AIR EMISSIONS GUIDE FOR AIR FORCE MOBILE SOURCES

METHODS FOR ESTIMATING EMISSIONS OF AIR POLLUTANTS FOR MOBILE SOURCES AT UNITED STATES AIR FORCE INSTALLATIONS

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Based on information and belief formed after reasonable inquiry, the statements and information in the document are true, accurate, and complete.

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Table of Contents

List of Tables

List of Figures

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
O_3	Ozone
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)

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 always know if they comply 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).** 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 guide is to provide authoritative documentation for National Environmental Policy Act (NEPA) and General Conformity analyses, *not* for conducting AEIs comprised solely of mobile emissions sources (Mobile AEIs). Mobile source AEIs are primarily conducted to provide data during the development of State Implementation Plan (SIP) budgets. However, since the SIP only accounts for criteria and precursor pollutants, it is unnecessary to calculate emissions for other pollutants though emission factors (EFs) may be provided in this guide. It is still imperative that the USAF adopts a uniform approach to calculating air pollutant emissions for the most common mobile sources found at USAF installations. This guide serves this purpose by being the USAF's single authoritative resource for mobile source emission estimating algorithms and 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 Engineer Center/Environmental Quality Technical Support Branch (AFCEC/CZTQ) that is reviewed on a case-by-case basis.

Any questions concerning this guide, or requests for additional information pertaining to Air Force AEIs, 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 guide only addresses mobile emission sources typically found on USAF 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 rather than a mobile 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 Air Force Instruction (AFI) 32-7040: "The CEIE must prepare and periodically update an AEI, using APIMS, of all installation stationary sources (stationary source AEI) and Air Force owned or operated mobile sources (mobile source AEI) IAW the current Air Force air emissions inventory guidance and applicable state or local requirements promulgated per 40 CFR Part 51 Subpart A, *Air Emissions Reporting Requirements*."

"Comprehensive AEIs (i.e., includes both permitted and non-permitted sources) are performed at the frequency as required by federal, state and local regulations. Overseas installations conduct AEIs IAW Foreign Governing Standards and/or Host Nation agreements. At a minimum, the CEIE, will annually review/validate APIMS as current (i.e., sources and consumption data is representative of the current base conditions) and update (i.e., a comprehensive review of all sources and their consumption data) at least every three years (five years for overseas and remotely located facilities) to accurately reflect current emissions."

"Stationary source AEIs include all criteria pollutants, HAPs, and GHGs and reflect the installation's current actual and PTE emissions. Annual regulatory emissions reports, a subset of the comprehensive AEI, are provided to federal, state and local (including Metropolitan Planning Organization or other regional) regulatory agencies as required. Mandatory pollutant emissions reporting is provided to AFCEC/CZ as part of the annual data call. GHG reporting mandated by E.O. 13693, is accomplished at the HAF level."

"Affected installations that exceed the GHG reporting threshold shall accomplish GHG reporting mandated by Title 40 CFR Part 98, Mandatory Reporting of Greenhouse Gases. Other installations within 10% of the GHG reporting threshold shall accomplish GHG estimates IAW Title 40 CFR Part 98 and only report the results to AFCEC/CZ via APIMS. Installation AEI data stored in APIMS are available for use as needed by AFCEC and higher headquarters." (4 November 2014, Certified Current 14 October 2016).

This guide describes the recommended methodologies for calculating 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 under Title II of the CAA which sets the standards for motor vehicle and aircraft emissions. Under Title II, the standards are set 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/documented 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 comply with the established air pollution standards.

1.3.2 Implementation Plans

As specified under Section 110 of the Clean Air Act, all States are required to submit a SIP to the EPA which provides for the protection and enhancement of air quality to promote public health and welfare. The 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 most 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.

1.3.3 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.

1.3.4 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 an evaluation to determine if a proposed action that was not categorically excluded would significantly affect the environment. If affects are not significant, 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 can decide on the proposed action.

1.3.5 Other Inventory Uses

Complying with environmental regulations is not the only reason AEIs are conducted. An AEI 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 AEI 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 AEIs 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 and 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 monitoring systems (CEMS) are usually preferred for estimating a source's emissions. The CEMS 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, EFs 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 emitted with an activity. 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 EF is:

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

Equation 1-1

Where,

- $\boldsymbol{E}$ = Total 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 considered 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 guide focuses on criteria pollutants, Hazardous Air Pollutants (HAPs), Volatile /Organic Compounds (VOCs), and Greenhouse Gases (GHGs).

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 particulate matter (PM), ozone (O_3), carbon monoxide (CO), sulfur dioxide (SO_2), nitrogen dioxide (NO_2), and lead (Pb). The NAAQS were established to regulate the emissions of the criteria pollutants using human health-based and/or environmentally-based criteria for setting permissible levels. The criteria pollutants are described in more detail below:

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:
    - **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 several 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 as well as an indicator for the presence of larger groups of nitrogen oxides.
- NO_2 forms 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 to several 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" HAPs. 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)

The emissions of GHGs has garnered more attention as their potential impact on global climate change has been explored in greater detail in recent years. Consequently, the world population's contribution to GHG emissions has been under increased scrutiny. 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 through other chemical reactions (e.g., cement manufacturing). CO_2 is 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).

GHGs are assigned a Global Warming Potential (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 GHGs and is shown in Table 1-1. The GWP values used to calculate GHG emissions throughout this document are subject to change due to new data becoming available but are considered current as of May 2018. The total GHG emissions are calculated by summing all emissions from each gas and are generally derived from the following equation:

$$\boldsymbol{EF_{CO_2e}} = \sum_{\boldsymbol{i=1}}^{\boldsymbol{n}} [(\boldsymbol{EF} \times \boldsymbol{GWP})_{\boldsymbol{i}} + \cdots + (\boldsymbol{EF} \times \boldsymbol{GWP})_{\boldsymbol{n}}]$$

Equation 1-2

Where,

$\mathbf{EF_{CO2e}}$ = Greenhouse gas emission factor in equivalent CO_2
$\mathbf{EF_i}$ = Emission Factor for greenhouse gas species i
$\mathbf{GWP_i}$ = 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
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 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 Sources*.

1.7 References

40 CFR 63, "Title 40-Protection of the Environment, Chapter I-Environmental Protection Agency, Subchapter C-Air Programs, Part 63-Standards for Hazardous Air Pollutants," U.S. Environmental Protection Agency

40 CFR 98, "Title 40-Protection of the Environment, Chapter I-Environmental Protection Agency, Subchapter C-Air Programs, Part 98-Mandatory Greenhouse Gas Reporting," U.S. Environmental Protection Agency

40 CFR 85, "Title 40-Protection of the Environment, Chapter I-Environmental Protection Agency, Subchapter C-Air Programs, Part 85-Control of Air Pollution from Mobile Sources," U.S. Environmental Protection Agency

40 CFR 86, "Title 40-Protection of the Environment, Chapter I-Environmental Protection Agency, Subchapter C-Air Programs, Part 86-Control of Emissions from New and In-Use Highway Vehicles and Engines," U.S. Environmental Protection Agency,

40 CFR 87, "Title 40-Protection of the Environment, Chapter I-Environmental Protection Agency, Subchapter C-Air Programs, Part 87-Control of Air Pollution fron Aircraft and Aircraft Engines," U.S. Environmental Protection Agency,

40 CFR 79, "Title 40-Protection of the Environment, Chapter I-Environmental Protection Agency, Subchapter C-Air Programs, Part 79-Registration of Fuel and Fuel additives," U.S. Environmental Protection Agency

40 CFR 80, "Title 40-Protection of the Environment, Chapter I-Environmental Protection Agency, Subchapter C-Air Programs, Part 80-Regulation of Fuel and Fuel Additives," U.S. Environmental Protection Agency

AFI 2016, “Air Force Instruction 32-7040,” Air Quality and Compliance Research Management, Current 14 October 2016

CAA 1990, “List of Hazardous Air Pollutants,” Clean Air Act Section 112 (b), 1990

CAA 2005, “Transformation and Conformity Regulations,” Clean Air Act Section 176 (c), August 2005

E.O. 2009, “Federal Leadership in Environmental, Energy, and Economic Performance,” Executive Order 13514, October 2009

FR 2004, "List of Hazardous Air Pollutants, Petition Process, Lesser Quantity Designations, Source Category List; Petition To Delist of Ethylene Glycol Monobutyl Ether: Final Rule," 69 FR 69320, November 2004

FR 1996, "Deletion of Caprolactam From the List of Hazardous Air Pollutants: Final Rule," 61 FR 30816, June 1996

FR 2005, "List of Hazardous Air Pollutants, Petition Process, Lesser Quantity Designations, Source Category List-methyl ethyl ketone: Final Rule," 70 FR 75047, December 2005

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, GHGs, and HAPs to the atmosphere.

Aircraft engine 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 USAF 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 the aircraft which is considered a mobile source. 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 stationary 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 (generally bound by the perimeter of the base) 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 EFs are derived from fuel flow rates, and the period of time (or time-in-mode, TIM) that each engine operates at a power setting during an LTO. Additionally, EFs are derived from the 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 for fixed-wing aircraft 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 time from engine startup to takeoff.
- **Takeoff:** Characterized by full engine thrust, the time it takes the aircraft to reach between 500 and 1,000 feet above ground level. This transition height is typical and does not vary much from location to location or among aircraft categories.
- **Climb Out:** The time following takeoff that concludes when an aircraft exits the mixing zone and continues to cruise altitude.
- **Approach:** The time from the moment the aircraft enters the mixing zone until the aircraft lands.
- **Taxi/Idle In:** The time spent after landing until the aircraft is parked and the engines are turned off.

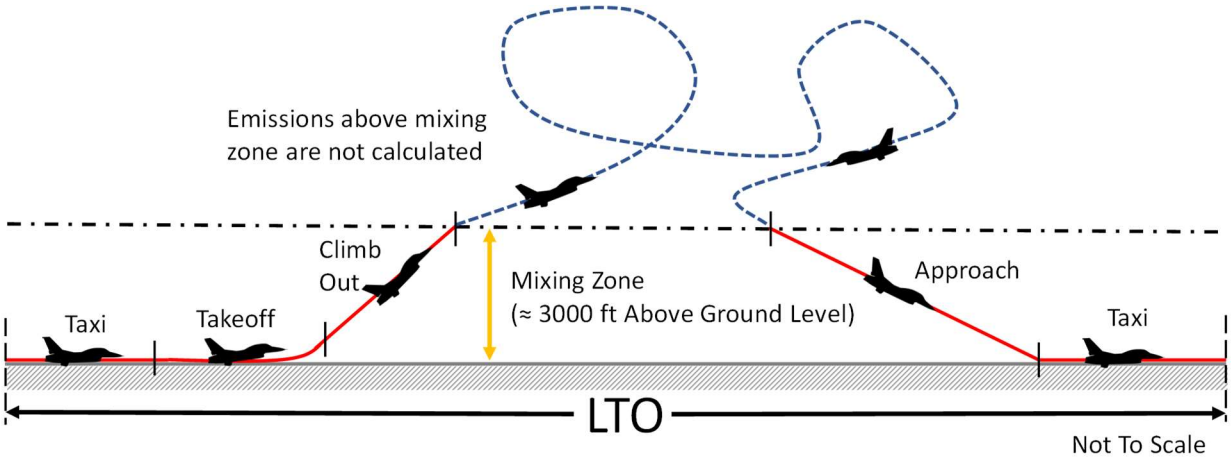


Figure 2-1. LTO Cycle

Note that helicopters are typically operated at settings that, while similar, reflect operational differences between fixed-wing aircraft and rotorcraft. 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.

2.2 Mixing Zone Height and Time in Mode (TIM)

2.2.1 Mobile Air Emissions Inventories

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". 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 EPA's default TIMs for various aircraft categories are provided in Table 2-4. These EPA default TIMs are based on a default mixing height of 3,000 feet above ground level as prescribed by the EPA within the General Conformity Rule (40 CFR 93 Subpart B). The Federal Aviation Administration (FAA) has adopted the EPA default TIM values in its recommended procedures (FAA 2000). Generally, these default TIM values should always be used for mobile air emissions inventories.

2.2.2 Air Impact Assessments

For air impact assessments under NEPA and General Conformity, a locally calculated mixing zone height may be used to demonstrate insignificant (de minimis) air quality impacts associated with a proposed action. In accordance with General Conformity, 40 CFR 93.153(c)(2)(xxii), a "Federal agency can use 3,000 feet above ground level as a default mixing height, unless the agency demonstrates that use of a different mixing height is appropriate because the change in emissions at and above that height caused by the Federal action is de minimis." Additionally, in accordance with the 40 CFR 93 Preamble, EPA "added regulatory language to sub-paragraph (xxii) to allow federal agencies to use a different mixing height if they can demonstrate that emissions at and above that height are de minimis." Therefore, a calculated local mixing height would only be used for air impact assessment (NEPA and General Conformity assessments) and only if it would result in a de minimis level of emissions. In other words, the default 3,000 feet mixing height will always be used initially and, if an action's emissions are not de minimis, the calculated local average mixing height may be used if (and only if) the adjustment in emission would result in the action being de minimis. Therefore, the local average mixing height should never be used in areas where the average calculated local average mixing height is greater than 3,000 feet.

The *USAF Air Quality Environmental Impact Analysis Processes (EIAP) Guide* should be consulted for more details on the specific use of local average mixing height. Additionally, to ensure proper use and to refine emissions estimates, contact the AFCEC Air Quality Subject Matter Expert to obtain approval and location-specific data for seasonal or annual average mixing heights.

2.3 Aircraft Flight Operations Data Quality

It is important to note that power settings, EFs, and fuel flow rates are derived from engine testing on the ground and intended for aircraft engine test cells (a stationary source that is regulated) and are indirectly applied to flight LTO cycle operations. The default TIMs were

reverse engineered using these ground-based parameters (i.e., power settings, EFs, and fuel flow rates) to provide rough (order of magnitude) emissions approximations for aircraft flight operations. Therefore, be aware of the relatively poor resulting data quality of any estimate of any aircraft flight operation.

2.4 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 most 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 a USAF installation. Additionally, 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 (FT) 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).

2.4.1 Synthetic Aviation Fuel

Currently, there are on-going Department of Defense (DoD) and USAF initiatives to reduce dependency on foreign petroleum sources. This includes development of battlefield fuels with essentially no sulfur and reduced aromatic content using 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). The 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 2-1. 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 Alternative Fuels Program, AFRL/WS/06-0078. 22nd Annual UC Symposium on Aviation Noise and Air Quality. March 2007.

2.5 Emission Factors

Air pollutant EFs for aircraft operations include emissions from the aircraft engines (either fixed wing or rotary) and any APUs used on the airframe. The EFs have been developed through testing from a variety of sources including the engine manufacturers themselves. While the EFs were developed for stationary jet engine testing and are most suited for this application, it is considered acceptable to use them for the estimating emissions from aircraft flight operations. Criteria pollutant EFs for each engine are provided in Table 2-8 while speciated VOC and HAP EFs are provided in Table 2-9. Criteria pollutants for APUs are provided in Table 2-10.

2.6 Emissions Calculation

Emissions calculation procedures for aircraft operations under various operational cycles 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 listed in Table 2-8, contact the Air Quality SME for assistance in selecting a representative surrogate engine.

2.6.1 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 EF 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 provided in the notes.

2.6.1.1 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 EFs, the mixing zone height, and the number of LTO cycles conducted during the year are also considered in the LTO emissions calculation. As TIM and fuel flow rate for each power setting vary 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.

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 an 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:

<u>Step 1</u> - 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 cycle:

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

Equation 2-2

Where,

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

$E(Pol)_{Mode\ i/n}$ = 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 for the aircraft model:

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

Equation 2-3

Where,

$E(Pol)_{LTO-Total}$ = Annual emissions of pollutant from all LTO cycles (lb/yr)

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

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 EFs are found in Table 2-8 and Table 2-9

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

Used primarily for NEPA/General Conformity air impact studies under EIAP assessments, Touch and Go (TGO) and Low Fly By (LFB) training operations may dictate the need to conduct aircraft operations that deviate from a standard LTO cycle. A TGO cycle is a common flight maneuver that involves practice landing on a runway by briefly touching the landing gear to the runway and transitioning immediately into climb out. An LFB is like a TGO; however, the landing gear never contacts the runway. TGO and LFB emissions are calculated in essentially the same manner as LTO emissions; however, only approach and climb out operating modes are factored in. For TGO emissions estimating, generally only the default TIMs for approach and climb out are used. For LFB emissions estimating, generally one half of the default TIMs for approach and climb out are used.

2.6.1.3 Low Flight Pattern (LFP) Emissions

Another training operation primarily used for NEPA/General Conformity air impact studies under EIAP is a Low Flight Pattern (LFP), which is any aircraft maneuver below the mixing zone height [EPA default 3,000 ft above ground level (AGL)] and not associated with an LTO, TGO and LFB. When calculating emissions in this manner, one must know both the number of LFPs per year and the average time of the LFP. For LFP emissions estimating, use only the intermediate power setting for the entire time of the LFP.

2.6.2 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. Criteria pollutant and ozone precursor EFs for APUs can be found in Table 2-10. 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 2-4

Where,

$E(Pol)_{APU}$ = Pollutant emissions 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 2-5

Where,

$E(Pol)_{APU\text{-}Total}$ = Total annual emissions of pollutant (lb/yr)
$E(Pol)_{APU}$ = Emissions of 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)

2.6.3 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 pollutant at each power setting, the values are summed to obtain the total annual emissions of 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 2-6

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 2-7

Where,

$E(Pol)_{Setting}$ = Pollutant emissions 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 EFs required to calculate emissions using Equation 2-7 may be found in Table 2-8 and Table 2-9. The challenge for estimating emissions from jet engine testing is in the selection of the appropriate emission factor. Ideally, the fuel flow rate and operating time for each test profile is recorded by a data logger. The appropriate EF may be selected based on the fuel flow rate. Since the fuel flow rate will vary from each test and operating mode, the EFs developed for each aircraft engine is suitable across a range of fuel flow rates. The range of fuel flow rates and appropriate EF is not provided in this Guide but are

provided in the "Aircraft Engine Testing" section of the *Air Emissions Guide for Air Force Stationary Sources* since off-wing engine testing is more common and a stationary source of emissions (and therefore subject to more regulation). Fuel flow ranges are determined by taking the midpoint of the fuel flow ranges between power settings at which the engine was tested. Refer to the tables in the *Air Emissions Guide for Air Force Stationary Sources* for assistance in selecting the appropriate EF.

2.6.4 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 content 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. For air impact assessments under NEPA and General Conformity, the use of a national average sulfur content is appropriate for estimating sulfur emissions from aircraft operations. For JP-8 fuel, the weighted national average was calculated using data obtained from the Defense Logistics Agency (DLA), Defense Energy Support Center, *Petroleum Quality Information System Fuels Data* (1997-2013). **Using this national weighted-average, a national EF was derived and should be used as the default value for all aircraft engines within the continental United States when estimating SO_X emissions.** For enhanced accuracy, regional averages have also been calculated. The default national average and regional averages are provided in Table 2-2.

The sulfur content in fuel varies significantly by the region in which the fuel is obtained. For an AEI, a SO_X EF specific for the JP-8 at the installation's geographic location should be derived. The sulfur content of the fuel may be provided by the fuel supplier. All the sulfur in the fuel is conservatively assumed to be converted to SO_2 during the combustion process and the SO_X EF is calculated according to the following equation:

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

Equation 2-8

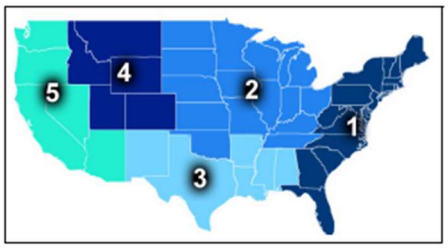
Where,

EF(SOx) = 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 2-2. 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		**0.054**	**1.07**
1. East Coast U.S.	ME, VT, NH, MA, RI, CT, NY, PA, NJ, DE, MD, VA, WV, NC, SC, GA, FL	0.110	2.19
2. East Central U.S.	ND, SD, MN, IA, NE, WI, MI, OH, KY, TN, IN, IL, MO, KS, OK	0.067	1.35
3. Gulf Coast U.S.	AL, MS, AR, LA, TX, NM	0.053	1.05
4. West Central U.S.	MT, ID, WY, UT, CO	0.028	0.56
5. West Coast U.S.	WA, OR, CA, NV, AZ	0.053	1.07
Middle East	Kuwait, Bahrain, Pakistan, United Arab Emirates	0.069	1.39
European	Europe, Israel, Turkey	0.118	2.37
Pacific	Korea, Japan, HI, AK, Australia, Russia, Singapore	0.096	1.91
Caribbean	Coastal Aruba	0.045	0.89

Source: *Petroleum Quality Information System Fuels Data*. Defense Logistics Agency, Defense Energy Support Center, 1997 – 2013. Values were calculated using the weight percent sulfur for years 1997 – 2013. Emission factors were calculated using Equation 2-8, though note that the values may not be exactly 20 times the weighted average due to rounding.

2.6.5 Calculating HAP Emissions

While this document provides HAP EFs for several engines and APUs in Table 2-9, there is limited information available regarding aircraft engine-specific or APU-specific HAP emissions. There may be instances where determination of a HAP is required for an engine or APU not listed in the table. In this situation, 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, an appropriate engine or APU should be selected as a surrogate.

2.6.6 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 because of the transition to unleaded aviation fuel.

2.6.7 Greenhouse Gas (GHG) Emissions

Since GHG emissions are becoming increasingly more important, it is common to record the carbon dioxide (CO_2), methane (CH_4), and nitrous oxide (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. For more guidance on the calculation of GHG emissions, refer to the *USAF Guide to the Mandatory Greenhouse Gas Reporting Rule*.

2.6.8 VOC Speciation

Though VOC emissions have been speciated for some engines, there is very little data available for most aircraft engines likely found at USAF 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 USAF 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. First, the average of all reported EFs for individual VOCs was calculated (Equation 2-9) for each engine at each mode. Next, a total VOC EF was estimated by summing the average EFs of each VOC (Equation 2-10). Finally, the weight percent of each VOC was calculated individually by taking the average EF of that pollutant and dividing by the total VOC (Equation 2-11).

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

Equation 2-9

Where,

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

n = Number of emission factors calculated at that mode

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

Equation 2-10

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 2-9.

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

Equation 2-11

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:

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

Equation 2-12

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.

2.6.9 International Civil Aviation Organization (ICAO) Emission Factors

The 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 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 USAF 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 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 (HC) 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 represent PM_{10}, with $PM_{2.5}$ 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, 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 Carbon Index. For those SNs less than or equal to 30, Equation 2-13 is used, while Equation 2-14 is used for those SNs greater than 30.

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

Equation 2-13

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

Equation 2-14

Where,

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

The volumetric flow rate (Q_{core} or Q_{Mixed}) is calculated according to the engine type reported on the ICAO data sheet, or in the database. For engines listed as turbofan (TF), Q_{Core} is calculated using Equation 2-15. For those listed as mixed turbofan (MTF), Q_{Mixed} may be calculated using Equation 2-16. 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 2-15

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

Equation 2-16

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 Carbon Index found in either Equation 2-13 or Equation 2-14 by the volumetric flow rate calculated from either Equation 2-15 or Equation 2-16, as shown in Equation 2-17.

$$EI(PM)_{nvol} = Carbon\ Index \times Q$$

Equation 2-17

Where,

$EI(PM)_{nvol}$ = Emission Index for non-volatile PM (mg/kg)
Carbon Index = Carbon Index calculated from either Equation 2-13 or Equation 2-14
Q = Volumetric flow rate; either Q_{Core} from Equation 2-15 or Q_{Mixed} from Equation 2-16

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, the national average weight percent as given in Table 2-2 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 2-18 is used 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 2-18

Where,

$EI(PM)_{vol\text{-}FSC}$ = Emission index for volatile sulfate PM (mg/kg)
FSC = Fuel sulfur content. **Use Table 2-2 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 EI is calculated by taking the product of the HC EI and 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 2-19.

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

Equation 2-19

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} is estimated by summing these values and converting into the correct units, as shown in Equation 2-20:

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

Equation 2-20

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 2-21.

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

Equation 2-21

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 USAF 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.

2.7 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. This includes 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.

2.8 Example Calculations

The following section provides example calculations for aircraft operations.

2.8.1 Problem 1 - Landing and Takeoff Cycle Emissions

A USAF installation needs to calculate the annual CO 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

The TIM data from Table 2-4 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	18.50	Idle	2,084	35.32
Takeoff	0.40*	Military	9,679	0.86
		Afterburner	41,682	11.87
Climb out	0.80	Intermediate	5,770	0.86
Approach	3.50	Approach	3,837	1.92
Taxi/Idle-in	11.30	Idle	2,084	35.32

*Since this engine has afterburner, it is assumed that the duration of the Takeoff mode is 50% Afterburner and 50% Military

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

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

$$\boldsymbol{E(CO)_{Approach}} = \frac{3.50\left(\frac{\cancel{min}}{cycle}\right)}{60\left(\frac{\cancel{min}}{\cancel{hr}}\right)} \times \frac{3837\left(\frac{\cancel{\text{lb fuel}}}{\cancel{hr}}\right)}{1000\left(\frac{\cancel{\text{lb fuel}}}{\cancel{10^3\ lb\text{-}fuel}}\right)} \times 1.92\left(\frac{lb}{\cancel{10^3\ lb\text{-}fuel}}\right) \times 2 = \mathbf{0.86}\ \frac{\boldsymbol{lb}}{\boldsymbol{cycle}}$$

$$\boldsymbol{E(CO)_{Idle-In}} = \frac{11.30\left(\frac{\cancel{min}}{cycle}\right)}{60\left(\frac{\cancel{min}}{\cancel{hr}}\right)} \times \frac{2084\left(\frac{\cancel{\text{lb fuel}}}{\cancel{hr}}\right)}{1000\left(\frac{\cancel{\text{lb fuel}}}{\cancel{10^3\ lb\text{-}fuel}}\right)} \times 35.32\left(\frac{lb}{\cancel{10^3\ lb\text{-}fuel}}\right) \times 2 = \mathbf{27.73}\ \frac{\boldsymbol{lb}}{\boldsymbol{cycle}}$$

$$\boldsymbol{E(CO)_{Idle-Out}} = \frac{18.50\left(\frac{\cancel{min}}{cycle}\right)}{60\left(\frac{\cancel{min}}{\cancel{hr}}\right)} \times \frac{2084\left(\frac{\cancel{\text{lb fuel}}}{\cancel{hr}}\right)}{1000\left(\frac{\cancel{\text{lb fuel}}}{\cancel{10^3\ lb\ fuel}}\right)} \times 35.32\ \left(\frac{lb}{\cancel{10^3\ lb\ fuel}}\right) \times 2 = \mathbf{45.39}\ \frac{\boldsymbol{lb}}{\boldsymbol{cycle}}$$

$$\boldsymbol{E(CO)_{Takeoff-Mil}} = \frac{0.20\left(\frac{\cancel{min}}{cycle}\right)}{60\left(\frac{\cancel{min}}{\cancel{hr}}\right)} \times \frac{9679\left(\frac{\cancel{\text{lb fuel}}}{\cancel{hr}}\right)}{1000\left(\frac{\cancel{\text{lb fuel}}}{\cancel{10^3\ lb\ fuel}}\right)} \times 0.86\ \left(\frac{lb}{\cancel{10^3\ lb\ fuel}}\right) \times 2 = \mathbf{0.06}\ \frac{\boldsymbol{lb}}{\boldsymbol{cycle}}$$

$$\boldsymbol{E(CO)_{Takeoff-AB}} = \frac{0.20\left(\frac{\cancel{min}}{cycle}\right)}{60\left(\frac{\cancel{min}}{\cancel{hr}}\right)} \times \frac{41682\left(\frac{\cancel{\text{lb fuel}}}{\cancel{hr}}\right)}{1000\left(\frac{\cancel{\text{lb fuel}}}{\cancel{10^3\ lb\ fuel}}\right)} \times 11.87\ \left(\frac{lb}{\cancel{10^3\ lb\ fuel}}\right) \times 2 = \mathbf{3.30}\ \frac{\boldsymbol{lb}}{\boldsymbol{cycle}}$$

$$\boldsymbol{E(CO)_{Climb\ out}} = \frac{0.80\left(\frac{\cancel{min}}{cycle}\right)}{60\left(\frac{\cancel{min}}{\cancel{hr}}\right)} \times \frac{5770\left(\frac{\cancel{\text{lb fuel}}}{\cancel{hr}}\right)}{1000\left(\frac{\cancel{\text{lb fuel}}}{\cancel{10^3\ lb\ fuel}}\right)} \times 0.86\ \left(\frac{lb}{\cancel{10^3\ lb\ fuel}}\right) \times 2 = \mathbf{0.13}\ \frac{\boldsymbol{lb}}{\boldsymbol{cycle}}$$

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:

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

$$\boldsymbol{E(CO)_{LTO}} = (0.86 + 27.73 + 45.39 + 0.06 + 3.30 + 0.13)\frac{lb}{cycle} = \mathbf{77.47}\frac{\boldsymbol{lb}}{\boldsymbol{cycle}}$$

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 LTOs conducted per year as demonstrated in Equation 2-3:

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

$$E(CO)_{Total} = 77.47\left(\frac{lb}{\cancel{cycle}}\right) \times 2500\left(\frac{\cancel{cycles}}{yr}\right)$$

$$\boxed{\boldsymbol{E(CO)_{Total} = 193,675.0\frac{lb}{yr}}}$$

2.8.2 Problem 2 - Auxiliary Power Unit Emissions

A USAF installation also needs to calculate the annual NO_X 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:

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

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

Step 3 - Calculate NO_X pollutant emissions for a single LTO cycle. Use Equation 2-4 and the EF recorded in Step 2 as follows:

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

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

Step 4 – Calculate the NO_X pollutant emissions from annual APU operations. Use Equation 2-5 and the NO_X emissions per LTO cycle calculated in Step 3 as follows:

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

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

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

2.8.3 Problem 3 - On-Wing Engine Testing

A USAF installation 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 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 2-6 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. Since EFs are appropriate across a range of fuel flow rates, the appropriate EF is selected based on where the average fuel flow rate falls for each power setting. In this example, since a power setting is provided, the EF may be selected from Table 2-8. In situations where only the fuel flow rate is available, refer to the tables in the "Aircraft Engine Testing" section of the *Air Emissions Guide for Air Force Stationary Sources* for assistance. For this example, the appropriate CO EFs, in units of lb/1,000 lb fuel, are **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 EFs from Step 2, and Equation 2-7:

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

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

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

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

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

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

<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, the SO_X EF from Table 2-2 is used in place of the SO_X EF 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 2-2 is **1.05 lb/10^3 lb$_{fuel}$**.

<u>Step 6</u> – Calculate the SO_X emissions for each mode. Use Equation 2-7, 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:

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

$$\boldsymbol{E(SO_X)_{Idle}} = \frac{1147.66\left(\frac{\cancel{lb\ fuel}}{\cancel{hr}}\right) \times 75\left(\frac{\cancel{hr}}{yr}\right)}{1000\left(\frac{\cancel{\text{lb fuel}}}{\cancel{10^3\ lb\ fuel}}\right)} \times 1.05\left(\frac{lb}{\cancel{10^3 lb\ fuel}}\right) = \mathbf{90.4}\ \frac{\boldsymbol{lb}}{\boldsymbol{yr}}$$

$$\boldsymbol{E(SO_X)_{Approach}} = \frac{4209.52\left(\frac{\cancel{lb\ fuel}}{\cancel{hr}}\right) \times 33.33\left(\frac{\cancel{hr}}{yr}\right)}{1000\left(\frac{\cancel{\text{lb fuel}}}{\cancel{10^3\ lb\ fuel}}\right)} \times 1.05\left(\frac{lb}{\cancel{10^3 lb\ fuel}}\right) = \mathbf{147.3}\ \frac{\boldsymbol{lb}}{\boldsymbol{yr}}$$

$$\boldsymbol{E(SO_X)_{Intermediate}} = \frac{6681.33\left(\frac{\cancel{lb\ fuel}}{\cancel{hr}}\right) \times 25\left(\frac{\cancel{hr}}{yr}\right)}{1000\left(\frac{\cancel{\text{lb fuel}}}{\cancel{10^3\ lb\ fuel}}\right)} \times 1.05\left(\frac{lb}{\cancel{10^3 lb\ fuel}}\right) = \mathbf{175.4}\ \frac{\boldsymbol{lb}}{\boldsymbol{yr}}$$

$$\boldsymbol{E(SO_X)_{Military}} = \frac{10070.45\left(\frac{\cancel{lb\ fuel}}{\cancel{hr}}\right) \times 25\left(\frac{\cancel{hr}}{yr}\right)}{1000\left(\frac{\text{lb fuel}}{\cancel{10^3\ lb\ fuel}}\right)} \times 1.05\left(\frac{lb}{\cancel{10^3 lb\ fuel}}\right) = \mathbf{264.3}\ \frac{\boldsymbol{lb}}{\boldsymbol{yr}}$$

$$\boldsymbol{E(SO_X)_{Afterburner}} = \frac{16532.47\left(\frac{\cancel{lb\ fuel}}{\cancel{hr}}\right) \times 8.33\left(\frac{\cancel{hr}}{yr}\right)}{1000\left(\frac{\text{lb fuel}}{\cancel{10^3\ lb\ fuel}}\right)} \times 1.05\left(\frac{lb}{\cancel{10^3 lb\ fuel}}\right) = \mathbf{144.6}\ \frac{\boldsymbol{lb}}{\boldsymbol{yr}}$$

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

$$E(SO_X)_{Total} = (90.4 + 147.3 + 175.4 + 264.3 + 144.6)\frac{lb}{yr}$$

$$\boxed{\boldsymbol{E(SO_X)_{Total} = 822.0\frac{lb}{yr}}}$$

Table 2-3. 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 [a]
	Climb out	Intermediate	70-85 [a]
	Approach	Approach	30
	Taxi/Idle in	Idle	7
Turboprop	Taxi/Idle out	Idle	7
	Takeoff	Military	90
	Climb out	Intermediate	70-85 [a]
	Approach	Approach	30
	Taxi/Idle in	Idle	7

SOURCE (unless otherwise noted): *Airport Air Quality Manual*, International Civil Aviation Organization, 2011.

a. 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. For military aircraft equipped with afterburner (AB), it should be generally assumed that the duration of Takeoff mode is 50% AB and 50% military.

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

Aircraft Type	Typical Duration by Mode (Minutes)					
	Taxi/Idle-out	Takeoff [a]	Climb out	Approach	Taxi/Idle-in	Total
Military Aircraft						
Combat:						
USAF	18.50	0.40	0.80	3.50	11.30	34.50
USAF F-35	18.50	0.48	0.35	2.60	11.30	33.23
USN	6.50	0.40	0.50	1.60	6.50	15.50
Trainer - Turbine [b]:						
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 [b]:						
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 [c]	4.53 [c]	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

a. For military aircraft equipped with afterburner (AB), it should be generally assumed that the duration of Takeoff mode is 50% AB and 50% military.

b. Turbines include both turbofan and turboprop engines.

c. 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

Aircraft Model(s)	Time-In-Mode Category [a]	Engine Model(s) (Number of Engines)	APU Model(s) (Number of APUs)	APU Hours of Operation Per LTO [b]	Notes:
A-3A	Combat: USN	J57-P-6B (2)	---	---	c, h(1)
A-3B	Combat: USN	J57-P-10 (2)	---	---	h(1)
A-4	Combat: USN	J52-P-2 (2)	---	---	c, h(4)
		J52-P-8 (1)	---	---	c, h(4)
		J65-W-2 (1)	---	---	c, h(4)
		J65-W-4 (1)	---	---	c, h(4)
A-4C	Combat: USN	J65-W-16A (1)	---	---	c, h(1)
		J65-W-20 (1)	---	---	h(3)
A-4E	Combat: USN	J52-P-6A (1)	---	---	c, h(1)
		J52-P-8A, -8B (1)	---	---	c, h(1)
A-4F	Combat: USN	J52-P-8A , -8B (1)	---	---	c, h(1)
A-4L	Combat: USN	J65-W-20 (1)	---	---	h(1)
A-4M	Combat: USN	J52-P-408 (1)	---	---	h(1)
A-6A	Combat: USN	J52-P-6A, -6B (2)	---	---	c, h(1), h(3)
		J52-P-8A, -8B (2)	---	---	c, h(1)
A-6B	Combat: USN	J52-P-6A (2)	---	---	c, h(1)
		J52-P-8A (2)	---	---	c, h(1)
A-6C	Combat: USN	J52-P-8A (2)	---	---	c, h(1)
A-6E	Combat: USN	J52-P-8A, -8B (2)	---	---	c, h(1)
A-6F	Combat: USN	F404-GE-400D (2)	---	---	c, h(1)
A-7A	Combat: USN	TF30-P-6B (1)	---	---	h(3)
A-7B, -7C	Combat: USN	TF30-P-8 (1)	---	---	c, h(1)
		TF30-P-408 (1)	---	---	c, h(1)
A-7D, -7K	Combat: USAF	TF41-A-1 (1)	---	---	h(1), h(5)
A-7E	Combat: USN	TF41-A-2 (1)	---	---	h(1)
A-10	Combat: USAF	TF34-GE-100A (2)	---	---	h(2)
		TF34-GE-400 (2)	---	---	h(3)
A-10A	Combat: USAF	TF34-GE-100 (2)	GTCP 36-50 (1)	1.00	b, c, h(1)
A-10C	Combat: USAF	TF34-GE-100 (2)	---	---	h(6)
A-37	Combat: USAF	J69-T-25 (2)	---	---	h(3)
AC-130A	Transport - Turbine: USAF general	T56-A-1A (4)	---	---	h(1)
		T56-A-9 (4)	---	---	h(1)
AC-130H	Transport - Turbine: USAF general	T56-A-15 (4)	GTCP 85-180L (1)	1.00	c, e, h(1), i(1)
AC-130J	Transport - Turbine: USAF general	AE2100D3 (4)	---	---	c, h(6)
AC-130U, -130W	Transport - Turbine: USAF general	T56-A-15 (4)	---	---	h(1), h(6)
AT-6B	Trainer - Turbine: USAF General	PT6A-68D (1)	---	---	h(17)
AT-38B	Trainer - Turbine: USAF T-38	J85-GE-5, -5A, -5G, -5J (2)	---	---	c, h(1)
AU-24	Combat: USAF	PT6A-27 (1)	---	---	h(3)
B-1A	Combat: USAF	F101-GE-100 (4)	---	---	h(5)
B-1B	Combat: USAF	F101-GE-102 (4)	GTCP 165-9 (1)	2.00	b, c, h(1)
B-2A	Combat: USAF	F118-GE-100 (4)	131-3A (2)	4.00	b, c, h(1)
B-52D	Transport - Turbine: USAF B-52	J57-P-19W (8)	---	---	h(5)
		J57-P/F-43WB (8)	---	---	h(5)
B-52G	Transport - Turbine: USAF B-52	J57-P-22 (8)	---	---	h(3)

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

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

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

Aircraft Model(s)	Time-In-Mode Category [a]	Engine Model(s) (Number of Engines)	APU Model(s) (Number of APUs)	APU Hours of Operation Per LTO [b]	Notes:
C-28A	General Aviation: Piston	GTSIO-520-M (2)	---	---	h(1)
C-32A	Transport - Turbine: USAF general	F117-PW-100 (2)	331-49-7081 (1)	3.00	b, h(1), k
		PW2040 (2)	331-49-7081 (1)	3.00	b, h(1)
C-37A	General Aviation: Business Jet	BR700-710A1-10 (2)	---	---	h(6)
C-38	General Aviation: Business Jet	TFE731-40R (2)	---	---	c, h(12)
C-40A	Transport - Turbine: USN	CFM56-7B24 (2)	---	---	d, h(1)
C-40B	Transport - Turbine: USAF general	CFM56-7B27 (2)	131-9 (1)	0.50	b, c, h(1)
		CFM56-7B3 (2)	131-9 (1)	0.50	b, c, h(1)
C-40C	Transport - Turbine: USAF general	CFM56-7B3 (2)	---	---	c, d, h(1)
		CFM56-7B27 (2)	---	---	d, h(1)
C-123K	Transport - Turbine: USAF general	J85-GE-17 (2)	---	---	c, h(1)
		R-2800-99W (2)	---	---	h(1)
C-130A, -130D	Transport - Turbine: USAF general	T56-A-9, -9A, -9B (4)	GTCP 85L (1)	1.00	b, c, h(1)
C-130B	Transport - Turbine: USAF general	T56-A-7, -7A (4)	GTCP71/71A (1)	1.00	b, c, h(1)
C-130E	Transport - Turbine: USAF general	T56-A-7, -7A (4)	GTCP71/71A (1)	1.00	b, c, h(1)
C-130F	Transport - Turbine: USN	T56-A-7, -7A (4)	GTCP71/71A (1)	1.00	b, c, h(1)
C-130H	Transport - Turbine: USAF general	T56-A-15 (4)	GTCP 85-180L (1)	1.00	c, e, h(1), i(1)
C-130J	Transport - Turbine: USAF general	T56-A-15 (4)	GTCP 85L (1)	1.00	b, h(1)
		AE2100D3 (4)	---	---	c, h(6)
C-130T	Transport - Turbine: USN	T56-A-16 (4)	---	---	h(1)
C-135A	Transport - Turbine: USAF general	J57-P/F-59W (4)	T41M-9A (1)	1.00 to 2.00	b, c, h(5)
			ASHG70-1 (1)	1.00 to 2.00	b, c, h(5)
C-135B, -135C	Transport - Turbine: USAF general	J57-P/F-59W (4)	T41M-9A (1)	1.00 to 2.00	b, c, h(5)
			ASHG70-1 (1)	1.00 to 2.00	b, c, h(5)
		TF33-P-5 (4)	T41M-9A (1)	1.00 to 2.00	b, c, h(1)
			ASHG70-1 (1)	1.00 to 2.00	b, c, h(1)
C-135E	Transport - Turbine: USAF general	TF33-P-102 (4)	T41M-9A (1)	1.00 to 2.00	b, c, h(1)
			ASHG70-1 (1)	1.00 to 2.00	b, c, h(1)
C-137B, -137C	Transport - Turbine: USAF general	JT3D-3B (4)	---	---	h(1)
C-140A	General Aviation: Business Jet	J60-P-5A, -5B (4)	---	---	h(5)
C-140B	General Aviation: Business Jet	J60-P-5 (4)	---	---	c, h(6)
C-141	Transport - Turbine: USAF general	TF33-P-3 (4)	GTCP 165-1 (1)	3.00	h(3), i(2)
		TF33-P-5 (4)	GTCP 165-1 (1)	3.00	h(3), i(2)
C-141A, -141B, -141C	Transport - Turbine: USAF general	TF33-P-7 (4)	GTCP85-106/106A (1)	3.00	b, c, h(1), h(3)
C-145A	Trainer - Turbine: USAF General	PT6A-65B (2)	---	---	c, h(6)
C-146A	Transport - Turbine: USAF general	PW119C (2)	---	---	c, h(6)
CT-1B	General Aviation: Business Jet	JT15D-5 (2)	---	---	d, h(1)
CT-39A	General Aviation: Business Jet	J60-P-3, -3A (2)	---	---	c, h(1)
CT-39E, -39G	General Aviation: Business Jet	JT12A-8 (2)	---	---	c, h(1)
CT-43A	Transport - Turbine: USAF general	JT8D-9A (2)	---	---	h(1)
CT-49A	Transport - Turbine: USAF general	JT3D-7 (4)	---	---	d, h(1)
CV-22, -22A	Transport - Turbine: USAF general	AE1107C (2)	---	---	f, h(1)
		T406-AD-400 (2)	---	---	f, h(1), l(2)

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

Aircraft Model(s)	Time-In-Mode Category [a]	Engine Model(s) (Number of Engines)	APU Model(s) (Number of APUs)	APU Hours of Operation Per LTO [b]	Notes:
DC-130A	Transport - Turbine: USAF general	T56-A-9, -9A (4)	---	---	c, h(1)
E-1B	General Aviation: Piston	R-1820-82A (2)	---	---	c, h(1)
E-2	Transport - Turbine: USN	T56-A-7 (2)	---	---	h(3)
E-2B	Transport - Turbine: USN	T56-A-8, -8A, -8B (2)	---	---	c, h(1)
E-2C	Transport - Turbine: USN	T56-A-422 (2)	---	---	c, h(1)
		T56-A-427 (2)	---	---	c, h(13)
E-2D	Transport - Turbine: USN	T56-A-427 (2)	---	---	c, h(13)
E-3A	Transport - Turbine: USAF general	TF33-P-3 (4)	---	---	d, h(3)
		TF33-P-5 (4)	---	---	d, h(3)
		TF33-P-7 (4)	---	---	d, h(3)
		TF33-P-100A (4)	---	---	c, d, h(1)
E-3B, -3C	Transport - Turbine: USAF general	TF33-P-100A (4)	GTCP 165-1 (1)	2.00	c, h(1), i(1)
E-4A	Transport - Turbine: USAF general	F103-GE-100 (4)	---	---	h(5)
E-4B	Transport - Turbine: USAF general	CF6-50E2 (4)	GTCP 660-4 (1)	2.00	h(6), i(1)
E-6B	Transport - Turbine: USN	CFM56-2A-2 (4)	---	---	c, h(7)
E-8C	Transport - Turbine: USAF general	JT3D-3B (4)	GTCP 85 (1)	2.00	e, h(1), k
		TF33-PW-102C (4)	GTCP 85 (1)	2.00	c, e, h(1)
E-9A	Transport - Turbine: USAF general	PW120A (2)	---	---	c, h(6)
EA-3B	Combat: USN	J57-P-10 (2)	---	---	h(1)
EA-4F	Combat: USN	J52-P-6A, -6B (1)	---	---	c, h(1)
		J52-P-8A (1)	---	---	c, h(1)
EA-6A	Combat: USN	J52-P-8A, -8B (2)	---	---	c, h(1)
EA-6B	Combat: USN	J52-P-8A, -8B (2)	---	---	c, h(1)
		J52-P-408 (2)	---	---	h(1)
EA-7L	Combat: USN	TF41-A-2 (1)	---	---	h(1)
		TF30-P-408 (1)	---	---	c, h(1)
EB-57B	Combat: USAF	J65-W-5, -5B (2)	---	---	c, h(1)
EC-18B, -18D	Transport - Turbine: USAF general	JT3D-7 (4)	---	---	h(1)
EC-24A	Transport - Turbine: USN	JT3D-3B (4)	---	---	h(1)
EC-37B	Transport - Turbine: USAF general	BR700-710C4-11 (2)	---	---	h(18)
EC-130E	Transport - Turbine: USAF general	T56-A-7, -7A (4)	---	---	c, h(1)
		T56-A-15 (4)	---	---	h(6)
EC-130H	Transport - Turbine: USAF general	T56-A-15 (4)	GTCP 85-180L (1)	1.00	h(1), i(1)
EC-130J, -130SJ	Transport - Turbine: USAF general	AE2100D3 (4)	---	---	c, h(6)
EC-130V	Transport - Turbine: USN	T56-A-15 (4)	---	---	d, h(1)
EC-135A, -135G, -135L	Transport - Turbine: USAF general	J57-P/F-59W (4)	---	---	h(1), h(5)
EC-135B	Transport - Turbine: USAF general	TF33-P-5 (4)	---	---	h(1)
EC-135C, -135J	Transport - Turbine: USAF general	TF33-P-9 (4)	---	---	h(1)
EC-135E	Transport - Turbine: USAF general	TF33-P-102 (4)	---	---	h(1)
EC-135H, -135K, -135P	Transport - Turbine: USAF general	J57-P/F-59W (4)	---	---	h(1), k
		TF33-P-102 (4)	---	---	h(5)
EC-135N	Transport - Turbine: USAF general	J57-P/F-43WB (4)	---	---	h(1)
EC-135Y	Transport - Turbine: USAF general	J57-P/F-43WB (4)	---	---	h(1)
		J57-P/F-59W (4)	---	---	h(1)

