}}{yr}\right) \times 12.46 \left(\frac{^\circ R\ lb-mol}{psia\ \cancel{10^3 gal}}\right) \times \frac{1.45 \times 5.20(psia) \times 66\left(\frac{lb}{lb-mol}\right)}{520.67^\circ R}\{1\}$$

$$\mathbf{E(VOC)} = 1869\left(\frac{^\circ\cancel{R\ lb-mol}}{\cancel{psia}\ \mathrm{yr}}\right) \times 0.956\left(\frac{\cancel{psia}\ lb}{^\circ\cancel{R\ lb-mol}}\right) = \mathbf{1{,}786.8}\ \frac{\boldsymbol{lb}}{\boldsymbol{yr}}$$

For Diesel:

$$\mathrm{E}(VOC) = 85{,}000 \frac{\cancel{gal}}{yr} \times \frac{1}{1000}\left(\frac{10^3 \mathrm{gal}}{\cancel{gal}}\right) \times 12.46 \left(\frac{^\circ R\ lb-mol}{psia\ 10^3 gal}\right) \times \frac{1.45 \times 0.0065(psia) \times 130\left(\frac{lb}{lb-mol}\right)}{520.67^\circ R}\left\{1 - \left[\left(\frac{0\%}{100\%}\right) \times \left(\frac{0\%}{100\%}\right)\right]\right\}$$

$$\mathrm{E}(VOC) = 85\left(\frac{\cancel{10^3}\mathrm{gal}}{yr}\right) \times 12.46 \left(\frac{^\circ R\ lb-mol}{psia\ \cancel{10^3 gal}}\right) \times \frac{1.45 \times 0.0065(psia) \times 130\left(\frac{lb}{lb-mol}\right)}{520.67^\circ R}\{1\}$$

$$\mathbf{E(VOC)} = 1059.1\left(\frac{^\circ\cancel{R\ lb-mol}}{\cancel{psia}\ \mathrm{yr}}\right) \times 0.002\left(\frac{\cancel{psia}\ lb}{^\circ\cancel{R\ lb-mol}}\right) = \mathbf{2.12}\ \frac{\boldsymbol{lb}}{\boldsymbol{yr}}$$

Step 5 – Record xylene weight percent. Table 6-6 states that the vapor weight percent xylene in gasoline and diesel fuel is **0.243% and 7.19%,** respectively.

Step 6 – Calculate xylene emissions. Using the VOC emissions for gasoline and diesel fuel calculated in Step 4 and the vapor weight percent xylene in each fuel as recorded in Step 5, the total xylene emissions are calculated using Equation 6-3 as shown:

$$\mathrm{E}(HAP) = \mathrm{E}(VOC) \times \frac{\mathrm{WP}(HAP)}{100}$$

For Gasoline:

$$\mathrm{E}(Xylene) = 1786.8\,\frac{lb}{yr} \times \frac{.243\%}{100\%}$$

$$\mathbf{E}(\boldsymbol{Xylene}) = 1786.8\,\frac{lb}{yr} \times 0.00243 = \mathbf{4.34}\,\frac{\boldsymbol{lb}}{\boldsymbol{yr}}$$

For Diesel:

$$\mathrm{E}(Xylene) = 2.12\,\frac{lb}{yr} \times \frac{7.19\%}{100\%}$$

$$\mathbf{E}(\boldsymbol{Xylene}) = 2.12\,\frac{lb}{yr} \times 0.0719 = \mathbf{0.15}\,\frac{\boldsymbol{lb}}{\boldsymbol{yr}}$$

Step 7 – Calculate total VOC emissions. The total VOC emissions from fuel dispensing are the sum of evaporative emissions from each fuel calculated in Step 4:

$$\mathrm{E}(VOC) = \sum_{i=1}^{n} [E(VOC_i) + \cdots + E(VOC_n)]$$

$$\mathrm{E}(VOC) = \left(1786.8\,\frac{lb}{yr} + 2.12\,\frac{lb}{yr}\right)$$

$$\boxed{\mathbf{E}(\boldsymbol{VOC}) = \mathbf{1,788.9}\,\frac{\boldsymbol{lb}}{\boldsymbol{yr}}}$$

Step 8 – Calculate total xylene emissions. The total xylene emissions from fuel dispensing are the sum of evaporative emissions from each fuel calculated in Step 6:

$$\mathrm{E}(HAP) = \sum_{i=1}^{n} [E(HAP_i) + \cdots + E(HAP_n)]$$

$$\mathrm{E}(Xylene) = \left(4.34\,\frac{lb}{yr} + 0.15\,\frac{lb}{yr}\right)$$

$$\boxed{\mathbf{E}(\boldsymbol{Xylene}) = \mathbf{4.49}\,\frac{\boldsymbol{lb}}{\boldsymbol{yr}}}$$

6.6.2 Problem 2 – Emission Factor Method

Using the same throughput for gasoline and diesel as given in Problem 1, re-calculate the VOC emissions using the EF method.

Step 1 – Select and record appropriate EF. Again, since the fuel was loaded into non-road equipment, the loading method is assumed to be splash loading without vapor balance. The emission factors for gasoline and diesel are **12** and **0.03 lb/10^3 gal,** respectively.

Step 2 – Calculate VOC emissions. Using Equation 6-2 and the EFs as recorded in Step 1, the total VOCs emitted are calculated as follows:

$$\mathrm{E}(VOC) = \mathrm{Q} \times \frac{1}{1000} \times \mathrm{EF}(VOC) \times \left\{1 - \left[\left(\frac{Cap}{100}\right) \times \left(\frac{CE}{100}\right)\right]\right\}$$

For Gasoline:

$$\mathrm{E}(VOC) = 150{,}000 \frac{\cancel{gal}}{yr} \times \frac{1}{1000}\left(\frac{10^3 gal}{\cancel{gal}}\right) \times 12 \frac{lb}{10^3 gal} \times \left\{1 - \left[\left(\frac{0\%}{100\%}\right) \times \left(\frac{0\%}{100\%}\right)\right]\right\}$$

$$\mathbf{E(VOC)} = 150 \frac{\cancel{10^3 gal}}{yr} \times 12 \frac{lb}{\cancel{10^3 gal}} \times \{1\} = \mathbf{1{,}800} \frac{\boldsymbol{lb}}{\boldsymbol{yr}}$$

For Diesel:

$$\mathrm{E}(VOC) = 85{,}000 \frac{\cancel{gal}}{yr} \times \frac{1}{1000}\left(\frac{10^3 gal}{\cancel{gal}}\right) \times 0.03 \frac{lb}{10^3 gal} \times \left\{1 - \left[\left(\frac{0\%}{100\%}\right) \times \left(\frac{0\%}{100\%}\right)\right]\right\}$$

$$\mathbf{E(VOC)} = 85 \frac{\cancel{10^3 gal}}{yr} \times 0.03 \frac{lb}{\cancel{10^3 gal}} \times \{1\} = \mathbf{2.55} \frac{\boldsymbol{lb}}{\boldsymbol{yr}}$$

Step 3 – Sum the VOC emissions. Adding the calculated emissions from Step 2, the total VOCs, as determined by the emission factor method is calculated as follows:

$$\mathrm{E}(VOC) = \sum_{i=1}^{n} [E(VOC_i) + \cdots + E(VOC_n)]$$

$$\mathrm{E}(VOC) = \left(1800 \frac{lb}{yr} + 2.55 \frac{lb}{yr}\right)$$

$$\boxed{\mathbf{E(VOC)} = \mathbf{1{,}802.55} \frac{\boldsymbol{lb}}{\boldsymbol{yr}}}$$

6.7 References

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