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

Aircraft Model(s)	Time-In-Mode Category [a]	Engine Model(s) (Number of Engines)	APU Model(s) (Number of APUs)	APU Hours of Operation Per LTO [b]	Notes:
EC-137D	Transport - Turbine: USAF general	JT3D-3B (4)	---	---	h(1)
EF-4J	Combat: USN	J79-GE-8B (2)	---	---	c, h(1)
EF-111A	Combat: USAF	TF30-P-109 (2)	---	---	h(1)
EKA-3B	Combat: USN	J57-P-10 (2)	---	---	h(1)
EP-3B, -3J	Transport - Turbine: USN	T56-A-14 (4)	---	---	h(1)
ERA-3B	Combat: USN	J57-P-10 (2)	---	---	h(1)
ES-2D	General Aviation: Piston	R-1820-82A (2)	---	---	c, h(1)
F-4	Combat: USN	J79-GE-10 (2)	---	---	c, h(3)
F-4B, -4N	Combat: USN	J79-GE-8B, -8C (2)	---	---	c, h(1)
F-4C, -4D	Combat: USAF	J79-GE-15 (2)	---	---	h(1)
F-4E, -4G	Combat: USAF	J79-GE-17 (2)	---	---	h(1)
F-4J	Combat: USN	J79-GE-8B (2)	---	---	c, h(1)
F-4S	Combat: USN	J79-GE-10B (2)	---	---	c, h(1)
F-5A, -5B	Combat: USAF	J85-GE-13 (2)	---	---	d, h(3)
F-5E, -5F	Combat: USAF	J85-GE-21 (2)	---	---	d, h(1)
F-8	Combat: USN	J57-P-22 (1)	---	---	c, h(3)
F-8J	Combat: USN	J57-P-420 (1)	---	---	h(1)
F-14A	Combat: USN	TF30-P-412 (2)	---	---	c, h(1)
		TF30-P-414A (2)	---	---	c, h(7)
F-14C	Combat: USN	TF30-P-412 (2)	---	---	c, h(1)
F-14B, -14D	Combat: USN	F110-GE-400 (2)	---	---	h(1)
F-15A, -15B	Combat: USAF	F100-PW-100 (2)	---	---	h(1)
F-15C, -15D	Combat: USAF	F100-PW-100 (2)	---	---	h(1)
		F100-PW-220 (2)	---	---	h(1)
		F100-PW-229 (2)	---	---	h(6)
F-15E	Combat: USAF	F100-PW-220 (2)	---	---	h(1)
		F100-PW-229 (2)	---	---	h(1)
F-16	Combat: USAF	F100-PW-100 (1)	T-62T-40-8 (1)	1.00	b, c, h(3)
F-16A, -16B	Combat: USAF	F100-PW-200 (1)	T-62T-40-8 (1)	1.00	b, c, h(1)
		F100-PW-220 (1)	T-62T-40-8 (1)	1.00	b, c, h(7)
F-16C, -16D	Combat: USAF	F100-PW-200 (1)	T-62T-40-8 (1)	1.00	b, c, h(1)
		F100-PW-220 (1)	T-62T-40-8 (1)	1.00	b, c, h(6)
		F100-PW-229 (1)	T-62T-40-8 (1)	1.00	b, c, h(1)
		F110-GE-100 (1)	T-62T-40-8 (1)	1.00	b, c, h(1)
		F110-GE-129 (1)	T-62T-40-8 (1)	1.00	b, c, h(1)
F-16N	Combat: USN	F110-GE-100 (1)	---	---	h(1)
F-22A, -22B	Combat: USAF	F119-PW-100 (2)	---	---	h(1)
F-35A	Combat: USAF	F135-PW-100 (1)	---	---	c, h(1)
F-35B	Combat: USN	F135-PW-600 (1)	---	---	c, d, h(14)
F-35C	Combat: USN	F135-PW-100 (1)	---	---	c, h(7)
F-100	Combat: USAF	J57-P-22 (1)	---	---	c, h(3)
F-106A, -106B	Combat: USAF	J75-P-17 (1)	---	---	h(1)
F-111, -111F	Combat: USAF	TF30-P-100 (2)	---	---	h(1), h(3)

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

Aircraft Model(s)	Time-In-Mode Category [a]	Engine Model(s) (Number of Engines)	APU Model(s) (Number of APUs)	APU Hours of Operation Per LTO [b]	Notes:
F-111A	Combat: USAF	TF30-P-3 (2)	---	---	h(1)
F-111D, -111E	Combat: USAF	TF30-P-3 (2)	---	---	h(1)
		TF30-P-9 (2)	---	---	h(5)
F-117A	Combat: USAF	F404-GE-F1D2 (2)	3800100-4 (1)	2.00	b, c, h(8)
F/A-18A, -18B	Combat: USN	F404-GE-400 (2)	---	---	h(1), h(7)
F/A-18C, -18D	Combat: USN	F404-GE-400 (2)	---	---	h(1)
		F404-GE-402 (2)	---	---	c, h(7)
F/A-18E, -18F	Combat: USN	F404-GE-400 (2)	---	---	h(7)
		F414-GE-400 (2)	---	---	c, h(7)
FA-22A	Combat: USAF	F119-PW-100 (2)	---	---	h(1)
FB-22A	Combat: USAF	F119-PW-100 (2)	---	---	h(1)
FB-111A	Combat: USAF	TF30-P-7 (2)	---	---	h(1)
HC-130H	Transport - Turbine: USAF general	T56-A-15 (4)	GTCP 85-180L (1)	1.00	e, h(1), i(1)
HC-130J	Transport - Turbine: USAF general	AE2100D3 (4)	---	---	c, h(6)
HC-130P/N	Transport - Turbine: USAF general	T56-A-15 (4)	---	---	h(6)
HV-22A, -22B	Transport - Turbine: USN	AE1107C (2)	---	---	f, h(1), k
		T406-AD-400 (2)	---	---	f, h(1), l(2)
JA-6A	Combat: USN	J52-P-6A, -6B (2)	---	---	c, h(1)
		J52-P-8A, -8B (2)	---	---	c, h(1)
KA-3B	Combat: USN	J57-P-10 (2)	---	---	h(1)
KA-6D	Combat: USN	J52-P-6A (2)	---	---	c, h(1)
		J52-P-8A (2)	---	---	c, h(1)
KC-10, -10A	Transport - Turbine: USAF general	CF6-50C2 (3)	TSCP 700-4B (1)	6.00	h(1), i(1)
		F103-GE-100 (3)	TSCP 700-4B (1)	6.00	h(5), i(1)
		F103-GE-101 (3)	TSCP 700-4B (1)	6.00	h(15), i(1)
KC-46A	Transport - Turbine: USAF general	PW4062 (2)	GTCP 331-200 (1)	0.87	e, h(10), j
			GTCP 331-200ER (1)	0.87	e, h(10), j
KC-130F, -130R, -130T	Transport - Turbine: USN	T56-A-16 (4)	---	---	h(1)
KC-135	Transport - Turbine: USAF KC-135	J57-P-22 (4)	---	---	h(3)
KC-135A	Transport - Turbine: USAF KC-135	J57-P/F-43WB (4)	---	---	h(1)
		J57-P/F-59W (4)	---	---	h(1)
KC-135D, -135Q	Transport - Turbine: USAF KC-135	J57-P/F-59W (4)	---	---	h(1), h(5)
KC-135E	Transport - Turbine: USAF KC-135	TF33-P-102 (4)	GTCP 85-180L (1)	1.00	c, e, h(1), i(1)
KC-135R, -135T	Transport - Turbine: USAF KC-135	CFM56-2B-1 (4)	---	---	h(1), k
		F108-CF-100 (4)	---	---	h(1), l(2)
KC-767A	Transport - Turbine: USAF general	CF6-80C2B6F (2)	---	---	h(16)
		CF6-80C2B7F (2)	---	---	h(16)
		PW4062 (2)	---	---	h(16)
LC-130F, -130R	Transport - Turbine: USN	T56-A-16 (4)	---	---	h(1)
LC-130H	Transport - Turbine: USAF general	T56-A-15 (4)	---	---	h(1)
MC-12W	General Aviation: Turboprop	PT6A-60 (2)	---	---	c, h(6)
MC-130E	Transport - Turbine: USAF general	T56-A-7 (4)	---	---	h(1)
		T56-A-15, -15A (4)	---	---	c, h(1), h(6)

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

Aircraft Model(s)	Time-In-Mode Category [a]	Engine Model(s) (Number of Engines)	APU Model(s) (Number of APUs)	APU Hours of Operation Per LTO [b]	Notes:
MC-130H	Transport - Turbine: USAF general	T56-A-15 (4)	GTCP 85-180L (1)	1.00	e, h(1), i(1)
MC-130J	Transport - Turbine: USAF general	AE2100D3 (4)	---	---	c, h(6)
MC-130P, -130W	Transport - Turbine: USAF general	T56-A-15 (4)	---	---	h(1), h(6)
MQ-1B	Military - Piston	Rotax 914F (1)	---	---	h(6)
MQ-1C	Military - Piston	TAE-125 (1)	---	---	h(16)
MQ-9	Combat: USAF	TPE331-10GD (1)	---	---	c, h(6)
MV-22A, -22B	Transport - Turbine: USN	AE1107C (2)	---	---	f, h(1), k
		T406-AD-400 (2)	---	---	f, h(1), l(2)
NA-3B	Combat: USN	J57-P-10 (2)	---	---	h(1)
NA-4E	Combat: USN	J52-P-6A (1)	---	---	c, h(1)
		J52-P-8A, -8B (1)	---	---	c, h(1)
NA-4F	Combat: USN	J52-P-8A (1)	---	---	c, h(1)
NA-4M	Combat: USN	J52-P-408 (1)	---	---	h(1)
NA-6A	Combat: USN	J52-P-6A, -6B (2)	---	---	c, h(1)
		J52-P-8A, -8B (2)	---	---	c, h(1)
NA-6E	Combat: USN	J52-P-8B (2)	---	---	h(1)
NA-7A	Combat: USN	TF30-P-6 (1)	---	---	c, h(1)
NA-7C	Combat: USN	TF30-P-8 (1)	---	---	c, h(1)
NA-7E	Combat: USN	TF41-A-2 (1)	---	---	h(1)
NB-52B	Transport - Turbine: USAF B-52	J57-P-19W (8)	---	---	h(1)
NC-12B	General Aviation: Turboprop	PT6A-41 (2)	---	---	h(1)
NC-21A	General Aviation: Business Jet	TFE731-2-2B (2)	---	---	h(1)
NC-130A	Transport - Turbine: USAF general	T56-A-9, -9A, -9B (4)	---	---	c, h(1)
NC-130B, -130E	Transport - Turbine: USAF general	T56-A-7, -7A (4)	---	---	c, h(1)
NC-130H	Transport - Turbine: USAF general	T56-A-15 (4)	GTCP 85-180L (1)	1.00	c, e, h(1), i(1)
NC-135A	Transport - Turbine: USAF general	J57-P/F-43WB (4)	---	---	h(5)
NC-135W	Transport - Turbine: USAF general	TF33-P-5 (4)	---	---	h(1)
NC-141A	Transport - Turbine: USAF general	TF33-P-7 (4)	GTCP 85-106/106A (1)	3.00	b, c, h(1)
NF-4D	Combat: USAF	J79-GE-15 (2)	---	---	h(1)
		J79-GE-17 (2)	---	---	h(1)
NF-16A	Combat: USAF	F100-PW-200 (1)	---	---	h(1)
NF-16D	Combat: USAF	F100-PW-200 (1)	---	---	h(1)
		F100-PW-229 (1)	---	---	h(1)
		F110-GE-100 (1)	---	---	h(1)
		F110-GE-129 (1)	---	---	h(1)
NF-106B	Combat: USAF	J75-P-17 (1)	---	---	h(5)
NF/A-18A, -18B, -18C	Combat: USN	F404-GE-400 (2)	---	---	h(1)
NKC-135A	Transport - Turbine: USAF KC-135	J57-P/F-43WB (4)	---	---	h(1)
		J57-P/F-59W (4)	---	---	h(1)
NKC-135E	Transport - Turbine: USAF KC-135	TF33-P-102 (4)	GTCP 85-180L (1)	2.00	c, h(1), i(1)
NP-3C, -3D	Transport - Turbine: USN	T56-A-14 (4)	---	---	h(1)
NRA-3B	Combat: USN	J57-P-10 (2)	---	---	h(1)
NT-33A	Trainer - Turbine: USAF General	J33-A-35 (1)	---	---	h(1)

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

Aircraft Model(s)	Time-In-Mode Category [a]	Engine Model(s) (Number of Engines)	APU Model(s) (Number of APUs)	APU Hours of Operation Per LTO [b]	Notes:
NT-39A	General Aviation: Business Jet	J60-P-3, -3A (2)	---	---	c, h(1)
NTA-4F, -4J	Combat: USN	J52-P-6A (1)	---	---	c, h(1)
NUP-3A	Transport - Turbine: USN	T56-A-14 (4)	---	---	h(1)
O-1	General Aviation: Piston	O-470C (1)	---	---	h(3)
O-2A, -2B	General Aviation: Piston	IO-360-C (1)	---	---	h(1), h(3)
		IO-360-D (1)	---	---	h(3)
OA-4M	Combat: USN	J52-P-6A, -6B (1)	---	---	c, h(1)
		J52-P-8A (1)	---	---	c, h(1)
OA-10A	Combat: USAF	TF34-GE-100 (2)	---	---	h(1)
OA-37B	Combat: USAF	J85-GE-17A (2)	---	---	h(1)
OC-135B	Transport - Turbine: USAF general	TF33-P-5 (4)	---	---	h(1)
OT-47B	General Aviation: Business Jet	JT15D-5D (2)	---	---	c, h(1)
OV-10A	General Aviation: Turboprop	T76-G-10A (2)	---	---	c, g, h(1)
		T76-G-12A (2)	---	---	c, g, h(1)
		T76-G-418 (2)	---	---	g, h(1)
		T76-G-419 (2)	---	---	g, h(1)
P-3B	Transport - Turbine: USN	T56-A-14 (4)	---	---	h(1)
P-3C	Transport - Turbine: USN	T56-A-7 (4)	---	---	h(3)
		T56-A-14 (4)	---	---	h(1)
QF-4B	Combat: USN	J79-GE-8B, -8C (2)	---	---	c, h(1)
QF-4E	Combat: USAF	J79-GE-10 (2)	---	---	c, h(1)
		J79-GE-17 (2)	---	---	h(1)
QF-4G	Combat: USAF	J79-GE-15 (2)	---	---	h(1)
		J79-GE-17 (2)	---	---	h(1)
QF-106A, -106B	Combat: USAF	J75-P-17 (1)	---	---	h(1)
QRF-4C	Combat: USAF	J79-GE-10 (2)	---	---	c, h(1)
		J79-GE-17 (2)	---	---	h(1)
QT-33A	Trainer - Turbine: USN	J33-A-35 (1)	---	---	h(1)
RA-3B	Combat: USN	J57-P-10 (2)	---	---	h(1)
RA-5C	Combat: USN	J79-GE-8B, -8C (2)	---	---	c, h(1)
		J79-GE-10 (2)	---	---	c, h(1)
RC-12D, -12G, -12H	General Aviation: Turboprop	PT6A-41 (2)	---	---	h(1)
RC-135M, -135X	Transport - Turbine: USAF general	TF33-P-5 (4)	---	---	h(1), h(5), h(6)
RC-135S	Transport - Turbine: USAF general	TF33-P-5 (4)	---	---	h(1)
		CFM56-2B-1 (4)	---	---	h(6), k
		F108-CF-201 (4)	---	---	h(6), l(2)
RC-135T	Transport - Turbine: USAF general	TF33-P-102 (4)	---	---	h(5)
RC-135U	Transport - Turbine: USAF general	TF33-P-9 (4)	---	---	h(1)
		CFM56-2B-1 (4)	---	---	h(6), k
		F108-CF-201 (4)	---	---	h(6), l(2)
RC-135V/W	Transport - Turbine: USAF general	TF33-P-5 (4)	---	---	h(1)
		CFM56-2B-1 (4)	---	---	h(6), k
		F108-CF-201 (4)	---	---	h(6), l(2)
RF-4B	Combat: USN	J79-GE-8B, -8C (2)	---	---	c, h(1)

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

Aircraft Model(s)	Time-In-Mode Category [a]	Engine Model(s) (Number of Engines)	APU Model(s) (Number of APUs)	APU Hours of Operation Per LTO [b]	Notes:
RF-4C	Combat: USAF	J79-GE-15 (2)	---	---	h(1)
RF-8G	Combat: USN	J57-P-22 (1)	---	---	c, h(1)
RF/A-18A	Combat: USN	F404-GE-400 (2)	---	---	h(1)
RP-3D	Transport - Turbine: USN	T56-A-14 (4)	---	---	h(1)
RQ-4	Combat: USAF	AE3007H (1)	---	---	c, h(1)
		F137-RR-100 (1)	---	---	c, h(6)
RQ-4A	Combat: USAF	AE3007 (1)	---	---	c, h(1)
		F137-RR-100 (1)			c, h(6)
RQ-4B	Combat: USAF	AE3007H (1)	---	---	c, h(1)
RU-21J	General Aviation: Turboprop	PT6A-41 (2)	---	---	h(1)
S-2, -2G	General Aviation: Piston	R-1820-82 (2)	---	---	h(1), h(3)
S-2D, -2E	General Aviation: Piston	R-1820-82A (2)	---	---	c, h(1)
S-3A	Combat: USN	TF34-GE-400 (2)	---	---	h(3)
SV-22A	Transport - Turbine: USN	AE1107C (2)	---	---	f, h(1), k
		T406-AD-400 (2)	---	---	f, h(1), l(2)
T-1A	Trainer - Turbine: USAF general	JT15D-5B (2)	---	---	h(1)
T-2	Trainer - Turbine: USN	J85-GE-5F (2)	---	---	h(3)
T-6A	Trainer - Turbine: USAF general	PT6A-68 (1)	---	---	g, h(1)
T-28	General Aviation: Piston	R-1820-82 (1)	---	---	h(3)
T-33A	Trainer - Turbine: USAF general	J33-A-35 (1)	---	---	h(1)
T-34	General Aviation: Piston	O-470C (1)	---	---	h(3)
T-34C	General Aviation: Piston	PT6A-27 (1)	---	---	h(3)
T-37, -37B	Trainer - Turbine: USAF general	J69-T-25 (2)	---	---	h(1), h(3)
T-38	Trainer - Turbine: USAF T-38	J85-GE-5F (2)	---	---	h(3)
T-38A	Trainer - Turbine: USAF T-38	J85-GE-5, -5A, -5G, -5J, -5M (2)	---	---	c, h(1)
T-38C	Trainer - Turbine: USAF T-38	J85-GE-5, -5A, -5G, -5J, -5R (2)	---	---	c, h(1)
T-38N	Trainer - Turbine: USAF T-38	J85-GE-5H, -5N (2)	---	---	c, h(1)
T-39A, -39D	General Aviation: Business Jet	J60-P-3A (2)	---	---	h(1), h(5)
T-39B	General Aviation: Business Jet	J60-P-3, -3A (2)	---	---	c, h(1)
T-41	General Aviation: Piston	IO-360-C (1)	---	---	h(3)
T-41B	General Aviation: Piston	IO-360-D (1)	---	---	h(1)
T-41C, -41D	General Aviation: Piston	IO-360-D34 (1)	---	---	h(1)
T-43A	Transport - Turbine: USAF general	JT8D-9 (2)	---	---	h(1)
T-44	Trainer - Turbine: USN	PT6A-27 (2)	---	---	h(3)
T-45A	Trainer - Turbine: USN	F405-RR-401 (1)	---	---	h(7)
T-47A	General Aviation: Business Jet	JT15D-5 (2)	---	---	h(1)
T-50A	Trainer - Turbine: USAF general	F404-GE-102 (1)	---	---	h(19)
TA-3B	Combat: USN	J57-P-10 (2)	---	---	h(1)
TA-4B	Combat: USN	J65-W-20 (1)	---	---	h(1)
TA-4F	Combat: USN	J52-P-6A, -6B (1)	---	---	c, h(1)
		J52-P-8A (1)	---	---	c, h(1)
TA-7C	Combat: USN	TF30-P-8 (1)	---	---	c, h(1)
TC-18E	Transport - Turbine: USAF general	TF33-P-100A (4)	---	---	c, h(1)
TC-18F	Transport - Turbine: USAF general	JT3D-3B (4)	---	---	h(1)

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

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

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

Table 2-6. Military Helicopter/Engine/APU Combinations

Aircraft Model(s)	Time-In-Mode Category [a]	Engine Model(s) (Number of Engines)	APU Model(s) (Number of APUs)	APU hours of Operation Per LTO [b]	Notes:
AH-1G	Military - Helicopter	T53-L-11D (1)	---	---	h(3)
		T53-L-13, -13A, -13B (1)	---	---	c, h(1)
AH-1J	Military - Helicopter	T400-CP-400 (1)	---	---	h(1)
AH-64A	Military - Helicopter	T700-GE-700 (2)	---	---	h(1)
CH-3B	Military - Helicopter	T58-GE-8B (2)	---	---	c, h(1)
CH-3E	Military - Helicopter	T58-GE-5 (2)	---	---	h(8)
CH-46	Military - Helicopter	T58-GE-5 (2)	---	---	h(3)
CH-46A	Military - Helicopter	T58-GE-8B, -8F (2)	---	---	c, h(1)
CH-46E	Military - Helicopter	T58-GE-16 (2)	---	---	h(1)
CH-53A	Military - Helicopter	T64-GE-6B (2)	---	---	h(1)
CH-53D	Military - Helicopter	T64-GE-413 (2)	---	---	h(1)
EH-1H	Military - Helicopter	T53-L-13 (1)	---	---	h(1)
EH-1X	Military - Helicopter	T53-L-13 (1)	---	---	h(1)
EH-60A	Military - Helicopter	T700-GE-700 (2)	---	---	h(1)
HH-1H	Military - Helicopter	T53-L-13B (1)	---	---	h(1)
HH-1K	Military - Helicopter	T53-L-13, -13A, -13B (1)	---	---	c, h(1)
HH-1N	Military - Helicopter	T400-CP-400 (2)	---	---	h(7)
HH-2D	Military - Helicopter	T58-GE-8B, -8F (2)	---	---	c, h(1)
HH-3A	Military - Helicopter	T58-GE-8F (2)	---	---	h(1)
HH-3E	Military - Helicopter	T58-GE-5 (2)	---	---	h(8)
HH-3F	Military - Helicopter	T58-GE-8B, -8F (2)	---	---	c, h(1)
HH-43	Military - Helicopter	T53-L-11D (1)	---	---	h(3)
HH-46A	Military - Helicopter	T58-GE-8B, -8F (2)	---	---	c, h(1)
HH-52	Military - Helicopter	T58-GE-5 (2)	---	---	h(3)
HH-52A	Military - Helicopter	T58-GE-8B (1)	---	---	c, h(1)
HH-53	Military - Helicopter	T64-GE-6B (2)	---	---	h(3)
HH-60G	Military - Helicopter	T700-GE-700 (2)	---	---	h(6)
		T700-GE-701C (2)	---	---	h(6)
MH-53J	Military - Helicopter	T64-GE-415 (2)	T-62T-27 (1)	4.00	h(1), i(1)
MH-53M	Military - Helicopter	T64-GE-100 (2)	---	---	h(6)
MH-60A	Military - Helicopter	T700-GE-700 (2)	---	---	h(1)
MH-60G	Military - Helicopter	T700-GE-700 (2)	---	---	h(1)

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

Aircraft Model(s)	Time-In-Mode Category [a]	Engine Model(s) (Number of Engines)	APU Model(s) (Number of APUs)	APU hours of Operation Per LTO [b]	Notes:
NCH-46A	Military - Helicopter	T58-GE-8B, -8F (2)	---	---	c, h(1)
NRH-53D	Military - Helicopter	T64-GE-415 (2)	---	---	h(1)
NSH-3A	Military - Helicopter	T58-GE-8B (2)	---	---	c, h(1)
NUH-1E	Military - Helicopter	T53-L-11D (1)	---	---	h(1)
NUH-1N	Military - Helicopter	T400-CP-400 (2)	---	---	h(1)
NVH-3A	Military - Helicopter	T58-GE-8F (2)	---	---	h(1)
OH-6A	Military - Helicopter	T63-A-5A (1)	---	---	h(3)
OH-58	Military - Helicopter	T63-A-5A (1)	---	---	h(3)
RH-53D	Military - Helicopter	T64-GE-415A (2)	---	---	c, h(1)
SH-2D	Military - Helicopter	T58-GE-5 (2)	---	---	h(3)
		T58-GE-8B (2)	---	---	c, h(1)
SH-2F	Military - Helicopter	T58-GE-5 (2)	---	---	h(3)
		T58-GE-8F (2)	---	---	h(1)
SH-3A	Military - Helicopter	T58-GE-8B (2)	---	---	c, h(1)
SH-3G	Military - Helicopter	T58-GE-8B, -8F (2)	---	---	c, h(1)
SH-60	Military - Helicopter	T700-GE-700 (2)	---	---	h(7)
TH-1L	Military - Helicopter	T53-L-13, -13A, -13B (1)	---	---	c, h(1)
TH-53A	Military - Helicopter	T64-GE-100 (2)	---	---	h(16)
UH-1E	Military - Helicopter	T53-L-11D (1)	---	---	h(1)
UH-1H	Military - Helicopter	T53-L-11D (1)	---	---	h(3)
		T53-L-13 (1)	---	---	h(1)
UH-1L	Military - Helicopter	T53-L-13, -13A, -13B (1)	---	---	c, h(1)
UH-1N	Military - Helicopter	T400-CP-400 (2)	---	---	h(6)
UH-1V	Military - Helicopter	T53-L-13 (1)	---	---	h(1)
UH-2C	Military - Helicopter	T58-GE-8B, -8F (2)	---	---	c, h(1)
UH-3A	Military - Helicopter	T58-GE-8B (2)	---	---	c, h(1)
UH-46A	Military - Helicopter	T58-GE-8B, -8F (2)	---	---	c, h(1)
UH-60A	Military - Helicopter	T700-GE-700 (2)	T-62T-40-1 (1)	1.00	c, b, h(1)
UH-60C	Military - Helicopter	T700-GE-700 (2)	---	---	h(1)
UH-60Q	Military - Helicopter	T700-GE-700 (2)	---	---	h(1)
YSH-2E	Military - Helicopter	T58-GE-8B, -8F (2)	---	---	c, h(1)

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

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

Note that some Aircraft model/engine/Auxiliary Power Unit (APU) combinations may be missing due to unverified sources and/or missing emission factors for either engine(s) and/or APU(s).

a. Time-in-Mode category selected for the aircraft based on that aircraft's expected flight pattern and not based on its mission designation.

b. 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.

c. This document does not have emission factors for at least one engine/APU listed for this aircraft.

d. Time-in-Mode category for this aircraft was selected as the recommended category for calculating emissions though this aircraft is operated by another military branch.

e. APU operating time an estimate based on similar APUs on similar aircraft.

f. 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.

g. This aircraft is operated by multiple military branches.

h. The Airframe/Engine combination source was reported in the following documents:

(1) SOURCE: *Model Designation of Military Aerospace Vehicles*, Department of Defense, May 2004.

(2) SOURCE: Air Force Reserve Website (www.afreserve.com).

(3) SOURCE: *Air Pollutant Emission Factors for Military and Civil Aircraft*, EPA-450/3-78-117, October 1978.

(4) SOURCE: Smithsonian National Air and Space Museum website (www.airandspace.si.edu).

(5) SOURCE: *Aircraft Engine Emissions Estimator*, AFESC, November 1985.

(6) SOURCE: US Air Force fact sheets accessed via official Air Force website (www.af.mil).

(7) SOURCE: US Navy fact sheets accessed via official navy website (www.navy.mil).

(8) SOURCE: National Museum of the Air Force accessed via official website (www.nationalmuseum.af.mil).

(9) SOURCE: GE Aviation website (www.geaviation.com).

(10) SOURCE: *National Environmental Policy ACT (NEPA) Facilitation Report*, April 2012.

(11) SOURCE: US Army website (www.army.mil).

(12) SOURCE: Naval air systems command website (www.navair.navy.mil).

(13) SOURCE: Northrop Grumman website (www.northropgrumman.com).

(14) SOURCE: Pratt and Whitney website (www.pw.utc.com).

(15) SOURCE: *Energy and Environmental Viability of Select Alternative Jet Fuel Pathways*, Carter, Nicholas A., et al. AIAA 2011-5968. 2011.

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

(17) SOURCE: Beechcraft website (www.beechcraft.com).

(18) SOURCE: Gulfstream website (www.gulfstream.com)

(19) SOURCE: Airforce Monthly website (www.airforcemonthly.com)

i. The Airframe/APU combination was reported in the following documents:

(1) SOURCE: *Air Emissions Factor Guide to Air Force Mobile Sources*, AFCEC 2009.

(2) SOURCE: EDMS input from Paine Field.

j. According to the source document, the actual APU operating time may range between 0.23 - 0.26 if there is gate power or 0.87 if there is no gate power. The most conservative value of 0.87 is listed here.

k. 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.

l. 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:

(1) SOURCE: *Air Force One*, Robert F. Dorr, 2002.

(2) 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

Aircraft Model(s)	Time-In-Mode Category	Engine Model(s) (Number of Engines)	APU Model(s) (Number of APUs)	APU hours of Operation Per LTO [a] [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]	b, c(2), c(3), d(2)
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]	b, c(2), c(3), d(2)
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]	b, c(3), c(4), d(2)
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]	b, c(3), c(4), c(5), d(2)
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]	b, c(3), c(4), c(5), d(2)
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]	b, c(3), c(4), c(5), d(2)
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]	b, c(3), c(4), c(5), d(2)
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)	---	---	b, c(4), c(5)
A380 Series	**Commercial Carrier:** Jumbo, long, and medium range jet	GP7270 (4) Trent 970B-84 (4) Trent 972B-84 (4)	---	---	b, c(2), c(4)
ACJ318	**General Aviation:** Business Jet	CFM56-5B9/3 (2)	---	---	c(5)
ACJ319	**General Aviation:** Business Jet	CFM56-5B7/3 (2)	---	---	c(5)
ACJ320	**General Aviation:** Business Jet	CFM56-5B4/3 (2)	---	---	c(5)
ACJ330	**General Aviation:** Business Jet	Trent 772B-60 (2)	---	---	b, c(5)
ACJ340	**General Aviation:** Business Jet	Trent 553-61 (4)	---	---	c(5)
ACJ380	**General Aviation:** Business Jet	Trent 970-84 (4)	---	---	c(5)
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]	b, c(1), c(2), c(6), d(1)
B717 Series	**Commercial Carrier:** Jumbo, long, and medium range jet	BR700-715A1-30, -715C1-30 (2)	---	---	c(2)

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

Aircraft Model(s)	Time-In-Mode Category	Engine Model(s) (Number of Engines)	APU Model(s) (Number of APUs)	APU hours of Operation Per LTO [a] [Without Gate Power]	Notes:
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]	b, c(1), c(2), c(6), d(1)
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]	b, c(4), d(3)
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]	b, c(2), c(4), d(3)
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]	b, c(2), c(4), d(3)
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]	b, c(2), c(4), d(1), d(3)
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, -4090-3, -4098 (2) Trent 875, -877, -884, -884B, -892, -892B, -895 (2)	GTCP 331-500 (1)	0.23 - 0.26 [1.0 - 1.5]	b, c(2), c(4), c(6), d(3)
B787 Series	**Commercial Carrier:** Jumbo, long, and medium range jet	Genx-1B64, -1B64/P1, -1B67, -1B67/P1, -1B70, -1B70/P1, -1B70/75/P1 (2) Trent 1000-A, -1000-C, -1000-E (2)	---	---	b, c(2), c(4)
BAe 146-100A, -200A	**General Aviation:** Business Jet	ALF 502R-3, -3A, -5 (4)	---	---	b, c(2)
BAe 146-300A	**General Aviation:** Business Jet	ALF 502R-3A, -5 (4)	---	---	b, c(2)
BAe Avro 146-RJ100A	**General Aviation:** Business Jet	LF507-1F (4)	---	---	c(2)
BAe Avro 146-RJ70A	**General Aviation:** Business Jet	LF507-1F (4)	---	---	c(2)
BAe Avro 146-RJ85A	**General Aviation:** Business Jet	LF507-1F (4)	---	---	c(2)
BD-100-1A10	**General Aviation:** Business Jet	AS907-1-1A (2)	---	---	c(2)
BD-700-1A10, -1A11	**General Aviation:** Business Jet	BR700-710A2-20 (2)	---	---	c(2)
Beechcraft 76	**General Aviation:** Turboprop	PT6A-27 (2)	---	---	c(1)
Beechcraft 99A, -99B, -A99A, -B99	**General Aviation:** Turboprop	PT6A-27 (2)	---	---	c(2)
BH.125 Series 400A	**General Aviation:** Business Jet	TFE731-3, -3R (2)	---	---	b, c(2)
BH.125 Series 600A	**General Aviation:** Business Jet	TFE731-3, -3R (2)	---	---	b, c(2)

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

Aircraft Model(s)	Time-In-Mode Category	Engine Model(s) (Number of Engines)	APU Model(s) (Number of APUs)	APU hours of Operation Per LTO [a] [Without Gate Power]	Notes:
Cessna 150, -150A, -150B, -150C, -150D, -150E, -150F, -150G, -150H, -150J, -150K, -150L, -150M	**General Aviation:** Piston	O-200-A (1)	---	---	b, c(2)
Cessna 172I, -172K, -172L, -172M	**General Aviation:** Piston	O-320-E2D (1)	---	---	b, c(2)
Cessna 172N	**General Aviation:** Piston	O-320-H2AD (1)	---	---	b, c(2)
Cessna 172P	**General Aviation:** Piston	O-320-D2J (1)	---	---	b, c(2)
Cessna 336	**General Aviation:** Piston	IO-360-A (2) TSIO-360-C (2)	---	---	b, c(1), c(2), c(6)
Cessna 337, -337A, -337B	**General Aviation:** Piston	IO-360-C, -360-CB, -360-D, -360-DB, -360-G, -360-GB (2)	---	---	b, c(2)
Cessna 337C, -337D, -337E, -337F, -337G	**General Aviation:** Piston	IO-360-C, -360-CB, -360-G, -360-GB (2)	---	---	b, c(2)
Cessna 337H	**General Aviation:** Piston	IO-360-G, -360-GB (2)	---	---	b, c(2)
Cessna Citation I	**General Aviation:** Business Jet	JT15D-1, -1A, -1B (2)	---	---	c(1), c(3)
Cessna Citation II, -II/S	**General Aviation:** Business Jet	JT15D-4, -4B (2)	---	---	c(3)
Cessna Citation Ultra	**General Aviation:** Business Jet	JT15D-5D (2)	---	---	b, c(3)
Cessna Citation V	**General Aviation:** Business Jet	JT15D-5A (2)	---	---	c(3)
Cessna M337B	**General Aviation:** Piston	IO-360-D, -360-DB (2)	---	---	b, c(2)
Cessna P337H	**General Aviation:** Piston	TSIO-360-C, -360-CB (2)	---	---	b, c(2)
Cessna T337B	**General Aviation:** Piston	TSIO-360-A, -360-AB, -360-B, -360-BB (2)	---	---	b, c(2)
Cessna T337C, -T337D, -T337E, -T337F	**General Aviation:** Piston	TSIO-360-A, -360-AB (2)	---	---	b, c(2)
Cessna T337H	**General Aviation:** Piston	IO-360-G, -360-GB (2) TSIO-360-JB (2)	---	---	b, c(2)
Cheyenne III, -IIIA	**General Aviation:** Turboprop	PT6A-41 (2)	---	---	c(3)
CL-600-1A11	**General Aviation:** Business Jet	ALF 502L, -502L-2 (2)	---	---	b, c(2)
CL-600-2A12	**General Aviation:** Business Jet	CF34-3A, -3A2 (2)	---	---	b, c(2)
CL-600-2B16	**General Aviation:** Business Jet	CF34-3A, -3A1, -3A2, -3B (2)	---	---	b, c(2)
CL-600-2B19	**General Aviation:** Business Jet	CF34-3A1, -3B1 (2)	---	---	b, c(2)
CL-600-2C10	**General Aviation:** Business Jet	CF34-8C1, -8C5B1 (2)	---	---	c(2)
CL-600-2D15	**General Aviation:** Business Jet	CF34-8C5, -8C5A1 (2)	---	---	c(2)
CL-600-2D24	**General Aviation:** Business Jet	CF34-8C5, -8C5A1 (2)	---	---	c(2)
CL-600-2E25	**General Aviation:** Business Jet	CF34-8C5, -8C5A1, -8C5A2 (2)	---	---	c(2)
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]	b, c(1), c(2), d(2)
DC-8 Series	**Commercial Carrier:** Jumbo, long, and medium range jet	CFM56-2-C1, -2-C3, -2-C5 (4) JT3D-3, -3B, -7 (4)	---	---	b, c(2)
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, -217A, -217C, -219 (2)	GTCP 85-98D (1)	0.23 - 0.26 [0.87]	b, c(1), c(2), d(1), d(2)
DH.125 Series 1A, -3A, -3A/RA, -400A	**General Aviation:** Business Jet	TFE731-3, -3R (2)	---	---	b, c(2)
DHC-6-300, -400	**General Aviation:** Turboprop	PT6A-27 (2)	---	---	c(2)
F.27 Mark 100, -200, -300, -400, -600, -700	**General Aviation:** Turboprop	SPEY Mk511, -Mk511-7E (2)	---	---	b, c(2)
F.28 Mark 0070	**General Aviation:** Business Jet	TAY Mk650-15 (2)	---	---	c(2)
F.28 Mark 0100	**General Aviation:** Business Jet	TAY Mk620-15 (2) TAY Mk650-15 (2)	---	---	c(2)
F.28 Mark 1000, -2000	**General Aviation:** Business Jet	SPEY MK555-15 (2)	---	---	b, c(2)
F.28 Mark 3000, -4000	**General Aviation:** Business Jet	SPEY Mk555-15H (2)	---	---	b, c(2)

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

Aircraft Model(s)	Time-In-Mode Category	Engine Model(s) (Number of Engines)	APU Model(s) (Number of APUs)	APU hours of Operation Per LTO [a] [Without Gate Power]	Notes:
Falcon 20	**General Aviation:** Business Jet	CF700-2D (2)	---	---	c(1)
G-1159, -1159A, -1159B	**General Aviation:** Business Jet	SPEY Mk511-8 (2)	GTCP 36-6 (1)	0.23 - 0.26 [0.87]	b, c(2), d(2)
G200	**General Aviation:** Business Jet	PW306A (2)	---	---	c(3)
G-21	**General Aviation:** Turboprop	PT6A-27 (2)	---	---	c(1)
G280	**General Aviation:** Business Jet	AS907-2-1G (2)	---	---	c(2)
GIV	**General Aviation:** Business Jet	TAY Mk611-8 (2)	---	---	c(2)
GIV-X	**General Aviation:** Business Jet	TAY Mk611-8C (2)	---	---	b, c(2)
GV	**General Aviation:** Business Jet	BR700-710A1-10 (2)	---	---	c(2)
GVI	**General Aviation:** Business Jet	BR725A1-12 (2)	---	---	c(2)
GV-SP	**General Aviation:** Business Jet	BR700-710C4-11 (2)	---	---	c(2)
Hawker 4000	**General Aviation:** Business Jet	PW308A (2)	---	---	c(3)
Hawker 400A, -400XP	**General Aviation:** Business Jet	JT15D-5, -5R (2)	---	---	b, c(3)
HS.125 Series 403B, -600A, -700A, -700B, -F3B, -F3B/RA, -F400B, -F600B	**General Aviation:** Business Jet	TFE731-3, -3R (2)	---	---	b, c(2)
JetStar 1329-25	**General Aviation:** Business Jet	TFE731-3-1F (4)	---	---	b, c(2)
King Air B200	**General Aviation:** Turboprop	PT6A-41 (2)	---	---	c(3)
L-1011-385-1	**Commercial Carrier:** Jumbo, long, and medium range jet	RB211-22C-02, -22B-02 (3)	---	---	b, c(2)
L-1011-385-1-14	**Commercial Carrier:** Jumbo, long, and medium range jet	RB211-22B-02, -524B-02, -524B4-02, -524B3-02 (3)	---	---	b, c(2)
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)	---	---	b, c(2)
Learjet 31, -31A	**General Aviation:** Business Jet	TFE731-2-3B (2)	---	---	b, c(2)
Learjet 35, -36	**General Aviation:** Business Jet	TFE731-2, -2-2B (2)	---	---	c(1)
Learjet 35A, -36A	**General Aviation:** Business Jet	TFE731-2-2B (2)	---	---	c(1)
Learjet 55	**General Aviation:** Business Jet	TFE731-3A-2B1, -3A-2B, -3AR-2B1, -3AR-2B (2)	---	---	b, c(2)
Learjet 55B	**General Aviation:** Business Jet	TFE731-3AR-2B1, -3AR-2B (2)	---	---	b, c(2)
Learjet 55C	**General Aviation:** Business Jet	TFE731-3AR-3B1, -3AR-3B, -3AR-2B1, -3AR-2B (2)	---	---	b, c(2)
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]	c(2), d(2)
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]	c(2), d(2)
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]	c(2), d(2)
MD-88	**Commercial Carrier:** Jumbo, long, and medium range jet	JT8D-217A, -217C, -219 (2)	---	---	c(2)
MD-90, -90-30	**Commercial Carrier:** Jumbo, long, and medium range jet	V2525-D5 (2) V2528-D5 (2)	---	---	c(2)
MU-300, -300-10	**General Aviation:** Business Jet	JT15D-4, -4D (2)	---	---	b, c(2)
NA-265-80	**General Aviation:** Business Jet	CF700-2D-2 (2)	---	---	b, c(2)
PA-18A	**General Aviation:** Piston	O-320 (1)	---	---	c(2)
PA-23, -23-160	**General Aviation:** Piston	O-320 (2)	---	---	c(2)
PA-28-140	**General Aviation:** Piston	O-320-E2A (1)	---	---	b, c(2)
PA-28-150	**General Aviation:** Piston	O-320-A2B, -E2A (1)	---	---	b, c(2)
PA-28-151	**General Aviation:** Piston	O-320-E3D (1)	---	---	b, c(2)

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

Aircraft Model(s)	Time-In-Mode Category	Engine Model(s) (Number of Engines)	APU Model(s) (Number of APUs)	APU hours of Operation Per LTO [a] [Without Gate Power]	Notes:
PA-28-160	**General Aviation:** Piston	O-320-B2B, -D2A (1)	---	---	b, c(2)
PA-28-161	**General Aviation:** Piston	O-320-D2A, -D3G (1)	---	---	b, c(2)
PA-28-201T	**General Aviation:** Piston	TSIO-360-FB (1)	---	---	b, c(2)
PA-28R-180	**General Aviation:** Piston	IO-360-B1E (1)	---	---	b, c(2)
PA-28R-200	**General Aviation:** Piston	IO-360-C1C, -C1C6 (1)	---	---	b, c(2)
PA-28R-201, -28RT-201	**General Aviation:** Piston	IO-360-C1C6 (1)	---	---	b, c(2)
PA-28R-201T	**General Aviation:** Piston	TSIO-360-F, -360-FB (1)	---	---	b, c(2)
PA-28RT-201T	**General Aviation:** Piston	TSIO-360-FB (1)	---	---	b, c(2)
PA-28S-160	**General Aviation:** Piston	O-320-D2A (1)	---	---	b, c(2)
PA-31	**General Aviation:** Piston	TIO-540, -540-A1A, -540-A1B, -540-A2A, -540-A2B, -540-A2C (2)	---	---	b, c(1)
PA-31-325	**General Aviation:** Piston	TIO-540-F2BD (2)	---	---	b, c(2)
PA-31-350	**General Aviation:** Piston	TIO-540-J2BD, -540-J2B (2)	---	---	b, c(2)
PA-32-301T	**General Aviation:** Piston	TIO-540-S1AD (1)	---	---	b, c(2)
PA-32-301XTC	**General Aviation:** Piston	TIO-540-AH1A (1)	---	---	b, c(2)
PA-32R-301T	**General Aviation:** Piston	TIO-540-S1AD, 540-AH1A (1)	---	---	b, c(2)
PA-32RT-300T	**General Aviation:** Piston	TIO-540-S1AD (1)	---	---	b, c(2)
PA-36-285	**General Aviation:** Turboprop	6-285-B, -285-BA, -285-C, -285-CA (1)	---	---	b, c(2)
PA-42	**General Aviation:** Turboprop	PT6A-41 (2)	---	---	c(2)
PA-46-350P, -46R-350T	**General Aviation:** Turboprop	TIO-540-AE2A (1)	---	---	b, c(2)
SA226-AT	**General Aviation:** Turboprop	TPE331-3U-303G, -3U-304G, -3UW-303G (2)	---	---	b, c(2)
SA226-T	**General Aviation:** Turboprop	TPE331-3U-303G, -3U-304G (2)	---	---	b, c(2)
SA226-TC	**General Aviation:** Turboprop	TPE331-3U-303G, -3U-304G, -3UW-303G, -3UW-304G (2)	---	---	b, c(2)
SC-7	**General Aviation:** Turboprop	TPE331-2-201A (2)	---	---	b, c(1)
Super King Air A100-1, -200, -200C, -200CT, -200T, -A200, -A200C, -A200CT, -B200, -B200C, -B200CT, -B200T	**General Aviation:** Turboprop	PT6A-41 (2)	---	---	c(2)
TU-154-B	**Commercial Carrier:** Jumbo, long, and medium range jet	NK-8-2U (3)	---	---	c(7)
Twin Commander 685	**General Aviation:** Piston	GTSIO-520-F, -520-K (2)	---	---	b, c(2)

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).

a. 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.

b. This document does not have emission factors for at least one engine/APU listed for this aircraft.

c. The Aircraft/Engine combination source was reported in one of the following documents:
   (1) SOURCE: *Air Pollutant Emission Factors for Military and Civil Aircraft*, EPA-450/3-78-117, October 1978.
   (2) SOURCE: The Federal Aviation Administration (FAA) Type Certificate Data Sheet (TCDS) for the airframe model listed.
   (3) SOURCE: Pratt & Whitney website (www.pw.utc.com).
   (4) SOURCE: The European Aviation Safety Agency (EASA) TCDS for the airframe model listed.
   (5) Airbus website (www.airbus.com).
   (6) Boeing Website (www.boeing.com).
   (7) Tupolev website (www.tupolev.ru/english/).

d. Airframe/APU combination source was reported in one of the following:
   (1) SOURCE: Emissions and Dispersion Modeling System Input from Paine Field
   (2) SOURCE: FAA TCDS for the listed airframe
   (3) SOURCE: EASA TCDS 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 [a]	CO	VOC	HAPs	PM_{10}	$PM_{2.5}$	CO_2e [b]
6-285-B	Idle (Taxi)	<40%	72	0.46	1.07	363.70	12.33	---	0.76 **(S)**	0.68 **(S)**	3214.59
	Approach	40%	84	4.72	1.07	1022.63	18.50	---	0.12 **(S)**	0.11 **(S)**	3214.59
	Climb out	75-100%	166	5.50	1.07	668.07	9.63	---	0.30 **(S)**	0.27 **(S)**	3214.59
	Takeoff	100%	153	5.88	1.07	998.04	13.38	---	0.31 **(S)**	0.28 **(S)**	3214.59
Notes: c(1), d(5) - PM_{10} and $PM_{2.5}$ data at all power settings, e, h, i, k(8)											
AE1107C	Idle	---	362	4.15	1.07	8.35	0.10	---	1.58	1.42	3214.59
	Flight Idle	---	663	6.05	1.07	3.47	0.02	---	1.58	1.42	3214.59
	Intermediate	---	948	7.87	1.07	1.82	0.02	---	1.58	1.42	3214.59
	Max Continuous	---	2507	18.03	1.07	0.29	0.01	---	1.58	1.42	3214.59
Notes: c(6) - This is the commercial designation of the T406-AD-400 engine, h, k(4)											
AE3007A	Idle (Taxi)	7%	389	3.83	1.07	17.35	2.89	---	0.05	0.05	3214.59
	Approach	30%	929	7.79	1.07	3.28	0.74	---	0.07	0.07	3214.59
	Climb out	85%	2500	17.47	1.07	0.92	0.33	---	0.06	0.05	3214.59
	Takeoff	100%	2992	20.54	1.07	0.75	0.29	---	0.08	0.07	3214.59
Notes: c(2), e, f, h, k(5)											
ALF 502L-2	Idle (Taxi)	7%	379	3.38	1.07	45.63	7.65	---	0.10	0.09	3214.59
	Approach	30%	930	6.47	1.07	3.97	0.21	---	0.11	0.10	3214.59
	Climb out	85%	2568	12.03	1.07	0.30	0.03	---	0.11	0.09	3214.59
	Takeoff	100%	3174	13.43	1.07	0.40	0.02	---	0.07	0.07	3214.59
Notes: c(2), e, f, h, k(8)											
ALF 502R-3	Idle (Taxi)	7%	343	3.30	1.07	44.67	7.49	---	0.09	0.08	3214.59
	Approach	30%	815	6.15	1.07	8.43	0.33	---	0.09	0.08	3214.59
	Climb out	85%	2286	9.94	1.07	0.50	0.06	---	0.10	0.09	3214.59
	Takeoff	100%	2759	11.20	1.07	0.43	0.06	---	0.10	0.09	3214.59
Notes: c(2), e, f, h, k(8)											
ALF 502R-5	Idle (Taxi)	7%	324	3.78	1.07	40.93	6.20	---	0.09	0.08	3214.59
	Approach	30%	821	6.60	1.07	7.10	0.25	---	0.09	0.08	3214.59
	Climb out	85%	2345	10.56	1.07	0.25	0.06	---	0.11	0.10	3214.59
	Takeoff	100%	2842	13.35	1.07	0.30	0.07	---	0.11	0.10	3214.59
Notes: c(2), e, f, h, k(8)											
AS907-1-1A	Idle (Taxi)	7%	381	3.91	1.07	33.24	1.45	---	0.10	0.09	3214.59
	Approach	30%	825	8.81	1.07	6.28	0.14	---	0.06	0.05	3214.59
	Climb out	85%	2286	16.17	1.07	0.63	0.07	---	0.31	0.28	3214.59
	Takeoff	100%	2754	17.90	1.07	0.56	0.06	---	0.36	0.33	3214.59
Notes: c(2), e, f, h, k(1)											
AS907-2-1G	Idle (Taxi)	7%	389	3.97	1.07	30.48	1.14	---	0.11	0.10	3214.59
	Approach	30%	849	8.96	1.07	6.07	0.14	---	0.06	0.06	3214.59
	Climb out	85%	2444	16.44	1.07	0.60	0.07	---	0.31	0.28	3214.59
	Takeoff	100%	2952	18.43	1.07	0.57	0.06	---	0.36	0.33	3214.59
Notes: c(2), e, f, h, k(1)											

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 [a]	CO	VOC	HAPs	PM_{10}	$PM_{2.5}$	CO_2e [b]
BR700-710A1-10	Idle (Taxi)	7%	706	4.69	1.07	27.82	1.25	---	0.06	0.05	3214.59
	Approach	30%	1698	7.68	1.07	4.78	0.06	---	0.05	0.04	3214.59
	Climb out	85%	4714	15.07	1.07	0.93	0.02	---	0.35	0.31	3214.59
	Takeoff	100%	5659	18.79	1.07	1.04	0.02	---	0.37	0.33	3214.59
Notes: c(2), e, f, h, k(8)											
BR700-710A2-20	Idle (Taxi)	7%	706	4.67	1.07	28.00	1.29	---	0.06	0.05	3214.59
	Approach	30%	1698	7.67	1.07	4.81	0.06	---	0.05	0.04	3214.59
	Climb out	85%	4722	15.03	1.07	0.93	0.02	---	0.34	0.31	3214.59
	Takeoff	100%	5667	18.73	1.07	1.04	0.02	---	0.37	0.33	3214.59
Notes: c(2), e, f, h, k(8)											
BR700-710C4-11	Idle (Taxi)	7%	659	4.50	1.07	31.57	2.63	---	0.06	0.06	3214.59
	Approach	30%	1706	7.71	1.07	4.92	0.06	---	0.05	0.04	3214.59
	Climb out	85%	4897	15.43	1.07	0.92	0.02	---	0.35	0.32	3214.59
	Takeoff	100%	5929	19.52	1.07	1.04	0.02	---	0.37	0.33	3214.59
Notes: c(2), e, f, h, k(8)											
BR700-715A1-30	Idle (Taxi)	7%	762	5.37	1.07	16.27	0.24	---	0.07	0.06	3214.59
	Approach	30%	1944	11.19	1.07	3.76	0.01	---	0.06	0.06	3214.59
	Climb out	85%	5476	18.65	1.07	0.75	0.02	---	0.09	0.08	3214.59
	Takeoff	100%	6635	23.97	1.07	0.78	0.00	---	0.10	0.09	3214.59
Notes: c(2), e, f, h, k(8)											
BR700-715C1-30	Idle (Taxi)	7%	833	4.28	1.07	17.85	0.07	---	0.04	0.04	3214.59
	Approach	30%	2159	9.23	1.07	3.23	0.02	---	0.07	0.06	3214.59
	Climb out	85%	6389	20.05	1.07	0.64	0.07	---	0.13	0.12	3214.59
	Takeoff	100%	7810	27.92	1.07	0.80	0.01	---	0.13	0.12	3214.59
Notes: c(2), e, f, h, k(8)											
BR725A1-12	Idle (Taxi)	7%	675	3.38	1.07	41.90	3.45	---	0.06	0.05	3214.59
	Approach	30%	1754	7.81	1.07	5.93	0.00	---	0.04	0.03	3214.59
	Climb out	85%	5159	13.32	1.07	0.32	0.00	---	0.13	0.12	3214.59
	Takeoff	100%	6262	16.92	1.07	0.40	0.00	---	0.11	0.10	3214.59
Notes: c(2), e, f, h, k(8)											
CF6-6D	Idle (Taxi)	7%	1371	4.50	1.07	54.20	24.15	---	0.20	0.18	3214.59
	Approach	30%	3841	11.40	1.07	6.50	0.81	---	0.10	0.09	3214.59
	Climb out	85%	11357	32.60	1.07	0.50	0.35	---	0.07	0.07	3214.59
	Takeoff	100%	13778	40.00	1.07	0.50	0.35	---	0.09	0.08	3214.59
Notes: c(2), e, f, h, k(1)											
CF6-6D1A	Idle (Taxi)	7%	1397	4.60	1.07	52.00	22.89	---	0.19	0.17	3214.59
	Approach	30%	3921	11.80	1.07	5.50	0.69	---	0.09	0.08	3214.59
	Climb out	85%	11921	33.90	1.07	0.50	0.35	---	0.07	0.07	3214.59
	Takeoff	100%	14381	41.60	1.07	0.50	0.35	---	0.09	0.08	3214.59
Notes: c(2), e, f, h, k(1)											

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 [a]	CO	VOC	HAPs	PM_{10}	$PM_{2.5}$	CO_2e [b]
CF6-6K	Idle (Taxi)	7%	1371	4.50	1.07	54.20	24.15	---	0.20	0.18	3214.59
	Approach	30%	3841	11.40	1.07	6.50	0.81	---	0.10	0.09	3214.59
	Climb out	85%	11357	32.60	1.07	0.50	0.35	---	0.07	0.07	3214.59
	Takeoff	100%	13778	40.00	1.07	0.50	0.35	---	0.09	0.08	3214.59
Notes: c(2), e, f, h, k(1)											
CF6-6K2	Idle (Taxi)	7%	1397	4.60	1.07	52.00	22.89	---	0.19	0.17	3214.59
	Approach	30%	3921	11.80	1.07	5.50	0.69	---	0.09	0.08	3214.59
	Climb out	85%	11921	33.90	1.07	0.50	0.35	---	0.07	0.07	3214.59
	Takeoff	100%	14381	41.60	1.07	0.50	0.35	---	0.09	0.08	3214.59
Notes: c(2), e, f, h, k(1)											
CF6-50A	Idle (Taxi)	7%	1294	3.40	1.07	24.04	3.13	---	0.06	0.06	3214.59
	Approach	30%	4960	9.72	1.07	4.35	0.36	---	0.06	0.06	3214.59
	Climb out	85%	14183	23.27	1.07	0.49	0.16	---	0.11	0.10	3214.59
	Takeoff	100%	17206	27.17	1.07	0.43	0.17	---	0.11	0.10	3214.59
Notes: c(2), e, f, h, k(1)											
CF6-50C	Idle (Taxi)	7%	1683	3.50	1.07	62.30	26.45	---	0.22	0.20	3214.59
	Approach	30%	5103	9.40	1.07	5.20	1.15	---	0.11	0.10	3214.59
	Climb out	85%	15199	29.00	1.07	0.50	0.81	---	0.10	0.09	3214.59
	Takeoff	100%	18881	35.00	1.07	0.50	0.69	---	0.12	0.11	3214.59
Notes: c(2), e, f, h, k(1)											
CF6-50C1, -50C2	Idle (Taxi)	7%	1706	3.60	1.07	61.80	25.07	---	0.21	0.19	3214.59
	Approach	30%	5238	9.50	1.07	4.30	1.15	---	0.11	0.10	3214.59
	Climb out	85%	15675	29.70	1.07	0.50	0.81	---	0.10	0.09	3214.59
	Takeoff	100%	19738	36.30	1.07	0.50	0.69	---	0.12	0.11	3214.59
Notes: c(2) - CF6-50C2 is the commercial designation of the F103-GE-101 engine, e, f, h, k(1)											
CF6-50C2B	Idle (Taxi)	7%	1294	3.40	1.07	24.04	3.13	---	0.06	0.06	3214.59
	Approach	30%	5294	10.49	1.07	3.42	0.30	---	0.06	0.06	3214.59
	Climb out	85%	15849	26.34	1.07	0.44	0.17	---	0.11	0.10	3214.59
	Takeoff	100%	19127	29.59	1.07	0.46	0.15	---	0.10	0.09	3214.59
Notes: c(2), e, f, h, k(1)											
CF6-50C2R	Idle (Taxi)	7%	1683	3.50	1.07	62.30	26.45	---	0.22	0.20	3214.59
	Approach	30%	5103	9.40	1.07	5.20	1.15	---	0.11	0.10	3214.59
	Climb out	85%	15199	29.00	1.07	0.50	0.81	---	0.10	0.09	3214.59
	Takeoff	100%	18881	35.00	1.07	0.50	0.69	---	0.12	0.11	3214.59
Notes: c(2), e, f, h, k(1)											
CF6-50CA	Idle (Taxi)	7%	1294	3.40	1.07	24.04	3.13	---	0.06	0.06	3214.59
	Approach	30%	5087	10.09	1.07	3.99	0.33	---	0.06	0.06	3214.59
	Climb out	85%	14881	24.30	1.07	0.46	0.16	---	0.11	0.10	3214.59
	Takeoff	100%	18103	28.03	1.07	0.44	0.16	---	0.10	0.09	3214.59
Notes: c(2), e, f, h, k(1)											

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 [a]	CO	VOC	HAPs	PM_{10}	$PM_{2.5}$	CO_2e [b]
CF6-50E, -50E1	Idle (Taxi)	7%	1294	3.40	1.07	24.04	3.13	---	0.06	0.06	3214.59
	Approach	30%	5262	10.16	1.07	3.71	0.32	---	0.06	0.06	3214.59
	Climb out	85%	15397	25.50	1.07	0.45	0.17	---	0.11	0.10	3214.59
	Takeoff	100%	18738	28.97	1.07	0.45	0.16	---	0.10	0.09	3214.59
Notes: c(2), e, f, h, k(1)											
CF6-50E2	Idle (Taxi)	7%	1706	3.60	1.07	61.80	25.07	---	0.21	0.19	3214.59
	Approach	30%	5238	9.50	1.07	4.30	1.15	---	0.11	0.10	3214.59
	Climb out	85%	15675	29.70	1.07	0.50	0.81	---	0.10	0.09	3214.59
	Takeoff	100%	19738	36.30	1.07	0.50	0.69	---	0.12	0.11	3214.59
Notes: c(2) - CF6-50E2 is the commercial designation of the F103-GE-100 engine, e, f, h, k(1)											
CF6-80A	Idle (Taxi)	7%	1190	3.40	1.07	28.20	7.23	---	0.09	0.08	3214.59
	Approach	30%	4881	10.30	1.07	3.10	0.54	---	0.08	0.07	3214.59
	Climb out	85%	14246	25.60	1.07	1.10	0.33	---	0.11	0.10	3214.59
	Takeoff	100%	17024	29.80	1.07	1.00	0.33	---	0.13	0.11	3214.59
Notes: c(2), e, f, h, k(1)											
CF6-80A2, -80A3	Idle (Taxi)	7%	1190	3.40	1.07	28.20	7.22	---	0.09	0.08	3214.59
	Approach	30%	5087	10.80	1.07	2.80	0.52	---	0.07	0.07	3214.59
	Climb out	85%	14960	26.60	1.07	1.10	0.43	---	0.11	0.10	3214.59
	Takeoff	100%	17889	29.60	1.07	1.00	0.35	---	0.13	0.11	3214.59
Notes: c(2), e, f, h, k(1)											
CF6-80C2A1	Idle (Taxi)	7%	1579	3.99	1.07	42.24	10.57	---	0.12	0.11	3214.59
	Approach	30%	5048	9.76	1.07	2.19	0.23	---	0.06	0.06	3214.59
	Climb out	85%	15500	24.85	1.07	0.54	0.10	---	0.07	0.06	3214.59
	Takeoff	100%	19048	32.22	1.07	0.56	0.09	---	0.08	0.07	3214.59
Notes: c(2), e, f, h, k(1)											
CF6-80C2A2	Idle (Taxi)	7%	1500	3.95	1.07	46.01	12.05	---	0.13	0.11	3214.59
	Approach	30%	4603	9.44	1.07	2.94	0.26	---	0.06	0.06	3214.59
	Climb out	85%	13849	20.69	1.07	0.55	0.12	---	0.06	0.06	3214.59
	Takeoff	100%	16802	27.93	1.07	0.57	0.09	---	0.07	0.07	3214.59
Notes: c(2), e, f, h, k(1)											
CF6-80C2A3	Idle (Taxi)	7%	1603	3.92	1.07	41.51	10.28	---	0.12	0.10	3214.59
	Approach	30%	5151	9.93	1.07	2.07	0.22	---	0.06	0.06	3214.59
	Climb out	85%	15897	25.46	1.07	0.56	0.09	---	0.07	0.06	3214.59
	Takeoff	100%	19500	34.50	1.07	0.58	0.07	---	0.08	0.07	3214.59
Notes: c(2), e, f, h, k(1)											
CF6-80C2A5	Idle (Taxi)	7%	1643	3.79	1.07	41.65	10.34	---	0.12	0.10	3214.59
	Approach	30%	5452	9.11	1.07	1.93	0.23	---	0.06	0.06	3214.59
	Climb out	85%	16524	22.86	1.07	0.52	0.09	---	0.07	0.06	3214.59
	Takeoff	100%	20484	34.38	1.07	0.52	0.08	---	0.08	0.07	3214.59
Notes: c(2), e, f, h, k(1)											

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 [a]	CO	VOC	HAPs	PM_{10}	$PM_{2.5}$	CO_2e [b]
CF6-80C2A5F	Idle (Taxi)	7%	1746	4.90	1.07	16.96	1.36	---	0.05	0.04	3214.59
	Approach	30%	5484	12.64	1.07	1.92	0.13	---	0.04	0.04	3214.59
	Climb out	85%	16714	21.27	1.07	0.04	0.05	---	0.06	0.06	3214.59
	Takeoff	100%	20873	28.11	1.07	0.05	0.06	---	0.07	0.07	3214.59
Notes: c(2), e, f, h, k(1)											
CF6-80C2B1	Idle (Taxi)	7%	1556	3.73	1.07	43.22	10.88	---	0.12	0.11	3214.59
	Approach	30%	4889	8.83	1.07	2.37	0.24	---	0.06	0.06	3214.59
	Climb out	85%	14865	21.26	1.07	0.55	0.10	---	0.06	0.06	3214.59
	Takeoff	100%	18135	28.11	1.07	0.58	0.09	---	0.08	0.07	3214.59
Notes: c(2), e, f, h, k(1)											
CF6-80C2B1F	Idle (Taxi)	7%	1579	4.73	1.07	19.23	1.77	---	0.05	0.04	3214.59
	Approach	30%	5159	12.47	1.07	2.13	0.13	---	0.04	0.04	3214.59
	Climb out	85%	15738	19.72	1.07	0.04	0.06	---	0.06	0.05	3214.59
	Takeoff	100%	19222	24.94	1.07	0.04	0.06	---	0.07	0.06	3214.59
Notes: c(2), e, f, h, k(1)											
CF6-80C2B2	Idle (Taxi)	7%	1508	4.45	1.07	22.41	2.27	---	0.05	0.05	3214.59
	Approach	30%	4643	11.79	1.07	2.61	0.14	---	0.05	0.04	3214.59
	Climb out	85%	13937	18.25	1.07	0.05	0.06	---	0.05	0.05	3214.59
	Takeoff	100%	16857	22.02	1.07	0.04	0.06	---	0.07	0.06	3214.59
Notes: c(2), e, f, h, k(1)											
CF6-80C2B2F	Idle (Taxi)	7%	1492	4.52	1.07	21.56	2.14	---	0.05	0.05	3214.59
	Approach	30%	4706	11.80	1.07	2.64	0.14	---	0.05	0.04	3214.59
	Climb out	85%	14103	18.09	1.07	0.06	0.06	---	0.05	0.05	3214.59
	Takeoff	100%	17048	21.55	1.07	0.04	0.06	---	0.07	0.06	3214.59
Notes: c(2), e, f, h, k(1)											
CF6-80C2B4	Idle (Taxi)	7%	1595	4.68	1.07	19.76	1.83	---	0.05	0.04	3214.59
	Approach	30%	5087	12.37	1.07	2.12	0.14	---	0.05	0.04	3214.59
	Climb out	85%	15595	20.17	1.07	0.04	0.06	---	0.06	0.05	3214.59
	Takeoff	100%	19119	25.93	1.07	0.05	0.06	---	0.07	0.06	3214.59
Notes: c(2), e, f, h, k(1)											
CF6-80C2B4F	Idle (Taxi)	7%	1579	4.73	1.07	19.23	1.77	---	0.05	0.04	3214.59
	Approach	30%	5159	12.47	1.07	2.13	0.13	---	0.04	0.04	3214.59
	Climb out	85%	15738	19.72	1.07	0.04	0.06	---	0.06	0.05	3214.59
	Takeoff	100%	19302	25.08	1.07	0.04	0.06	---	0.07	0.06	3214.59
Notes: c(2), e, f, h, k(1)											
CF6-80C2B5F	Idle (Taxi)	7%	1635	4.91	1.07	17.45	1.51	---	0.05	0.04	3214.59
	Approach	30%	5532	12.74	1.07	1.83	0.13	---	0.04	0.04	3214.59
	Climb out	85%	17159	21.76	1.07	0.04	0.06	---	0.06	0.06	3214.59
	Takeoff	100%	21310	28.58	1.07	0.05	0.06	---	0.07	0.07	3214.59
Notes: c(2), e, f, h, k(1)											

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 [a]	CO	VOC	HAPs	PM_{10}	$PM_{2.5}$	CO_2e [b]
CF6-80C2B6	Idle (Taxi)	7%	1627	4.76	1.07	18.89	1.70	---	0.05	0.04	3214.59
	Approach	30%	5333	12.53	1.07	1.91	0.13	---	0.04	0.04	3214.59
	Climb out	85%	16635	21.69	1.07	0.04	0.06	---	0.07	0.06	3214.59
	Takeoff	100%	20476	28.57	1.07	0.06	0.05	---	0.07	0.06	3214.59
Notes: c(2), e, f, h, k(1)											
CF6-80C2B6F	Idle (Taxi)	7%	1611	4.81	1.07	18.42	1.64	---	0.05	0.04	3214.59
	Approach	30%	5413	12.63	1.07	1.93	0.13	---	0.04	0.04	3214.59
	Climb out	85%	16699	21.05	1.07	0.04	0.06	---	0.06	0.06	3214.59
	Takeoff	100%	20587	27.38	1.07	0.05	0.06	---	0.07	0.06	3214.59
Notes: c(2), e, f, h, k(1)											
CF6-80C2B7F	Idle (Taxi)	7%	1611	4.81	1.07	18.42	1.64	---	0.05	0.04	3214.59
	Approach	30%	5413	12.63	1.07	1.93	0.13	---	0.04	0.04	3214.59
	Climb out	85%	16699	21.05	1.07	0.04	0.06	---	0.06	0.06	3214.59
	Takeoff	100%	20587	27.38	1.07	0.05	0.06	---	0.07	0.06	3214.59
Notes: c(2), e, f, h, k(1)											
CF6-80C2B8F	Idle (Taxi)	7%	1627	4.59	1.07	16.69	1.31	---	0.05	0.04	3214.59
	Approach	30%	5437	12.42	1.07	1.69	0.10	---	0.04	0.04	3214.59
	Climb out	85%	16714	20.84	1.07	0.02	0.05	---	0.06	0.05	3214.59
	Takeoff	100%	20500	26.85	1.07	0.03	0.05	---	0.07	0.06	3214.59
Notes: c(2), e, f, h, k(1)											
CF6-80C2D1F	Idle (Taxi)	7%	1556	3.80	1.07	41.78	10.38	---	0.12	0.11	3214.59
	Approach	30%	5214	9.16	1.07	1.94	0.23	---	0.06	0.06	3214.59
	Climb out	85%	16389	24.02	1.07	0.52	0.09	---	0.07	0.06	3214.59
	Takeoff	100%	20603	32.65	1.07	0.52	0.08	---	0.08	0.07	3214.59
Notes: c(2), e, f, h, k(1)											
CF6-80E1A1	Idle (Taxi)	7%	1794	4.47	1.07	43.24	11.13	---	0.10	0.09	3214.59
	Approach	30%	5667	9.84	1.07	1.70	0.16	---	0.05	0.04	3214.59
	Climb out	85%	17452	27.11	1.07	0.34	0.08	---	0.07	0.07	3214.59
	Takeoff	100%	21445	37.87	1.07	0.38	0.06	---	0.09	0.08	3214.59
Notes: c(2), e, f, h, k(1)											
CF6-80E1A2	Idle (Taxi)	7%	1810	4.53	1.07	42.67	10.78	---	0.10	0.09	3214.59
	Approach	30%	5746	9.91	1.07	1.61	0.16	---	0.05	0.04	3214.59
	Climb out	85%	17818	28.02	1.07	0.34	0.08	---	0.08	0.07	3214.59
	Takeoff	100%	21960	39.29	1.07	0.38	0.06	---	0.09	0.08	3214.59
Notes: c(2), e, f, h, k(1)											
CF6-80E1A3	Idle (Taxi)	7%	1802	4.69	1.07	37.02	10.96	---	0.10	0.09	3214.59
	Approach	30%	5992	10.29	1.07	1.23	0.21	---	0.05	0.04	3214.59
	Climb out	85%	18945	31.74	1.07	0.31	0.08	---	0.08	0.08	3214.59
	Takeoff	100%	23722	45.63	1.07	0.34	0.08	---	0.09	0.08	3214.59
Notes: c(2), e, f, h, k(1)											

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 [a]	CO	VOC	HAPs	PM_{10}	$PM_{2.5}$	CO_2e [b]
CF6-80E1A4	Idle (Taxi)	7%	1802	4.62	1.07	38.09	11.90	---	0.10	0.09	3214.59
	Approach	30%	5905	10.13	1.07	1.33	0.21	---	0.05	0.04	3214.59
	Climb out	85%	18548	30.30	1.07	0.30	0.08	---	0.08	0.07	3214.59
	Takeoff	100%	23048	43.15	1.07	0.34	0.07	---	0.09	0.08	3214.59
Notes: c(2), e, f, h, k(1)											
CF34-3A, -3A1	Idle (Taxi)	7%	394	3.82	1.07	42.60	4.54	---	0.09	0.08	3214.59
	Approach	30%	944	6.86	1.07	1.90	0.15	---	0.06	0.06	3214.59
	Climb out	85%	2653	10.14	1.07	0.00	0.07	---	0.09	0.08	3214.59
	Takeoff	100%	3230	11.61	1.07	0.00	0.07	---	0.16	0.14	3214.59
Notes: c(2), e, f, h, k(4)											
CF34-3B	Idle (Taxi)	7%	388	3.72	1.07	47.59	5.39	---	0.09	0.08	3214.59
	Approach	30%	921	6.63	1.07	1.88	0.15	---	0.06	0.06	3214.59
	Climb out	85%	2610	9.68	1.07	0.00	0.06	---	0.09	0.08	3214.59
	Takeoff	100%	3167	11.28	1.07	0.00	0.07	---	0.14	0.12	3214.59
Notes: c(2), e, f, h, k(1)											
CF34-8C1	Idle (Taxi)	7%	548	4.31	1.07	24.92	0.09	---	0.04	0.04	3214.59
	Approach	30%	1334	11.10	1.07	2.91	0.07	---	0.04	0.04	3214.59
	Climb out	85%	3921	12.82	1.07	0.50	0.02	---	0.04	0.04	3214.59
	Takeoff	100%	4795	14.67	1.07	0.41	0.02	---	0.06	0.05	3214.59
Notes: c(2), e, f, h, k(1)											
CF34-8C5	Idle (Taxi)	7%	508	4.60	1.07	18.25	0.15	---	0.04	0.04	3214.59
	Approach	30%	1421	10.75	1.07	4.24	0.07	---	0.04	0.04	3214.59
	Climb out	85%	4206	12.60	1.07	0.57	0.02	---	0.05	0.04	3214.59
	Takeoff	100%	5143	14.69	1.07	0.64	0.02	---	0.07	0.07	3214.59
Notes: c(2), e, f, h, k(1)											
CF34-8C5A1	Idle (Taxi)	7%	516	4.65	1.07	17.85	0.15	---	0.04	0.04	3214.59
	Approach	30%	1452	10.87	1.07	4.17	0.07	---	0.04	0.04	3214.59
	Climb out	85%	4310	12.82	1.07	0.57	0.02	---	0.05	0.04	3214.59
	Takeoff	100%	5278	15.09	1.07	0.66	0.02	---	0.08	0.08	3214.59
Notes: c(2), e, f, h, k(1)											
CF34-8C5A2	Idle (Taxi)	7%	524	4.70	1.07	17.30	0.15	---	0.04	0.04	3214.59
	Approach	30%	1492	11.06	1.07	4.05	0.07	---	0.04	0.04	3214.59
	Climb out	85%	4468	13.15	1.07	0.57	0.02	---	0.05	0.05	3214.59
	Takeoff	100%	5484	15.81	1.07	0.71	0.02	---	0.10	0.09	3214.59
Notes: c(2), e, f, h, k(1)											
CF34-8C5B1	Idle (Taxi)	7%	500	4.50	1.07	19.52	0.18	---	0.04	0.04	3214.59
	Approach	30%	1357	10.42	1.07	4.44	0.08	---	0.04	0.04	3214.59
	Climb out	85%	3944	12.03	1.07	0.58	0.03	---	0.04	0.04	3214.59
	Takeoff	100%	4810	13.89	1.07	0.60	0.02	---	0.06	0.05	3214.59
Notes: c(2), e, f, h, k(1)											

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 [a]	CO	VOC	HAPs	PM_{10}	$PM_{2.5}$	CO_2e [b]
CF700-2D	Idle (Taxi)	<30%	460	0.89	1.07	155.00	20.70	---	3.0E-03 **(S)**	2.7E-03 **(S)**	3214.59
	Approach	30%	919	1.80	1.07	62.00	1.61	---	0.01 **(S)**	0.01 **(S)**	3214.59
	Climb out	90 - 100%	2322	4.30	1.07	11.34	0.11	---	0.01 **(S)**	0.01 **(S)**	3214.59
	Takeoff	>100%	2607	5.60	1.07	9.98	0.11	---	0.02 **(S)**	0.02 **(S)**	3214.59
Notes: c(1), d(8) - PM_{10} and $PM_{2.5}$ at all power settings, e, j, k(8)											
CFM56-2A Series	Idle (Taxi)	7%	1032	4.30	1.07	23.50	1.30	---	0.06	0.05	3214.59
	Approach	30%	2524	8.70	1.07	3.40	0.09	---	0.06	0.05	3214.59
	Climb out	70%	7230	17.30	1.07	0.90	0.05	---	0.06	0.05	3214.59
	Takeoff	100%	8841	20.40	1.07	0.90	0.05	---	0.08	0.07	3214.59
Notes: c(2), e, f, h, k(1)											
CFM56-2B-1	Idle (Taxi)	9%	1136	3.88	1.07	23.65	0.19	0.208	2.07	0.16	3214.59
	Approach	30%	2547	5.73	1.07	8.57	0.06	0.084	1.55	0.76	3214.59
	Intermediate	70%	5650	11.04	1.07	2.32	0.03	0.069	0.65	0.36	3214.59
	Military	78%	6458	12.05	1.07	0.36	0.03	0.018	1.59	1.02	3214.59
Notes: c(3) - CFM56-2B-1 is the commercial designation of the F108-CF-100 engine, k(5)											
CFM56-2-C5	Idle (Taxi)	7%	1016	4.00	1.07	30.70	2.10	---	0.07	0.06	3214.59
	Approach	30%	2468	8.20	1.07	4.20	0.09	---	0.06	0.05	3214.59
	Climb out	85%	6500	16.00	1.07	0.90	0.06	---	0.05	0.05	3214.59
	Takeoff	100%	7818	18.50	1.07	0.90	0.05	---	0.07	0.06	3214.59
Notes: c(2), e, f, h, k(1)											
CFM56-3-B1	Idle (Taxi)	7%	905	3.90	1.07	34.40	2.62	---	0.07	0.06	3214.59
	Approach	30%	2302	8.30	1.07	3.80	0.09	---	0.06	0.05	3214.59
	Climb out	85%	6286	15.50	1.07	0.95	0.06	---	0.05	0.05	3214.59
	Takeoff	100%	7508	17.70	1.07	0.90	0.05	---	0.06	0.05	3214.59
Notes: c(2), e, f, h, k(1)											
CFM56-3B-2	Idle (Taxi)	7%	944	4.10	1.07	30.10	2.01	---	0.06	0.06	3214.59
	Approach	30%	2492	8.70	1.07	3.40	0.08	---	0.06	0.05	3214.59
	Climb out	85%	6968	16.70	1.07	0.90	0.05	---	0.05	0.05	3214.59
	Takeoff	100%	8381	19.40	1.07	0.90	0.04	---	0.07	0.06	3214.59
Notes: c(2), e, f, h, k(1)											
CFM56-3C-1	Idle (Taxi)	7%	984	4.30	1.07	26.80	1.63	---	0.06	0.06	3214.59
	Approach	30%	2667	9.10	1.07	3.10	0.08	---	0.06	0.05	3214.59
	Climb out	85%	7571	17.80	1.07	0.90	0.05	---	0.06	0.05	3214.59
	Takeoff	100%	9159	20.70	1.07	0.90	0.03	---	0.07	0.07	3214.59
Notes: c(2), e, f, h, k(1)											
CFM56-5-A1	Idle (Taxi)	7%	802	4.00	1.07	17.60	1.61	---	0.06	0.06	3214.59
	Approach	30%	2310	8.00	1.07	2.50	0.46	---	0.09	0.08	3214.59
	Climb out	85%	6841	19.60	1.07	0.90	0.26	---	0.13	0.12	3214.59
	Takeoff	100%	8341	24.60	1.07	0.90	0.26	---	0.14	0.13	3214.59
Notes: c(2), e, f, h, k(1)											

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 [a]	CO	VOC	HAPs	PM_{10}	$PM_{2.5}$	CO_2e [b]
CFM56-5A3	Idle (Taxi)	7%	829	4.10	1.07	16.20	1.50	---	0.07	0.06	3214.59
	Approach	30%	2437	8.30	1.07	2.40	0.35	---	0.09	0.08	3214.59
	Climb out	85%	7341	21.10	1.07	0.90	0.23	---	0.13	0.12	3214.59
	Takeoff	100%	8976	26.40	1.07	0.90	0.23	---	0.14	0.13	3214.59
Notes: c(2), e, f, h, k(1)											
CFM56-5A4	Idle (Taxi)	7%	754	4.04	1.07	20.30	2.01	---	0.07	0.06	3214.59
	Approach	30%	2071	8.51	1.07	3.10	0.58	---	0.09	0.08	3214.59
	Climb out	85%	5873	19.11	1.07	1.10	0.26	---	0.11	0.10	3214.59
	Takeoff	100%	7119	22.64	1.07	1.10	0.26	---	0.13	0.12	3214.59
Notes: c(2), e, f, h, k(1)											
CFM56-5A5	Idle (Taxi)	7%	778	4.29	1.07	18.50	1.76	---	0.07	0.06	3214.59
	Approach	30%	2190	8.94	1.07	2.80	0.52	---	0.09	0.08	3214.59
	Climb out	85%	6341	19.98	1.07	1.10	0.26	---	0.12	0.11	3214.59
	Takeoff	100%	7714	24.79	1.07	1.10	0.26	---	0.13	0.12	3214.59
Notes: c(2), e, f, h, k(1)											
CFM56-5B1	Idle (Taxi)	7%	929	4.60	1.07	28.40	3.69	---	0.06	0.05	3214.59
	Approach	30%	2889	10.80	1.07	1.57	0.14	---	0.05	0.04	3214.59
	Climb out	85%	8833	27.20	1.07	0.50	0.12	---	0.10	0.09	3214.59
	Takeoff	100%	10786	35.10	1.07	0.50	0.12	---	0.09	0.08	3214.59
Notes: c(2), e, f, h, k(1)											
CFM56-5B2	Idle (Taxi)	7%	944	4.70	1.07	27.40	3.50	---	0.06	0.05	3214.59
	Approach	30%	2984	11.00	1.07	1.40	0.14	---	0.05	0.04	3214.59
	Climb out	85%	9191	28.50	1.07	0.50	0.12	---	0.10	0.09	3214.59
	Takeoff	100%	11318	37.80	1.07	0.50	0.12	---	0.08	0.08	3214.59
Notes: c(2), e, f, h, k(1)											
CFM56-5B4	Idle (Taxi)	7%	849	4.30	1.07	31.90	4.45	---	0.06	0.06	3214.59
	Approach	30%	2587	10.00	1.07	2.33	0.15	---	0.05	0.04	3214.59
	Climb out	85%	7627	23.30	1.07	0.50	0.12	---	0.10	0.09	3214.59
	Takeoff	100%	9254	28.70	1.07	0.50	0.12	---	0.09	0.08	3214.59
Notes: c(2), e, f, h, k(1)											
CFM56-5B4/3, -5B7/3	Idle (Taxi)	7%	810	4.22	1.07	32.07	2.21	---	0.06	0.06	3214.59
	Approach	30%	2508	8.85	1.07	3.24	0.06	---	0.05	0.05	3214.59
	Climb out	85%	7452	17.23	1.07	0.16	0.02	---	0.09	0.08	3214.59
	Takeoff	100%	9064	21.57	1.07	0.25	0.02	---	0.10	0.09	3214.59
Notes: c(2), e, f, h, k(1)											
CFM56-5B9/3	Idle (Taxi)	7%	754	3.92	1.07	38.80	3.46	---	0.07	0.06	3214.59
	Approach	30%	2206	8.26	1.07	4.42	0.08	---	0.05	0.05	3214.59
	Climb out	85%	6294	14.76	1.07	0.17	0.03	---	0.08	0.07	3214.59
	Takeoff	100%	7587	17.54	1.07	0.16	0.02	---	0.09	0.08	3214.59
Notes: c(2), e, f, h, k(1)											

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 [a]	CO	VOC	HAPs	PM_{10}	$PM_{2.5}$	CO_2e [b]
CFM56-5C2	Idle (Taxi)	7%	933	4.19	1.07	34.00	6.53	---	0.12	0.11	3214.59
	Approach	30%	2824	10.00	1.07	1.75	0.09	---	0.08	0.07	3214.59
	Climb out	85%	8540	25.80	1.07	0.80	0.01	---	0.34	0.31	3214.59
	Takeoff	100%	10381	32.60	1.07	0.93	0.01	---	0.41	0.37	3214.59
Notes: c(2), e, f, h, k(1)											
CFM56-5C2/P	Idle (Taxi)	7%	865	3.90	1.07	35.10	6.67	---	0.12	0.11	3214.59
	Approach	30%	2714	9.30	1.07	2.10	0.00	---	0.07	0.07	3214.59
	Climb out	85%	8214	23.80	1.07	0.70	0.00	---	0.34	0.30	3214.59
	Takeoff	100%	9937	29.70	1.07	0.80	0.00	---	0.39	0.35	3214.59
Notes: c(2), e, f, h, k(1)											
CFM56-5C3/P	Idle (Taxi)	7%	889	4.00	1.07	33.40	6.21	---	0.12	0.11	3214.59
	Approach	30%	2817	9.60	1.07	1.90	0.00	---	0.07	0.07	3214.59
	Climb out	85%	8611	25.10	1.07	0.70	0.00	---	0.36	0.32	3214.59
	Takeoff	100%	10445	31.60	1.07	0.80	0.00	---	0.43	0.38	3214.59
Notes: c(2), e, f, h, k(1)											
CFM56-5C4	Idle (Taxi)	7%	984	4.28	1.07	30.93	5.75	---	0.12	0.11	3214.59
	Approach	30%	3064	10.67	1.07	1.40	0.07	---	0.08	0.07	3214.59
	Climb out	85%	9484	29.05	1.07	0.85	0.01	---	0.39	0.35	3214.59
	Takeoff	100%	11556	37.67	1.07	1.00	0.01	---	0.46	0.42	3214.59
Notes: c(2), e, f, h, k(1)											
CFM56-5C4/P	Idle (Taxi)	7%	913	4.10	1.07	31.60	5.75	---	0.12	0.11	3214.59
	Approach	30%	2937	9.90	1.07	1.60	0.00	---	0.07	0.07	3214.59
	Climb out	85%	9071	26.70	1.07	0.70	0.00	---	0.38	0.34	3214.59
	Takeoff	100%	11072	34.10	1.07	0.80	0.00	---	0.44	0.39	3214.59
Notes: c(2), e, f, h, k(1)											
CFM56-7B18/3	Idle (Taxi)	7%	730	3.65	1.07	46.64	5.19	---	0.08	0.07	3214.59
	Approach	30%	2032	7.78	1.07	5.54	0.09	---	0.05	0.05	3214.59
	Climb out	85%	5571	13.00	1.07	0.28	0.03	---	0.07	0.06	3214.59
	Takeoff	100%	6683	14.81	1.07	0.17	0.03	---	0.07	0.07	3214.59
Notes: c(2), e, f, h, k(1)											
CFM56-7B20	Idle (Taxi)	7%	794	4.30	1.07	25.90	3.57	---	0.06	0.05	3214.59
	Approach	30%	2175	9.50	1.07	3.20	0.12	---	0.04	0.04	3214.59
	Climb out	85%	6040	17.40	1.07	0.50	0.12	---	0.08	0.07	3214.59
	Takeoff	100%	7246	20.50	1.07	0.60	0.12	---	0.10	0.09	3214.59
Notes: c(2), e, f, h, k(1)											
CFM56-7B20/2	Idle (Taxi)	7%	810	3.75	1.07	49.71	9.33	---	0.09	0.08	3214.59
	Approach	30%	2206	9.39	1.07	11.37	0.41	---	0.07	0.06	3214.59
	Climb out	85%	5984	10.81	1.07	11.38	0.26	---	0.06	0.05	3214.59
	Takeoff	100%	7167	13.25	1.07	4.26	0.08	---	0.05	0.04	3214.59
Notes: c(2), e, f, h, k(1)											

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 [a]	CO	VOC	HAPs	PM_{10}	$PM_{2.5}$	CO_2e [b]
CFM56-7B20/3, -7B20E	Idle (Taxi)	7%	746	3.77	1.07	43.31	4.42	---	0.08	0.07	3214.59
	Approach	30%	2127	7.98	1.07	5.03	0.09	---	0.05	0.05	3214.59
	Climb out	85%	5921	13.53	1.07	0.23	0.03	---	0.07	0.06	3214.59
	Takeoff	100%	7111	15.61	1.07	0.15	0.03	---	0.08	0.07	3214.59
Notes: c(2), e, f, h, k(1)											
CFM56-7B22	Idle (Taxi)	7%	833	4.50	1.07	22.80	2.88	---	0.05	0.05	3214.59
	Approach	30%	2365	10.00	1.07	2.50	0.12	---	0.04	0.04	3214.59
	Climb out	85%	6698	19.00	1.07	0.60	0.12	---	0.10	0.09	3214.59
	Takeoff	100%	8103	23.10	1.07	0.50	0.12	---	0.10	0.09	3214.59
Notes: c(2), e, f, h, k(1)											
CFM56-7B22/2	Idle (Taxi)	7%	833	3.94	1.07	45.35	8.35	---	0.09	0.08	3214.59
	Approach	30%	2405	6.37	1.07	30.87	6.97	---	0.38	0.34	3214.59
	Climb out	85%	6643	12.16	1.07	6.58	0.12	---	0.05	0.04	3214.59
	Takeoff	100%	8000	15.08	1.07	2.18	0.07	---	0.05	0.04	3214.59
Notes: c(2), e, f, h, k(1)											
CFM56-7B22/3, -7B22E	Idle (Taxi)	7%	786	3.95	1.07	37.90	3.25	---	0.07	0.06	3214.59
	Approach	30%	2310	8.35	1.07	4.18	0.08	---	0.05	0.05	3214.59
	Climb out	85%	6603	14.67	1.07	0.17	0.03	---	0.08	0.07	3214.59
	Takeoff	100%	7968	17.40	1.07	0.16	0.02	---	0.08	0.07	3214.59
Notes: c(2), e, f, h, k(1)											
CFM56-7B24	Idle (Taxi)	7%	865	4.40	1.07	22.00	2.76	---	0.05	0.05	3214.59
	Approach	30%	2508	10.10	1.07	2.20	0.12	---	0.04	0.04	3214.59
	Climb out	85%	7222	20.50	1.07	0.60	0.12	---	0.10	0.09	3214.59
	Takeoff	100%	8754	25.30	1.07	0.40	0.12	---	0.11	0.10	3214.59
Notes: c(2), e, f, h, k(1)											
CFM56-7B24/2	Idle (Taxi)	7%	865	4.08	1.07	42.72	7.53	---	0.08	0.07	3214.59
	Approach	30%	2484	6.72	1.07	30.32	6.91	---	0.38	0.34	3214.59
	Climb out	85%	7159	13.23	1.07	4.30	0.08	---	0.05	0.04	3214.59
	Takeoff	100%	8643	16.63	1.07	1.38	0.06	---	0.05	0.04	3214.59
Notes: c(2), e, f, h, k(1)											
CFM56-7B24/3	Idle (Taxi)	7%	817	4.09	1.07	34.71	2.65	---	0.07	0.06	3214.59
	Approach	30%	2444	8.60	1.07	3.68	0.07	---	0.05	0.05	3214.59
	Climb out	85%	7103	15.60	1.07	0.15	0.03	---	0.08	0.07	3214.59
	Takeoff	100%	8619	18.93	1.07	0.18	0.02	---	0.09	0.09	3214.59
Notes: c(2), e, f, h, k(1)											
CFM56-7B24E, -7B24E/B1	Idle (Taxi)	7%	794	4.10	1.07	34.70	2.65	---	0.07	0.06	3214.59
	Approach	30%	2381	8.60	1.07	3.70	0.12	---	0.06	0.05	3214.59
	Climb out	85%	7143	15.60	1.07	0.20	0.00	---	0.08	0.07	3214.59
	Takeoff	100%	8730	18.90	1.07	0.20	0.00	---	0.09	0.09	3214.59
Notes: c(2), e, f, h, k(1)											

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 [a]	CO	VOC	HAPs	PM_{10}	$PM_{2.5}$	CO_2e [b]
CFM56-7B26	Idle (Taxi)	7%	897	4.70	1.07	18.80	2.19	---	0.05	0.05	3214.59
	Approach	30%	2683	10.80	1.07	1.60	0.12	---	0.04	0.04	3214.59
	Climb out	85%	7929	22.50	1.07	0.60	0.12	---	0.11	0.10	3214.59
	Takeoff	100%	9691	28.80	1.07	0.20	0.12	---	0.12	0.11	3214.59
Notes: c(2), e, f, h, k(1)											
CFM56-7B26/2	Idle (Taxi)	7%	897	4.27	1.07	39.93	6.76	---	0.08	0.07	3214.59
	Approach	30%	2651	7.26	1.07	26.07	5.44	---	0.31	0.28	3214.59
	Climb out	85%	7849	14.77	1.07	2.51	0.07	---	0.05	0.04	3214.59
	Takeoff	100%	9548	19.20	1.07	0.77	0.03	---	0.04	0.04	3214.59
Notes: c(2), e, f, h, k(1)											
CFM56-7B26/3, -7B26E, -7B26E/B1, -7B26E/B2, -7B26E/B2F, -7B26E/F	Idle (Taxi)	7%	857	4.27	1.07	30.94	2.01	---	0.06	0.06	3214.59
	Approach	30%	2627	8.93	1.07	3.07	0.06	---	0.05	0.05	3214.59
	Climb out	85%	7825	17.08	1.07	0.16	0.02	---	0.09	0.08	3214.59
	Takeoff	100%	9627	21.79	1.07	0.20	0.02	---	0.10	0.09	3214.59
Notes: c(2), e, f, h, k(1)											
CFM56-7B27	Idle (Taxi)	7%	921	4.80	1.07	17.90	1.96	---	0.05	0.04	3214.59
	Approach	30%	2770	11.00	1.07	1.40	0.12	---	0.04	0.04	3214.59
	Climb out	85%	8278	23.70	1.07	0.50	0.12	---	0.11	0.10	3214.59
	Takeoff	100%	10191	30.90	1.07	0.20	0.12	---	0.12	0.11	3214.59
Notes: c(2), e, f, h, k(1)											
CFM56-7B27/2	Idle (Taxi)	7%	913	4.36	1.07	38.73	6.39	---	0.08	0.07	3214.59
	Approach	30%	2786	7.53	1.07	24.28	4.84	---	0.28	0.25	3214.59
	Climb out	85%	8198	15.59	1.07	1.97	0.07	---	0.05	0.04	3214.59
	Takeoff	100%	10040	20.81	1.07	0.54	0.06	---	0.05	0.04	3214.59
Notes: c(2), e, f, h, k(1)											
CFM56-7B27/3, -7B27E, -7B27E/B1, -7B27E/B1F, -7B27E/B3, -7B27E/F	Idle (Taxi)	7%	873	4.36	1.07	29.39	1.77	---	0.06	0.06	3214.59
	Approach	30%	2722	9.09	1.07	2.82	0.06	---	0.05	0.05	3214.59
	Climb out	85%	8183	17.89	1.07	0.17	0.02	---	0.10	0.09	3214.59
	Takeoff	100%	10262	23.94	1.07	0.31	0.03	---	0.10	0.09	3214.59
Notes: c(2), e, f, h, k(1)											
CT7-5	Idle (Taxi)	7%	131	2.20	1.07	35.33	3.78	---	0.18	0.16	3214.59
	Approach	30%	364	6.88	1.07	5.29	1.42	---	0.37	0.33	3214.59
	Climb out	70%	756	13.17	1.07	2.59	0.95	---	0.57	0.51	3214.59
	Takeoff	100%	809	13.77	1.07	2.59	0.95	---	0.69	0.62	3214.59
Notes: c(13), j, k(8)											
F100-PW-100	Idle (Taxi)	3%	1127	4.64	1.07	49.58	3.79	1.538	3.13	2.82	3214.59
	Approach	13%	2765	12.52	1.07	3.99	1.06	0.853	1.57	1.41	3214.59
	Intermediate	45%	7685	27.09	1.07	0.72	0.14	0.044	0.72	0.65	3214.59
	Military	100%	10996	35.01	1.07	0.70	0.12	0.067	1.24	1.12	3214.59
	Afterburner-1	134%	54007	6.62	1.07	9.57	0.13	0.026	0.87	0.78	3214.59
Notes: c(14), h, k(5)											

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 [a]	CO	VOC	HAPs	PM_{10}	$PM_{2.5}$	CO_2e [b]
F100-PW-200	Idle (Taxi)	3%	1006	6.21	1.07	24.06	2.05	1.294	2.49	2.24	3214.59
	Approach	13%	3251	17.93	1.07	1.22	0.05	0.003	2.37	2.13	3214.59
	Intermediate	45%	5651	26.55	1.07	0.38	0.07	0.018	1.58	1.42	3214.59
	Military	100%	8888	34.32	1.07	0.56	0.11	0.026	1.58	1.42	3214.59
	Afterburner-5	134%	40123	6.63	1.07	10.42	0.69	0.046	3.04	2.74	3214.59
Notes: c(5), h, k(5)											
F100-PW-220	Idle (Taxi)	---	2084	4.61	1.07	35.32	7.94	---	0.67	0.60	3214.59
	Approach	---	3837	12.50	1.07	1.92	5.12	---	0.70	0.63	3214.59
	Intermediate	---	5770	22.20	1.07	0.86	2.89	---	0.70	0.63	3214.59
	Military	---	9679	29.60	1.07	0.86	2.08	---	0.91	0.82	3214.59
	Afterburner-5	---	41682	8.20	1.07	11.87	1.60	---	0.38	0.35	3214.59
Notes: c(17), e, g, h, k(5)											
F100-PW-229	Idle (Taxi)	5%	1087	3.80	1.07	10.17	0.45	---	0.67 **(S)**	0.60 **(S)**	3214.59
	Approach	21%	3098	15.08	1.07	1.17	0.24	---	0.70 **(S)**	0.63 **(S)**	3214.59
	Intermediate	49%	5838	17.54	1.07	0.15	0.35	---	0.70 **(S)**	0.63 **(S)**	3214.59
	Military	86%	11490	29.29	1.07	0.33	0.31	---	0.91 **(S)**	0.82 **(S)**	3214.59
	Afterburner-1	102%	20793	14.30	1.07	21.51	5.26	---	0.38 **(S)**	0.35 **(S)**	3214.59
Notes: c(3), d(2) - $PM_{2.5}$ and PM_{10} data at all power settings, e, h, k(5)											
F101-GE-100	Idle (Taxi)	---	476	7.30	1.07	120.10	28.98	---	0.09	0.08	3214.59
	Approach	---	4533 **(S)**	9.16 **(S)**	1.07	1.03 **(S)**	0.02 **(S)**	---	4.21 **(S)**	3.74 **(S)**	3214.59
	Intermediate	---	6557 **(S)**	13.15 **(S)**	1.07	0.85 **(S)**	0.04 **(S)**	---	1.35 **(S)**	0.72 **(S)**	3214.59
	Military	---	10000	2.30	1.07	7.60	0.46	---	0.03	0.03	3214.59
	Afterburner	---	66747	4.60	1.07	16.70	0.12	---	0.05	0.05	3214.59
Notes: c(7), d(3) - All pollutants and fuel flow rates at Approach and Intermediate power settings, e, h, k(8)											
F101-GE-102	Idle (Taxi)	5%	1117	4.10	1.07	24.46	0.16	0.127	2.18	0.96	3214.59
	Approach	47%	4533	9.16	1.07	1.03	0.02	0.009	4.21	3.74	3214.59
	Intermediate	66%	6557	13.15	1.07	0.85	0.04	0.009	1.35	0.72	3214.59
	Military	77%	7828	12.83	1.07	0.83	0.12	0.014	1.68	1.20	3214.59
	Afterburner-1	106%	15314	16.92	1.07	43.49	1.46	0.969	2.87	2.40	3214.59
Notes: c(3), k(5)											
F103-GE-100, -101	Idle (Taxi)	7%	1706	3.60	1.07	61.80	25.07	---	0.21	0.19	3214.59
	Approach	30%	5238	9.50	1.07	4.30	1.15	---	0.11	0.10	3214.59
	Climb out	85%	15675	29.70	1.07	0.50	0.81	---	0.10	0.09	3214.59
	Takeoff	100%	19738	36.30	1.07	0.50	0.69	---	0.12	0.11	3214.59
Notes: c(2) - F103-GE-100 is the military designation of the CF6-50E2 engine and F103-GE-101 is the military designation of the CF6-50C2 engine, e, f, h, k(1)											
F108-CF-100, -201	Idle (Taxi)	9%	1136	3.88	1.07	23.65	0.19	0.125	2.07	0.16	3214.59
	Approach	30%	2547	5.73	1.07	8.57	0.06	0.027	1.55	0.76	3214.59
	Intermediate	70%	5650	11.04	1.07	2.32	0.03	0.008	0.65	0.36	3214.59
	Military	78%	6458	12.05	1.07	0.36	0.03	0.009	1.59	1.02	3214.59
Notes: c(3) - 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, k(5)											
F110-GE-100	Idle (Taxi)	3%	1111	3.77	1.07	24.11	0.22	0.164	2.60	1.12	3214.59
	Approach	44%	5080	9.78	1.07	5.77	0.03	0.015	1.37	0.91	3214.59
	Intermediate	66%	7332	16.92	1.07	3.47	0.05	0.025	0.58	0.41	3214.59
	Military	100%	11358	29.00	1.07	3.38	0.04	0.019	0.14	2.6E-04	3214.59
	Afterburner-1	113%	18088	14.26	1.07	67.41	1.21	0.697	3.35	2.98	3214.59
Notes: c(3), k(5)											

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 [a]	CO	VOC	HAPs	PM_{10}	$PM_{2.5}$	CO_2e [b]
F110-GE-129	Idle (Taxi)	4%	961	2.62	1.07	45.04	4.90	---	2.60 **(S)**	1.12 **(S)**	3214.59
	Approach	45%	4832	13.42	1.07	1.93	0.03 **(S)**	---	1.37 **(S)**	0.91 **(S)**	3214.59
	Intermediate	65%	6939	17.82	1.07	1.53	0.05 **(S)**	---	0.58 **(S)**	0.41 **(S)**	3214.59
	Military	76%	8611	20.34	1.07	1.17	0.93	---	0.14 **(S)**	2.6E-04 **(S)**	3214.59
	Afterburner-1	99%	15564	7.09	1.07	63.28	53.46	---	3.35 **(S)**	2.98 **(S)**	3214.59
Notes: c(3), d(4) - VOC at Approach and Intermediate settings and PM_{10} and $PM_{2.5}$ at all power settings, e, k(5)											
F110-GE-400	Idle (Taxi)	7%	1287	2.76	1.07	16.57	3.48	---	0.02	0.02	3214.59
	Approach	30%	5809	12.41	1.07	0.96	0.44	---	0.02	0.02	3214.59
	Climb out	70%	11868	58.57	1.07	0.84	0.38	---	0.26	0.23	3214.59
	Takeoff	100%	11833	28.47	1.07	0.84	0.38	---	0.31	0.28	3214.59
Notes: c(13), j, k(8)											
F113-RR-100	Idle (Taxi)	7%	1008	3.60	1.07	31.77	4.24	---	0.16	0.15	3214.59
	Approach	30%	2206	7.20	1.07	2.65	0.21	---	0.22	0.20	3214.59
	Climb out	85%	5762	17.30	1.07	0.63	0.14	---	0.24	0.22	3214.59
	Takeoff	100%	7071	22.70	1.07	0.12	0.10	---	0.23	0.21	3214.59
Notes: c(2) - F113-RR-100 is the military designation of the SPEY Mk511 engine, e, f, h, k(8)											
F117-PW-100	Idle (Taxi)	4%	978	3.76	1.07	22.70	0.37	0.291	10.67	8.75	3214.59
	Approach	31%	4645	15.49	1.07	0.51	0.05	0.019	5.53	5.10	3214.59
	Intermediate	68%	10408	32.72	1.07	0.32	0.04	0.012	2.31	1.42	3214.59
	Takeoff	---	13905 **(S)**	35.04 **(S)**	1.07	0.32 **(S)**	0.01 **(S)**	0.013 **(C)**	0.06 **(S)**	0.05 **(S)**	3214.59
Notes: c(3) - F117-PW-100 is the military designation of the PW2040 engine, d(1) - HAPs at Takeoff setting only, d(16) - All remaining pollutants at Takeoff setting, k(5)											
F118-GE-100	Idle (Taxi)	---	1097	4.30	1.07	20.98	0.29	0.234	1.25	1.03	3214.59
	Approach	---	3773	11.09	1.07	2.02	0.05	0.017	4.70	2.32	3214.59
	Intermediate	---	6350	18.01	1.07	0.85	0.03	0.013	3.05	2.72	3214.59
	Military	---	10887	33.12	1.07	0.65	0.03	0.007	1.64	1.48	3214.59
Notes: c(3), k(5)											
F119-PW-100	Idle (Taxi)	10%	1377	3.01	1.07	48.15	1.67	1.492	2.42	1.76	3214.59
	Approach	20%	2740	6.59	1.07	7.92	0.05	0.047	1.96	1.73	3214.59
	Intermediate	70%	10110	12.40	1.07	2.14	0.03	0.030	1.40	1.09	3214.59
	Military	100%	18612	19.81	1.07	0.75	0.01	0.010	1.12	0.97	3214.59
	Afterburner	150%	50170	7.37	1.07	16.10	1.8E-03 **(C)**	0.002 **(C)**	0.85 **(C)**	0.75 **(C)**	3214.59
Notes: c(4), d(1) - VOC, HAP, PM_{10}, and $PM_{2.5}$ pollutants at Afterburner setting only, k(5)											
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	1.07	106.08	18.75	---	0.49	0.44	3214.59
	Approach	30%	3735	4.99	1.07	21.46	1.05	---	0.30	0.27	3214.59
	Intermediate	70%	7125	9.48	1.07	8.35	0.43	---	0.30	0.27	3214.59
	Military	100%	8094	10.78	1.07	6.93	0.43	---	0.32	0.29	3214.59
Notes: c(13), j, k(8)											

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 [a]	CO	VOC	HAPs	PM_{10}	$PM_{2.5}$	CO_2e [b]
F402-RR-408	Idle (Taxi)	7%	1449	2.20	1.07	39.72	2.41	---	0.16	0.14	3214.59
	Approach	30%	3974	5.02	1.07	16.57	0.46	---	0.19	0.17	3214.59
	Intermediate	70%	7290	7.55	1.07	9.79	0.20	---	0.02	0.02	3214.59
	Military	100%	8494	8.38	1.07	8.58	0.20	---	0.21	0.19	3214.59
Notes: c(13), j, k(8)											
F404-GE-102	Idle (Taxi)	6% **(S)**	685 **(S)**	1.70 **(S)**	1.07	110.18 **(S)**	3.39 **(S)**	2.798 **(S)**	4.47 **(S)**	3.10 **(S)**	3214.59
	Approach	38% **(S)**	3111 **(S)**	7.86 **(S)**	1.07	2.02 **(S)**	0.04 **(S)**	0.022 **(S)**	1.46 **(S)**	0.87 **(S)**	3214.59
	Intermediate	79% **(S)**	6464 **(S)**	17.03 **(S)**	1.07	1.54 **(S)**	0.07 **(S)**	0.026 **(S)**	1.57 **(S)**	0.90 **(S)**	3214.59
	Military	91% **(S)**	7739 **(S)**	25.83 **(S)**	1.07	1.48 **(S)**	0.02 **(S)**	0.012 **(S)**	1.61 **(S)**	0.89 **(S)**	3214.59
Notes: c(3), d(24), k(5)											
F404-GE-400	Idle (Taxi)	6%	685	1.70	1.07	110.18	3.39	2.798	4.47	3.10	3214.59
	Approach	38%	3111	7.86	1.07	2.02	0.04	0.022	1.46	0.87	3214.59
	Intermediate	79%	6464	17.03	1.07	1.54	0.07	0.026	1.57	0.90	3214.59
	Military	91%	7739	25.83	1.07	1.48	0.02	0.012	1.61	0.89	3214.59
	Afterburner-3	114%	15851	5.43	1.07	50.31	1.85	1.099	3.57	3.21	3214.59
Notes: c(3), k(5)											
F404-GE-402	Ground Idle	---	624	1.16	1.07	137.34	66.91	---	13.79	13.79	3214.59
	Flight Idle	---	815	2.01	1.07	123.52	51.18	---	12.38	12.38	3214.59
	Average Intermediate	---	10467	25.16	1.07	1.05	0.36	---	2.81	2.81	3214.59
	Max Afterburner	---	31764	9.22	1.07	23.12	0.15	---	1.49 **(C)**	1.34 **(C)**	3214.59
Notes: c(18), d(1), e, h, k(4)											
F404-GE-F1D2	Idle (Taxi)	6%	685	1.70	1.07	110.18	3.39	2.798	4.47	3.10	3214.59
	Approach	38%	3111	7.86	1.07	2.02	0.04	0.022	1.46	0.87	3214.59
	Intermediate	79%	6464	17.03	1.07	1.54	0.07	0.026	1.57	0.90	3214.59
	Military	91%	7739	25.83	1.07	1.48	0.02	0.012	1.61	0.89	3214.59
Notes: c(3), k(5)											
F414-GE-400	Ground Idle	---	695	3.18	1.07	98.18	75.13	---	12.64	12.64	3214.59
	Flight Idle	---	821	3.47	1.07	77.90	48.65	---	12.37	12.37	3214.59
	Intermediate	---	11768	38.17	1.07	0.70	0.14	---	2.78	2.78	3214.59
	Max Afterburner	---	35763	9.67	1.07	275.00	5.60	---	1.52 **(C)**	1.37 **(C)**	3214.59
Notes: c(19), d(1), e, g, h, k(4)											
GE90-76B	Idle (Taxi)	7%	2048	5.10	1.07	34.12	3.69	---	0.07	0.06	3214.59
	Approach	30%	5857	13.76	1.07	2.77	0.08	---	0.05	0.04	3214.59
	Climb out	85%	18103	32.43	1.07	0.32	0.03	---	0.04	0.04	3214.59
	Takeoff	100%	22191	40.25	1.07	0.31	0.03	---	0.04	0.04	3214.59
Notes: c(2), e, f, h, k(1)											
GE90-77B	Idle (Taxi)	7%	2064	5.12	1.07	33.81	3.63	---	0.07	0.06	3214.59
	Approach	30%	5913	13.87	1.07	2.71	0.08	---	0.05	0.04	3214.59
	Climb out	85%	18326	32.78	1.07	0.32	0.03	---	0.04	0.04	3214.59
	Takeoff	100%	22460	40.83	1.07	0.31	0.03	---	0.04	0.04	3214.59
Notes: c(2), e, f, h, k(1)											

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 [a]	CO	VOC	HAPs	PM_{10}	$PM_{2.5}$	CO_2e [b]
GE90-85B	Idle (Taxi)	7%	2151	5.33	1.07	31.34	3.22	---	0.06	0.06	3214.59
	Approach	30%	6381	14.77	1.07	2.16	0.07	---	0.05	0.04	3214.59
	Climb out	85%	20262	36.35	1.07	0.31	0.03	---	0.04	0.04	3214.59
	Takeoff	100%	24849	45.54	1.07	0.30	0.05	---	0.05	0.04	3214.59
Notes: c(2), e, f, h, k(1)											
GE90-90B	Idle (Taxi)	7%	2310	6.00	1.07	13.21	0.49	---	0.06	0.05	3214.59
	Approach	30%	6968	16.94	1.07	1.16	0.06	---	0.06	0.05	3214.59
	Climb out	85%	21691	39.50	1.07	0.13	0.05	---	0.05	0.05	3214.59
	Takeoff	100%	26572	52.48	1.07	0.12	0.05	---	0.06	0.05	3214.59
Notes: c(2), e, f, h, k(1)											
GE90-94B	Idle (Taxi)	7%	2349	6.09	1.07	12.69	0.47	---	0.06	0.05	3214.59
	Approach	30%	7206	17.38	1.07	1.07	0.06	---	0.06	0.05	3214.59
	Climb out	85%	22603	41.74	1.07	0.12	0.05	---	0.05	0.05	3214.59
	Takeoff	100%	27889	56.41	1.07	0.12	0.05	---	0.06	0.05	3214.59
Notes: c(2), e, f, h, k(1)											
GE90-110B1	Idle (Taxi)	7%	2937	5.11	1.07	40.59	5.23	---	0.07	0.07	3214.59
	Approach	30%	8571	15.78	1.07	2.29	0.07	---	0.05	0.04	3214.59
	Climb out	85%	27540	33.85	1.07	0.07	0.03	---	0.05	0.04	3214.59
	Takeoff	100%	34286	44.44	1.07	0.07	0.03	---	0.05	0.05	3214.59
Notes: c(2), e, f, h, k(1)											
GE90-115B	Idle (Taxi)	7%	3016	5.19	1.07	39.11	4.88	---	0.07	0.06	3214.59
	Approach	30%	8968	16.50	1.07	1.98	0.07	---	0.05	0.04	3214.59
	Climb out	85%	29127	35.98	1.07	0.07	0.03	---	0.05	0.04	3214.59
	Takeoff	100%	37222	50.34	1.07	0.08	0.05	---	0.06	0.05	3214.59
Notes: c(2), e, f, h, k(1)											
GEnx-1B64	Idle (Taxi)	7%	1579	4.24	1.07	21.62	0.93	---	0.04	0.04	3214.59
	Approach	30%	4794	9.03	1.07	2.99	0.07	---	0.08	0.07	3214.59
	Climb out	85%	14770	14.61	1.07	0.38	0.02	---	0.04	0.04	3214.59
	Takeoff	100%	17976	24.82	1.07	0.18	0.02	---	0.04	0.04	3214.59
Notes: c(2), e, f, h, k(1)											
GEnx-1B64/P1	Idle (Taxi)	7%	1667	4.37	1.07	19.73	0.74	---	0.04	0.04	3214.59
	Approach	30%	4905	9.11	1.07	2.91	0.07	---	0.07	0.06	3214.59
	Climb out	85%	14889	15.36	1.07	0.36	0.02	---	0.04	0.04	3214.59
	Takeoff	100%	18079	25.74	1.07	0.18	0.02	---	0.04	0.04	3214.59
Notes: c(2), e, f, h, k(1)											
GEnx-1B67	Idle (Taxi)	7%	1611	4.30	1.07	20.70	0.83	---	0.04	0.04	3214.59
	Approach	30%	4960	9.29	1.07	2.76	0.07	---	0.08	0.07	3214.59
	Climb out	85%	15397	16.26	1.07	0.30	0.02	---	0.04	0.04	3214.59
	Takeoff	100%	18794	28.56	1.07	0.17	0.02	---	0.04	0.04	3214.59
Notes: c(2), e, f, h, k(1)											

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 [a]	CO	VOC	HAPs	PM_{10}	$PM_{2.5}$	CO_2e [b]
GEnx-1B67/P1	Idle (Taxi)	7%	1698	4.43	1.07	18.94	0.67	---	0.04	0.04	3214.59
	Approach	30%	5071	9.39	1.07	2.68	0.07	---	0.08	0.07	3214.59
	Climb out	85%	15508	17.04	1.07	0.29	0.02	---	0.04	0.04	3214.59
	Takeoff	100%	18889	29.34	1.07	0.18	0.02	---	0.04	0.04	3214.59
Notes: c(2), e, f, h, k(1)											
GEnx-1B70, -1B70/P1, -1B70/75/P1	Idle (Taxi)	7%	1738	4.50	1.07	18.05	0.60	---	0.04	0.04	3214.59
	Approach	30%	5270	9.73	1.07	2.42	0.06	---	0.08	0.07	3214.59
	Climb out	85%	16278	19.30	1.07	0.24	0.02	---	0.04	0.04	3214.59
	Takeoff	100%	19881	34.61	1.07	0.17	0.02	---	0.04	0.04	3214.59
Notes: c(2), e, f, h, k(1)											
GEnx-2B67	Idle (Taxi)	7%	1714	4.43	1.07	18.95	0.66	---	0.04	0.04	3214.59
	Approach	30%	5564	9.58	1.07	2.53	0.07	---	0.08	0.07	3214.59
	Climb out	85%	15968	17.94	1.07	0.28	0.02	---	0.04	0.04	3214.59
	Takeoff	100%	19453	31.20	1.07	0.17	0.02	---	0.04	0.04	3214.59
Notes: c(2), e, f, h, k(1)											
GEnx-2B67B	Idle (Taxi)	7%	1611	4.66	1.07	16.39	0.67	---	0.04	0.04	3214.59
	Approach	30%	4183	9.27	1.07	2.81	0.07	---	0.04	0.04	3214.59
	Climb out	85%	12333	11.54	1.07	1.73	0.02	---	0.04	0.04	3214.59
	Takeoff	100%	14921	17.22	1.07	0.32	0.02	---	0.04	0.04	3214.59
Notes: c(2), e, f, h, k(1)											
GP7270	Idle (Taxi)	7%	1857	5.24	1.07	33.58	4.65	---	0.09	0.08	3214.59
	Approach	30%	5643	12.90	1.07	1.27	0.08	---	0.05	0.05	3214.59
	Climb out	85%	17214	31.37	1.07	0.09	0.03	---	0.06	0.05	3214.59
	Takeoff	100%	20929	41.73	1.07	0.11	0.03	---	0.06	0.05	3214.59
Notes: c(2), e, f, h, k(1)											
GTSIO-520-F	Idle (Taxi)	---	25	0.04	1.07	1293.70	78.29	---	0.50	0.45	3214.59
	Approach	---	99	1.39	1.07	1261.60	15.39	---	0.40	0.36	3214.59
	Climb out	---	205	0.24	1.07	1470.90	19.12	---	0.70	0.63	3214.59
	Takeoff	---	260	0.36	1.07	1442.10	14.21	---	0.10	0.09	3214.59
Notes: c(16), e, g, h, k(8)											
GTSIO-520-H	Idle (Taxi)	<40%	22	0.88	1.07	720.50	47.31	---	0.50	0.45	3214.59
	Pattern	40%	102	7.70	1.07	697.40	7.52	---	0.40	0.36	3214.59
	Climb out	75%	145	9.76	1.07	728.75	7.04	---	0.70	0.63	3214.59
	Takeoff	100%	256	1.03	1.07	1045.66	11.66	---	0.10	0.09	3214.59
Notes: c(8), e, i, k(8)											
GTSIO-520-K, -520-M	Idle (Taxi)	---	25	0.04	1.07	1293.70	78.29	---	0.50	0.45	3214.59
	Approach	---	99	1.39	1.07	1261.60	15.39	---	0.40	0.36	3214.59
	Climb out	---	205	0.24	1.07	1470.90	19.12	---	0.70	0.63	3214.59
	Takeoff	---	260	0.36	1.07	1442.10	14.21	---	0.10	0.09	3214.59
Notes: c(16), e, g, h, k(8)											

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 [a]	CO	VOC	HAPs	PM_{10}	$PM_{2.5}$	CO_2e [b]
IO-360-A	Idle (Taxi)	32%	11	0.40	1.07	956.24	278.09	---	0.76	0.68	3214.59
	Approach	66%	22	10.62	1.07	727.75	85.31	---	0.12	0.11	3214.59
	Climb out	100%	85	17.65	1.07	840.53	55.11	---	0.30	0.27	3214.59
	Takeoff	100%	85	18.08	1.07	842.50	52.09	---	0.31	0.28	3214.59
Notes: c(16), e, g, h, k(7)											
IO-360-B	Idle (Taxi)	5-10%	8	1.16	1.07	897.40	56.58	---	0.76 **(S)**	0.68 **(S)**	3214.59
	Approach	30%	37	10.16	1.07	691.26	11.15	---	0.12 **(S)**	0.11 **(S)**	3214.59
	Climb out	75%	72	4.59	1.07	983.26	9.38	---	0.30 **(S)**	0.27 **(S)**	3214.59
	Takeoff	100%	103	1.99	1.07	1199.03	11.50	---	0.31 **(S)**	0.28 **(S)**	3214.59
Notes: c(1), d(5) - PM_{10} and $PM_{2.5}$ at all power settings, e, j, k(8)											
IO-360-B1E, -360-C, -360-C1C	Idle (Taxi)	32%	11	0.40	1.07	956.24	278.09	---	0.76	0.68	3214.59
	Approach	66%	22	10.62	1.07	727.75	85.31	---	0.12	0.11	3214.59
	Climb out	100%	85	17.65	1.07	840.53	55.11	---	0.30	0.27	3214.59
	Takeoff	100%	85	18.08	1.07	842.50	52.09	---	0.31	0.28	3214.59
Notes: c(16), e, g, h, k(7)											
IO-360-C1C6	Idle (Taxi)	32%	12	0.28	1.07	882.98	263.40	---	0.30	0.27	3214.59
	Approach	61%	26	3.36	1.07	938.16	123.88	---	0.06	0.06	3214.59
	Climb out	101%	81	6.63	1.07	753.23	53.27	---	0.09	0.08	3214.59
	Takeoff	101%	81	7.48	1.07	757.17	47.22	---	0.10	0.09	3214.59
Notes: c(16), e, g, h, k(7)											
IO-360-CB	Idle (Taxi)	32%	11	0.40	1.07	956.24	278.09	---	0.76	0.68	3214.59
	Approach	66%	22	10.62	1.07	727.75	85.31	---	0.12	0.11	3214.59
	Climb out	100%	85	17.65	1.07	840.53	55.11	---	0.30	0.27	3214.59
	Takeoff	100%	85	18.08	1.07	842.50	52.09	---	0.31	0.28	3214.59
Notes: c(16), e, g, h, k(7)											
IO-360-D	Idle (Taxi)	---	30	1.10	1.07	848.00	166.75	---	60.00	54.00	3214.59
	Approach	---	50	4.00	1.07	912.45	54.17	---	47.95	43.16	3214.59
	Intermediate	---	70	6.60	1.07	972.00	20.01	---	40.00	36.00	3214.59
	Military	---	90	5.80	1.07	1030.00	25.88	---	20.00	18.00	3214.59
Notes: c(7), e, k(8)											
IO-360-D34, -360-DB, -360-G, -360-GB	Idle (Taxi)	32%	11	0.40	1.07	956.24	278.09	---	0.76	0.68	3214.59
	Approach	66%	22	10.62	1.07	727.75	85.31	---	0.12	0.11	3214.59
	Climb out	100%	85	17.65	1.07	840.53	55.11	---	0.30	0.27	3214.59
	Takeoff	100%	85	18.08	1.07	842.50	52.09	---	0.31	0.28	3214.59
Notes: c(16), e, g, h, k(7)											
J33-A-35	Idle (Taxi)	---	1190	1.50	1.07	127.00	22.43	---	0.73	0.66	3214.59
	Approach	---	1984	1.90	1.07	84.60	7.48	---	0.57	0.51	3214.59
	Intermediate	---	4762	2.70	1.07	49.10	1.50	---	0.02	0.02	3214.59
	Military	---	5556	3.60	1.07	31.30	0.58	---	0.02	0.02	3214.59
Notes: c(7), e, g, h, k(8)											

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 [a]	CO	VOC	HAPs	PM_{10}	$PM_{2.5}$	CO_2e [b]
J52-P-6B	Idle (Taxi)	<35%	714	2.07	1.07	86.37	27.46	---	19.94	17.95	3214.59
	3000lb Thrust	35% **(C)**	2301	3.91	1.07	16.57	0.94	---	0.18 **(S)**	0.16 **(S)**	3214.59
	75% Thrust	75%	3977	5.84	1.07	6.00	0.75	---	0.18 **(S)**	0.16 **(S)**	3214.59
	Military	>75%	6328	9.00	1.07	3.01	0.38	---	7.75	6.98	3214.59
Notes: c(9), d(6) - PM_{10} and $PM_{2.5}$ at 3000lb and 75% thrust power settings only, e, g, h, j - Percent thrust for 3000lb setting assumes maximum thrust of 8500lb for this engine, k(8)											
J52-P-8B	Idle (Taxi)	<32%	680	1.79	1.07	63.78	48.53	---	0.18 **(S)**	0.16 **(S)**	3214.59
	3000lb Thrust	32% **(C)**	2300	6.34	1.07	10.54	1.98	---	0.18 **(S)**	0.16 **(S)**	3214.59
	75% Thrust	75%	4320	10.10	1.07	3.00	0.67	---	0.13 **(S)**	0.12 **(S)**	3214.59
	Military	>75%	7370	13.05	1.07	0.71	1.07	---	0.13 **(S)**	0.12 **(S)**	3214.59
Notes: c(9), d(6) - PM_{10} and $PM_{2.5}$ at all power settings, e, j - Percent thrust for 3000lb setting assumes maximum thrust of 9300lb for this engine, k(8)											
J52-P-408	Idle (Taxi)	7%	1466	2.79	1.07	50.10	3.62	---	0.18	0.16	3214.59
	Approach	30%	3325	7.25	1.07	16.07	0.29	---	0.18	0.16	3214.59
	Intermediate	70%	6502	7.53	1.07	7.70	0.03	---	0.13	0.12	3214.59
	Military	100%	6483	7.53	1.07	7.70	0.03	---	0.13	0.12	3214.59
Notes: c(13), e, j, k(8)											
J57-P-10	Idle (Taxi)	<75%	1100	1.87	1.07	80.52	111.09	---	0.16 **(S)**	0.14 **(S)**	3214.59
	75% Thrust	75%	5670	7.40	1.07	3.21	0.87	---	0.93 **(S)**	0.84 **(S)**	3214.59
	Normal Rated	76-99%	7250	9.00	1.07	1.79	1.15	---	1.92 **(S)**	1.73 **(S)**	3214.59
	Military	100%	8370	10.37	1.07	1.16	0.99	---	1.72 **(S)**	1.55 **(S)**	3214.59
Notes: c(9), d(7) - PM_{10} and $PM_{2.5}$ at all power settings, e, j - Assumes 100% thrust at Military setting, k(8)											
J57-P-19W	Idle (Taxi)	---	952	2.20	1.07	79.00	88.55	---	0.16	0.14	3214.59
	Approach	---	3333	5.80	1.07	7.90	1.61	---	0.93	0.84	3214.59
	Intermediate	---	6508	9.50	1.07	2.40	0.23	---	1.92	1.73	3214.59
	Military	---	7460	11.00	1.07	1.90	0.12	---	1.72	1.55	3214.59
Notes: c(7), e, g, h, k(8)											
J57-P-22	Idle (Taxi)	---	1087	2.48	1.07	59.25	59.03	---	7.64	6.87	3214.59
	Approach	---	1693	2.95	1.07	23.51	14.26	---	5.32 **(C)**	4.79 **(C)**	3214.59
	Climb out	---	8358	11.16	1.07	1.78	0.74	---	1.44	1.29	3214.59
	Takeoff	---	8358	11.16	1.07	1.78	0.74	---	1.44	1.29	3214.59
Notes: c(1), d(1), e, g, h, k(8)											
J57-P-420	Idle (Taxi)	<30%	1322	1.53	1.07	80.74	87.93	---	0.16 **(S)**	0.14 **(S)**	3214.59
	30% Thrust	30%	3413	4.45	1.07	14.83	5.22	---	0.93 **(S)**	0.84 **(S)**	3214.59
	75% Thrust	75%	5767	6.99	1.07	4.32	1.25	---	1.92 **(S)**	1.73 **(S)**	3214.59
	Intermediate	75-100%	10570	12.97	1.07	0.34	0.56	---	1.72 **(S)**	1.55 **(S)**	3214.59
	Afterburner	>100%	39721	5.16	1.07	14.20	2.92	---	3.10 **(C)**	2.80 **(C)**	3214.59
Notes: c(9), d(1) - PM_{10} and $PM_{2.5}$ at Afterburner power setting only, d(7) - PM_{10} and $PM_{2.5}$ at all other power settings, e, j, k(8)											
J57-P/F-43WB	Idle (Taxi)	---	952	2.20	1.07	78.00	86.25	---	0.14	0.13	3214.59
	Approach	---	1825	4.45	1.07	16.85	6.33	---	0.41	0.37	3214.59
	Intermediate	---	6667	9.90	1.07	2.30	0.12	---	1.23	1.11	3214.59
	Military	---	7778	11.00	1.07	1.50	0.12	---	1.74	1.57	3214.59
Notes: c(7), e, g, h, k(8)											

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 [a]	CO	VOC	HAPs	PM_{10}	$PM_{2.5}$	CO_2e [b]
J57-P/F-59W	Idle (Taxi)	---	1270	2.40	1.07	65.00	60.84	---	0.13	0.12	3214.59
	Approach	---	1825	3.30	1.07	32.50	16.33	---	0.22	0.20	3214.59
	Intermediate	---	3889	6.10	1.07	8.90	1.27	---	0.60	0.54	3214.59
	Military	---	7937	11.30	1.07	2.40	0.23	---	0.84	0.76	3214.59
Notes: c(7), e, g, h, k(8)											
J60-P-3A	Idle (Taxi)	---	556	1.50	1.07	70.00	10.58	---	0.02	0.02	3214.59
	Approach	---	556	1.70	1.07	50.50	6.44	---	0.02	0.02	3214.59
	Intermediate	---	1429	4.00	1.07	5.80	0.23	---	0.23	0.21	3214.59
	Military	---	3413	4.60	1.07	4.00	0.12	---	0.17	0.15	3214.59
Notes: c(7), e, g, h, k(8)											
J60-P-5A, -5B	Idle (Taxi)	---	476	1.50	1.07	70.00	10.58	---	0.02	0.02	3214.59
	Approach	---	556	1.70	1.07	50.50	6.44	---	0.02	0.02	3214.59
	Intermediate	---	1429	4.00	1.07	5.80	0.23	---	0.23	0.21	3214.59
	Military	---	2460	4.60	1.07	4.00	0.12	---	0.17	0.15	3214.59
Notes: c(7), e, g, h, k(8)											
J65-W-5F	Idle (Taxi)	---	1320	2.46	1.07	47.16	11.25	---	0.18 **(S)**	0.16 **(S)**	3214.59
	7450 rpm	---	4370	7.30	1.07	12.61	1.09	---	0.18 **(S)**	0.16 **(S)**	3214.59
	8000 rpm	---	5970	5.71	1.07	7.39	0.83	---	0.13 **(S)**	0.12 **(S)**	3214.59
	8300 rpm	---	7040	5.15	1.07	4.57	0.38	---	0.13 **(S)**	0.12 **(S)**	3214.59
	Military	---	6946	5.23	1.07	5.31	0.70	---	0.13 **(S)**	0.12 **(S)**	3214.59
Notes: c(9), d(6) - PM_{10} and $PM_{2.5}$ at all power settings, e, k(8)											
J65-W-20	Idle (Taxi)	---	1333	2.78	1.07	50.19	4.31	---	0.18 **(S)**	0.16 **(S)**	3214.59
	75% rpm	---	2346	4.82	1.07	21.82	1.57	---	0.18 **(S)**	0.16 **(S)**	3214.59
	85% rpm	---	3260	7.27	1.07	16.13	0.32	---	0.18 **(S)**	0.16 **(S)**	3214.59
	90% rpm	---	3951	7.97	1.07	14.30	0.15	---	0.18 **(S)**	0.16 **(S)**	3214.59
	Intermediate (Mil)	---	6421	7.55	1.07	7.72	0.04	---	0.13 **(S)**	0.12 **(S)**	3214.59
Notes: c(1), d(6) - PM_{10} and $PM_{2.5}$ at all power settings, e, k(8)											
J69-T-25	Idle (Taxi)	4%	167	0.80	1.07	160.08	2.33	1.712	3.15	1.47	3214.59
	Approach	30%	568 **(C)**	1.71 **(C)**	1.07	56.03 **(C)**	0.14 **(C)**	0.233 **(C)**	1.52 **(C)**	0.58 **(C)**	3214.59
	Intermediate	63%	872	2.92	1.07	38.27	0.06	0.038	0.94	0.39	3214.59
	Military	84%	1085	4.53	1.07	32.86	0.03	0.015	0.67	0.38	3214.59
Notes: c(3), d(1) - All pollutants at Approach power setting only, g, h, k(5)											
J75-P-17	Idle (Taxi)	---	1700	1.29	1.07	76.18	65.41	---	0.47	0.42	3214.59
	Approach	---	11300	11.90	1.07	1.40	0.11	---	0.10	0.09	3214.59
	Intermediate	---	12386 **(C)**	9.79 **(C)**	1.07	0.94 **(C)**	0.20 **(C)**	---	0.64 **(C)**	0.58 **(C)**	3214.59
	Military	---	13200	8.20	1.07	0.60	0.26	---	1.05	0.95	3214.59
	Afterburner	---	53700	4.10	1.07	12.00	0.14	---	1.73 **(C)**	1.57 **(C)**	3214.59
Notes: c(1), d(1) - PM_{10} and $PM_{2.5}$ at Afterburner power setting only, e, g, h, j - Assumes military setting has maximum percent thrust of 100%, k(8)											
J79-GE-8D	Idle (Taxi)	7%	1325	2.36	1.07	55.59	16.14	---	0.44	0.40	3214.59
	75% rpm	30%	1550	2.97	1.07	30.55	4.20	---	0.90	0.81	3214.59
	87% rpm	70%	8310	8.44	1.07	2.56	0.12	---	0.15	0.14	3214.59
	Military	100%	9544	10.42	1.07	2.56	0.12	---	0.18	0.16	3214.59
	Afterburner	110-150%	34647	4.71	1.07	8.14	0.19	---	0.56	0.50	3214.59
Notes: c(13), e, j, k(8)											

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 [a]	CO	VOC	HAPs	PM_{10}	$PM_{2.5}$	CO_2e [b]
J79-GE-10D	Idle (Taxi)	7%	1375	1.33	1.07	111.18	37.37	---	0.88	0.79	3214.59
	Approach	30%	3490	4.22	1.07	20.00	2.80	---	0.63	0.57	3214.59
	Intermediate	70%	7674	8.24	1.07	4.69	1.34	---	0.72	0.65	3214.59
	Military	100%	10097	10.24	1.07	2.83	1.34	---	0.72	0.65	3214.59
	Afterburner	110-150%	35339	4.50	1.07	8.63	1.01	---	0.37	0.33	3214.59
Notes: c(13), e, j, k(8)											
J79-GE-15	Idle (Taxi)	---	1111	2.50	1.07	57.00	13.80	---	0.50	0.45	3214.59
	Approach	---	3492	4.80	1.07	9.40	1.27	---	1.80	1.62	3214.59
	Intermediate	---	5397	5.60	1.07	4.60	0.35	---	2.80	2.52	3214.59
	Military	---	8889	8.90	1.07	2.20	0.23	---	2.20	1.98	3214.59
	Afterburner	---	32223	9.10	1.07	4.00	0.01	---	0.15	0.14	3214.59
Notes: c(7), e, g, h, k(8)											
J79-GE-17	Idle (Taxi)	---	1032	2.70	1.07	66.00	26.57	---	0.18	0.16	3214.59
	Approach	---	3492	4.50	1.07	15.40	0.58	---	0.51	0.46	3214.59
	Intermediate	---	6984	5.80	1.07	7.80	0.12	---	0.72	0.65	3214.59
	Military	---	9841	10.60	1.07	5.20	0.12	---	0.92	0.83	3214.59
	Afterburner	---	34921	8.10	1.07	4.00	0.01	---	0.15	0.14	3214.59
Notes: c(7), e, g, h, k(8)											
J85-GE-5A	Idle (Taxi)	4%	434	1.34	1.07	250.22	2.00	1.306	4.70	4.02	3214.59
	Approach	13% **(C)**	875 **(C)**	1.45 **(C)**	1.07	115.08 **(C)**	1.31 **(C)**	0.851 **(C)**	2.42 **(C)**	0.81 **(C)**	3214.59
	Intermediate	15%	950	1.47	1.07	104.02	0.92	0.811	1.79	0.69	3214.59
	Military	88%	2740	2.64	1.07	32.91	0.12	0.094	1.13	0.04	3214.59
	Afterburner-1	116%	8138	1.98	1.07	13.46	0.05	0.038	0.25	0.09	3214.59
Notes: c(3), d(1) - All pollutants at Approach power setting only, k(5)											
J85-GE-5F	Idle (Taxi)	---	524	1.34	1.07	178.05	34.46	---	4.70 **(S)**	4.02 **(S)**	3214.59
	75% rpm	---	798	2.13	1.07	78.20	2.59	---	3.01 **(C)**	1.84 **(C)**	3214.59
	85% rpm	---	1098	2.73	1.07	58.01	1.36	---	2.15 **(C)**	1.20 **(C)**	3214.59
	Intermediate	---	1297	2.31	1.07	43.02	3.99	---	1.79 **(S)**	0.69 **(S)**	3214.59
	Afterburner	---	8470	2.60	1.07	29.00	0.92	---	0.25 **(S)**	0.09 **(S)**	3214.59
Notes: c(1), d(1) - PM_{10} and $PM_{2.5}$ at 75% rpm and 85% rpm power settings, d(10) - PM_{10} and $PM_{2.5}$ for remaining power settings, e, k(8)											
J85-GE-5H	Idle (Taxi)	---	434	1.14	1.07	211.97	39.12	---	4.70	4.02	3214.59
	Approach	---	875 **(C)**	1.64 **(C)**	1.07	148.04 **(C)**	6.56 **(C)**	---	2.42 **(C)**	0.81 **(C)**	3214.59
	Intermediate	---	950	1.74	1.07	123.43	6.51	---	1.79	0.69	3214.59
	Military	---	2740	2.92	1.07	36.40	0.67	---	1.13	0.04	3214.59
	Afterburner	---	8138	2.09	1.07	14.19	2.63	---	0.25	0.09	3214.59
Notes: c(10), d(1) - All pollutants at Approach setting, g, k(8)											
J85-GE-5M	Idle (Taxi)	---	525	0.79	1.07	191.41	4.01	3.111	7.02	4.90	3214.59
	Approach	---	703 **(C)**	1.09 **(C)**	1.07	110.79 **(C)**	1.50 **(C)**	1.117 **(C)**	8.83 **(C)**	6.52 **(C)**	3214.59
	Intermediate	---	1045	1.81	1.07	48.90	0.54	0.450	12.30	9.63	3214.59
	Military	---	2550	1.65	1.07	25.35	0.04	0.032	4.25	2.43	3214.59
	Afterburner	---	7695	1.21	1.07	10.19	0.05 **(S)**	0.038 **(S)**	0.25 **(S)**	0.09 **(S)**	3214.59
Notes: c(10), d(1) - All pollutants at Approach setting, d(10) - VOC, HAPs, PM_{10} and $PM_{2.5}$ at Afterburner power setting only, k(6)											
J85-GE-5R	Idle (Taxi)	---	520	1.08	1.07	177.45	16.80	---	4.70 **(S)**	4.02 **(S)**	3214.59
	Approach	---	689 **(C)**	0.91 **(C)**	1.07	119.23 **(C)**	7.96 **(C)**	---	2.42 **(S)**	0.81 **(S)**	3214.59
	Intermediate	---	1030	0.70	1.07	65.07	2.78	---	1.79 **(S)**	0.69 **(S)**	3214.59
	Military	---	2220	1.92	1.07	30.99	0.75	---	1.13 **(S)**	0.04 **(S)**	3214.59
	Afterburner	---	7695	6.23	1.07	53.43	6.97	---	0.25 **(S)**	0.09 **(S)**	3214.59
Notes: c(10), d(1) - Fuel flow, NO_X, CO, and VOC at Approach setting, d(10) - PM_{10} and $PM_{2.5}$ at all power settings, e, k(6)											

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 [a]	CO	VOC	HAPs	PM_{10}	$PM_{2.5}$	CO_2e [b]
J85-GE-13	Idle (Taxi)	---	556	1.30	1.07	178.00	34.50	---	3.0E-03	2.7E-03	3214.59
	Approach	---	1230	2.05	1.07	58.30	5.69	---	0.01	0.01	3214.59
	Intermediate	---	2222	2.30	1.07	43.00	4.03	---	0.01	0.01	3214.59
	Military	---	2778	2.60	1.07	29.00	0.92	---	0.02	0.02	3214.59
	Afterburner	---	8968	2.00	1.07	26.00	0.08	---	0.01	0.01	3214.59
Notes: c(7), e, g, h, i, k(8)											
J85-GE-17A	Idle (Taxi)	---	556	1.30	1.07	178.00	34.50	---	3.0E-03 **(S)**	2.7E-03 **(S)**	3214.59
	Approach	---	1230	2.05	1.07	58.30	5.69	---	0.01 **(S)**	0.01 **(S)**	3214.59
	Intermediate	---	2222	2.30	1.07	43.00	4.03	---	0.01 **(S)**	0.01 **(S)**	3214.59
	Military	---	3810	2.60	1.07	29.00	0.92	---	0.02 **(S)**	0.02 **(S)**	3214.59
Notes: c(7), d(8) - PM_{10} and $PM_{2.5}$ for all power settings, e, g, h, k(8)											
J85-GE-21	Idle (Taxi)	---	400	1.25	1.07	159.00	27.89	---	3.0E-03 **(S)**	2.7E-03 **(S)**	3214.59
	75% rpm	---	700	2.00	1.07	92.14	14.29	---	0.01 **(S)**	0.01 **(S)**	3214.59
	85% rpm	---	1200	2.92	1.07	46.17	2.97	---	0.01 **(S)**	0.01 **(S)**	3214.59
	Intermediate (Military)	---	3200	5.00	1.07	21.56	0.29	---	0.02 **(S)**	0.02 **(S)**	3214.59
	Afterburner	---	10650	5.60	1.07	36.40	0.12	---	0.01 **(S)**	0.01 **(S)**	3214.59
Notes: c(1), d(8) - PM_{10} and $PM_{2.5}$ at all power settings, e, g, h, k(8)											
JT3D-3B	Idle (Taxi)	7%	1071	2.50	1.07	98.00	128.80	---	0.91	0.82	3214.59
	Approach	30%	2746	4.80	1.07	24.50	4.60	---	0.41	0.37	3214.59
	Climb out	85%	7397	9.90	1.07	2.80	2.30	---	0.80	0.72	3214.59
	Takeoff	100%	9318	12.10	1.07	1.50	4.60	---	1.28	1.15	3214.59
Notes: c(2), e, f, h, k(1)											
JT3D-7 Series	Idle (Taxi)	7%	1016	2.20	1.07	138.99	141.45	---	0.97	0.87	3214.59
	Approach	30%	3087	5.30	1.07	19.50	2.42	---	0.29	0.26	3214.59
	Climb out	85%	8191	9.59	1.07	1.90	0.46	---	0.58	0.52	3214.59
	Takeoff	100%	9952	12.69	1.07	0.89	0.58	---	0.76	0.68	3214.59
Notes: c(2), e, f, h, k(1)											
JT8D-7 Series	Idle (Taxi)	7%	1025	2.70	1.07	35.50	12.19	---	0.23	0.20	3214.59
	Approach	30%	2271	5.50	1.07	10.50	1.84	---	0.22	0.20	3214.59
	Climb out	85%	6439	13.50	1.07	2.00	0.58	---	0.31	0.28	3214.59
	Takeoff	100%	7851	17.10	1.07	1.50	0.46	---	0.32	0.28	3214.59
Notes: c(2), e, f, h, k(1)											
JT8D-9 Series	Idle (Taxi)	7%	1048	2.90	1.07	34.50	11.50	---	0.23	0.20	3214.59
	Approach	30%	2365	5.64	1.07	9.43	1.99	---	0.24	0.21	3214.59
	Climb out	85%	6714	14.21	1.07	1.66	0.54	---	0.31	0.28	3214.59
	Takeoff	100%	8254	17.92	1.07	1.24	0.54	---	0.33	0.30	3214.59
Notes: c(2), e, f, h, k(1)											
JT8D-9A	Idle (Taxi)	7%	1155	2.89	1.07	14.11	2.95	---	0.21	0.19	3214.59
	Approach	30%	2409	5.99	1.07	2.14	0.57	---	0.25	0.23	3214.59
	Intermediate	70%	6794	14.47	1.07	1.07	0.16	---	0.27	0.24	3214.59
	Military	100%	8334	19.26	1.07	1.07	0.16	---	0.27	0.24	3214.59
Notes: c(13), j, k(8)											

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 [a]	CO	VOC	HAPs	PM_{10}	$PM_{2.5}$	CO_2e [b]
JT8D-11	Idle (Taxi)	7%	1155	2.75	1.07	35.00	11.50	---	0.23	0.20	3214.59
	Approach	30%	2650	5.80	1.07	9.40	1.61	---	0.22	0.19	3214.59
	Climb out	85%	7251	14.60	1.07	1.90	0.52	---	0.31	0.28	3214.59
	Takeoff	100%	8897	18.90	1.07	1.20	0.46	---	0.32	0.29	3214.59
Notes: c(2), e, f, h, k(1)											
JT8D-15	Idle (Taxi)	7%	1172	3.00	1.07	35.20	12.65	---	0.24	0.21	3214.59
	Approach	30%	2701	5.90	1.07	9.60	1.90	---	0.24	0.21	3214.59
	Climb out	85%	7500	15.00	1.07	1.00	0.29	---	0.31	0.28	3214.59
	Takeoff	100%	9349	19.10	1.07	0.70	0.29	---	0.32	0.29	3214.59
Notes: c(2), e, f, h, k(1)											
JT8D-15A	Idle (Taxi)	7%	1089	3.10	1.07	12.93	2.14	---	0.13	0.12	3214.59
	Approach	30%	2476	6.60	1.07	2.90	0.75	---	0.14	0.12	3214.59
	Climb out	85%	7107	13.90	1.07	1.20	0.38	---	0.22	0.19	3214.59
	Takeoff	100%	8849	18.10	1.07	1.08	0.29	---	0.22	0.20	3214.59
Notes: c(2), e, f, h, k(1)											
JT8D-17	Idle (Taxi)	7%	1170	3.20	1.07	10.46	1.44	---	0.13	0.12	3214.59
	Approach	30%	2810	8.00	1.07	2.67	0.60	---	0.14	0.12	3214.59
	Climb out	85%	7913	15.70	1.07	1.10	0.31	---	0.22	0.20	3214.59
	Takeoff	100%	9881	20.60	1.07	0.95	0.25	---	0.23	0.20	3214.59
Notes: c(2), e, f, h, k(1)											
JT8D-17A	Idle (Taxi)	7%	1112	3.20	1.07	12.46	7.59	---	0.17	0.15	3214.59
	Approach	30%	2622	6.70	1.07	2.88	0.74	---	0.14	0.13	3214.59
	Climb out	85%	7416	14.30	1.07	1.16	0.35	---	0.22	0.20	3214.59
	Takeoff	100%	9310	19.10	1.07	1.07	0.29	---	0.23	0.21	3214.59
Notes: c(2), e, f, h, k(1)											
JT8D-17AR	Idle (Taxi)	7%	1172	3.20	1.07	10.70	1.53	---	0.15	0.13	3214.59
	Approach	30%	2837	8.00	1.07	2.68	0.63	---	0.15	0.13	3214.59
	Climb out	85%	8310	16.00	1.07	1.08	0.31	---	0.25	0.22	3214.59
	Takeoff	100%	10833	24.50	1.07	0.93	0.24	---	0.25	0.23	3214.59
Notes: c(2), e, f, h, k(1)											
JT8D-17R	Idle (Taxi)	7%	1230	3.30	1.07	9.43	1.09	---	0.15	0.13	3214.59
	Approach	30%	2980	8.40	1.07	2.54	0.61	---	0.15	0.13	3214.59
	Climb out	85%	8754	17.60	1.07	1.03	0.31	---	0.25	0.22	3214.59
	Takeoff	100%	11246	25.30	1.07	0.95	0.24	---	0.25	0.23	3214.59
Notes: c(2), e, f, h, k(1)											
JT8D-209	Idle (Taxi)	7%	1034	3.50	1.07	14.10	4.63	---	0.13	0.12	3214.59
	Approach	30%	2851	8.80	1.07	4.37	1.94	---	0.19	0.17	3214.59
	Climb out	85%	7800	19.00	1.07	1.40	0.58	---	0.21	0.19	3214.59
	Takeoff	100%	9452	22.80	1.07	1.03	0.40	---	0.21	0.19	3214.59
Notes: c(2), e, f, h, k(1)											

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 [a]	CO	VOC	HAPs	PM_{10}	$PM_{2.5}$	CO_2e [b]
JT8D-217, -217A	Idle (Taxi)	7%	1089	4.57	1.07	15.31	0.00	---	0.07	0.06	3214.59
	Approach	30%	3042	7.66	1.07	3.54	0.00	---	0.06	0.06	3214.59
	Climb out	85%	8556	13.54	1.07	0.47	0.00	---	0.10	0.09	3214.59
	Takeoff	100%	10476	17.54	1.07	0.42	0.00	---	0.10	0.09	3214.59
Notes: c(2), e, f, h, k(1)											
JT8D-217C	Idle (Taxi)	7%	1087	4.05	1.07	17.89	0.00	---	0.04	0.03	3214.59
	Approach	30%	2881	7.65	1.07	3.79	0.00	---	0.06	0.05	3214.59
	Climb out	85%	8294	13.02	1.07	0.49	0.00	---	0.08	0.07	3214.59
	Takeoff	100%	10175	16.49	1.07	0.42	0.00	---	0.10	0.09	3214.59
Notes: c(2), e, f, h, k(1)											
JT8D-219	Idle (Taxi)	7%	1067	3.60	1.07	12.63	4.00	---	0.16	0.14	3214.59
	Approach	30%	3029	9.13	1.07	4.07	1.83	---	0.20	0.18	3214.59
	Climb out	85%	8611	20.80	1.07	1.20	0.48	---	0.25	0.22	3214.59
	Takeoff	100%	10746	27.00	1.07	0.73	0.31	---	0.25	0.22	3214.59
Notes: c(2), e, f, h, k(1)											
JT9D-7	Idle (Taxi)	7%	1667	3.10	1.07	84.10	41.98	---	0.27	0.24	3214.59
	Approach	30%	4833	7.60	1.07	7.80	1.50	---	0.13	0.11	3214.59
	Climb out	85%	14000	27.70	1.07	0.00	0.12	---	0.09	0.08	3214.59
	Takeoff	100%	16532	37.90	1.07	0.00	0.12	---	0.10	0.09	3214.59
Notes: c(2), e, f, h, k(1)											
JT9D-7A	Idle (Taxi)	7%	1675	3.10	1.07	83.60	41.52	---	0.27	0.24	3214.59
	Approach	30%	4913	7.60	1.07	7.60	1.50	---	0.13	0.11	3214.59
	Climb out	85%	14199	28.50	1.07	0.00	0.12	---	0.09	0.08	3214.59
	Takeoff	100%	16659	38.70	1.07	0.00	0.12	---	0.11	0.09	3214.59
Notes: c(2), e, f, h, k(1)											
JT9D-7F	Idle (Taxi)	7%	1841	3.20	1.07	68.60	29.79	---	0.24	0.21	3214.59
	Approach	30%	4952	9.10	1.07	5.80	0.69	---	0.10	0.09	3214.59
	Climb out	85%	14119	31.50	1.07	0.90	0.00	---	0.11	0.10	3214.59
	Takeoff	100%	17151	41.70	1.07	0.90	0.00	---	0.11	0.10	3214.59
Notes: c(2), e, f, h, k(1)											
JT9D-7J	Idle (Taxi)	7%	1889	3.30	1.07	66.70	28.18	---	0.23	0.21	3214.59
	Approach	30%	5389	9.40	1.07	5.50	0.58	---	0.10	0.09	3214.59
	Climb out	85%	15095	34.90	1.07	0.90	0.00	---	0.11	0.10	3214.59
	Takeoff	100%	18373	44.90	1.07	0.90	0.00	---	0.11	0.10	3214.59
Notes: c(2), e, f, h, k(1)											
JT9D-7Q	Idle (Taxi)	7%	1881	3.00	1.07	53.00	13.80	---	0.13	0.12	3214.59
	Approach	30%	5400	7.80	1.07	1.70	0.35	---	0.07	0.06	3214.59
	Climb out	85%	15870	25.60	1.07	0.20	0.23	---	0.09	0.08	3214.59
	Takeoff	100%	19380	31.60	1.07	0.20	0.23	---	0.09	0.08	3214.59
Notes: c(2), e, f, h, k(1)											

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 [a]	CO	VOC	HAPs	PM_{10}	$PM_{2.5}$	CO_2e [b]
JT9D-7R4D, -7R4D1	Idle (Taxi)	7%	1630	4.10	1.07	8.84	1.44	---	0.06	0.05	3214.59
	Approach	30%	5233	9.80	1.07	1.36	0.15	---	0.05	0.05	3214.59
	Climb out	85%	13318	30.00	1.07	0.48	0.14	---	0.06	0.06	3214.59
	Takeoff	100%	16310	38.50	1.07	0.51	0.17	---	0.07	0.07	3214.59
Notes: c(2), e, f, h, k(1)											
JT9D-7R4E, -7R4E1	Idle (Taxi)	7%	1754	4.10	1.07	8.27	1.28	---	0.06	0.05	3214.59
	Approach	30%	5182	10.40	1.07	1.23	0.15	---	0.05	0.05	3214.59
	Climb out	85%	13683	34.20	1.07	0.53	0.15	---	0.07	0.06	3214.59
	Takeoff	100%	16810	41.60	1.07	0.57	0.18	---	0.08	0.07	3214.59
Notes: c(2), e, f, h, k(1)											
JT9D-7R4E4	Idle (Taxi)	7%	1750	3.50	1.07	16.00	3.85	---	0.07	0.06	3214.59
	Approach	30%	5079	8.50	1.07	1.46	0.25	---	0.06	0.05	3214.59
	Climb out	85%	14516	29.70	1.07	0.67	0.15	---	0.06	0.06	3214.59
	Takeoff	100%	17603	36.90	1.07	0.67	0.17	---	0.07	0.06	3214.59
Notes: c(2), e, f, h, k(1)											
JT9D-7R4G2	Idle (Taxi)	7%	1777	3.80	1.07	11.82	1.78	---	0.06	0.06	3214.59
	Approach	30%	5230	8.80	1.07	1.40	0.21	---	0.06	0.05	3214.59
	Climb out	85%	14921	29.50	1.07	0.63	0.16	---	0.08	0.07	3214.59
	Takeoff	100%	19278	41.30	1.07	0.74	0.17	---	0.08	0.07	3214.59
Notes: c(2), e, f, h, k(1)											
JT9D-7R4H1	Idle (Taxi)	7%	1948	3.80	1.07	11.63	1.70	---	0.06	0.06	3214.59
	Approach	30%	5736	8.90	1.07	1.39	0.21	---	0.06	0.06	3214.59
	Climb out	85%	15865	30.00	1.07	0.63	0.16	---	0.08	0.07	3214.59
	Takeoff	100%	19937	45.20	1.07	0.74	0.17	---	0.09	0.08	3214.59
Notes: c(2), e, f, h, k(1)											
JT9D-20	Idle (Taxi)	7%	1675	3.10	1.07	83.60	41.52	---	0.27	0.24	3214.59
	Approach	30%	4913	7.60	1.07	7.60	1.50	---	0.13	0.11	3214.59
	Climb out	85%	14199	28.50	1.07	0.00	0.12	---	0.09	0.08	3214.59
	Takeoff	100%	16659	38.70	1.07	0.00	0.12	---	0.11	0.09	3214.59
Notes: c(2), e, f, h, k(2)											
JT9D-20J	Idle (Taxi)	7%	1889	3.30	1.07	66.70	28.18	---	0.23	0.21	3214.59
	Approach	30%	5389	9.40	1.07	5.50	0.58	---	0.10	0.09	3214.59
	Climb out	85%	15095	34.90	1.07	0.90	0.00	---	0.11	0.10	3214.59
	Takeoff	100%	18373	44.90	1.07	0.90	0.00	---	0.11	0.10	3214.59
Notes: 3b, 5, 6, 8, 10, 12a											
JT9D-59A, -70A	Idle (Taxi)	7%	1881	3.00	1.07	53.00	13.80	---	0.13	0.12	3214.59
	Approach	30%	5400	7.80	1.07	1.70	0.35	---	0.07	0.06	3214.59
	Climb out	85%	15870	25.60	1.07	0.20	0.23	---	0.09	0.08	3214.59
	Takeoff	100%	19380	31.60	1.07	0.20	0.23	---	0.09	0.08	3214.59
Notes: c(2), e, f, h, k(1)											

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 [a]	CO	VOC	HAPs	PM_{10}	$PM_{2.5}$	CO_2e [b]
JT15D-1 Series	Idle (Taxi)	7%	183	1.75	1.07	132.00	58.08	---	0.39	0.35	3214.59
	Approach	30%	405	3.44	1.07	40.50	5.09	---	0.32	0.29	3214.59
	Climb out	85%	984	6.77	1.07	3.50	0.01	---	0.11	0.10	3214.59
	Takeoff	100%	1175	7.60	1.07	2.65	0.01	---	0.11	0.10	3214.59
Notes: c(2), e, f, h, k(2)											
JT15D-4 Series	Idle (Taxi)	7%	207	2.63	1.07	97.00	46.00	---	0.32	0.29	3214.59
	Approach	30%	468	5.29	1.07	32.00	5.92	---	0.36	0.32	3214.59
	Climb out	85%	1135	8.56	1.07	3.18	0.22	---	0.12	0.11	3214.59
	Takeoff	100%	1347	9.23	1.07	2.10	0.10	---	0.11	0.10	3214.59
Notes: c(2), e, f, h, k(2)											
JT15D-5, -5A, -5B	Idle (Taxi)	7%	235	1.66	1.07	119.20	136.97	---	0.82	0.74	3214.59
	Approach	30%	524	4.93	1.07	38.60	13.46	---	0.73	0.66	3214.59
	Climb out	85%	1371	10.08	1.07	1.15	1.50	---	0.23	0.21	3214.59
	Takeoff	100%	1630	11.13	1.07	0.00	0.00	---	0.13	0.12	3214.59
Notes: c(2), e, f, h, k(2)											
LF507-1F	Idle (Taxi)	7%	360	3.28	1.07	37.83	5.43	---	0.13	0.12	3214.59
	Approach	30%	860	6.39	1.07	4.43	0.14	---	0.09	0.09	3214.59
	Climb out	85%	2350	12.02	1.07	0.30	0.01	---	0.09	0.08	3214.59
	Takeoff	100%	2840	14.52	1.07	0.20	0.01	---	0.08	0.08	3214.59
Notes: c(2), e, f, h, k(8)											
NK-8-2U	Idle (Taxi)	7%	1905	2.70	1.07	116.00	119.37	---	0.82	0.74	3214.59
	Approach	30%	4603	5.40	1.07	21.00	5.75	---	0.43	0.39	3214.59
	Climb out	85%	9286	12.90	1.07	6.00	0.63	---	0.35	0.31	3214.59
	Takeoff	100%	13889	13.90	1.07	5.50	0.52	---	0.36	0.33	3214.59
Notes: c(2), e, f, h, k(8)											
O-200	Idle (Taxi)	<40%	8	1.58	1.07	644.42	33.36	---	0.76 **(S)**	0.68 **(S)**	3214.59
	Approach	40%	26	1.14	1.07	1187.84	38.20	---	0.12 **(S)**	0.11 **(S)**	3214.59
	Climb out	75-100%	45	4.87	1.07	974.10	23.93	---	0.30 **(S)**	0.27 **(S)**	3214.59
	Takeoff	100%	45	4.87	1.07	974.10	23.93	---	0.31 **(S)**	0.28 **(S)**	3214.59
Notes: c(1), d(5) - PM_{10} and $PM_{2.5}$ at all power settings, e, j, k(8)											
O-200A	Idle (Taxi)	31%	9	0.93	1.07	969.24	198.77	---	0.55	0.49	3214.59
	Approach	71%	26	3.81	1.07	926.54	55.21	---	0.13	0.12	3214.59
	Climb out	96%	49	4.70	1.07	1047.01	56.02	---	0.17	0.16	3214.59
	Takeoff	100%	53	3.90	1.07	1033.41	55.30	---	0.21	0.19	3214.59
Notes: c(16), e, g, h, k(7)											
O-320	Idle (Taxi)	<40%	9	0.52	1.07	1077.00	42.46	---	0.47 **(S)**	0.42 **(S)**	3214.59
	Approach	40%	47	0.95	1.07	1221.51	22.13	---	0.27 **(S)**	0.24 **(S)**	3214.59
	Climb out	75-100%	67	3.97	1.07	989.51	14.24	---	0.20 **(S)**	0.18 **(S)**	3214.59
	Takeoff	100%	89	2.19	1.07	1077.44	13.55	---	0.20 **(S)**	0.18 **(S)**	3214.59
Notes: c(1), d(9) - PM_{10} and $PM_{2.5}$ at all power settings, e, j, k(8)											

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 [a]	CO	VOC	HAPs	PM_{10}	$PM_{2.5}$	CO_2e [b]
O-320-A2B, -320-B2B, -320-D2A	Idle (Taxi)	34%	10	1.63	1.07	766.81	111.03	---	0.47	0.42	3214.59
	Approach	70%	34	7.25	1.07	769.65	45.56	---	0.27	0.24	3214.59
	Climb out	100%	81	7.96	1.07	904.75	40.87	---	0.20	0.18	3214.59
	Takeoff	100%	81	7.96	1.07	904.75	40.87	---	0.20	0.18	3214.59
Notes: c(16), e, g, h, k(7)											
O-320-D2J	Idle (Taxi)	---	8	1.94	1.07	707.12	127.12	---	0.02	0.02	3214.59
	Approach	---	34 **(S)**	7.25 **(S)**	1.07	769.65 **(S)**	45.56 **(S)**	---	0.27 **(S)**	0.24 **(S)**	3214.59
	Climb out	---	81 **(S)**	7.96 **(S)**	1.07	904.75 **(S)**	40.87 **(S)**	---	0.20 **(S)**	0.18 **(S)**	3214.59
	Takeoff	---	81 **(S)**	7.96 **(S)**	1.07	904.75 **(S)**	40.87 **(S)**	---	0.20 **(S)**	0.18 **(S)**	3214.59
Notes: c(16), d(9) - All fuel flow rates and pollutants at Approach, Climb out, and Takeoff power settings, e, g, h, k(7)											
O-320-D3G	Idle (Taxi)	33%	9	1.19	1.07	771.19	79.91	---	0.21	0.19	3214.59
	Approach	65%	27	14.03	1.07	599.45	49.43	---	0.09	0.08	3214.59
	Climb out	101%	82	19.46	1.07	649.65	51.31	---	0.12	0.11	3214.59
	Takeoff	101%	82	19.46	1.07	649.65	51.31	---	0.12	0.11	3214.59
Notes: c(16), e, g, h, k(7)											
O-320-E2A	Idle (Taxi)	---	10	1.64	1.07	689.60	18.34	---	0.05	0.05	3214.59
	Approach	---	38	19.44	1.07	695.60	15.74	---	0.04	0.04	3214.59
	Climb out	---	63	6.92	1.07	836.60	17.32	---	0.07	0.06	3214.59
	Takeoff	---	79	6.68	1.07	815.50	14.50	---	0.10	0.09	3214.59
Notes: c(16), e, g, h, k(7)											
O-320-E2D	Idle (Taxi)	33%	10	1.49	1.07	756.45	118.10	---	0.39	0.35	3214.59
	Approach	68%	33	4.62	1.07	836.50	45.72	---	0.42	0.38	3214.59
	Climb out	100%	83	4.43	1.07	1020.21	35.43	---	0.16	0.14	3214.59
	Takeoff	100%	83	4.43	1.07	1020.21	35.43	---	0.16	0.14	3214.59
Notes: c(16), e, g, h, k(7)											
O-320-E3D	Idle (Taxi)	26%	7	0.59	1.07	706.42	197.76	---	0.19	0.17	3214.59
	Approach	67%	29	2.55	1.07	762.97	50.07	---	0.20	0.18	3214.59
	Climb out	100%	82	5.60	1.07	941.15	46.63	---	0.29	0.26	3214.59
	Takeoff	100%	82	5.60	1.07	941.15	46.63	---	0.29	0.26	3214.59
Notes: c(16), e, g, h, k(7)											
O-320-H2AD	Idle (Taxi)	35%	10	3.45	1.07	713.64	103.42	---	0.18	0.16	3214.59
	Approach	79%	44	7.94	1.07	718.04	39.68	---	0.30	0.27	3214.59
	Climb out	95%	69	3.95	1.07	941.82	41.35	---	0.16	0.15	3214.59
	Takeoff	95%	69	3.95	1.07	941.82	41.35	---	0.16	0.15	3214.59
Notes: c(16), e, g, h, k(7)											
O-470C	Idle (Taxi)	---	11	1.91	1.07	592.20	159.00	---	0.50	0.45	3214.59
	Approach	---	61	3.77	1.07	995.10	13.01	---	0.40	0.36	3214.59
	Climb out	---	99	4.32	1.07	960.80	10.98	---	0.07	0.06	3214.59
	Takeoff	---	133	2.71	1.07	1082.00	10.55	---	0.10	0.09	3214.59
Notes: c(16), e, g, h, k(8)											

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 [a]	CO	VOC	HAPs	PM_{10}	$PM_{2.5}$	CO_2e [b]
PT6A-27	Idle (Taxi)	<30%	115	2.43	1.07	64.00	57.70	---	0.50 **(S)**	0.45 **(S)**	3214.59
	Approach	30%	215	8.37	1.07	23.26	2.51	---	0.10 **(S)**	0.09 **(S)**	3214.59
	Climb out	90%	400	7.00	1.07	1.20	0.00	---	0.25 **(S)**	0.23 **(S)**	3214.59
	Takeoff	100%	425	7.81	1.07	1.01	0.00	---	0.24 **(S)**	0.22 **(S)**	3214.59
Notes: c(1), d(15) - PM_{10} and $PM_{2.5}$ at all power settings, e, j, k(8)											
PT6A-38	Idle (Taxi)	7%	103	2.09	1.07	82.44	2.09	---	0.50	0.45	3214.59
	Approach	30%	275	4.79	1.07	7.29	9.6E-05	---	0.10	0.09	3214.59
	Climb out	70%	450	6.69	1.07	2.17	9.6E-05	---	0.25	0.23	3214.59
	Takeoff	90%	489	7.08	1.07	2.05	9.6E-05	---	0.24	0.22	3214.59
Notes: c(13), j, k(8)											
PT6A-41	Idle (Taxi)	<30%	147	1.97	1.07	115.31	116.88	---	0.50 **(S)**	0.45 **(S)**	3214.59
	Approach	30%	273	4.65	1.07	34.80	26.12	---	0.10 **(S)**	0.09 **(S)**	3214.59
	Climb out	90%	473	7.57	1.07	6.49	2.33	---	0.25 **(S)**	0.23 **(S)**	3214.59
	Takeoff	100%	510	7.98	1.07	5.10	2.01	---	0.24 **(S)**	0.22 **(S)**	3214.59
Notes: c(1), d(15) - PM_{10} and $PM_{2.5}$ at all power settings, e, j, k(8)											
PT6A-42	Idle (Taxi)	7%	103	2.16	1.07	76.55	16.61	---	0.45	0.41	3214.59
	Approach	30%	275	4.89	1.07	6.89	9.6E-05	---	0.10	0.09	3214.59
	Intermediate	70%	466	6.88	1.07	1.95	9.6E-05	---	0.24	0.22	3214.59
	Military	90%	513	7.28	1.07	1.95	9.6E-05	---	0.23	0.21	3214.59
Notes: c(13), j, k(8)											
PT6A-60A	Idle (Taxi)	---	480	2.98	1.07	42.18	166.43	---	0.09	0.08	3214.59
	Approach	---	340 **(S)**	4.59 **(S)**	1.07	20.86 **(S)**	3.31 **(S)**	---	0.74 **(S)**	0.67 **(S)**	3214.59
	Climb out	---	571 **(S)**	6.69 **(S)**	1.07	6.72 **(S)**	0.72 **(S)**	---	0.29 **(S)**	0.26 **(S)**	3214.59
	Takeoff	---	633 **(S)**	7.08 **(S)**	1.07	5.36 **(S)**	0.53 **(S)**	---	0.26 **(S)**	0.23 **(S)**	3214.59
Notes: c(16), d(11) - All fuel flow rates and pollutants at Approach, Climb out, and Takeoff power settings, e, g, h, k(1)											
PT6A-65	Idle (Taxi)	7%	131	1.89	1.07	166.43	53.66	---	1.23	1.11	3214.59
	Approach	30%	340	4.59	1.07	20.86	3.31	---	0.74	0.67	3214.59
	Intermediate	70%	571	6.69	1.07	6.72	0.72	---	0.29	0.26	3214.59
	Military	90%	633	7.08	1.07	5.36	0.53	---	0.26	0.23	3214.59
Notes: c(13), j, k(8)											
PT6A-67B	Idle (Taxi)	7%	143	1.83	1.07	183.80	61.52	---	1.38	1.24	3214.59
	Approach	30%	364	4.59	1.07	20.96	3.24	---	0.72	0.65	3214.59
	Intermediate	70%	619	6.59	1.07	6.12	0.61	---	0.32	0.29	3214.59
	Military	90%	681	6.98	1.07	5.73	0.45	---	0.25	0.23	3214.59
Notes: c(13), j, k(8)											
PT6A-67D	Idle (Taxi)	7%	149	1.83	1.07	177.91	57.94	---	1.31	1.18	3214.59
	Approach	30%	372	4.69	1.07	19.76	2.93	---	0.66	0.59	3214.59
	Intermediate	70%	643	6.69	1.07	5.35	0.50	---	0.28	0.25	3214.59
	Military	90%	713	7.18	1.07	5.09	0.35	---	0.24	0.22	3214.59
Notes: c(13), j, k(8)											

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 [a]	CO	VOC	HAPs	PM_{10}	$PM_{2.5}$	CO_2e [b]
PT6A-68	Ground Idle	2%	156	1.77	1.07	117.85	7.89	6.571	3.95	2.16	3214.59
	Flight Idle	3%	180	1.95	1.07	94.99	1.33	7.546	4.18	1.96	3214.59
	Descend	19%	328	5.03	1.07	33.69	3.29	3.208	4.15	1.23	3214.59
	Approach	46%	449	4.73	1.07	10.91	0.71	0.697	3.34	0.70	3214.59
	Max. Continuous	88%	612	8.18	1.07	3.88	0.20	0.104	4.30	0.61	3214.59
Notes: c(11), j - Percent hp calculated assuming maximum hp of 1250 per manufacturer's stated specifications, k(6)											
PW306A	Idle (Taxi)	7%	335	4.26	1.07	36.35	5.01	---	0.07	0.06	3214.59
	Approach	30%	773	11.87	1.07	7.11	0.00	---	0.04	0.03	3214.59
	Climb out	85%	2096	19.26	1.07	2.51	0.00	---	0.05	0.05	3214.59
	Takeoff	100%	2517	20.08	1.07	2.27	0.00	---	0.08	0.07	3214.59
Notes: c(2), e, f, h, k(2)											
PW308A	Idle (Taxi)	7%	353	3.65	1.07	38.21	7.61	---	0.14	0.12	3214.59
	Approach	30%	980	8.03	1.07	4.08	0.02	---	0.11	0.10	3214.59
	Climb out	85%	2374	14.06	1.07	1.06	0.00	---	0.44	0.39	3214.59
	Takeoff	100%	2860	16.74	1.07	0.83	0.00	---	0.39	0.35	3214.59
Notes: c(2), e, f, h, k(1)											
PW2037	Idle (Taxi)	7%	1206	4.10	1.07	22.36	2.21	---	0.06	0.05	3214.59
	Approach	30%	3635	9.77	1.07	1.95	0.13	---	0.06	0.06	3214.59
	Climb out	85%	10373	23.96	1.07	0.34	0.02	---	0.09	0.08	3214.59
	Takeoff	100%	12468	29.41	1.07	0.33	0.02	---	0.06	0.06	3214.59
Notes: c(2), e, f, h, k(1)											
PW2040	Idle (Taxi)	4%	978	3.76	1.07	22.70	0.37	0.311	10.67	8.75	3214.59
	Approach	31%	4645	15.49	1.07	0.51	0.05	0.033	5.53	5.10	3214.59
	Intermediate	68%	10408	32.72	1.07	0.32	0.04	0.026	2.31	1.42	3214.59
	Takeoff	100%	13905	35.04	1.07	0.32	0.01	0.013 **(C)**	0.06	0.05	3214.59
Notes: c(2) - Pollutants at Takeoff power setting, c(3) - PW2040 is the commercial designation of the F117-PW-100 engine, d(1) - HAPs at Takeoff power setting only, k(5)											
PW2041	Idle (Taxi)	7%	1388	4.49	1.07	23.05	2.13	---	0.15	0.14	3214.59
	Approach	30%	4184	10.98	1.07	2.49	0.15	---	0.13	0.12	3214.59
	Climb out	70%	12345	28.94	1.07	0.20	0.03	---	0.12	0.11	3214.59
	Takeoff	100%	15362	36.92	1.07	0.20	0.03	---	0.12	0.11	3214.59
Notes: c(13), j, k(8)											
PW4056	Idle (Taxi)	7%	1492	5.00	1.07	11.60	0.76	---	0.08	0.07	3214.59
	Approach	30%	5135	11.60	1.07	0.90	0.29	---	0.08	0.07	3214.59
	Climb out	85%	15722	24.60	1.07	0.14	0.20	---	0.12	0.11	3214.59
	Takeoff	100%	19437	32.50	1.07	0.08	0.13	---	0.12	0.11	3214.59
Notes: c(2), e, f, h, k(1)											
PW4060	Idle (Taxi)	7%	1635	3.72	1.07	44.46	13.37	---	0.11	0.10	3214.59
	Approach	30%	5524	11.91	1.07	2.04	0.12	---	0.05	0.04	3214.59
	Climb out	85%	16159	25.03	1.07	0.49	0.07	---	0.07	0.06	3214.59
	Takeoff	100%	20373	31.74	1.07	0.58	0.09	---	0.08	0.07	3214.59
Notes: c(2), e, f, h, k(1)											

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 [a]	CO	VOC	HAPs	PM_{10}	$PM_{2.5}$	CO_2e [b]
PW4062	Idle (Taxi)	7%	1667	3.78	1.07	42.61	12.49	---	0.11	0.10	3214.59
	Approach	30%	5698	12.17	1.07	1.93	0.10	---	0.05	0.04	3214.59
	Climb out	85%	16865	25.98	1.07	0.50	0.08	---	0.07	0.06	3214.59
	Takeoff	100%	21627	34.36	1.07	0.61	0.09	---	0.08	0.07	3214.59
Notes: c(2), e, f, h, k(1)											
PW4074	Idle (Taxi)	7%	1810	4.20	1.07	21.00	3.68	---	0.06	0.05	3214.59
	Approach	30%	6310	11.00	1.07	0.40	0.23	---	0.05	0.05	3214.59
	Climb out	85%	18794	31.50	1.07	0.10	0.12	---	0.06	0.05	3214.59
	Takeoff	100%	23008	38.10	1.07	0.10	0.12	---	0.07	0.07	3214.59
Notes: c(2), e, f, h, k(1)											
PW4074D	Idle (Taxi)	7%	2421	3.80	1.07	26.34	3.59	---	0.06	0.05	3214.59
	Approach	30%	6897	11.35	1.07	0.96	0.05	---	0.04	0.04	3214.59
	Climb out	85%	19611	32.71	1.07	0.35	0.02	---	0.05	0.04	3214.59
	Takeoff	100%	24143	42.46	1.07	0.30	0.02	---	0.06	0.05	3214.59
Notes: c(2), e, f, h, k(1)											
PW4077	Idle (Taxi)	7%	1841	4.20	1.07	20.20	3.45	---	0.06	0.05	3214.59
	Approach	30%	6476	11.30	1.07	0.40	0.23	---	0.05	0.05	3214.59
	Climb out	85%	19460	32.50	1.07	0.10	0.12	---	0.06	0.05	3214.59
	Takeoff	100%	23960	39.80	1.07	0.10	0.12	---	0.08	0.07	3214.59
Notes: c(2), e, f, h, k(1)											
PW4077D	Idle (Taxi)	7%	1937	3.83	1.07	32.62	5.36	---	0.07	0.06	3214.59
	Approach	30%	6627	12.10	1.07	0.60	0.08	---	0.05	0.04	3214.59
	Climb out	85%	19897	35.82	1.07	0.25	0.05	---	0.05	0.05	3214.59
	Takeoff	100%	24460	44.74	1.07	0.22	0.03	---	0.06	0.05	3214.59
Notes: c(2), e, f, h, k(1)											
PW4084	Idle (Taxi)	7%	1921	4.40	1.07	18.73	3.11	---	0.06	0.05	3214.59
	Approach	30%	6944	12.00	1.07	0.40	0.23	---	0.05	0.05	3214.59
	Climb out	85%	21341	35.50	1.07	0.10	0.12	---	0.07	0.06	3214.59
	Takeoff	100%	27072	45.00	1.07	0.10	0.12	---	0.10	0.09	3214.59
Notes: c(2), e, f, h, k(1)											
PW4084D	Idle (Taxi)	7%	2048	4.08	1.07	25.74	3.78	---	0.06	0.05	3214.59
	Approach	30%	7198	12.70	1.07	0.48	0.07	---	0.05	0.04	3214.59
	Climb out	85%	21992	39.47	1.07	0.24	0.03	---	0.05	0.05	3214.59
	Takeoff	100%	27865	53.02	1.07	0.18	0.03	---	0.06	0.06	3214.59
Notes: c(2), e, f, h, k(1)											
PW4090	Idle (Taxi)	7%	2683	4.48	1.07	11.94	0.79	---	0.04	0.04	3214.59
	Approach	30%	7770	12.74	1.07	0.55	0.05	---	0.04	0.04	3214.59
	Climb out	85%	23778	41.17	1.07	0.31	0.02	---	0.06	0.05	3214.59
	Takeoff	100%	31159	57.52	1.07	0.27	0.02	---	0.09	0.08	3214.59
Notes: c(2), e, f, h, k(1)											

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 [a]	CO	VOC	HAPs	PM_{10}	$PM_{2.5}$	CO_2e [b]
PW4098	Idle (Taxi)	7%	2548	7.78	1.07	6.48	0.00	---	0.04	0.03	3214.59
	Approach	30%	8532	14.89	1.07	0.70	0.00	---	0.05	0.05	3214.59
	Climb out	85%	25754	36.45	1.07	0.21	0.00	---	0.07	0.07	3214.59
	Takeoff	100%	32841	51.29	1.07	0.16	0.00	---	0.06	0.06	3214.59
Notes: c(2), e, f, h, k(1)											
PW4152	Idle (Taxi)	7%	1405	4.90	1.07	12.76	0.85	---	0.07	0.07	3214.59
	Approach	30%	4706	11.10	1.07	1.09	0.17	---	0.07	0.06	3214.59
	Climb out	85%	14167	22.70	1.07	0.17	0.18	---	0.11	0.10	3214.59
	Takeoff	100%	17278	26.90	1.07	0.12	0.15	---	0.11	0.10	3214.59
Notes: c(2), e, f, h, k(1)											
PW4156	Idle (Taxi)	7%	1492	5.00	1.07	11.60	0.76	---	0.08	0.07	3214.59
	Approach	30%	5135	11.60	1.07	0.90	0.29	---	0.08	0.07	3214.59
	Climb out	70%	15722	24.60	1.07	0.14	0.20	---	0.12	0.11	3214.59
	Takeoff	100%	19437	32.50	1.07	0.08	0.13	---	0.12	0.11	3214.59
Notes: c(2), e, f, h, k(1)											
PW4158	Idle (Taxi)	7%	1675	4.80	1.07	20.99	2.05	---	0.07	0.06	3214.59
	Approach	30%	5413	11.80	1.07	1.88	0.16	---	0.06	0.05	3214.59
	Climb out	85%	15905	23.70	1.07	0.54	0.02	---	0.07	0.07	3214.59
	Takeoff	100%	19691	30.20	1.07	0.40	0.10	---	0.08	0.07	3214.59
Notes: c(2), e, f, h, k(1)											
PW4164	Idle (Taxi)	7%	1667	4.03	1.07	26.67	5.13	---	0.07	0.06	3214.59
	Approach	30%	5984	14.10	1.07	1.86	0.18	---	0.05	0.05	3214.59
	Climb out	85%	17294	31.66	1.07	0.79	0.05	---	0.05	0.05	3214.59
	Takeoff	100%	20841	38.57	1.07	0.69	0.03	---	0.05	0.05	3214.59
Notes: c(2), e, f, h, k(1)											
PW4164-1D	Idle (Taxi)	7%	1929	3.79	1.07	17.13	1.66	---	0.05	0.04	3214.59
	Approach	30%	6151	12.10	1.07	1.55	0.07	---	0.04	0.04	3214.59
	Climb out	85%	17770	20.97	1.07	0.17	0.00	---	0.06	0.05	3214.59
	Takeoff	100%	21595	26.31	1.07	0.16	0.00	---	0.06	0.05	3214.59
Notes: c(2), e, f, h, k(1)											
PW4168, -4168A	Idle (Taxi)	7%	1754	4.15	1.07	23.51	3.78	---	0.06	0.05	3214.59
	Approach	30%	6333	14.66	1.07	1.75	0.17	---	0.05	0.05	3214.59
	Climb out	85%	18468	33.91	1.07	0.74	0.05	---	0.05	0.05	3214.59
	Takeoff	100%	22508	42.39	1.07	0.72	0.03	---	0.06	0.05	3214.59
Notes: c(2), e, f, h, k(1)											
PW4168-1D, -4168A-1D	Idle (Taxi)	7%	2000	4.08	1.07	14.78	1.09	---	0.04	0.04	3214.59
	Approach	30%	6492	12.39	1.07	1.26	0.06	---	0.04	0.04	3214.59
	Climb out	85%	19032	22.31	1.07	0.18	0.00	---	0.06	0.06	3214.59
	Takeoff	100%	23310	30.15	1.07	0.17	0.00	---	0.06	0.05	3214.59
Notes: c(2), e, f, h, k(1)											

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 [a]	CO	VOC	HAPs	PM_{10}	$PM_{2.5}$	CO_2e [b]
PW4170	Idle (Taxi)	7%	2024	4.18	1.07	14.04	0.95	---	0.04	0.04	3214.59
	Approach	30%	6611	12.49	1.07	1.17	0.06	---	0.04	0.04	3214.59
	Climb out	85%	19445	22.84	1.07	0.18	0.00	---	0.06	0.06	3214.59
	Takeoff	100%	23960	31.40	1.07	0.18	0.00	---	0.06	0.05	3214.59
Notes: c(2), e, f, h, k(1)											
PW4460	Idle (Taxi)	7%	1690	4.90	1.07	20.32	1.91	---	0.07	0.06	3214.59
	Approach	30%	5579	12.00	1.07	1.78	0.16	---	0.06	0.05	3214.59
	Climb out	85%	16548	24.70	1.07	0.51	0.03	---	0.07	0.07	3214.59
	Takeoff	100%	21008	32.80	1.07	0.37	0.12	---	0.08	0.08	3214.59
Notes: c(2), e, f, h, k(1)											
PW6122A	Idle (Taxi)	7%	865	3.08	1.07	24.68	0.01	---	0.10	0.09	3214.59
	Approach	30%	2413	5.95	1.07	3.99	1.2E-03	---	0.08	0.07	3214.59
	Climb out	85%	6825	13.40	1.07	0.72	1.2E-03	---	0.14	0.12	3214.59
	Takeoff	100%	8310	17.04	1.07	0.74	0.00	---	0.13	0.12	3214.59
Notes: c(2), e, f, h, k(1)											
PW6124A	Idle (Taxi)	7%	905	3.58	1.07	25.19	2.3E-03	---	0.09	0.08	3214.59
	Approach	30%	2579	6.88	1.07	3.69	1.2E-03	---	0.08	0.07	3214.59
	Climb out	85%	7452	15.85	1.07	0.81	2.3E-03	---	0.15	0.13	3214.59
	Takeoff	100%	9278	21.03	1.07	0.68	0.00	---	0.15	0.13	3214.59
Notes: c(2), e, f, h, k(1)											
R-1820-82	Idle (Taxi)	---	89	0.00	1.07	474.16	173.15	---	0.10 **(S)**	0.09 **(S)**	3214.59
	Approach	---	323	6.50	1.07	384.83	6.41	---	0.10 **(S)**	0.09 **(S)**	3214.59
	Climb out	---	862	2.09	1.07	435.03	55.77	---	0.10 **(S)**	0.09 **(S)**	3214.59
	Takeoff	---	1166	1.72	1.07	531.73	108.89	---	0.10 **(S)**	0.09 **(S)**	3214.59
Notes: c(1), d(12) - PM_{10} and $PM_{2.5}$ at all power settings, e, k(8)											
R-2800-99W	Idle (Taxi)	---	8	22.00	1.07	1294.00	42.48	---	0.10	0.09	3214.59
	Approach	---	175	13.64	1.07	1262.00	14.81	---	0.10	0.09	3214.59
	Climb out	---	356	2.38	1.07	499.99	18.78	---	0.10	0.09	3214.59
	Takeoff	---	1780	0.99	1.07	35.91	3.70	---	0.10	0.09	3214.59
Notes: c(16), e, g, h, k(7)											
RB211-22B	Idle (Taxi)	7%	1786	2.86	1.07	88.99	77.91	---	0.50	0.45	3214.59
	Approach	30%	4492	8.18	1.07	20.65	6.85	---	0.47	0.43	3214.59
	Climb out	85%	12270	26.89	1.07	1.68	0.29	---	0.17	0.15	3214.59
	Takeoff	100%	14897	37.33	1.07	0.78	0.17	---	0.17	0.16	3214.59
Notes: c(2), e, f, h, k(8)											
RB211-524B Series	Idle (Taxi)	7%	2159	3.53	1.07	82.20	58.19	---	0.36	0.32	3214.59
	Approach	30%	5500	9.75	1.07	20.00	5.73	---	0.33	0.30	3214.59
	Climb out	85%	15389	33.00	1.07	2.82	0.46	---	0.14	0.12	3214.59
	Takeoff	100%	18913	47.00	1.07	1.83	0.60	---	0.19	0.17	3214.59
Notes: c(2), e, f, h, k(8)											

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 [a]	CO	VOC	HAPs	PM_{10}	$PM_{2.5}$	CO_2e [b]
RB211-524C2	Idle (Taxi)	7%	2381	3.37	1.07	81.00	62.33	---	0.38	0.34	3214.59
	Approach	30%	5873	10.40	1.07	18.90	5.08	---	0.30	0.27	3214.59
	Climb out	85%	16032	32.30	1.07	1.63	0.25	---	0.11	0.10	3214.59
	Takeoff	100%	19683	41.90	1.07	0.66	0.00	---	0.11	0.10	3214.59
Notes: c(2), e, f, h, k(8)											
RB211-524D4	Idle (Taxi)	7%	2381	4.11	1.07	73.80	53.43	---	0.33	0.30	3214.59
	Approach	30%	5873	9.65	1.07	16.90	5.52	---	0.32	0.29	3214.59
	Climb out	85%	15952	41.00	1.07	1.18	0.48	---	0.11	0.10	3214.59
	Takeoff	100%	19921	56.90	1.07	0.51	0.00	---	0.09	0.08	3214.59
Notes: c(2), e, f, h, k(8)											
RB211-524G	Idle (Taxi)	7%	2064	4.63	1.07	13.74	1.02	---	0.05	0.04	3214.59
	Approach	30%	5556	9.56	1.07	1.01	0.43	---	0.11	0.10	3214.59
	Climb out	85%	16508	40.54	1.07	0.43	0.31	---	0.13	0.12	3214.59
	Takeoff	100%	20794	58.71	1.07	0.59	0.45	---	0.13	0.12	3214.59
Notes: c(2), e, f, h, k(8)											
RB211-524G-T	Idle (Taxi)	7%	2064	4.00	1.07	28.82	4.54	---	0.08	0.07	3214.59
	Approach	30%	5873	9.68	1.07	1.17	0.00	---	0.09	0.08	3214.59
	Climb out	85%	16667	21.80	1.07	0.14	0.03	---	0.15	0.14	3214.59
	Takeoff	100%	20794	28.43	1.07	0.16	0.00	---	0.14	0.12	3214.59
Notes: c(2), e, f, h, k(8)											
RB211-524H	Idle (Taxi)	7%	2064	4.78	1.07	11.75	0.85	---	0.05	0.04	3214.59
	Approach	30%	5635	10.26	1.07	0.99	0.41	---	0.11	0.10	3214.59
	Climb out	85%	17222	46.31	1.07	0.38	0.38	---	0.13	0.12	3214.59
	Takeoff	100%	21667	65.84	1.07	0.87	0.39	---	0.13	0.11	3214.59
Notes: c(2), e, f, h, k(8)											
RB211-524H-T	Idle (Taxi)	7%	2064	4.16	1.07	26.17	3.81	---	0.07	0.07	3214.59
	Approach	30%	6111	9.91	1.07	1.05	0.00	---	0.09	0.08	3214.59
	Climb out	85%	17619	23.19	1.07	0.14	0.02	---	0.15	0.14	3214.59
	Takeoff	100%	22302	31.19	1.07	0.18	0.00	---	0.14	0.12	3214.59
Notes: c(2), e, f, h, k(8)											
RB211-535C	Idle (Taxi)	7%	1587	3.44	1.07	18.79	1.66	---	0.06	0.06	3214.59
	Approach	30%	4286	6.37	1.07	0.48	0.51	---	0.09	0.08	3214.59
	Climb out	85%	11667	24.89	1.07	0.27	0.16	---	0.08	0.07	3214.59
	Takeoff	100%	14286	33.71	1.07	0.70	0.29	---	0.10	0.09	3214.59
Notes: c(2), e, f, h, k(8)											
RB211-535E4	Idle (Taxi)	7%	1429	4.40	1.07	20.33	0.31	---	0.05	0.05	3214.59
	Approach	30%	4127	8.38	1.07	2.72	0.05	---	0.05	0.05	3214.59
	Climb out	85%	11905	17.56	1.07	0.29	0.00	---	0.19	0.17	3214.59
	Takeoff	100%	14683	22.31	1.07	0.26	0.03	---	0.19	0.17	3214.59
Notes: c(2), e, f, h, k(8)											

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 [a]	CO	VOC	HAPs	PM_{10}	$PM_{2.5}$	CO_2e [b]
Rotax 912	Idle (Taxi)	---	10	0.80	1.07	1206.17	21.03	---	1.0E-03	9.0E-04	3214.59
	Approach	---	14	14.28	1.07	569.47	12.76	---	1.0E-03	9.0E-04	3214.59
	Climb out	---	25	10.29	1.07	760.18	14.53	---	2.0E-03	1.8E-03	3214.59
	Takeoff	---	30	12.71	1.07	700.69	14.08	---	3.0E-03	2.7E-03	3214.59
Notes: c(16), e, g, h, k(8)											
Rotax 914	Idle (Taxi)	---	14	5.00	1.07	994.00	38.60	---	1.0E-03	9.0E-04	3214.59
	Approach	---	23	14.00	1.07	776.00	16.00	---	1.0E-03	9.0E-04	3214.59
	Climb out	---	44	18.00	1.07	664.00	12.30	---	2.0E-03	1.8E-03	3214.59
	Takeoff	---	57	6.00	1.07	1020.00	15.00	---	3.0E-03	2.7E-03	3214.59
Notes: c(16), e, g, h, k(8)											
Spey Mk511	Idle (Taxi)	7%	1008	3.60	1.07	31.77	4.24	---	0.16	0.15	3214.59
	Approach	30%	2206	7.20	1.07	2.65	0.21	---	0.22	0.20	3214.59
	Climb out	85%	5762	17.30	1.07	0.63	0.14	---	0.24	0.22	3214.59
	Takeoff	100%	7071	22.70	1.07	0.12	0.10	---	0.23	0.21	3214.59
Notes: c(2) - Spey MK511 is the commercial designation of the F113-RR-100 engine, e, f, h, k(8)											
Spey Mk555	Idle (Taxi)	7%	762	3.70	1.07	29.30	2.14	---	0.18	0.16	3214.59
	Approach	30%	1754	6.80	1.07	3.70	0.33	---	0.35	0.32	3214.59
	Climb out	85%	4698	16.50	1.07	0.70	0.17	---	0.35	0.32	3214.59
	Takeoff	100%	5833	21.90	1.07	0.30	0.33	---	0.32	0.29	3214.59
Notes: c(2), e, f, h, k(8)											
T53-L-11D	Ground Idle	---	145	1.58	1.07	31.51	66.80	---	1.44 **(S)**	1.30 **(S)**	3214.59
	Flight Idle	---	222	2.53	1.07	37.79	15.61	---	2.95 **(S)**	2.66 **(S)**	3214.59
	Normal Rated	---	645	6.43	1.07	6.83	0.66	---	0.31 **(S)**	0.28 **(S)**	3214.59
	Military	---	685	6.34	1.07	3.34	0.30	---	0.36 **(S)**	0.32 **(S)**	3214.59
	Takeoff	---	690	7.75	1.07	3.85	0.31	---	0.36 **(S)**	0.32 **(S)**	3214.59
Notes: c(9), d(17) - PM_{10} and $PM_{2.5}$ at all power settings, e, k(8)											
T53-L-13	Idle (Taxi)	7%	160	1.58	1.07	31.45	64.28	---	1.44	1.30	3214.59
	Approach	30%	227	2.52	1.07	37.71	15.02	---	2.95	2.66	3214.59
	Climb out	70%	694	6.33	1.07	3.59	0.30	---	0.31	0.28	3214.59
	Takeoff	90%	696	7.73	1.07	3.59	0.30	---	0.36	0.32	3214.59
Notes: c(13), j, k(8)											
T56 Series I	Idle (Taxi)	7%	829	7.33	1.07	5.73	0.86	---	0.12	0.11	3214.59
	Approach	30%	1036	7.12	1.07	4.70	0.61	---	0.22	0.20	3214.59
	Intermediate	70%	1824	9.61	1.07	2.84	0.31	---	0.28	0.25	3214.59
	Military	90%	2059	9.87	1.07	2.82	0.31	---	0.28	0.25	3214.59
Notes: c(13), j, k(8)											
T56 Series III	Idle (Taxi)	7%	986	6.05	1.07	6.50	0.90	---	0.12	0.11	3214.59
	Approach	30%	1262	9.10	1.07	2.79	0.44	---	0.19	0.17	3214.59
	Intermediate	70%	2210	12.19	1.07	1.47	0.26	---	0.24	0.22	3214.59
	Military	90%	2476	12.76	1.07	1.47	0.26	---	0.26	0.23	3214.59
Notes: c(13), j, k(8)											

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 [a]	CO	VOC	HAPs	PM_{10}	$PM_{2.5}$	CO_2e [b]
T56-A-7	Idle (Taxi)	5%	724	7.58	1.07	5.06	0.08	0.062	3.64	1.88	3214.59
	Approach	15%	880	7.54	1.07	3.89	0.06	0.043	3.85	2.18	3214.59
	Intermediate	61%	1742	9.15	1.07	1.94	0.02	0.013	1.46	0.56	3214.59
	Military	90%	2262	12.46	1.07	2.30	0.01	0.003	1.22	0.33	3214.59
Notes: c(3), k(5)											
T56-A-9	Idle	7%	794	3.90	1.07	32.00	24.15	---	0.83	0.75	3214.59
	Approach	30%	1423 **(C)**	4.40	1.07	22.20	14.26	---	0.97	0.87	3214.59
	Intermediate	70%	1825	9.20	1.07	2.40	0.58	---	0.51	0.46	3214.59
	Military	100%	1905	9.30	1.07	2.10	0.46	---	0.50	0.45	3214.59
Notes: c(7), d(1), e, k(4)											
T56-A-14	Idle (Taxi)	5%	324	3.72	1.07	30.39	15.85	---	0.43	0.39	3214.59
	Approach	15%	839	6.79	1.07	3.49	0.92	---	0.28	0.25	3214.59
	Intermediate	61%	1409	10.30	1.07	1.07	0.04	---	0.17	0.15	3214.59
	Military	90%	1563	12.05	1.07	0.95	0.04	---	0.16	0.14	3214.59
Notes: c(13), k(8)											
T56-A-15	Idle (Taxi)	7%	794	3.90	1.07	32.00	24.15	---	0.83	0.75	3214.59
	Approach	30%	1423 **(C)**	4.40	1.07	22.20	14.26	---	0.97	0.87	3214.59
	Intermediate	70%	1825	9.20	1.07	2.40	0.58	---	0.51	0.46	3214.59
	Military	90%	2302	9.30	1.07	2.10	0.46	---	0.50	0.45	3214.59
Notes: c(7), d(1), e, h, k(8)											
T56-A-16	Ground Idle	---	756	6.35	1.07	5.65	1.40	---	0.83 **(S)**	0.75 **(S)**	3214.59
	Flight Idle	---	836	6.52	1.07	4.54	1.09	---	0.97 **(S)**	0.87 **(S)**	3214.59
	75%	---	1996	9.93	1.07	0.42	0.20	---	0.51 **(S)**	0.46 **(S)**	3214.59
	100%	---	2136	10.29	1.07	0.68	0.14	---	0.50 **(S)**	0.45 **(S)**	3214.59
	Military	---	2219	10.45	1.07	0.65	0.16	---	0.50 **(S)**	0.45 **(S)**	3214.59
Notes: c(9), d(18) - PM_{10} and $PM_{2.5}$ at all power settings, e, k(8)											
T58-GE-5	Idle	---	133	1.50	1.07	169.17	111.54	---	0.75	0.68	3214.59
	Normal Cruise	---	757	6.34	1.07	7.66	1.82	---	0.79	0.71	3214.59
	Intermediate (Military)	---	821	6.70	1.07	6.82	3.78	---	0.97	0.88	3214.59
	Power Takeoff	---	886	7.22	1.07	5.64	0.91	---	0.90	0.81	3214.59
Notes: c(1), e, k(4)											
T58-GE-8F	Idle	---	132	1.43	1.07	178.44	149.98	---	0.75 **(S)**	0.68 **(S)**	3214.59
	Approach	---	581	4.47	1.07	17.28	1.29	---	0.79 **(S)**	0.71 **(S)**	3214.59
	Cruise	---	627	4.68	1.07	14.13	0.92	---	0.79 **(S)**	0.71 **(S)**	3214.59
	Max Continuous	---	685	4.90	1.07	12.96	0.84	---	0.79 **(S)**	0.71 **(S)**	3214.59
	Takeoff	---	786	5.47	1.07	9.03	0.46	---	0.97 **(S)**	0.88 **(S)**	3214.59
Notes: c(9), d(19) - PM_{10} and $PM_{2.5}$ at all power settings, e, k(8)											
T58-GE-16	Ground Idle	---	150	3.03	1.07	139.73	47.05	---	0.75 **(S)**	0.68 **(S)**	3214.59
	60% Normal	---	656	7.88	1.07	14.56	0.44	---	0.79 **(S)**	0.71 **(S)**	3214.59
	75% Normal	---	779	9.47	1.07	10.89	0.72	---	0.79 **(S)**	0.71 **(S)**	3214.59
	90% Normal	---	890	10.07	1.07	9.10	0.96	---	0.90 **(S)**	0.81 **(S)**	3214.59
	Military	---	1020	11.60	1.07	7.73	1.52	---	0.90 **(S)**	0.81 **(S)**	3214.59
Notes: c(9), d(19) - PM_{10} and $PM_{2.5}$ at all power settings, e, k(4)											

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 [a]	CO	VOC	HAPs	PM_{10}	$PM_{2.5}$	CO_2e [b]
T63-A-5A	Ground Idle	---	61	1.42	1.07	79.15	23.35	---	0.83 **(S)**	0.75 **(S)**	3214.59
	Flight Idle	---	70	1.89	1.07	61.83	12.02	---	0.83 **(S)**	0.75 **(S)**	3214.59
	30%	---	105	2.90	1.07	38.59	3.76	---	0.97 **(S)**	0.87 **(S)**	3214.59
	60%	---	157	4.11	1.07	20.79	0.78	---	0.51 **(S)**	0.46 **(S)**	3214.59
	Military	---	215	5.07	1.07	7.54	0.09	---	0.50 **(S)**	0.45 **(S)**	3214.59
Notes: c(9), d(18) - PM_{10} and $PM_{2.5}$ at all power settings, e, k(8)											
T64-GE-6B	Idle	---	337	3.86	1.07	48.66	15.01	---	0.30	0.27	3214.59
	75% hp	---	1039	8.95	1.07	4.72	0.89	---	0.58	0.52	3214.59
	Normal Rated	---	1257	10.42	1.07	2.86	0.82	---	0.72	0.64	3214.59
	Intermediate (Military)	---	1390	11.15	1.07	2.30	0.74	---	0.79	0.71	3214.59
Notes: c(1), e, k(8)											
T64-GE-100	Ground Idle	2%	298	1.11	1.07	76.46	1.26	0.744	2.36	2.14	3214.59
	75% Normal	34%	941	6.85	1.07	7.85	0.05	0.033	1.97	0.45	3214.59
	Normal	81%	1698	9.46	1.07	2.21	0.01	0.004	1.61	0.88	3214.59
	Military	90%	1848	11.30	1.07	2.17	0.01	0.007	0.92	0.09	3214.59
Notes: c(3), e, 8(5)											
T64-GE-413	Idle	---	260	2.62	1.07	51.83	19.87	---	2.36 **(S)**	2.14 **(S)**	3214.59
	75% hp	---	1287	8.54	1.07	1.94	0.40	---	1.97 **(S)**	0.45 **(S)**	3214.59
	Normal Rated	---	1511	9.65	1.07	1.20	0.38	---	1.61 **(S)**	0.88 **(S)**	3214.59
	Intermediate	---	1661	10.92	1.07	0.67	0.39	---	1.61 **(S)**	0.88 **(S)**	3214.59
	Maximum	---	1721	11.42	1.07	0.49	0.31	---	1.61 **(S)**	0.88 **(S)**	3214.59
Notes: c(9), d(20) - PM_{10} and $PM_{2.5}$ at all power settings, e, k(8)											
T64-GE-415	Idle	---	269	2.12	1.07	74.33	28.00	---	2.36 **(S)**	2.14 **(S)**	3214.59
	75%	---	1493	8.09	1.07	2.10	0.15	---	1.61 **(S)**	0.88 **(S)**	3214.59
	Normal Rated	---	1730	9.29	1.07	1.50	0.09	---	1.61 **(S)**	0.88 **(S)**	3214.59
	Military	---	1916	9.99	1.07	1.29	0.32	---	0.92 **(S)**	0.09 **(S)**	3214.59
	Max. Rated	---	2005	10.83	1.07	1.47	0.22	---	0.92 **(S)**	0.09 **(S)**	3214.59
Notes: c(9), d(20) - PM_{10} and $PM_{2.5}$ at all power settings, e, k(8)											
T76-G-10	Idle (Taxi)	---	238	7.40	1.07	23.80	8.51	---	0.38	0.34	3214.59
	Approach	---	476	8.50	1.07	17.20	0.92	---	0.50	0.45	3214.59
	Intermediate	---	794	9.90	1.07	5.90	0.12	---	0.63	0.57	3214.59
	Military	---	873	10.30	1.07	2.30	0.12	---	0.71	0.64	3214.59
Notes: c(7), e, g, h, k(8)											
T76-G-12	Idle (Taxi)	---	397	7.40	1.07	23.80	8.51	---	0.38	0.34	3214.59
	Approach	---	476	8.50	1.07	17.20	0.92	---	0.50	0.45	3214.59
	Intermediate	---	794	9.90	1.07	5.90	0.12	---	0.63	0.57	3214.59
	Military	---	857 **(C)**	10.30	1.07	2.30	0.12	---	0.71	0.64	3214.59
Notes: c(7), d(1), e, g, h, k(8)											
T76-G-418	Idle (Taxi)	---	238	7.40	1.07	23.80	8.51	---	0.38	0.34	3214.59
	Approach	---	476	8.50	1.07	17.20	0.92	---	0.50	0.45	3214.59
	Intermediate	---	794	9.90	1.07	5.90	0.12	---	0.63	0.57	3214.59
	Military	---	873	10.30	1.07	2.30	0.12	---	0.71	0.64	3214.59
Notes: c(7), e, g, h, k(8)											

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 [a]	CO	VOC	HAPs	PM_{10}	$PM_{2.5}$	CO_2e [b]
T76-G-419	Idle (Taxi)	---	397	7.40	1.07	23.80	8.51	---	0.38	0.34	3214.59
	Approach	---	476	8.50	1.07	17.20	0.92	---	0.50	0.45	3214.59
	Intermediate	---	794	9.90	1.07	5.90	0.12	---	0.63	0.57	3214.59
	Military	---	857 **(C)**	10.30	1.07	2.30	0.12	---	0.71	0.64	3214.59
Notes: c(7), d(1), e, g, h, k(8)											
T400-CP-400	Ground Idle	---	136	2.21	1.07	27.94	10.99	---	0.44	0.40	3214.59
	Flight Idle	---	141	2.84	1.07	29.08	8.97	---	0.41 **(C)**	0.37 **(C)**	3214.59
	Cruise	---	279	4.66	1.07	1.79	0.00	---	0.36	0.32	3214.59
	Intermediate (Military)	---	406	5.91	1.07	0.00	0.00	---	0.25	0.22	3214.59
	Maximum	---	1069	11.51	1.07	0.00	0.22	---	0.28	0.25	3214.59
Notes: c(1), d(1) - PM_{10} and $PM_{2.5}$ at Flight Idle power setting only, e, k(8)											
T406-AD-400	Idle	---	362	4.15	1.07	8.35	0.10	---	1.58	1.42	3214.59
	Flight Idle	---	663	6.05	1.07	3.47	0.02	---	1.58	1.42	3214.59
	Intermediate	---	948	7.87	1.07	1.82	0.02	---	1.58	1.42	3214.59
	Max Continuous	---	2507	18.03	1.07	0.29	0.01	---	1.58	1.42	3214.59
Notes: c(6) - T406-AD-400 is the military designation of the AE1107C engine, h, k(4)											
T700-GE-401, -401C	Idle	---	432	5.36	1.07	10.46	0.54	---	0.12	0.11	3214.59
	Approach	---	348	5.36	1.07	10.46	0.54	---	0.21	0.19	3214.59
	Climb out	---	443	5.60	1.07	10.11	0.53	---	0.46	0.41	3214.59
	Takeoff	---	442	5.59	1.07	10.15	0.53	---	0.53	0.48	3214.59
Notes: c(13), k(8)											
T700-GE-700	Ground Idle	4%	134	3.36	1.07	46.24	0.50	0.334	1.48	0.98	3214.59
	Flight Idle	56%	469	10.95	1.07	5.12	0.02	0.007	1.26	0.07	3214.59
	Flight Max	82%	626	11.87	1.07	3.51	0.01	0.003	2.22	0.93	3214.59
	Overspeed	100%	725	11.43	1.07	2.81	0.01	0.007	2.61	1.21	3214.59
Notes: c(3), k(5)											
TAE-125-01	Idle (Taxi)	---	2	16.91	1.07	24.80	9.78	---	0.05	0.05	3214.59
	Approach	---	20	26.96	1.07	16.06	3.29	---	0.04	0.04	3214.59
	Climb out	---	40	22.78	1.07	6.65	1.25	---	0.07	0.06	3214.59
	Takeoff	---	51	20.01	1.07	7.51	1.05	---	0.10	0.09	3214.59
Notes: c(16), e, g, h, k(8)											
TAY Mk611-8	Idle (Taxi)	7%	873	2.50	1.07	24.10	3.91	---	0.16	0.15	3214.59
	Approach	30%	1825	5.70	1.07	3.90	1.04	---	0.52	0.47	3214.59
	Climb out	85%	5000	16.80	1.07	0.80	0.35	---	0.48	0.43	3214.59
	Takeoff	100%	6032	21.10	1.07	0.70	0.92	---	0.56	0.50	3214.59
Notes: c(2), e, f, h, k(8)											
TAY Mk611-8C	Idle (Taxi)	7%	810	2.53	1.07	24.40	1.71	---	0.05	0.05	3214.59
	Approach	30%	1706	5.31	1.07	2.89	0.75	---	0.08	0.07	3214.59
	Climb out	85%	4794	15.40	1.07	0.95	0.06	---	0.10	0.09	3214.59
	Takeoff	100%	5802	19.30	1.07	0.50	0.03	---	0.11	0.10	3214.59
Notes: c(2), e, f, h, k(8)											

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 [a]	CO	VOC	HAPs	PM_{10}	$PM_{2.5}$	CO_2e [b]
TAY Mk620-15	Idle (Taxi)	7%	873	2.50	1.07	24.10	3.91	---	0.16	0.15	3214.59
	Approach	30%	1825	5.70	1.07	3.90	1.04	---	0.52	0.47	3214.59
	Climb out	85%	5000	16.80	1.07	0.80	0.35	---	0.48	0.43	3214.59
	Takeoff	100%	6032	21.10	1.07	0.70	0.92	---	0.56	0.50	3214.59
Notes: c(2), e, f, h, k(8)											
TAY Mk650-15	Idle (Taxi)	7%	944	1.70	1.07	33.77	3.78	---	0.06	0.06	3214.59
	Approach	30%	2016	4.55	1.07	6.54	1.01	---	0.14	0.12	3214.59
	Climb out	85%	5675	16.47	1.07	2.01	0.47	---	0.41	0.37	3214.59
	Takeoff	100%	6937	19.81	1.07	1.74	0.43	---	0.42	0.38	3214.59
Notes: c(2), e, f, h, k(8)											
TF30-P-3	Idle (Taxi)	---	873	2.30	1.07	72.00	71.30	---	0.01	0.01	3214.59
	Approach	---	2064	4.80	1.07	9.20	2.42	---	0.05	0.05	3214.59
	Intermediate	---	4921	9.40	1.07	1.30	0.12	---	0.45	0.41	3214.59
	Military	---	6191	12.00	1.07	0.80	0.03	---	0.40	0.36	3214.59
	Afterburner	---	38413	3.10	1.07	4.06	0.01	---	0.15	0.14	3214.59
Notes: c(7), e, g, h, k(8)											
TF30-P-6B	Idle (Taxi)	<75%	689	1.31	1.07	68.21	21.53	---	0.02 **(S)**	0.02 **(S)**	3214.59
	75% Thrust	75%	3550	6.68	1.07	6.31	3.40	---	0.12 **(S)**	0.11 **(S)**	3214.59
	Normal Rated	75-99%	4700	8.06	1.07	5.55	1.61	---	0.44 **(S)**	0.40 **(S)**	3214.59
	Intermediate (Military)	100%	6835	12.04	1.07	3.09	1.16	---	0.35 **(S)**	0.32 **(S)**	3214.59
Notes: c(1), d(21) - PM_{10} and $PM_{2.5}$ at all power settings, e, j - Assumes 100% thrust at Intermediate setting, k(8)											
TF30-P-7	Idle (Taxi)	---	952	3.00	1.07	53.00	34.50	---	0.02	0.02	3214.59
	Approach	---	2064	6.10	1.07	11.50	3.68	---	0.12	0.11	3214.59
	Intermediate	---	5714	14.00	1.07	1.20	0.23	---	0.44	0.40	3214.59
	Military	---	7222	20.00	1.07	0.80	0.12	---	0.35	0.32	3214.59
	Afterburner	---	38413	3.10	1.07	4.00	0.01	---	0.15	0.14	3214.59
Notes: c(7), e, g, h, k(8)											
TF30-P-9	Idle (Taxi)	---	952	3.00	1.07	53.00	34.50	---	0.02	0.02	3214.59
	Approach	---	2064	6.10	1.07	11.50	3.68	---	0.12	0.11	3214.59
	Intermediate	---	5714	14.00	1.07	1.20	0.23	---	0.44	0.40	3214.59
	Military	---	8730	20.00	1.07	0.80	0.12	---	0.35	0.32	3214.59
	Afterburner	---	54525	3.10	1.07	4.00	0.01	---	0.15	0.14	3214.59
Notes: c(7), e, k(8)											
TF30-P-100	Idle (Taxi)	---	1260	2.86	1.07	47.62	21.72	---	26.27	23.64	3214.59
	Approach	---	4562 **(C)**	10.95 **(C)**	1.07	1.70 **(C)**	0.41 **(C)**	---	24.88 **(C)**	22.39 **(C)**	3214.59
	Intermediate	---	6650	20.00	1.07	0.71	0.12	---	24.00	21.60	3214.59
	Military	---	7120	28.01	1.07	0.70	0.11	---	8.34	7.51	3214.59
	Afterburner	---	42850	4.47	1.07	24.80	2.30	---	5.36	4.82	3214.59
Notes: c(1), d(1) - All pollutants at Approach power setting, e, j - Assumes 100% thrust at Takeoff power setting, k(8)											
TF30-P-103	Idle (Taxi)	<30%	827	4.00	1.07	100.00	88.44	---	0.51	0.46	3214.59
	30%	30%	2003	7.00	1.07	36.20	12.54	---	0.82	0.74	3214.59
	75%	75%	4119	15.10	1.07	5.50	0.36	---	0.20	0.18	3214.59
	100%	100%	5541	20.10	1.07	2.10	0.10	---	16.34	14.70	3214.59
	Afterburner-1	>100%	14292	11.20	1.07	77.20	32.20	---	35.69 **(C)**	31.84 **(C)**	3214.59
Notes: c(15), d(1) - PM_{10} and $PM_{2.5}$ at Afterburner power setting only, e, f, h, k(3)											

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 [a]	CO	VOC	HAPs	PM_{10}	$PM_{2.5}$	CO_2e [b]
TF30-P-109	Idle (Taxi)	5%	761	2.93	1.07	48.49	7.44	3.242	1.24	1.11	3214.59
	Approach	23%	1727	6.19	1.07	20.73	2.35	1.279	1.52	1.37	3214.59
	Intermediate	47%	2921	9.58	1.07	5.17	0.80	0.072	1.64	1.47	3214.59
	Military	99%	6263	23.63	1.07	0.71	0.87	0.023	0.92	0.82	3214.59
	Afterburner-5	>99%	38460	4.89	1.07	6.19	2.50	0.034	0.51	0.46	3214.59
Notes: c(12), h, k(5)											
TF30-P-412A	Idle (Taxi)	---	999	2.40	1.07	68.17	44.20	---	26.53	23.87	3214.59
	75% rpm	---	1448	3.66	1.07	38.60	11.12	---	24.03	21.63	3214.59
	90% rpm	---	3597	9.62	1.07	6.34	0.19	---	15.01	13.51	3214.59
	Intermediate (Military)	---	7394	16.66	1.07	2.12	0.11	---	8.34	7.51	3214.59
	Afterburner	---	40000	6.75	1.07	15.00	1.15	---	17.33	15.60	3214.59
Notes: c(1), e, k(8)											
TF33-P-3, -P-5	Idle (Taxi)	<30%	846	1.77	1.07	88.53	105.76	---	5.20	4.68	3214.59
	Approach	30%	3797	7.30	1.07	9.01	4.36	---	13.98	12.59	3214.59
	Climb out	85%	7323	9.00	1.07	1.80	0.46	---	14.00	12.60	3214.59
	Takeoff	100%	9979	11.00	1.07	1.30	0.35	---	8.00	7.20	3214.59
Notes: c(1), e, h, j, k(8)											
TF33-P-7	Idle (Taxi)	4%	1093	0.78	1.07	134.96	5.32	4.640	6.13	3.80	3214.59
	Approach	45%	4884	7.12	1.07	9.67	0.24	0.190	3.68	1.46	3214.59
	Intermediate	58%	6356	8.10	1.07	4.16	0.06	0.041	5.28	1.72	3214.59
	Military	73%	8264	10.29	1.07	1.49	0.02	0.011	3.58	1.23	3214.59
Notes: c(3), e, k(5)											
TF33-P-9	Idle (Taxi)	---	1120	1.39	1.07	95.06	90.91	---	4.98	4.48	3214.59
	Approach	---	4140	6.37	1.07	5.24	1.37	---	3.55	3.20	3214.59
	Intermediate	---	8960	7.88	1.07	2.11	1.50	---	3.15	2.84	3214.59
	Military	---	9630	12.08	1.07	0.00	0.55	---	3.67	3.30	3214.59
Notes: c(6), e, h, k(4)											
TF33-P-100	Idle (Taxi)	---	1108	1.50	1.07	136.96	131.16	---	6.13	5.52	3214.59
	Approach	---	2794	6.22	1.07	14.60	3.62	---	5.46	4.91	3214.59
	Intermediate	---	8069	8.47	1.07	2.96	0.39	---	5.29	4.76	3214.59
	Military	---	10856	11.49	1.07	1.19	0.25	---	2.93	2.64	3214.59
Notes: c(6), h, k(8)											
TF33-P-102	Idle (Taxi)	5%	1114	1.39	1.07	95.02	3.42	2.610	4.96	4.06	3214.59
	Approach	49%	4737	6.37	1.07	5.24	0.11	0.087	3.55	1.66	3214.59
	Intermediate	59%	5782	7.88	1.07	2.11	0.06	0.032	3.15	1.42	3214.59
	Military	75%	7561	12.08	1.07	0.00	0.02	0.003	2.52	1.02	3214.59
Notes: c(3), e, k(5)											
TF33-P-102A	Idle (Taxi)	7%	1065	1.80	1.07	117.03	106.96	---	4.98	4.48	3214.59
	Approach	30%	3912	5.84	1.07	12.37	1.74	---	3.55	3.20	3214.59
	Intermediate	70%	6985	8.74	1.07	2.01	0.95	---	3.15	2.84	3214.59
	Military	100%	8756	12.39	1.07	0.45	0.53	---	3.67	3.30	3214.59
Notes: c(6), h, j, k(8)											

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 [a]	CO	VOC	HAPs	PM_{10}	$PM_{2.5}$	CO_2e [b]
TF33-P-103	Idle (Taxi)	---	900	1.39	1.07	95.06	90.91	---	4.98	4.48	3214.59
	Approach	---	3800	6.37	1.07	5.24	1.37	---	3.55	3.20	3214.59
	Intermediate	---	6240	7.88	1.07	2.11	1.50	---	3.15	2.84	3214.59
	Military	---	7440	12.08	1.07	0.00	0.55	---	3.67	3.30	3214.59
Notes: c(6), e, h, k(4)											
TF34-GE-100	Idle (Taxi)	---	390	2.10	1.07	106.70	39.45	---	8.13 **(S)**	3.60 **(S)**	3214.59
	Approach	---	920	5.70	1.07	16.30	2.19	---	6.21 **(S)**	2.12 **(S)**	3214.59
	Intermediate	---	460	2.60	1.07	78.00	23.35	---	8.93 **(S)**	6.95 **(S)**	3214.59
	Military	---	2710	10.70	1.07	2.20	0.12	---	2.66 **(S)**	1.68 **(S)**	3214.59
Notes: c(7), d(22) - PM_{10} and $PM_{2.5}$ at all power settings, e, k(8)											
TF34-GE-100A	Idle (Taxi)	7%	498	0.32	1.07	65.62	2.24	2.030	8.13	3.60	3214.59
	Approach	28%	933	3.09	1.07	27.92	1.44	1.340	6.21	2.12	3214.59
	Intermediate	46%	1512	5.61	1.07	8.88	0.13	0.087	8.93	6.95	3214.59
	Military	78%	2628	9.11	1.07	3.94	0.07	0.040	2.66	1.68	3214.59
Notes: c(3), k(5)											
TF34-GE-400	Idle (Taxi)	10% **(C)**	458	1.69	1.07	90.98	17.24	---	8.13 **(S)**	3.60 **(S)**	3214.59
	Approach	30% **(C)**	1201 **(C)**	2.98 **(C)**	1.07	72.08 **(C)**	13.51 **(C)**	---	6.21 **(S)**	2.12 **(S)**	3214.59
	Intermediate	70% **(C)**	2686 **(C)**	5.57 **(C)**	1.07	34.29 **(C)**	6.05 **(C)**	---	2.66 **(S)**	1.68 **(S)**	3214.59
	Military	100% **(C)**	3800	7.51	1.07	5.95	0.45	---	2.66 **(S)**	1.68 **(S)**	3214.59
Notes: c(9), d(1) - Fuel flow rates, NO_X, CO, and VOC at Approach and Intermediate power settings, d(22) - PM_{10} and $PM_{2.5}$ at all power settings, e, k(8)											
TF39-GE-1C	Idle (Taxi)	7%	1448	3.37	1.07	58.43	3.44	2.590	2.80	2.49	3214.59
	Approach	76%	10477	24.91	1.07	0.77	0.03	0.014	1.20	0.44	3214.59
	Intermediate	87%	12541	28.16	1.07	1.53	0.03	0.010	0.89	0.37	3214.59
	Military	94%	13862	32.66	1.07	1.29	0.03	0.014	1.18	0.77	3214.59
Notes: c(3), k(5)											
TF41-A-1	Idle (Taxi)	---	1032	1.50	1.07	119.00	105.80	---	0.15	0.14	3214.59
	Approach	---	3492	6.80	1.07	10.20	2.53	---	0.36	0.32	3214.59
	Intermediate	---	5873	12.00	1.07	3.70	0.46	---	0.52	0.47	3214.59
	Military	---	8413	21.00	1.07	1.80	0.23	---	0.67	0.60	3214.59
Notes: c(7), e, k(8)											
TF41-A-2	Idle (Taxi)	<30%	1047	4.00	1.07	176.00	114.54	---	0.65	0.59	3214.59
	30%	30%	2704	8.90	1.07	45.00	11.62	---	0.73	0.66	3214.59
	75%	75%	5810	23.80	1.07	4.70	0.10	---	16.94	15.25	3214.59
	100%	100%	8086	32.90	1.07	3.20	0.09	---	28.60	25.74	3214.59
Notes: c(15), e, f, h, k(3)											
TFE731-2, -2A	Idle (Taxi)	---	206	3.50	1.07	47.80	8.54	---	0.13 **(S)**	0.12 **(S)**	3214.59
	Approach	---	571	6.90	1.07	15.56	1.41	---	0.13 **(S)**	0.12 **(S)**	3214.59
	Intermediate	---	1476	16.08	1.07	1.62	0.07	---	0.09 **(S)**	0.09 **(S)**	3214.59
	Military	---	1786	19.15	1.07	1.13	0.06	---	0.09 **(S)**	0.08 **(S)**	3214.59
Notes: c(6), d(14) - PM_{10} and $PM_{2.5}$ at all power settings, k(8)											

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 [a]	CO	VOC	HAPs	PM_{10}	$PM_{2.5}$	CO_2e [b]
TFE731-2-2B	Idle (Taxi)	7%	190	2.82	1.07	58.60	23.05	---	0.13 **(S)**	0.12 **(S)**	3214.59
	Approach	30%	532	5.90	1.07	22.38	4.90	---	0.09 **(S)**	0.08 **(S)**	3214.59
	Climb out	85%	1373	13.08	1.07	2.03	0.15	---	0.09 **(S)**	0.08 **(S)**	3214.59
	Takeoff	100%	1627	15.25	1.07	1.39	0.13	---	0.08 **(S)**	0.08 **(S)**	3214.59
Notes: c(2), d(14) - PM_{10} and $PM_{2.5}$ at all power settings, e, f, h, k(8)											
TFE731-3	Idle (Taxi)	7%	206	3.72	1.07	47.70	10.40	---	0.13 **(S)**	0.12 **(S)**	3214.59
	Approach	30%	571	6.92	1.07	15.56	1.62	---	0.09 **(S)**	0.08 **(S)**	3214.59
	Climb out	85%	1476	16.02	1.07	1.62	0.08	---	0.09 **(S)**	0.08 **(S)**	3214.59
	Takeoff	100%	1786	19.15	1.07	1.13	0.07	---	0.08 **(S)**	0.08 **(S)**	3214.59
Notes: c(2), d(14) - PM_{10} and $PM_{2.5}$ at all power settings, e, f, h, k(8)											
TIO-540-A1A, -540-A1B, -540-A1B, -540-A2A, -540-A2B, - 540-A2C, -540-AE2A, -540-AH1A, -540-F2BD, -540-J2B	Idle (Taxi)	---	25	0.04	1.07	1293.70	78.29	---	0.50	0.45	3214.59
	Approach	---	99	1.39	1.07	1261.60	15.39	---	0.40	0.36	3214.59
	Climb out	---	205	0.24	1.07	1470.90	19.12	---	0.70	0.63	3214.59
	Takeoff	---	260	0.36	1.07	1442.10	14.21	---	0.10	0.09	3214.59
Notes: c(16), e, g, h, k(8)											
TIO-540-J2B2	Idle (Taxi)	<40%	25	0.39	1.07	1293.70	78.29	---	0.50 **(S)**	0.45 **(S)**	3214.59
	Approach	40%	99	1.39	1.07	1261.57	15.38	---	0.40 **(S)**	0.36 **(S)**	3214.59
	Climb out	75-100%	205	0.24	1.07	1470.90	19.12	---	0.70 **(S)**	0.63 **(S)**	3214.59
	Takeoff	100%	260	0.36	1.07	1442.05	14.21	---	0.10 **(S)**	0.09 **(S)**	3214.59
Notes: c(1), d(13) - PM_{10} and $PM_{2.5}$ at all power settings, e, j, k(8)											
TIO-540-J2BD, -540-S1AD	Idle (Taxi)	---	25	0.04	1.07	1293.70	78.29	---	0.50	0.45	3214.59
	Approach	---	99	1.39	1.07	1261.60	15.39	---	0.40	0.36	3214.59
	Climb out	---	205	0.24	1.07	1470.90	19.12	---	0.70	0.63	3214.59
	Takeoff	---	260	0.36	1.07	1442.10	14.21	---	0.10	0.09	3214.59
Notes: c(16), e, g, h, k(8)											
TPE331-2	Idle (Taxi)	<30%	105	2.57	1.07	64.10	104.92	---	2.68 **(S)**	2.41 **(S)**	3214.59
	Approach	30%	220	8.27	1.07	16.59	3.08	---	2.40 **(S)**	2.16 **(S)**	3214.59
	Climb out	90%	372	9.92	1.07	1.37	0.46	---	1.47 **(S)**	1.32 **(S)**	3214.59
	Takeoff	100%	405	10.22	1.07	0.94	0.45	---	1.75 **(S)**	1.57 **(S)**	3214.59
Notes: c(1), d(23) - PM_{10} and $PM_{2.5}$ at all power settings, e, j, k(8)											
TPE331-3	Idle (Taxi)	<30%	112	2.86	1.07	61.52	90.97	---	2.68	2.41	3214.59
	Approach	30%	250	9.92	1.07	6.96	0.74	---	2.40	2.16	3214.59
	Climb out	90%	409	11.86	1.07	0.98	0.17	---	1.47	1.32	3214.59
	Takeoff	100%	458	12.36	1.07	0.76	0.13	---	1.75	1.57	3214.59
Notes: c(1), e, j, k(8)											
Trent 553-61	Idle (Taxi)	7%	1825	5.96	1.07	10.50	0.16	---	0.04	0.04	3214.59
	Approach	30%	4762	11.37	1.07	0.66	0.05	---	0.05	0.05	3214.59
	Climb out	85%	13730	30.98	1.07	0.44	0.01	---	0.06	0.05	3214.59
	Takeoff	100%	16746	40.55	1.07	0.18	0.02	---	0.06	0.05	3214.59
Notes: c(2), e, f, h, k(8)											

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 [a]	CO	VOC	HAPs	PM_{10}	$PM_{2.5}$	CO_2e [b]
Trent 556-61	Idle (Taxi)	7%	1825	6.09	1.07	9.96	0.15	---	0.04	0.04	3214.59
	Approach	30%	4921	11.68	1.07	0.54	0.05	---	0.05	0.05	3214.59
	Climb out	85%	14524	33.25	1.07	0.38	0.01	---	0.06	0.05	3214.59
	Takeoff	100%	17778	44.77	1.07	0.17	0.02	---	0.06	0.05	3214.59
Notes: c(2), e, f, h, k(8)											
Trent 768	Idle (Taxi)	7%	2056	4.46	1.07	26.94	3.67	---	0.06	0.06	3214.59
	Approach	30%	6198	10.12	1.07	1.71	0.05	---	0.05	0.05	3214.59
	Climb out	85%	18849	24.90	1.07	0.49	0.01	---	0.07	0.07	3214.59
	Takeoff	100%	23072	32.01	1.07	0.35	0.00	---	0.06	0.06	3214.59
Notes: c(2), e, f, h, k(8)											
Trent 772	Idle (Taxi)	7%	2143	4.66	1.07	23.97	2.83	---	0.06	0.05	3214.59
	Approach	30%	6516	10.42	1.07	1.56	0.05	---	0.06	0.05	3214.59
	Climb out	85%	20079	26.82	1.07	0.49	0.01	---	0.07	0.07	3214.59
	Takeoff	100%	24913	35.56	1.07	0.21	0.01	---	0.06	0.06	3214.59
Notes: c(2), e, f, h, k(8)											
Trent 875	Idle (Taxi)	7%	2222	4.64	1.07	19.66	2.05	---	0.05	0.05	3214.59
	Approach	30%	6984	10.43	1.07	0.86	0.00	---	0.05	0.05	3214.59
	Climb out	85%	20397	26.55	1.07	0.16	0.00	---	0.06	0.05	3214.59
	Takeoff	100%	24603	33.32	1.07	0.19	0.00	---	0.06	0.05	3214.59
Notes: c(2), e, f, h, k(8)											
Trent 877	Idle (Taxi)	7%	2222	4.75	1.07	18.42	1.78	---	0.05	0.05	3214.59
	Approach	30%	7143	10.59	1.07	0.80	0.00	---	0.05	0.05	3214.59
	Climb out	85%	21111	27.59	1.07	0.16	0.00	---	0.06	0.05	3214.59
	Takeoff	100%	25476	34.76	1.07	0.20	0.00	---	0.05	0.05	3214.59
Notes: c(2), e, f, h, k(8)											
Trent 884	Idle (Taxi)	7%	2460	5.04	1.07	15.19	1.15	---	0.05	0.04	3214.59
	Approach	30%	7698	11.07	1.07	0.65	0.00	---	0.05	0.05	3214.59
	Climb out	85%	22937	30.63	1.07	0.18	0.00	---	0.06	0.05	3214.59
	Takeoff	100%	28254	40.05	1.07	0.24	0.00	---	0.05	0.05	3214.59
Notes: c(2), e, f, h, k(8)											
Trent 892	Idle (Taxi)	7%	2381	5.33	1.07	13.07	0.81	---	0.05	0.04	3214.59
	Approach	30%	7937	11.58	1.07	0.57	0.00	---	0.05	0.05	3214.59
	Climb out	85%	24603	33.30	1.07	0.20	0.00	---	0.06	0.05	3214.59
	Takeoff	100%	31032	45.70	1.07	0.28	0.01	---	0.05	0.05	3214.59
Notes: c(2), e, f, h, k(8)											
Trent 895	Idle (Taxi)	7%	2619	5.11	1.07	14.71	1.02	---	0.05	0.04	3214.59
	Approach	30%	8333	11.39	1.07	0.54	0.00	---	0.05	0.05	3214.59
	Climb out	85%	25318	34.29	1.07	0.19	0.00	---	0.06	0.05	3214.59
	Takeoff	100%	31984	47.79	1.07	0.27	0.02	---	0.05	0.05	3214.59
Notes: c(2), e, f, h, k(8)											

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 [a]	CO	VOC	HAPs	PM_{10}	$PM_{2.5}$	CO_2e [b]
Trent 970-84	Idle (Taxi)	7%	2381	5.10	1.07	15.10	0.23	---	0.04	0.04	3214.59
	Approach	30%	5556	11.40	1.07	1.40	0.00	---	0.05	0.05	3214.59
	Climb out	85%	17460	29.10	1.07	0.20	0.00	---	0.06	0.05	3214.59
	Takeoff	100%	20638	37.20	1.07	0.40	0.00	---	0.05	0.05	3214.59
Notes: c(2), e, f, h, k(8)											
Trent 972-84	Idle (Taxi)	7%	2048	5.51	1.07	13.00	0.05	---	0.04	0.04	3214.59
	Approach	30%	5833	12.23	1.07	1.10	0.08	---	0.06	0.06	3214.59
	Climb out	85%	17540	30.36	1.07	0.31	0.13	---	0.07	0.07	3214.59
	Takeoff	100%	21206	39.78	1.07	0.32	0.01	---	0.06	0.06	3214.59
Notes: c(2), e, f, h, k(8)											
Trent 1000-A	Idle (Taxi)	7%	1881	5.40	1.07	8.73	0.07	---	0.04	0.04	3214.59
	Approach	30%	4960	13.29	1.07	0.77	0.00	---	0.06	0.05	3214.59
	Climb out	85%	14897	35.87	1.07	0.45	0.00	---	0.05	0.05	3214.59
	Takeoff	100%	18111	46.67	1.07	0.53	0.00	---	0.05	0.04	3214.59
Notes: c(2), e, f, h, k(8)											
Trent 1000-C	Idle (Taxi)	7%	1952	5.66	1.07	7.66	0.05	---	0.04	0.04	3214.59
	Approach	30%	5302	13.86	1.07	0.68	0.00	---	0.06	0.05	3214.59
	Climb out	85%	16254	40.33	1.07	0.48	0.00	---	0.05	0.05	3214.59
	Takeoff	100%	19905	53.54	1.07	0.51	0.00	---	0.05	0.04	3214.59
Notes: c(2), e, f, h, k(8)											
Trent 1000-E	Idle (Taxi)	7%	1762	5.06	1.07	10.63	0.10	---	0.04	0.04	3214.59
	Approach	30%	4524	12.54	1.07	0.92	0.00	---	0.05	0.05	3214.59
	Climb out	85%	13167	30.55	1.07	0.43	0.00	---	0.06	0.05	3214.59
	Takeoff	100%	15929	39.17	1.07	0.47	0.00	---	0.05	0.05	3214.59
Notes: c(2), e, f, h, k(8)											
TSIO-360-A, -360-AB, -360-B, -360-BB, -360-C, -360-CB, -360-F, -360-FB, -360-JB	Idle (Taxi)	---	11	1.91	1.07	592.20	159.00	---	0.05	0.05	3214.59
	Approach	---	61	3.77	1.07	995.10	13.01	---	0.04	0.04	3214.59
	Climb out	---	99	4.32	1.07	960.80	10.98	---	0.07	0.06	3214.59
	Takeoff	---	133	2.71	1.07	1082.00	10.55	---	0.10	0.09	3214.59
Notes: c(16), e, g, h, k(8)											
V2500-A1	Idle (Taxi)	7%	984	5.91	1.07	7.76	0.25	---	0.08	0.07	3214.59
	Approach	30%	2651	13.45	1.07	0.77	0.17	---	0.08	0.07	3214.59
	Climb out	85%	7333	30.82	1.07	0.55	0.13	---	0.12	0.11	3214.59
	Takeoff	100%	8833	37.13	1.07	0.55	0.12	---	0.12	0.11	3214.59
Notes: c(2), e, f, h, k(1)											
V2522-A5	Taxi (Idle)	7%	937	4.50	1.07	13.42	0.12	---	0.15	0.13	3214.59
	Approach	30%	2468	8.70	1.07	2.60	0.07	---	0.19	0.17	3214.59
	Climb out	85%	6484	20.80	1.07	0.67	0.05	---	0.24	0.21	3214.59
	Takeoff	100%	7706	24.50	1.07	0.57	0.05	---	0.16	0.14	3214.59
Notes: c(2), e, f, h, k(1)											

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 [a]	CO	VOC	HAPs	PM_{10}	$PM_{2.5}$	CO_2e [b]
V2524-A5	Idle (Taxi)	7%	976	4.70	1.07	12.64	0.12	---	0.15	0.13	3214.59
	Approach	30%	2603	9.00	1.07	2.37	0.07	---	0.20	0.18	3214.59
	Climb out	85%	6889	22.00	1.07	0.63	0.05	---	0.23	0.20	3214.59
	Takeoff	100%	8270	26.20	1.07	0.54	0.05	---	0.15	0.14	3214.59
Notes: c(2), e, f, h, k(1)											
V2525-D5	Taxi (Idle)	7%	1016	4.70	1.07	12.43	0.12	---	0.15	0.13	3214.59
	Approach	30%	2532	8.90	1.07	2.44	0.07	---	0.20	0.18	3214.59
	Climb out	85%	6984	22.30	1.07	0.62	0.05	---	0.23	0.20	3214.59
	Takeoff	100%	8357	26.50	1.07	0.53	0.05	---	0.15	0.14	3214.59
Notes: c(2), e, f, h, k(1)											
V2527-A5	Idle (Taxi)	7%	1016	4.70	1.07	12.43	0.12	---	0.15	0.13	3214.59
	Approach	30%	2532	8.90	1.07	2.44	0.07	---	0.20	0.18	3214.59
	Climb out	85%	6984	22.30	1.07	0.62	0.05	---	0.23	0.20	3214.59
	Takeoff	100%	8357	26.50	1.07	0.53	0.05	---	0.15	0.14	3214.59
Notes: c(2), e, f, h, k(1)											
V2528-D5	Taxi (Idle)	7%	1063	4.90	1.07	11.53	0.12	---	0.13	0.12	3214.59
	Approach	30%	2802	9.60	1.07	2.03	0.07	---	0.20	0.18	3214.59
	Climb out	85%	7905	25.10	1.07	0.56	0.05	---	0.20	0.18	3214.59
	Takeoff	100%	9595	30.50	1.07	0.47	0.05	---	0.14	0.13	3214.59
Notes: c(2), e, f, h, k(1)											
V2530-A5	Idle (Taxi)	7%	1095	5.00	1.07	10.95	0.12	---	0.13	0.12	3214.59
	Approach	30%	2992	10.10	1.07	1.81	0.06	---	0.21	0.18	3214.59
	Climb out	85%	8548	27.10	1.07	0.52	0.05	---	0.19	0.17	3214.59
	Takeoff	100%	10564	33.80	1.07	0.45	0.05	---	0.14	0.13	3214.59
Notes: c(2), e, f, h, k(1)											
V2533-A5	Taxi (Idle)	7%	1082	5.24	1.07	9.32	0.12	---	0.13	0.12	3214.59
	Approach	30%	3096	10.83	1.07	1.65	0.06	---	0.21	0.19	3214.59
	Climb out	85%	9085	28.67	1.07	0.52	0.05	---	0.19	0.17	3214.59
	Takeoff	100%	11318	36.48	1.07	0.46	0.05	---	0.13	0.12	3214.59
Notes: c(2), e, f, h, k(1)											

Notes for Table 2-8:

a. The emission factor for sulfur oxides assume JP-8 used as the fuel. The value provided is the national average for sulfur content in JP-8, though when conducting an air emissions inventory (AEI), the sulfur content should be obtained directly from the fuel supplier.

b. The equivalent CO_2 (CO_2e) 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 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/1000lb fuel. JP-8 with a density of 6.71 lb/gal was used for unit conversion.

c. The Emission factors were found in the following sources:

(1) SOURCE: *Air Pollutant Emission Factors for Military and Civil Aircraft*, EPA-450/3-78-117, October 1978.

(2) SOURCE: *Airport Air Quality Manual*, International Civil Aviation Organization, 2011 version 24 datasheets.

(3) SOURCE: *Aircraft Engine and Auxiliary Power Unit Emissions* Volumes I-III, March 1999, IERA-RS-BR-TR-1999-0006.

(4) SOURCE: *Aircraft Engine and Auxiliary Power Unit Emissions Testing Final Report Addendum F119-PW-100* June 2002, IERA-RS-BR-SR-2002-0006.

(5) SOURCE: *Engine and Hush House Emissions from a F100-PW-200 Jet Engine Tested at Kelly AFB*, TX Final Volume I February 1997.

(6) SOURCE: Air Emissions Inventory Guidance Document for Mobile Sources at Air Force Installations January 2002, IERA-RS-BR-SR-2001-0010.

(7) SOURCE: *Aircraft Engine Emissions Estimator*, AFESC, September 1985.

(8) SOURCE: *Collection and Assessment of Aircraft Emissions*, US EPA, October 1971.

(9) SOURCE: *Summary Tables of Gaseous and Particulate Emissions from Aircraft Engines*, Aircraft Environmental Support Office.
(10) SOURCE: *Clean Air Act Emission Testing of the T-38C Aircraft Engines* September 2002, IERA-RS-BR-SR-2003-001.
(11) SOURCE: *PT6A-68 Emissions Measurement Program Summary, September 2002*, IERA-RS-BR-SR-2003-0003.
(12) SOURCE: *Engine and Hush House Emissions from a TF30-P-109 Jet Engine Tested at Canon AFB*, NM Final Volume I June 1996.
(13) SOURCE: *Air Emissions Factor Guide to Air Force Mobile Sources*, December 2009.
(14) SOURCE: *Engine and Hush House Emissions from a F100-PW-100 Jet Tested at Langley Air Force Base, VA*, November 1996.
(15) SOURCE: *Aircraft Emissions Characterization: TF41-A2, TF30-P-103, and TF30-P109 Engines*, December 1987.
(16) SOURCE: *Exhaust Emissions from In-Use General Aviation Aircraft,* The National Academies of Sciences Engineering Medicine. The National Academies Press, 2016.
(17) SOURCE: *Source Sampling of Aerospace Ground Equipment and Jet Engines Technical Report,* Environmental Quality Management, Inc. 1996.
(18) SOURCE: *Fuel Flows and Emission Indexes of the F404-GE-402 Engine Burning JP-5,* AESO Memorandum Report No. 2003-01 Revision A, September 2016.
(19) SOURCE: *Fuel Flows and Emission Indexes of the F414-GE-400 Engines Burning JP-5,* AESO Memorandum Report No. 9725 Revision E, September 2016.

d. Surrogate data was used for this engine. The surrogate data was found in the following sources:
(1) Data was calculated using values provided in the source document.
(2) F100-PW-220
(3) F101-GE-102
(4) F110-GE-100
(5) IO-360-A
(6) J52-P-408
(7) J57-P-19W
(8) J85-GE-13
(9) O-320-A2B
(10) J85-GE-5A
(11) PT6A-65
(12) R-1820-82
(13) TIO-540-A1A
(14) LF507-1F
(15) PT6A-38
(16) PW2040
(17) T53-L-13
(18) T56-A-15
(19) T58-GE-5
(20) T64-GE-100
(21) TF30-P-7
(22) TF34-GE-100A
(23) TPE331-3

e. 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.
f. PM data calculated using smoke numbers and the ICAO method. The PM calculated was assumed to be PM_{10}.
g. PM reported in the source document was assumed to be PM_{10}.
h. $PM_{2.5}$ calculated at 90% of PM_{10}.
i. For at least one setting, the emission factors reported are an average of values provided in the source document.
j. Percent thrust is an estimate based on tables provided in the source document.
k. Fuel used for emissions testing:
(1) Jet A

(2) Jet A-1
(3) JP-4
(4) JP-5
(5) JP-8
(6) JP-8+100
(7) AVGAS
(8) No data on fuel used in tests

"(**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)			1127	2765	7685	10996	54007
Percent Thrust/hp			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		2.40E-02	1.00E-02	ND	ND	ND
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
Xylenes (mixed isomers)	1330-20-7	X	5.10E-02	7.35E-03	1.92E-03	4.55E-03	9.42E-04

Notes for F100-PW-100

SOURCE: *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)			1006	3251	5651	8888	40123
Percent Thrust/hp			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	4.73E-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
Xylenes (mixed isomers)	1330-20-7	X	1.83E-02	1.68E-03	1.78E-03	2.58E-03	3.17E-04

Notes for F100-PW-200 Engine:

SOURCE: *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)			1117	4533	6557	7828	15314
Percent Thrust/hp			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		2.28E-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
Xylenes (mixed isomers)	1330-20-7	X	9.22E-04	4.34E-04	6.65E-04	2.45E-03	2.24E-01

Notes for F101-GE-102 Engine:

SOURCE: *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)			1136	2547	5650	6458	---
Percent Thrust/hp			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	---
Xylenes (mixed isomers)	1330-20-7	X	1.65E-03	1.61E-03	5.42E-04	3.36E-04	---

Notes for F108-CF-100 Engine

SOURCE: *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)			1111	5080	7332	11358	18088
Percent Thrust/hp			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
Xylenes (mixed isomers)	1330-20-7	X	4.22E-03	1.12E-03	9.70E-04	5.07E-04	8.89E-02

Notes for F110-GE-100 Engine:

SOURCE: *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)			978	4645	10408	---	---
Percent Thrust/hp			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	---	---
Xylenes (mixed isomers)	1330-20-7	X	3.27E-03	6.21E-04	5.47E-04	---	---

Notes for F117-PW-100 Engine:

SOURCE: *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)			1097	3773	6350	10887	---
Percent Thrust/hp			---	---	---	---	---
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	---
Xylenes (mixed isomers)	1330-20-7	X	5.26E-03	1.96E-03	2.87E-04	2.05E-04	---

Notes for F118-GE-100 Engine:

SOURCE: *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	---
Fuel Flowrate (lb/hr)			1377	2740	10110	18612	---
Percent Thrust/hp			10%	20%	70%	100%	---
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	---
Xylenes (mixed isomers)	1330-20-7	X	6.71E-02	8.81E-04	4.89E-04	3.77E-04	---

Notes for F119-PW-100 Engine:

SOURCE: *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)			685	3111	6464	7739	15851
Percent Thrust/hp			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
Xylenes (mixed isomers)	1330-20-7	X	2.49E-01	2.64E-03	1.97E-03	1.01E-03	1.42E-01

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

SOURCE: *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)			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	---	---	---	---
Xylenes (mixed isomers)	1330-20-7	X	2.65E-03	---	---	---	---

Notes for GTCP85-180 Engine:

SOURCE: *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)			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	---	---	---	---
Xylenes (mixed isomers)	1330-20-7	X	6.01E-03	---	---	---	---

Notes for GTCP165-1 Engine:

SOURCE: *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)			167	872	1085	---	---
Percent Thrust/hp			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	---	---
Xylenes (mixed isomers)	1330-20-7	X	8.96E-02	2.79E-03	4.94E-04	---	---

Notes for J69-T-25 Engine:

SOURCE: *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)			434	950	2740	8138	---
Percent Thrust/hp			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	---
Xylenes (mixed isomers)	1330-20-7	X	1.37E-01	3.62E-02	1.78E-03	2.78E-03	---

Notes for J85-GE-5A Engine:

SOURCE: *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	---	---
Fuel Flowrate (lb/hr)			525	1045	2550	---	---
Percent Thrust/hp			---	---	---	---	---
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	---	---
Xylenes (mixed isomers)	1330-20-7	X	4.04E-02	1.25E-02	6.65E-04	---	---

Notes for J85-GE-5M Engine:

SOURCE: *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)			156	180	328	449	612
Percent Thrust/hp			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		3.71E-01	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	1.30E-01	1.08E-01	ND	ND	ND
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
Xylenes (mixed isomers)	1330-20-7	X	1.73E-01	1.97E-01	8.95E-03	8.60E-04	1.44E-03

Notes for PT6A-68 Engine:

SOURCE: *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)			724	880	1742	2262	---
Percent Thrust/hp			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	---
Xylenes	1330-20-7	X	1.33E-03	1.05E-03	5.82E-04	8.75E-04	---

Notes for T56-A-7 Engine:

SOURCE: *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)			298	941	1698	1848	---
Percent Thrust/hp			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		5.90E-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	---
Xylenes (mixed isomers)	1330-20-7	X	6.45E-02	9.68E-04	ND	ND	---

Notes for T64-GE-100 Engine:

SOURCE: *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)			134	469	626	725	---
Percent Thrust/hp			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	---
Xylenes (mixed isomers)	1330-20-7	X	7.14E-03	5.69E-04	5.07E-04	1.24E-03	---

Notes for T700-GE-700 Engine:

SOURCE: *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)			761	1727	2921	6263	38460
Percent Thrust/hp			5%	23%	47%	99%	---
Compound Name	**CAS Number**	**HAP**	**Emission Factors (lb/1000lb fuel burned)**				
Acetaldehyde	75-07-0	X	4.47E-01	2.36E-01	9.00E-03	1.50E-02	6.70E-03
Acrolein	107-02-8	X	3.50E-02	2.30E-02	ND	ND	ND
Benzaldehyde	100-52-7		1.90E-02	7.00E-03	ND	ND	ND
Benzene	71-43-2	X	1.95E-01	5.16E-02	4.39E-03	3.74E-04	6.85E-04
1,3-Butadiene	106-99-0	X	8.34E-02	2.89E-02	ND	ND	ND
2-Butanone (MEK)	78-93-3		2.00E-02	3.60E-02	1.10E-02	4.00E-03	2.50E-03
Crotonaldehyde	4170-30-3		6.20E-02	3.30E-02	ND	ND	ND
Ethylbenzene	100-41-4	X	4.36E-02	4.99E-03	5.67E-04	3.65E-04	6.31E-05
Formaldehyde	50-00-0	X	1.82E+00	7.52E-01	4.70E-02	3.00E-03	2.44E-02
Hexanal	66-25-1		8.00E-02	1.85E-01	2.02E-01	1.17E-01	4.41E-02
Naphthalene	91-20-3	X	1.13E-01	2.24E-02	3.59E-03	8.94E-04	8.44E-04
Phenol	108-95-2	X	7.12E-02	1.70E-02	1.69E-03	2.37E-04	7.38E-04
Propanal	123-38-6	X	5.50E-02	2.50E-02	ND	ND	ND
Styrene	100-42-5	X	2.95E-02	1.28E-02	3.95E-04	ND	3.13E-05
Toluene	108-88-3	X	1.61E-01	2.45E-02	2.12E-03	8.63E-04	2.77E-04
Xylenes (mixed isomers)	1330-20-7	X	1.95E-01	1.77E-02	2.64E-03	1.77E-03	2.68E-04

Notes for TF30-P-109 Engine:

SOURCE: *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)			1093	4884	6356	8264	---
Percent Thrust/hp			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	---
Xylenes (mixed isomers)	1330-20-7	X	4.62E-01	4.82E-03	1.34E-03	1.64E-03	---

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

SOURCE: *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)			1114	4737	5782	7561	---
Percent Thrust/hp			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	---
Xylenes (mixed isomers)	1330-20-7	X	1.98E-01	2.40E-03	1.04E-03	1.08E-03	---

Notes for TF33-P-102 Engine:

SOURCE: *Aircraft Engine and APU Emissions Testing* Volumes I-III March 1999, IERA-RS-BR-TR-1999-0006

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"---" 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)			498	933	1512	2628	---
Percent Thrust/hp			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	---
Xylenes (mixed isomers)	1330-20-7	X	8.17E-02	1.16E-02	1.52E-03	3.14E-03	---

Notes for TF34-GE-100A Engine:

SOURCE: *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)			1448	10477	12541	13862	---
Percent Thrust/hp			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	---
Xylenes (mixed isomers)	1330-20-7	X	5.82E-02	9.26E-04	2.58E-03	AA	---

Notes for TF39-GE-1C Engine:

SOURCE: *Aircraft Engine and APU Emissions Testing Volumes I-III March 1999,* IERA-RS-BR-TR-1999-0006

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"---" 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

APU Model	Manufacturer	Fuel Flow Rate (lb/hr)	Emission Factors in lb/hr of Operation						
			NO_X	CO	VOC	SO_X [a]	PM_{10}	$PM_{2.5}$	CO_2e [b]
GTC 85-72 (200 hp)[c]	Honeywell Inc.	210	0.81	3.11	0.03	0.23	---	---	674.49
GTCP 30-300	Honeywell Inc.	282	2.85	---	0.06	0.30	---	---	---
GTCP 36-6[d]	Honeywell Inc.	150	0.87	1.41	0.06	0.16	---	---	---
GTCP 36-50	Honeywell Inc.	135	4.25	11.65	0.05	0.15	---	---	---
GTCP 36-300 (80 hp)	Honeywell Inc.	282	2.85	0.58 [e]	0.06	0.30	---	---	---
GTCP 85 (200 hp)	Honeywell Inc.	235	1.12	---	0.24	0.25	---	---	---
GTCP 85-98ck (200 hp)	Honeywell Inc.	235	1.12	4.23 [e]	0.24	0.25	---	---	---
GTCP 85-98d	Honeywell Inc.	297	1.78	1.64	0.04	0.32	---	---	---
GTCP 85-129 (200 hp)	Honeywell Inc.	235	1.12	4.23 [e]	0.24	0.25	---	---	---
GTCP 85-129ck (200 hp)	Honeywell Inc.	235	1.12	4.23 [e]	0.24	0.25	---	---	---
GTCP 85-180[f]	Honeywell Inc.	270	1.28	2.05	0.01	0.29	0.05	0.01	906.25
GTCP 95-2 (300 hp)[c]	Honeywell Inc.	293	1.65	0.94	0.11	0.32	---	---	948.89
GTCP 100-54 (400 hp)[c]	Honeywell Inc.	413	2.46	2.43	0.07	0.45	---	---	1337.86
GTCP 165-1[f]	Honeywell Inc.	273	1.22	3.76	0.49	0.29	0.13	0.04	910.75
GTCP 331-200/250 (143 hp)	Honeywell Inc.	268	2.55	---	0.12	0.29	---	---	---
GTCP 331-200ER (143 hp)	Honeywell Inc.	268	2.55	1.11 [e]	0.12	0.29	---	---	---
GTCP 331-500 (143 hp)	Honeywell Inc.	536	7.86	0.05 [e]	0.07	0.58	---	---	---
GTCP 660-4 (300 hp)	Honeywell Inc.	863	4.60	7.46 [e]	0.24	0.93	---	---	---
PW901A	Pratt & Whitney	863	2.72	14.48 [e]	1.29	0.93	---	---	---
ST-6[g]	United Technologies Corporation	440	3.92	0.02	0.01	0.48	---	---	---
T-62T-27 (100 hp)[c]	United Technologies Corporation	102	0.40	4.36	0.79	0.11	---	---	344.76
T-62T-47C1[e]	United Technologies Corporation	235	1.01	9.46	0.04	0.25	---	---	---
TSCP 700 (142 hp)	Honeywell Inc.	324	2.77	---	0.08	0.35	---	---	---
TSCP 700-4B (142 hp)	Honeywell Inc.	324	2.77	0.48 [e]	0.08	0.35	---	---	---
WR27-1[c]	Williams International	140	0.65	0.79	0.03	0.15	---	---	444.77

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.

a. SO_X Emission factors assume that JP-8, with an average wt. % of 0.054 Sulfur, is used to power the APU.

b. 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.

c. SOURCE: Summary Tables of Gaseous and Particulate Emissions from Aircraft Engines, June 1990.

d. SOURCE: Air Pollutant Emission Factors for Military and Civil Aircraft.

e. 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)

f. SOURCE: Aircraft Engine and Auxiliary Power Unit Emissions Testing Volume I -III, March 1999

g. 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-Choroisopropyl) 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

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 On-Wing Engine Testing

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.

Figure 2-3. Example Data Collection Form for Aircraft Movements

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3 FLIGHTLINE GROUND SUPPORT EQUIPMENT (AGE)

3.1 Introduction

Most USAF 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 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. Other non-road engines and equipment are addressed separately in this document in the **NONROAD ENGINES AND EQUIPMENT (NRDE)** 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 USAF 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 process 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 EF 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 USAF (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 USAF 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 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

EFs for flightline GSE have been developed through measurement and testing and are provided in a variety of sources. EFs may be model specific and provided in units of pounds per hour (lb/hr) as provided in Table 3-4, based on the GSE and fuel type as shown in Table 3-7. 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 hp of the engine. This method requires that the GSE engine hp, 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 hp for each GSE.
- EFs for common GSE are provided in a lb/10^3 hp-hr basis in Table 3-7.
- Table 3-8 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 gal/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 (BSFC) factor, and the heating value of the fuel. The following equation is used:

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

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 HVs and BSFC values for several types of fuel that may power GSE operated at USAF installations.

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

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

a. SOURCE (Unless otherwise noted): Table C-1 to Subpart C of 40 CFR 98.
b. SOURCE (Unless otherwise noted): *Compendium of Greenhouse Gas Emissions Methodologies for the Oil and Natural Gas Industry*, American Petroleum Institute, 2009.
c. SOURCE: Defense Logistics Agency, Defense Energy Support Center, *Petroleum Quality Information System Fuels Data (2005),* April 2006.
d. 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 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 flow rate data to derive an SO_2 EF based on pounds of pollutant emitted per hour of operation (lb/hr). There is a 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 2-2.

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	0.018
JP-8	6.71 [a]	0.054 [a]
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

a. SOURCE: *Petroleum Quality Information System Fuels Data.* Defense Logistics Agency, Defense Energy Support Center, 2001 – 2013. Values were calculated as the average weighted average density for years 2001 – 2013.

3.3.5 Calculating Emissions from Synthetic Aviation Fuel

On-going DoD and USAF 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 1.8% (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 (name subsection) and apply emission reduction factors of 35%, 50%, and 1.8%, 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

A USAF base 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:

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

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

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

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

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

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

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**:**

$$FC = OT \times FFR$$

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

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

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

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

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

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

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

Step 7 – Record the xylene emission factor. Table 3-8 lists the total xylenes EF as **3.93E-02 lb/10^3 gal**.

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

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

$$\text{E}(Xylenes) = 74.65\,\frac{\cancel{gal}}{\cancel{unit}} \times \frac{1}{1000}\left(\frac{\cancel{10^3 gal}}{\cancel{\text{gal}}}\right) \times 0.0393\,\frac{lb}{\cancel{10^3 gal}} \times 200\,\frac{\cancel{unit}}{yr}$$

$$\boxed{\text{E}(\boldsymbol{Xylenes}) = \boldsymbol{0.587\,\frac{lb}{yr}}}$$

3.5.2 Problem 2 - Horsepower/Load Factor Method

A USAF base 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 EF for CO for diesel baggage tractors as **11.00 lb/10^3 hp-hr**. Table 3-8 lists the EF 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

A USAF base 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 diesel-fired engines. This table lists the toluene as **5.64E-02 lb/10^{3}gal**.

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

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

$$E(\text{Toluene}) = 5000 \frac{\cancel{gal}}{\cancel{unit}} \times \frac{1}{1000} \left(\frac{\cancel{10^3 gal}}{\cancel{gal}}\right) \times 0.0564 \frac{lb}{\cancel{10^3 gal}} \times 35 \frac{\cancel{unit}}{yr}$$

$$\boxed{\mathbf{E(Toluene) = 9.87 \frac{lb}{yr}}}$$

3.5.4 Problem 4 - Estimating SO_2 Emissions

A USAF base 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	40
Fuel	JP-8
Fuel Flow Rate	18 gal/hr
Operating time	2 hours

Calculate SO_2 emissions for the AFB which is 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 **6.71 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 in Table 2-2 of this document states the sulfur content of JP-8 in that particular region is **0.067%.**

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

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

$$\mathbf{EF}(\boldsymbol{SO_2}) = 18\frac{\cancel{gal}}{hr} \times 6.71\frac{lb}{\cancel{gal}} \times \frac{0.067\cancel{\%}}{100\cancel{\%}} \times 2 = \mathbf{0.162}\,\boldsymbol{\frac{lb}{hr}}$$

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

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

$$\mathrm{E}(SO_2) = 2\frac{\cancel{hr}}{\cancel{unit}} \times 0.162\frac{lb}{\cancel{hr}} \times 40\frac{\cancel{units}}{yr}$$

$$\boxed{\mathbf{E}(\boldsymbol{SO_2}) = \mathbf{12.96}\,\boldsymbol{\frac{lb}{yr}}}$$

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[(a)]	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
		BT400-46HT	10.00
	Hydraulic Test Stand	MJ-1-1[(a)]	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[(a)]	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[(a)]	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[(a)]	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[(a)]	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 **(S)**	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 **(S)**	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[a]	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[b]
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-1A, -4, -4A, -4B [(d)]	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[(a)]	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[(a)]	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 [a]	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 **(S)**	2.00
	Bomb Lift	MJ-1B	1.00
Generic 3 Small Trainers (T-37, -37B)	Generator Set	A/M32A-86D [a]	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 [c]	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.

a. Operating time estimated based on operating time of GSE on similar aircraft.
b. GSE model changed from what was stated in the source document because of suspected error in source.
c. Cold weather months and cold weather bases only.
d. 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 [a]	Engine Manufacturer	Model Number	Rated Hp	Fuel	Operational Mode	Fuel Flow Rate (gal/hr)	Emission Factors (lb/hr)						
									NO_X	SO_X [b]	CO	VOC [c]	PM_{10}	$PM_{2.5}$ [d]	CO_2e [e]
1H1	Heater	(5)	---	---	6.5	Diesel/JP-8	All Loads	0.39	0.160	0.003	0.180	0.105	0.006	0.006	8.81
A/M27T-13	Hydraulic Test Stand	(5)	---	---	30	Diesel/JP-8	All Loads	---	0.180	0.051	12.250	0.295	0.167 [g]	0.162 [g]	39.70
A/M32A-60A	Start Cart	(5)	Garrett	---	180	Diesel/JP-8	All Loads	---	1.820	0.306	5.480	0.284	0.211	0.205	238.22
A/M32A-86D	Generator Set	(2)	Detroit Diesel	4-71N	148	Diesel/JP-8	All Loads	6.47	6.102	0.047	0.457	0.294	0.091	0.089	146.08
A/M32A-95	Start Cart	(5)	Garrett	---	155	Diesel/JP-8	All Loads	---	1.470	0.264	5.860	0.074	0.110	0.107	205.14
A/M32C-18	Air Compressor	(1)	Detroit Diesel	6V71T	290	Diesel/JP-8	100% Load	16.57	7.973	0.120	1.522	0.205	0.211	0.205	374.13
Ace 401	Air Conditioner	(5)	Detroit Diesel	---	---	Diesel/JP-8	All Loads	---	7.970	0.408	1.520	0.211	0.211	0.205	337.48
Ace 802-329S	Air Conditioner	(3)	Detroit Diesel	6V71N	272	Diesel/JP-8	All Loads	6.8	2.938	0.049	0.150	0.204	0.192	0.192	153.53
AF/M27M-1	Pumping Unit	(1)	Wisconsin	VH4D	30	Gasoline	100% Load	1.78	0.177	0.004	12.262	0.276	0.167 [g]	0.162 [g]	34.57
AF/M32T-1	Cabin Pressure Tester	(7)	Hatz	4M40	---	Diesel/JP-8	All Loads	---	0.118	0.238	0.203	0.095	0.167 [g]	0.162 [g]	185.29
B-1B Heater/Air Conditioner	Heater/Air Conditioner	(1)	Detroit Diesel	6V-92TA	300	Diesel/JP-8	100% Load	17.14	7.659	0.124	1.409	0.258	0.152	0.148	387.00
BAK-13	Arresting Barrier	(1)	Wisconsin	MV-465D	64	Gasoline	100% Load	3.9	0.377	0.010	29.207	0.319	0.167 [g]	0.162 [g]	75.74
BT400-46	Heater	(1)	Lister-Petter	AC1-389548	6.5	Diesel/JP-8	All Loads	0.39	0.158	0.003	0.181	0.100	0.167 [g]	0.162 [g]	8.81
Cargo Loader	Cargo Loader	(6)	---	---	133	Diesel/JP-8	All Loads	7.28	2.554	0.053	1.862	0.420	0.279	0.271	164.37
Deicer Truck	Deicer Truck	(6)	---	---	270	Gasoline	All Loads	14.78	5.940	0.036	73.170	2.519	0.027	0.024	287.04
Elevator Loader	Elevator Loader	(1)	Detroit Diesel	3-53 Series	110	Diesel/JP-8	100% Load	6.29	3.128	0.046	1.048	0.129	0.063	0.061	142.02
EMU-15	Generator Set	(1)	Detroit Diesel	3-71	100	Diesel/JP-8	100% Load	5.71	3.505	0.041	4.905	0.095	0.115	0.111	128.92
EMU-17	Generator Set	(1)	Detroit Diesel	12V-71N	300	Diesel/JP-8	100% Load	17.14	8.863	0.124	11.078	0.337	0.185	0.180	387.00
EMU-19U	Generator Set	(1)	Lister	ST-3	30	Diesel/JP-8	All Loads	1.78	0.743	0.013	0.351	0.266	0.167 [g]	0.162 [g]	40.19
FL-1D	Light Cart	(7)	Kubota	D905	10.5	Diesel/JP-8	All Loads	---	0.030	0.018	0.025	0.008	0.167 [g]	0.162 [g]	13.90
Fuel Truck	Fuel Truck	(6)	---	---	300	Diesel/JP-8	All Loads	16.42	3.300	0.119	0.900	0.316	0.210	0.204	370.74
Generator Light Cart	Generator Light Cart	(4)	Onan	P218G-I/10876C	10.5	Diesel/JP-8	All Loads	0.62	0.181	0.004	0.139	0.022 [f]	0.167 [g]	0.162 [g]	14.00
Generator Set	Generator Set	(1)	Caterpillar	D3333T	214	Diesel/JP-8	100% Load	17.5	3.170	0.127	0.689	0.547	0.071	0.069	395.13
							62% Load	10.46	3.067	0.026	0.618	0.745	0.080	0.078	236.17
Ground Mobile Terminal Generator Set	Ground Mobile Terminal Generator Set	(1)	Detroit Diesel	4-71-T	150	Diesel/JP-8	100% Load	8.57	6.855	0.062	1.114	0.155	0.109	0.106	193.50
H1	Heater	(5)	---	---	6.5	Diesel/JP-8	All Loads	0.39	0.160	0.003	0.180	0.105	0.006	0.006	8.81
MA-3	Air Conditioner	(1)	Onan	L643T*I/1C178-C	65	Diesel/JP-8	All Loads	3.79	0.497	0.027	0.133	0.011	0.167 [g]	0.162 [g]	85.57
MA-3D	Air Conditioner	(1)	John Deere	4045T	120	Diesel/JP-8	All Loads	7.12	4.167	0.052	0.317	0.053	0.167 [g]	0.162 [g]	160.76
MA-3D	Air Conditioner	(3)	John Deere	4039T	110	Diesel/JP-8	All Loads	4.57	0.640	0.033	0.058	0.284	0.063	0.061	103.18

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

GSE Model	GSE Type	Source of Data [a]	Engine Manufacturer	Model Number	Rated Hp	Fuel	Operational Mode	Fuel Flow Rate (gal/hr)	Emission Factors (lb/hr)						
									NO_X	SO_X [b]	CO	VOC [c]	PM_{10}	$PM_{2.5}$ [d]	CO_2e [e]
MC-1A	Air Compressor	(1)	Hatz	Z790-193	18.4	Diesel/JP-8	All Loads	1.09	0.419	0.008	0.267	0.267	0.071	0.068	24.61
MC-1A	Air Compressor	(1)	Lister Engineering Co.	ST2A/MC1A	20	Diesel/JP-8	All Loads	1.19	0.496	0.009	0.234	0.177	0.167 [g]	0.162 [g]	26.87
MC-5	Air Compressor	(3)	Deutz	F4L912 4CYL	100	Diesel/JP-8	All Loads	2.38	0.547	0.017	0.333	0.110	0.167 [g]	0.162 [g]	53.74
MC-5	Air Compressor	(1)	GMC	Series 4-53	130	Diesel/JP-8	100% Load	7.43	3.396	0.054	0.794	0.195	0.089	0.086	167.76
MC-5	Air Compressor	(1)	John Deere	4039	110	Diesel/JP-8	All Loads	6.52	2.425	0.047	0.485	0.073	0.167 [g]	0.162 [g]	147.21
MC-7	Air Compressor	(1)	John Deere	3164D	52	Diesel/JP-8	100% Load	3.3	1.285	0.024	0.642	0.057	0.167 [g]	0.162 [g]	74.51
MC-7	Air Compressor	(3)	John Deere	3179 SPEC FD16694J	48	Diesel/JP-8	All Loads	1.8	0.414	0.013	0.018	0.053	0.167 [g]	0.162 [g]	40.64
MC-8	Air Compressor	(1)	Deutz	F6L912	110	Diesel/JP-8	All Loads	6.52	2.983	0.047	0.752	0.121	0.167 [g]	0.162 [g]	147.21
MC-20	Air Compressor	(7)	Hatz	1B50	11	Diesel/JP-8	All Loads	---	0.025	0.019	0.045	0.016	0.012	0.012	14.56
Miller Concrete Cutter	Miller Concrete Cutter	(1)	Deutz	BF4D-1011T	75	Diesel/JP-8	All Loads	4.45	1.042	0.032	0.198	0.083	0.167 [g]	0.162 [g]	100.47
MJ-1-1	Hydraulic Test Stand	(1)	Detroit Diesel	3-53 N	97	Diesel/JP-8	All Loads	2.52	0.757	0.018	0.043	0.026	0.167 [g]	0.162 [g]	56.90
MJ-1B	Bomb Lift	(5)	Detroit Diesel	---	---	Diesel/JP-8	All Loads	---	4.780	0.219	3.040	3.201	0.800	0.776	152.20
MJ-1B/C	Bomb Lift	(7)	Deutz	F21011F	26	Diesel/JP-8	All Loads	---	0.009	0.050	0.023	0.006	0.167 [g]	0.162 [g]	34.54
MJ-2/TTU-228	Hydraulic Test Stand	(3)	Detroit Diesel	6V-53N	125	Diesel/JP-8	All Loads	4.92	0.937	0.036	0.083	0.292	0.083	0.080	111.09
MJ-2/TTU-228	Hydraulic Test Stand	(1)	Detroit Diesel	4-53	130	Diesel/JP-8	100% Load	7.43	3.396	0.054	0.794	0.195	0.089	0.086	167.76
MJ-2/TTU-229	Hydraulic Test Stand	(1)	Detroit Diesel	6V-53N	125	Diesel/JP-8	100% Load	10.86	3.858	0.079	2.466	0.193	0.083	0.080	245.20
MJ-2A	Hydraulic Test Stand	(5)	Detroit Diesel	---	---	Diesel/JP-8	All Loads	---	3.850	0.238	2.460	0.200	0.083	0.076	185.29
MJ-40	Bomb Lift	(5)	Detroit Diesel	---	---	Diesel/JP-8	All Loads	---	0.340	0.219	0.210	0.221	0.060	0.055	152.20
NF-2	Light Cart	(5)	---	---	18	Diesel/JP-8	All Loads	---	0.110	0.031	0.080	0.011	0.010	0.010	23.82
Nitrogen Cart	Nitrogen Generating Cart	(7)	Isuzu	4LE1PW14	52	Diesel/JP-8	All Loads	---	0.147	0.089	0.050	0.006	0.016	0.015	69.22
PD501	Air Conditioner	(5)	---	---	---	Diesel/JP-8	All Loads	---	7.650	0.408	1.410	0.274	0.167 [g]	0.162 [g]	337.48
PMU 27/M	Pumping Unit	(1)	Petter Diesel Engine	AC-1	6.5	Diesel/JP-8	All Loads	0.39	0.158	0.003	0.181	0.100	0.167 [g]	0.162 [g]	8.81
R-22	Pumping Unit	(1)	Detroit Diesel	3-53 Series	110	Diesel/JP-8	100% Load	6.29	3.128	0.046	1.048	0.129	0.063	0.061	142.02
TF-1	Light Cart	(5)	---	---	---	Diesel/JP-8	All Loads	---	0.170	0.043	0.130	0.026 [f]	0.160	0.155	33.09
Trilectron D200T 400	Generator Set	(3)	Detroit Diesel	8V-71T	236	Diesel/JP-8	All Loads	10.9	8.621	0.079	0.219	0.271	0.208	0.202	246.11
Tug - Large	Tug	(6)	---	---	617	Diesel/JP-8	All Loads	33.4	10.489	0.242	4.936	0.650	0.864	0.839	754.13
Tug - Medium	Tug	(6)	---	---	475	Diesel/JP-8	All Loads	25.7	8.075	0.186	3.800	0.500	0.665	0.646	580.27
Tug - Small	Tug	(6)	---	---	190	Diesel/JP-8	All Loads	10.3	3.230	0.075	1.520	0.200	0.266	0.258	232.56

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

Notes for Table 3-4:

a. Sources of data include the following:
   (1) Emission factors were obtained from the manufacturer. any documents? Fuel usage rates were based on 7,500 Btu/hp-hr.
   (2) Emission factors were obtained from the Southwest Research Institute report titled *Exhaust Emissions from a USAF A/M32-86D Generator.*
   (3) Emission factors were obtained from the Pacific Environmental Services report titled *Aerospace Ground Support Equipment Emissions Characterization for Edwards AFB, California.*
   (4) Emission factors are EPA tier I Non-road engine factors.
   (5) Emission factors were obtained from *Aircraft/Auxiliary Power Units/Ground Support Equipment Emission Factors,* December 2002
   (6) 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.
   (7) Emission factors calculated from on-site emissions testing.

b. SO_X emission factor assumes that all sulfur in the fuel reacts to form SO_2. Emission factors calculated using Equation 3-7. Sulfur content and density of the fuels taken from Table 3-2. Where the fuel flow rate was not provided, the appropriate EF was selected from Table 3-7 and multiplied by the horsepower (hp). If no hp was provided, the appropriate value was selected from Table 3-6.

c. Emission factors from reference (5) were converted from total hydrocarbons (THC) to VOC by multiplying by a factor of 1.053. Emission factors from reference (7) were converted from total organic gas (TOG) to VOC by multiplying by a factor 1.053 and dividing the result by 1.07. These hydrocarbon conversion factors come from "Conversion Factors for Hydrocarbon Emission Components", U.S. Environmental Protection Agency (EPA), Office of Transportation and Air Quality, July 2010.

d. $PM_{2.5}$ 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).

e. CO_2e emission factor calculated by taking the product of the default CO_2, CH_4, and N_2O emission factors from Tables C-1 and C-2 of 40 Code of Federal Regulations (CFR) part 98, subpart C and their respective global warming potentials (GWP). The GWP for CO_2, CH_4, and N_2O are 1, 25, and 298 respectively. These values were multiplied by the high heat value of the fuel from Table C-1 of 40 CFR part 98 and the fuel flow rate. In cases where the fuel flow rate was not provided, the product of the EF and GWP were multiplied by the engine hp and brake specific fuel consumption (BSFC). A BSFC value of 8089 Btu/hp-hr was used for the diesel/JP-8 equipment.

f. These values were not provided from test data but calculated using the hp (or hp from Table 3-6) and the appropriate emission factor from Table 3-7.

g. The source did not provide an EF for this pollutant. The value provided is the average of EF for this pollutant for all ground support equipment.

"---" 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 [a]	NO_X	SO_X	PM_{10} [b]	$PM_{2.5}$ [c]	CO_2e [d]
Air Conditioner	Diesel	5.00	1.05	16.40	1.60	1.00	0.97	1330.83
Air Start	Diesel	6.00	1.05	19.30	1.60	1.20	1.16	1330.83
	Gasoline	271.00	9.33	22.00	0.40	0.10	0.09	1093.30
Aircraft Tractor/Tug	Diesel	8.00	1.05	17.00	1.70	1.40	1.36	1330.83
	Gasoline	393.00	12.13	23.20	0.40	0.10	0.09	1093.30
	CNG/LPG	---	---	---	---	---	---	1458.76
Baggage Tractor	Diesel	11.00	2.11	13.70	1.80	2.10	2.04	1330.83
	Gasoline	395.00	12.13	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	2.11	14.80	1.80	1.70	1.65	1330.83
	Gasoline	275.00	9.33	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	1.05	16.70	1.70	1.30	1.26	1330.83
	Gasoline	398.00	12.13	22.30	0.40	0.20	0.18	1093.30
	CNG/LPG	---	---	---	---	---	---	1458.76
Cabin Service Truck	Diesel	2.00	1.05	10.30	1.60	0.30	0.29	1330.83
	Gasoline	24.00	3.73	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	3.16	19.20	1.90	2.10	2.04	1330.83
	Gasoline	400.00	12.13	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	2.11	17.00	1.80	2.40	2.33	1330.83
	Gasoline	404.00	12.13	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	12.13	22.30	0.40	0.10	0.09	1093.30
	CNG/LPG	---	---	---	---	---	---	1458.76
Catering Truck	Diesel	2.00	1.05	10.30	1.60	0.30	0.29	1330.83
	Gasoline	24.00	3.73	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	9.33	22.00	0.40	0.10	0.09	1093.30
	CNG/LPG	---	---	---	---	---	---	1458.76
Forklift	Diesel	15.00	4.21	22.00	1.90	2.70	2.62	1330.83
	Gasoline	392.00	12.13	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 [a]	NO_X	SO_X	PM_{10} [b]	$PM_{2.5}$ [c]	CO_2e [d]
Fuel Truck	Diesel	3.00	1.05	11.00	1.60	0.70	0.68	1330.83
	Gasoline	37.00	4.67	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	2.11	20.00	1.60	1.40	1.36	1330.83
	Gasoline	271.00	9.33	22.00	0.40	0.10	0.09	1093.30
	CNG/LPG	---	---	---	---	---	---	1458.76
Ground Power Unit	Diesel	5.00	1.05	17.00	1.60	1.00	0.97	1330.83
	Gasoline	271.00	9.33	22.00	0.40	0.10	0.09	1093.30
	CNG/LPG	---	---	---	---	---	---	---
Hydrant Truck	Diesel	4.00	1.05	12.00	1.60	1.60	1.55	1330.83
	Gasoline	26.00	3.73	11.00	0.30	0.10	0.09	1093.30
	CNG/LPG	---	---	---	---	---	---	1458.76
Lavatory Truck	Diesel	4.00	1.05	12.00	1.60	1.30	1.26	1330.83
	Gasoline	18.00	3.73	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	4.21	22.00	1.90	2.70	2.62	1330.83
	Gasoline	397.00	12.13	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	1.05	12.00	1.60	1.60	1.55	1330.83
	Gasoline	46.00	4.67	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	1.05	11.00	1.60	0.90	0.87	1330.83
	Gasoline	46.00	4.67	11.00	0.30	0.10	0.09	1093.30
Sweeper	Diesel	12.00	2.11	17.00	1.80	2.40	2.33	1330.83
	Gasoline	393.00	12.13	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	4.67	11.00	0.30	0.10	0.09	1093.30
	CNG/LPG	---	---	---	---	---	---	1458.76
Other	Diesel	8.00	1.05	17.00	1.70	1.30	1.26	1330.83
	Gasoline	396.00	12.13	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.

a. Reported as HC in EDMS. All values assumed to be equal to total hydrocarbons (THC) and converted into VOC. For diesel engines, THC was converted to VOC by multiplying THC value by 1.053. All gasoline engines were assumed to be 4-stroke. For gasoline engines, THC was converted to VOC by multiplying the THC value by 0.933. THC values were assumed to equal VOC emissions for CNG and LPG-fired engines. Hydrocarbon conversion factors come from *Conversion Factors for Hydrocarbon Emission Components*, U.S. Environmental Protection Agency (EPA), July 2010.

b. Reported as PM in EDMS. All PM assumed to be PM_{10}.

c. Using assumptions and factors applied by EPA in its NONROAD model, $PM_{2.5}$ emissions 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.

d. 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. 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	5.40E-03	3.16E-04
Acenaphthene	1.96E-04	1.15E-05
Acenaphthylene	6.98E-04	4.09E-05
Acetaldehyde	1.06E-01	6.20E-03
Acrolein	1.28E-02	7.48E-04
Anthracene	2.58E-04	1.51E-05
Benz(a)anthracene	2.32E-04	1.36E-05
Benzene	1.29E-01	7.55E-03
Benzo(a)pyrene	2.59E-05	1.52E-06
Benzo(b)fluoranthene	1.37E-05	8.02E-07
Benzo(g,h,i)perylene	6.75E-05	3.96E-06
Benzo(k)fluoranthene	2.14E-05	1.25E-06
Chrysene	4.87E-05	2.86E-06
Dibenz(a,h)anthracene	8.05E-05	4.72E-06
Fluoranthene	1.05E-03	6.16E-05
Fluorene	4.03E-03	2.36E-04
Formaldehyde	1.63E-01	9.55E-03
Indeno(1,2,3-c,d)pyrene	5.18E-05	3.03E-06
Naphthalene	1.17E-03	6.86E-05
Phenanthrene	4.06E-03	2.38E-04
Pyrene	6.60E-04	3.87E-05
Toluene	5.64E-02	3.31E-03
Xylenes	3.93E-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, the average brake specific fuel consumption (BSFC) and heating value from Table 3-1 were used for unit conversion.

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]

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

a. 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.

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

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4 NONROAD ENGINES AND EQUIPMENT (NRDE)

4.1 Introduction

Air emissions at USAF installations result not only from military operations, but also from day to day activities involving nonroad engines and equipment (NRDE). Examples of NRDE that are commonly operated on USAF 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). AGE and GSE are also nonroad engines that are widely used on USAF installations, but are addressed separately in the "Flightline Ground Support Equipment" section of this Guide. 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 can 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 (CI or SI). 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 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. SI engines, which use gasoline, natural gas, or LPG differ from CI engines in that the fuel/air mixture does not ignite spontaneously, but rather by a spark. Emissions from nonroad 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 EF should be selected based on the fuel the engine uses and whether 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 mean that some USAF 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 can operate on E85 and 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 regarding 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 nonroad diesel fuel has been limited to 500 ppm which was then further reduced to 15 ppm effective June 2010. Another study was conducted under the auspices of the DoD Environmental Security Technology Certification Program (ESTCP). This study 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. Information can be obtained from either the EPA, the Department of Energy (DOE), the DoD, and Service Engineering and Research Organizations. Application of the B20 EFs developed by the EPA should only be considered if an installation is confident that the nonroad 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 nonroad engines and fuels.

4.3 Emissions Calculation

This section describes several methodologies available for calculating emissions from nonroad 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 nonroad 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 Motor Vehicle Emissions Simulator (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. Therefore, 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 EF 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 NRDE 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. EFs are provided in Table 4-1 through Table 4-6 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 NRDE 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 (AGE)" 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 nonroad 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 through Table 4-5.

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 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, and 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 nonroad fuels.
- Table 4-1 through Table 4-6 provide the EFs 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 nonroad 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 EF 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:

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

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:

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

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 weight percent pollutant speciation values provided in Table 4-7, 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 3-8 provides EFs for uncontrolled diesel reciprocating internal combustion engines in a lb/1,000 hp-hr format and may be used to calculate HAPs directly using Equation 4-1.
- Table 4-7 gives the weight percent VOC and HAP speciation of 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 USAF-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 USAF installations are performed by contractors, and therefore may 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 NRDE (such as leaf blowers, trimmers/edgers, snow blowers, etc.) operated on USAF 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 USAF-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 NRDE in which emissions are calculated using EFs based on fuel usage (i.e., using "g/gal" EFs), 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 to calculate emissions from non-road vehicle and equipment operations. The procedures are applied to each individual NRDE, and for each pollutant for which emissions must be calculated. Emissions for all NRDE 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 through Table 4-7.

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 for the calendar year 2018, a USAF base 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 EF and typical load factor are given in Table 4-1 as **0.881 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:

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

$$\mathrm{E}(CO) = 200 \frac{\cancel{hr}}{\cancel{unit}} \times \frac{59\%}{100\%} \times 85(\cancel{hp}) \times \frac{1}{1000} \left(\frac{\cancel{10^3 hp}}{\cancel{hp}}\right) \times 0.881 \frac{lb}{\cancel{10^3 hp\text{-}hr}} \times 6 \frac{\cancel{units}}{yr}$$

$$\boxed{\boldsymbol{E(CO) = 53.02 \frac{lb}{yr}}}$$

4.5.2 Problem 2 - Estimating Emissions Using Fuel Consumption

A USAF base 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 this year. 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 (for 2018) are given as **14.716** and **880 lb/10^3 hp-hr,** respectively.

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

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

$$\mathrm{E}(VOC) = \frac{\left(40\frac{\cancel{gal}}{unit} \times 6.15\frac{\cancel{lb}}{\cancel{gal}}\right)}{880\frac{\cancel{lb}}{10^3\ hp-hr}} \times 14.716\frac{lb}{10^3\ hp-hr} \times 25\frac{units}{yr}$$

$$\mathrm{E}(VOC) = 0.2795\frac{\cancel{10^3 hp-hr}}{\cancel{unit}} \times 14.716\frac{lb}{\cancel{10^3 hp-hr}} \times 25\frac{\cancel{units}}{yr}$$

$$\boxed{\mathbf{E}(\boldsymbol{VOC}) = \mathbf{102.83}\frac{\boldsymbol{lb}}{\boldsymbol{yr}}}$$

Next, calculate formaldehyde emissions.

Step 3 – Record formaldehyde weight percent VOC emissions for 4-stroke gasoline engines. Table 4-7 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:

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

$$\mathrm{E}(Formaldehyde) = 102.83\frac{lb}{yr} \times \frac{1.32\%}{100\%}$$

$$\mathrm{E}(Formaldehyde) = 102.83\frac{lb}{yr} \times 0.0132$$

$$\boxed{\mathbf{E}(\boldsymbol{Formaldehyde}) = \mathbf{1.36}\frac{\boldsymbol{lb}}{\boldsymbol{yr}}}$$

4.5.3 Problem 3 - Estimating SO_x Emissions

A USAF base 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 4-6. 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 4-6 states the SO_X EF as **0.42 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:

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

$$E(SO_X) = 250 \frac{\cancel{hr}}{\cancel{unit}} \times \frac{59\%}{100\%} \times 80\cancel{hp} \times \frac{1}{1000}\left(\frac{\cancel{10^3 hp}}{\cancel{hp}}\right) \times 0.42 \frac{lb}{\cancel{10^3 hp-hr}} \times 5 \frac{\cancel{units}}{yr}$$

$$\boxed{\mathbf{E(SO_X) = 24.78 \frac{lb}{yr}}}$$

4.5.4 Problem 4 - Estimating Emissions from the Use of B20

A USAF base 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 EF and load factor (for 2018) as **4.085 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:

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

$$\mathbf{E}(\boldsymbol{NO_X}) = 200\,\frac{\cancel{hr}}{\cancel{unit}} \times \frac{59\%}{100\%} \times 250\cancel{hp} \times \frac{1}{1000}\left(\frac{\cancel{10^3 hp}}{\cancel{hp}}\right) \times 4.085\,\frac{lb}{\cancel{10^3 hp{-}hr}} \times 10\,\frac{\cancel{units}}{yr} = \mathbf{1,205.08}\,\frac{\boldsymbol{lb}}{\boldsymbol{yr}}$$

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

$$\mathrm{E}(NO_X) = 1{,}205.08\,\frac{lb}{yr} \times \left(1 + \frac{2\%}{100\%}\right)$$

$$\mathrm{E}(NO_X) = 1{,}205.08\,\frac{lb}{yr} \times (1.02)$$

$$\boxed{\mathbf{E}(\boldsymbol{NO_X}) = \mathbf{1,229.18}\,\frac{\boldsymbol{lb}}{\boldsymbol{yr}}}$$

<u>Step 4</u> – Record the PM_{10} emission factor. Table 4-1 lists this value as **0.122 lb/10^3 hp-hr**.

<u>Step 5</u> - 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**:**

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

$$\mathrm{E}(PM_{10}) = 200\,\frac{\cancel{hr}}{\cancel{unit}} \times \frac{59\%}{100\%} \times 250\cancel{hp} \times \frac{1}{1000}\left(\frac{\cancel{10^3 hp}}{\cancel{hp}}\right) \times 0.122\,\frac{lb}{\cancel{10^3 hp{-}hr}} \times 10\,\frac{\cancel{units}}{yr} = \mathbf{35.99}\,\frac{\boldsymbol{lb}}{\boldsymbol{yr}}$$

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

$$\mathrm{E}(PM_{10}) = 35.99\,\frac{lb}{yr} \times \left(1 - \frac{10\%}{100\%}\right)$$

$$\mathrm{E}(PM_{10}) = 35.99\,\frac{lb}{yr} \times (0.9)$$

$$\boxed{\mathbf{E}(\boldsymbol{PM_{10}}) = \mathbf{32.39}\,\frac{\boldsymbol{lb}}{\boldsymbol{yr}}}$$

Table 4-1. Criteria Pollutant Emission Factors for Non-Road Engines and Equipment - 2018

SCC	Equipment Description	Load Factor [a] (% Max Power)	BSFC [b] (lb/1000 hp-hr)	Emission Factors (lb/1000 hp-hr)						
				CO	VOC	NO_x	SO_2	PM_{10} [d]	$PM_{2.5}$ [e,f]	CO_2e [g]
2260001010	2 Stroke Motorcycles: Off- Road [c]	100	260	80.972	76.478	0.889	0.003	2.807	2.583	564.782
2260001020	2 Stroke Snowmobiles	34	1640	153.279	188.750	5.118	0.013	1.997	1.837	2159.480
2260001030	2 Stroke ATVs [c]	100	210	85.208	32.907	0.892	0.003	1.084	0.997	474.419
2260001060	2 Stroke Specialty Vehicles/Carts	58	1000	579.379	20.805	4.935	0.014	0.296	0.272	2349.748
2260002006	2 Stroke Tampers/Rammers	55	680	560.746	134.661	3.369	0.009	20.435	18.800	1595.632
2260002009	2 Stroke Plate Compactors	55	830	490.399	109.598	5.250	0.014	16.838	15.491	2440.216
2260002021	2 Stroke Paving Equipment	59	830	494.121	109.256	5.250	0.014	16.951	15.595	2437.502
2260002027	2 Stroke Signal Boards/Light Plants	72	830	512.608	128.630	5.250	0.014	17.574	16.168	2422.453
2260002039	2 Stroke Concrete/Industrial Saws	78	630	580.559	136.824	3.520	0.009	21.176	19.482	1645.700
2260002054	2 Stroke Crushing/Proc. Equipment	85	830	512.608	112.601	5.250	0.014	17.574	16.168	2422.455
2260003030	2 Stroke Sweepers/Scrubbers	71	820	512.608	115.211	5.250	0.014	17.574	16.168	2422.453
2260003040	2 Stroke Other General Industrial Equipment	54	830	512.609	113.746	5.250	0.014	17.574	16.168	2422.455
2260004015	2 Stroke Rotary Tillers < 6 HP (Residential)	40	940	454.106	107.542	5.264	0.014	16.249	14.949	2455.009
2260004016	2 Stroke Rotary Tillers < 6 HP (Commercial)	40	900	459.028	93.988	5.264	0.014	16.390	15.079	2451.607
2260004020	2 Stroke Chain Saws < 6 HP (Residential)	70	900	469.577	107.782	5.250	0.014	16.235	14.936	2454.623
2260004021	2 Stroke Chain Saws < 6 HP (Commercial)	70	650	576.681	133.468	3.619	0.010	20.971	19.293	1690.015
2260004025	2 Stroke Trimmers/Edgers/Brush Cutter (Residential)	91	890	433.554	108.335	5.300	0.014	16.873	15.523	2441.884
2260004026	2 Stroke Trimmers/Edgers/Brush Cutter (Commercial)	91	810	494.099	102.821	4.981	0.013	17.164	15.791	2323.610
2260004030	2 Stroke Leaf blowers/Vacuums (Residential)	94	890	459.809	125.781	5.264	0.014	16.413	15.100	2451.071
2260004031	2 Stroke Leaf blowers/Vacuums (Commercial)	94	760	519.595	113.573	4.357	0.012	18.418	16.944	2042.255
2260004035	2 Stroke Snow blowers (Residential)	35	870	529.594	376.130	1.774	0.006	5.889	5.418	1240.113
2260004036	2 Stroke Snow blowers (Commercial)	35	870	617.846	229.746	2.069	0.007	6.871	6.321	1446.797

Table 4-1. Criteria Pollutant Emission Factors for Non-Road Engines and Equipment - 2018 (cont.)

SCC	Equipment Description	Load Factor [a] (% Max Power)	BSFC [b] (lb/1000 hp-hr)	Emission Factors (lb/1000 hp-hr)						
				CO	VOC	NO_x	SO_2	PM_{10} [d]	$PM_{2.5}$ [e,f]	CO_2e [g]
2260004071	2 Stroke Commercial Turf Equipment	60	840	481.202	98.006	5.250	0.014	16.565	15.240	2446.753
2260005035	2 Stroke Sprayers	65	840	423.385	106.055	5.323	0.014	17.356	15.967	2431.245
2260006005	2 Stroke Generator Sets	68	830	483.138	130.912	5.255	0.014	16.808	15.464	2441.132
2260006010	2 Stroke Pumps	69	830	461.928	136.262	5.281	0.014	18.335	16.868	2396.764
2260006015	2 Stroke Air Compressors	56	830	512.608	134.439	5.250	0.014	17.574	16.168	2422.454
2260006035	2 Stroke Hydro Power Units	56	830	512.608	141.646	5.250	0.014	17.574	16.168	2422.454
2260007005	2 Stroke Chain Saws > 6 HP	70	620	586.493	137.019	3.369	0.009	21.491	19.772	1577.853
2265001010	4 Stroke Motorcycles: Off- Road	100	160	61.463	7.122	1.267	0.003	0.147	0.135	504.445
2265001030	4 Stroke ATVs	100	170	81.742	8.324	1.019	0.003	0.147	0.135	533.129
2265001050	4 Stroke Golf Carts	46	740	586.285	13.329	4.945	0.014	0.301	0.277	2345.391
2265001060	4 Stroke Specialty Vehicles/Carts	58	820	667.037	25.075	9.139	0.014	0.252	0.232	2373.583
2265002003	4 Stroke Pavers	66	700	436.954	9.533	4.593	0.013	0.257	0.236	2160.008
2265002006	4 Stroke Tampers/Rammers	55	760	573.339	12.695	4.727	0.014	0.251	0.231	2345.819
2265002009	4 Stroke Plate Compactors	55	830	488.359	14.932	5.213	0.015	0.518	0.476	2585.173
2265002015	4 Stroke Rollers	62	690	448.254	9.820	4.358	0.013	0.254	0.233	2152.969
2265002021	4 Stroke Paving Equipment	59	780	533.258	14.144	5.076	0.014	0.345	0.318	2417.460
2265002024	4 Stroke Surfacing Equipment	49	750	535.164	13.247	4.889	0.014	0.359	0.330	2389.799
2265002027	4 Stroke Signal Boards/Light Plants	72	780	524.754	13.225	5.122	0.015	0.464	0.427	2495.247
2265002030	4 Stroke Trenchers	66	710	419.696	10.366	4.757	0.013	0.324	0.298	2206.826
2265002033	4 Stroke Bore/Drill Rigs	79	790	376.085	14.766	8.018	0.014	0.491	0.452	2421.671
2265002039	4 Stroke Concrete/Industrial Saws	78	710	518.775	11.289	4.654	0.013	0.279	0.257	2250.928
2265002042	4 Stroke Cement & Mortar Mixers	59	820	546.017	19.503	5.673	0.014	0.353	0.325	2455.521

Table 4-1. Criteria Pollutant Emission Factors for Non-Road Engines and Equipment - 2018 (cont.)

SCC	Equipment Description	Load Factor [a] (% Max Power)	BSFC [b] (lb/1000 hp-hr)	Emission Factors (lb/1000 hp-hr)						
				CO	VOC	NO_x	SO_2	PM_{10} [d]	$PM_{2.5}$ [e,f]	CO_2e [g]
2265002045	4 Stroke Cranes	47	590	138.554	5.261	7.651	0.010	0.164	0.151	1685.402
2265002054	4 Stroke Crushing/Proc. Equipment	85	740	499.486	12.048	5.123	0.014	0.327	0.301	2315.721
2265002057	4 Stroke Rough Terrain Forklifts	63	570	52.930	2.481	4.610	0.009	0.154	0.141	1574.878
2265002060	4 Stroke Rubber Tire Loaders	71	550	28.562	1.500	3.066	0.009	0.153	0.141	1546.235
2265002066	4 Stroke Tractors/Loaders/ Backhoes	48	730	541.979	11.197	4.597	0.014	0.263	0.242	2293.744
2265002072	4 Stroke Skid Steer Loaders	58	640	269.566	7.213	6.447	0.011	0.191	0.176	1888.030
2265002078	4 Stroke Dumpers/Tenders	41	800	569.893	19.813	6.195	0.014	0.283	0.260	2378.754
2265002081	4 Stroke Other Construction Equipment	48	580	105.092	5.239	9.501	0.010	0.152	0.140	1631.647
2265003010	4 Stroke Aerial Lifts	46	630	312.116	12.016	17.170	0.011	0.185	0.170	1915.919
2265003020	4 Stroke Forklifts	30	560	38.808	1.848	3.844	0.009	0.158	0.145	1552.092
2265003030	4 Stroke Sweepers/Scrubbers	71	610	206.819	5.354	3.794	0.011	0.223	0.205	1824.836
2265003040	4 Stroke Other General Industrial Equipment	54	760	442.141	13.710	5.174	0.014	0.535	0.492	2400.821
2265003050	4 Stroke Other Material Handling Equipment	53	640	304.096	10.168	12.605	0.011	0.194	0.178	1907.859
2265003060	4 Stroke AC/Refrigeration	46	740	576.517	12.629	4.708	0.014	0.267	0.245	2345.393
2265003070	4 Stroke Terminal Tractors	78	520	24.990	1.332	2.776	0.009	0.157	0.144	1544.029
2265004010	4 Stroke Lawn mowers (Residential)	33	900	431.304	26.439	5.678	0.016	0.669	0.615	2760.353
2265004011	4 Stroke Lawn mowers (Commercial)	33	880	426.492	14.716	5.589	0.016	0.716	0.659	2760.005
2265004015	4 Stroke Rotary Tillers < 6 HP (Residential)	40	910	431.098	23.286	5.675	0.016	0.669	0.615	2760.471
2265004016	4 Stroke Rotary Tillers < 6 HP (Commercial)	40	890	425.245	14.070	5.514	0.016	0.666	0.612	2760.210
2265004025	4 Stroke Trimmers/Edgers/Brush Cutter HP (Residential)	91	900	425.108	20.269	5.509	0.016	0.667	0.613	2760.208
2265004026	4 Stroke Trimmers/Edgers/Brush Cutter (Commercial)	91	820	495.861	12.324	5.147	0.015	0.499	0.459	2566.441
2265004030	4 Stroke Leaf blowers/Vacuums (Residential)	94	900	425.041	26.574	5.507	0.016	0.667	0.613	2760.206

Table 4-1. Criteria Pollutant Emission Factors for Non-Road Engines and Equipment - 2018 (cont.)

SCC	Equipment Description	Load Factor [a] (% Max Power)	BSFC [b] (lb/1000 hp-hr)	Emission Factors (lb/1000 hp-hr)						
				CO	VOC	NO_x	SO_2	PM_{10} [d]	$PM_{2.5}$ [e,f]	CO_2e [g]
2265004031	4 Stroke Leaf blowers/Vacuums (Commercial)	94	700	437.695	8.557	4.603	0.013	0.249	0.229	2158.966
2265004035	4 Stroke Snow blowers (Residential)	35	940	603.610	207.604	4.759	0.009	0.126	0.116	1506.735
2265004036	4 Stroke Snow blowers (Commercial)	35	940	707.577	32.811	5.415	0.010	0.147	0.135	1757.352
2265004040	4 Stroke Rear Engine Riding Mowers (Residential)	38	760	574.703	22.300	4.929	0.014	0.247	0.227	2347.877
2265004041	4 Stroke Rear Engine Riding Mowers (Commercial)	38	740	573.513	11.270	4.639	0.014	0.259	0.238	2346.139
2265004046	4 Stroke Front Mowers	65	790	591.297	14.375	5.919	0.014	0.244	0.224	2351.155
2265004051	4 Stroke Shredders < 6 HP	80	890	426.865	15.125	5.572	0.016	0.666	0.613	2760.246
2265004055	4 Stroke Lawn & Garden Tractors (Residential)	44	760	574.274	16.973	4.914	0.014	0.246	0.227	2346.817
2265004056	4 Stroke Lawn & Garden Tractors (Commercial)	44	740	573.680	10.720	4.637	0.014	0.258	0.237	2345.656
2265004066	4 Stroke Chippers/Stump Grinders	78	640	293.038	6.200	3.804	0.011	0.213	0.196	1930.789
2265004071	4 Stroke Commercial Turf Equipment	60	730	486.246	10.320	4.567	0.014	0.315	0.290	2309.829
2265004075	4 Stroke Other Lawn & Garden Equipment	58	850	519.823	26.269	6.161	0.015	0.459	0.422	2565.534
2265004076	4 Stroke Other Lawn & Garden Equipment	58	850	517.568	24.521	6.210	0.015	0.457	0.421	2560.238
2265005010	4 Stroke 2-Wheel Tractors	62	740	576.217	11.692	4.689	0.014	0.266	0.245	2345.336
2265005015	4 Stroke Agricultural Tractors	62	580	110.485	2.992	3.423	0.010	0.169	0.156	1665.304
2265005020	4 Stroke Combines	74	580	153.995	10.774	14.533	0.010	0.150	0.138	1702.400
2265005025	4 Stroke Balers	62	580	154.190	12.714	14.550	0.010	0.150	0.138	1702.647
2265005030	4 Stroke Agricultural Mowers	48	770	577.136	13.045	5.144	0.014	0.249	0.229	2350.243
2265005035	4 Stroke Sprayers	65	740	412.157	16.419	9.039	0.013	0.299	0.275	2216.035
2265005040	4 Stroke Tillers > 6 HP	71	870	811.467	27.342	8.752	0.015	0.245	0.225	2539.443
2265005045	4 Stroke Swathers	52	580	154.191	10.822	14.550	0.010	0.150	0.138	1702.649
2265005055	4 Stroke Other Agricultural Equipment	55	620	240.680	9.977	12.697	0.011	0.173	0.159	1837.312

Table 4-1. Criteria Pollutant Emission Factors for Non-Road Engines and Equipment - 2018 (cont.)

SCC	Equipment Description	Load Factor [a] (% Max Power)	BSFC [b] (lb/1000 hp-hr)	Emission Factors (lb/1000 hp-hr)						
				CO	VOC	NO_x	SO_2	PM_{10} [d]	$PM_{2.5}$ [e,f]	CO_2e [g]
2265005060	4 Stroke Irrigation Sets	60	550	36.879	1.722	2.868	0.009	0.167	0.154	1571.229
2265006005	4 Stroke Generator Sets	68	780	565.185	15.473	5.250	0.014	0.287	0.264	2386.849
2265006010	4 Stroke Pumps	69	760	441.623	12.418	5.427	0.014	0.414	0.381	2366.626
2265006015	4 Stroke Air Compressors	56	700	362.487	9.596	4.661	0.013	0.336	0.309	2148.561
2265006025	4 Stroke Welders	68	710	474.448	9.941	4.616	0.013	0.259	0.238	2201.846
2265006030	4 Stroke Pressure Washers	85	800	520.908	13.956	5.034	0.015	0.415	0.382	2490.265
2265006035	4 Stroke Hydro Power Units	56	750	539.257	12.437	4.814	0.014	0.334	0.307	2370.969
2265007010	4 Stroke Shredders > 6 HP	80	800	597.762	14.817	6.209	0.014	0.241	0.222	2357.866
2265007015	4 Stroke Forest Equipment - Feller/Bunch/Skidder	70	810	491.109	14.447	5.413	0.015	0.598	0.550	2593.244
2265008005	4 Stroke Airport Ground Support Equipment	56	600	131.415	4.230	3.441	0.010	0.233	0.214	1744.816
2265010010	4 Stroke Other Oil Field Equipment	90	740	592.922	12.456	5.116	0.014	0.323	0.297	2345.442
2267001060	LPG Specialty Vehicle Carts	58	490	62.828	2.813	12.845	0.007	0.126	0.126	1347.759
2267002003	LPG Pavers	66	460	17.923	0.512	3.098	0.006	0.127	0.127	1227.382
2267002015	LPG Rollers	62	450	12.037	0.275	2.157	0.006	0.128	0.128	1217.111
2267002021	LPG Paving Equipment	59	480	37.717	1.308	6.313	0.006	0.126	0.126	1262.311
2267002024	LPG Surfacing Equipment	49	460	17.365	0.482	2.976	0.006	0.127	0.127	1225.831
2267002030	LPG Trenchers	66	460	18.303	0.524	3.147	0.006	0.127	0.127	1227.828
2267002033	LPG Bore/Drill Rigs	79	490	57.840	2.531	11.646	0.006	0.125	0.125	1332.410
2267002039	LPG Concrete/Industrial Saws	78	430	10.830	0.251	2.068	0.006	0.129	0.129	1216.744
2267002045	LPG Cranes	47	480	37.485	1.280	6.157	0.006	0.126	0.126	1260.032
2267002054	LPG Crushing/Proc. Equipment	85	480	34.546	1.112	5.451	0.006	0.126	0.126	1250.909
2267002057	LPG Rough Terrain Forklifts	63	470	20.642	0.612	3.492	0.006	0.127	0.127	1231.410

Table 4-1. Criteria Pollutant Emission Factors for Non-Road Engines and Equipment - 2018(cont.)

SCC	Equipment Description	Load Factor [a] (% Max Power)	BSFC [b] (lb/1000 hp-hr)	Emission Factors (lb/1000 hp-hr)						
				CO	VOC	NO_x	SO_2	PM_{10} [d]	$PM_{2.5}$ [e,f]	CO_2e [g]
2267002060	LPG Rubber Tire Loaders	71	460	13.448	0.315	2.308	0.006	0.127	0.127	1218.305
2267002066	LPG Tractors/Loaders/ Backhoes	48	450	11.611	0.263	2.112	0.006	0.128	0.128	1216.767
2267002072	LPG Skid Steer Loaders	58	470	33.534	1.177	5.790	0.006	0.126	0.126	1257.666
2267002081	LPG Other Construction Equipment	48	480	42.222	1.557	7.333	0.006	0.126	0.126	1275.310
2267003010	LPG Aerial Lifts	46	480	38.957	1.466	7.013	0.006	0.126	0.126	1273.060
2267003020	LPG Forklifts	30	460	13.446	0.315	2.311	0.006	0.127	0.127	1218.355
2267003030	LPG Sweepers/Scrubbers	71	440	11.900	0.276	2.162	0.006	0.128	0.128	1217.318
2267003040	LPG Other General Industrial Equipment	54	450	12.268	0.279	2.173	0.006	0.127	0.127	1217.172
2267003050	LPG Other Material Handling Equipment	53	480	33.551	1.072	5.292	0.006	0.126	0.126	1249.207
2267003070	LPG Terminal Tractors	78	430	10.645	0.246	2.055	0.006	0.129	0.129	1216.735
2267004066	LPG Chippers/Stump Grinders	78	450	12.640	0.289	2.207	0.006	0.127	0.127	1217.381
2267005055	LPG Other Agricultural Equipment	55	490	66.489	3.028	13.738	0.007	0.126	0.126	1359.402
2267005060	LPG Irrigation Sets	60	450	11.579	0.262	2.110	0.006	0.128	0.128	1216.767
2267006005	LPG Generator Sets	68	480	36.490	1.560	9.538	0.006	0.124	0.124	1307.518
2267006010	LPG Pumps	69	470	24.176	0.851	5.492	0.006	0.125	0.125	1257.372
2267006015	LPG Air Compressors	56	460	15.253	0.393	2.920	0.006	0.126	0.126	1226.210
2267006025	LPG Welders	68	460	17.797	0.491	3.014	0.006	0.126	0.126	1226.098
2267006030	LPG Pressure Washers	85	470	36.283	1.254	6.107	0.006	0.125	0.125	1260.252
2267006035	LPG Hydro Power Units	56	460	14.143	0.362	2.733	0.006	0.127	0.127	1224.257
2267008005	LPG Airport Ground Support Equipment	56	450	12.449	0.284	2.191	0.006	0.127	0.127	1217.324
2268002081	CNG Other Construction Equipment	48	480	42.222	5.583	7.396	0.006	0.126	0.126	1698.682
2268003020	CNG Forklifts	30	460	13.533	1.189	2.413	0.006	0.127	0.127	1190.286

Table 4-1. Criteria Pollutant Emission Factors for Non-Road Engines and Equipment - 2018 (cont.)

SCC	Equipment Description	Load Factor [a] (% Max Power)	BSFC [b] (lb/1000 hp-hr)	Emission Factors (lb/1000 hp-hr)						
				CO	VOC	NO_x	SO_2	PM_{10} [d]	$PM_{2.5}$ [e,f]	CO_2e [g]
2268003030	CNG Sweepers/Scrubbers	71	460	13.244	1.151	2.371	0.006	0.127	0.127	1186.016
2268003040	CNG Other General Industrial Equipment	54	460	12.592	1.076	2.291	0.006	0.127	0.127	1177.554
2268003060	CNG AC\Refrigeration	46	450	13.466	1.286	2.536	0.006	0.128	0.128	1202.560
2268003070	CNG Terminal Tractors	78	430	10.646	0.936	2.152	0.006	0.129	0.129	1162.804
2268005055	CNG Other Agricultural Equipment	55	510	121.817	22.663	27.226	0.006	0.139	0.139	3720.129
2268006005	CNG Generator Sets	68	490	40.512	6.576	11.162	0.006	0.124	0.124	1851.119
2268006010	CNG Pumps	69	480	30.831	4.315	7.509	0.006	0.125	0.125	1573.169
2268006015	CNG Air Compressors	56	470	16.111	1.567	3.185	0.006	0.126	0.126	1238.834
2268006020	CNG Gas Compressors	85	410	11.753	1.087	2.256	0.006	0.139	0.139	1178.199
2268006035	CNG Hydro Power Units	56	470	17.720	1.784	3.530	0.006	0.126	0.126	1264.999
2268010010	CNG Other Oil Field Equipment	90	410	11.077	0.995	2.192	0.006	0.133	0.133	1168.804
2270001060	Diesel Specialty Vehicle Carts	21	450	8.487	2.230	10.079	0.009	1.242	1.205	1437.891
2270002003	Diesel Pavers	59	380	1.578	0.409	3.618	0.007	0.252	0.245	1214.073
2270002006	Diesel Tampers/Rammers	43	1000	9.822	1.473	10.036	0.009	0.913	0.886	1300.152
2270002009	Diesel Plate Compactors	43	410	8.316	1.359	9.975	0.009	0.853	0.828	1300.314
2270002015	Diesel Rollers	59	390	2.117	0.446	4.179	0.007	0.327	0.317	1233.636
2270002018	Diesel Scrapers	59	370	1.636	0.384	3.494	0.007	0.211	0.205	1183.227
2270002021	Diesel Paving Equipment	59	390	2.517	0.523	4.909	0.007	0.395	0.383	1226.935
2270002024	Diesel Surfacing Equipment	59	380	3.340	0.585	6.880	0.007	0.451	0.438	1223.904
2270002027	Diesel Signal Boards/Light Plants	43	410	4.330	0.952	9.304	0.008	0.640	0.620	1293.363
2270002030	Diesel Trenchers	59	400	3.145	0.525	6.343	0.007	0.413	0.400	1273.264
2270002033	Diesel Bore/Drill Rigs	43	370	2.530	0.701	8.213	0.007	0.441	0.428	1190.017

Table 4-1. Criteria Pollutant Emission Factors for Non-Road Engines and Equipment - 2018 (cont.)

SCC	Equipment Description	Load Factor [a] (% Max Power)	BSFC [b] (lb/1000 hp-hr)	Emission Factors (lb/1000 hp-hr)						
				CO	VOC	NO_x	SO_2	PM_{10} [d]	$PM_{2.5}$ [e,f]	CO_2e [g]
2270002036	Diesel Excavators	59	380	0.928	0.375	2.472	0.006	0.145	0.141	1194.557
2270002039	Diesel Concrete/Industrial Saws	59	410	3.460	0.560	6.622	0.007	0.453	0.439	1304.643
2270002042	Diesel Cement & Mortar Mixers	43	390	4.534	1.039	9.302	0.008	0.683	0.663	1244.179
2270002045	Diesel Cranes	43	370	1.097	0.423	4.092	0.007	0.192	0.186	1175.458
2270002048	Diesel Graders	59	370	0.907	0.379	2.456	0.006	0.158	0.153	1185.197
2270002051	Diesel Off-highway Trucks	59	370	1.206	0.448	4.085	0.006	0.122	0.119	1183.216
2270002054	Diesel Crushing/Proc. Equipment	43	380	1.683	0.448	5.230	0.007	0.246	0.239	1202.945
2270002057	Diesel Rough Terrain Forklifts	59	390	2.983	0.491	4.542	0.007	0.439	0.426	1255.497
2270002060	Diesel Rubber Tire Loaders	59	370	1.773	0.440	4.401	0.007	0.272	0.264	1190.177
2270002066	Diesel Tractors/Loaders/ Backhoes	21	460	7.376	1.499	7.898	0.009	1.150	1.115	1465.722
2270002069	Diesel Crawler Tractor/Dozers	59	370	1.496	0.407	3.558	0.006	0.213	0.207	1189.795
2270002072	Diesel Skid Steer Loaders	21	480	10.150	2.077	10.120	0.009	1.515	1.469	1527.951
2270002075	Diesel Off-Highway Tractors	59	370	2.226	0.477	5.672	0.007	0.264	0.256	1183.015
2270002078	Diesel Dumpers/Tenders	21	470	10.400	2.360	10.545	0.009	1.550	1.503	1506.857
2270002081	Diesel Other Construction Equipment	59	370	2.514	0.485	5.690	0.007	0.349	0.338	1185.123
2270003010	Diesel Aerial Lifts	21	480	10.722	2.443	11.013	0.009	1.507	1.462	1528.233
2270003020	Diesel Forklifts	59	400	0.881	0.344	2.598	0.006	0.066	0.064	1265.347
2270003030	Diesel Sweepers/Scrubbers	43	380	1.140	0.401	3.338	0.006	0.187	0.182	1219.078
2270003040	Diesel Other General Industrial Equipment	43	380	1.542	0.471	4.372	0.007	0.274	0.265	1205.200
2270003050	Diesel Other Material Handling Equipment	21	440	6.283	1.670	9.558	0.009	1.012	0.982	1412.146
2270003060	Diesel AC\Refrigeration	43	410	2.245	0.433	7.043	0.007	0.251	0.244	1301.231
2270003070	Diesel Terminal Tractors	59	380	0.641	0.355	1.816	0.006	0.084	0.081	1199.471

Table 4-1. Criteria Pollutant Emission Factors for Non-Road Engines and Equipment - 2018 (cont.)

SCC	Equipment Description	Load Factor [a] (% Max Power)	BSFC [b] (lb/1000 hp-hr)	Emission Factors (lb/1000 hp-hr)						
				CO	VOC	NO_x	SO_2	PM_{10} [d]	$PM_{2.5}$ [e,f]	CO_2e [g]
2270004031	Diesel Leaf blowers/Vacuums	43	410	6.850	1.626	11.438	0.008	0.918	0.890	1298.267
2270004036	Diesel Snow blowers	43	370	1.167	0.356	4.184	0.004	0.189	0.184	682.325
2270004046	Diesel Front Mowers	43	410	3.919	0.881	9.262	0.008	0.616	0.597	1300.525
2270004056	Diesel Lawn & Garden Tractors	43	410	5.013	1.086	9.706	0.009	0.736	0.714	1300.635
2270004066	Diesel Chippers/Stump Grinders	43	380	2.812	0.720	7.451	0.007	0.481	0.467	1215.386
2270004071	Diesel Commercial Turf Equipment	43	400	1.662	0.473	5.281	0.007	0.265	0.257	1263.020
2270004076	Diesel Other Lawn & Garden Equipment	43	410	4.651	1.020	9.390	0.008	0.757	0.734	1292.717
2270005010	Diesel 2-Wheel Tractors	59	410	10.051	1.380	9.532	0.009	0.806	0.782	1313.357
2270005015	Diesel Agricultural Tractors	59	380	2.933	0.617	6.473	0.007	0.479	0.464	1210.903
2270005020	Diesel Combines	59	370	2.961	0.747	7.897	0.007	0.607	0.589	1184.996
2270005025	Diesel Balers	59	400	5.479	1.097	8.726	0.008	0.830	0.806	1269.169
2270005030	Diesel Agricultural Mowers	59	410	6.531	0.975	7.617	0.008	1.008	0.977	1312.408
2270005035	Diesel Sprayers	59	380	3.474	0.886	7.635	0.007	0.578	0.560	1195.296
2270005040	Diesel Tillers > 6 HP	59	370	3.794	0.698	7.630	0.007	0.474	0.460	1186.153
2270005045	Diesel Swathers	59	400	5.702	0.991	8.519	0.008	0.906	0.879	1283.851
2270005055	Diesel Other Agricultural Equipment	59	380	3.177	0.715	7.090	0.007	0.579	0.562	1195.899
2270005060	Diesel Irrigation Sets	43	390	2.207	0.561	5.436	0.007	0.370	0.359	1234.809
2270006005	Diesel Generator Sets	43	390	3.727	0.917	8.712	0.008	0.624	0.605	1253.384
2270006010	Diesel Pumps	43	390	3.910	0.917	8.601	0.008	0.658	0.638	1252.473
2270006015	Diesel Air Compressors	43	400	2.516	0.531	5.731	0.007	0.362	0.351	1265.702
2270006020	Diesel Gas Compressors	43	410	0.600	0.341	2.028	0.006	0.032	0.031	1301.322
2270006025	Diesel Welders	21	480	9.302	1.998	10.205	0.009	1.362	1.322	1527.555

Table 4-1. Criteria Pollutant Emission Factors for Non-Road Engines and Equipment - 2018 (cont.)

SCC	Equipment Description	Load Factor [a] (% Max Power)	BSFC [b] (lb/1000 hp-hr)	Emission Factors (lb/1000 hp-hr)						
				CO	VOC	NO_x	SO_2	PM_{10} [d]	$PM_{2.5}$ [e,f]	CO_2e [g]
2270006030	Diesel Pressure Washers	43	380	3.513	1.009	8.901	0.008	0.550	0.533	1223.489
2270006035	Diesel Hydro Power Units	43	400	2.655	0.566	6.160	0.007	0.389	0.377	1271.935
2270007015	Diesel Forest Equipment - Feller/Bunch/Skidder	59	370	0.662	0.358	1.853	0.006	0.095	0.092	1186.345
2270008005	Diesel Airport Ground Support Equipment	59	380	1.838	0.427	4.047	0.007	0.288	0.279	1195.202
2270009010	Diesel Other Underground Mining Equipment	21	450	9.325	2.214	11.792	0.010	1.156	1.121	1427.894
2270010010	Diesel Other Oil Field Equipment	43	370	1.325	0.453	5.246	0.007	0.195	0.189	1174.415
2282005010	2 Stroke Outboard	21	850	230.029	108.405	13.190	0.013	0.991	0.911	2236.653
2282005015	2 Stroke Personal Water Craft	21	820	256.794	31.801	13.496	0.013	0.390	0.359	2150.863
2282010005	4 Stroke Inboard/Sterndrive	21	630	162.560	28.048	16.950	0.011	0.151	0.139	1887.885
2282020005	Diesel Inboard/Sterndrive	35	370	2.291	0.627	11.152	0.040	0.248	0.241	1173.080
2282020010	Diesel Outboards	35	410	4.741	1.485	8.637	0.044	0.791	0.767	1299.147
2285002015	Diesel Railway Maintenance	21	440	5.834	1.454	8.714	0.008	0.991	0.961	1400.615
2285004015	4 Stroke Railway Maintenance	62	750	532.005	13.522	4.837	0.014	0.294	0.271	2345.371
2285006015	LPG Railway Maintenance	62	480	29.056	0.897	4.593	0.006	0.126	0.126	1241.795

Notes for Table 4-1 follows Table 4-5

Table 4-2. Criteria Pollutant Emission Factors for Non-Road Engines and Equipment - 2019

SCC	Equipment Description	Load Factor [a] (% Max Power)	BSFC [b] (lb/1000 hp-hr)	Emission Factors (lb/1000 hp-hr)						
				CO	VOC	NO_x	SO_2	PM_{10} [d]	$PM_{2.5}$ [e,f]	CO_2e [g]
2260001010	2 Stroke Motorcycles: Off- Road [c]	100	260	80.167	74.046	0.901	0.003	2.718	2.501	567.650
2260001020	2 Stroke Snowmobiles	34	1640	146.289	178.333	5.348	0.013	1.896	1.745	2147.709
2260001030	2 Stroke ATVs [c]	100	210	84.186	26.852	0.909	0.003	0.856	0.787	483.572
2260001060	2 Stroke Specialty Vehicles/Carts	58	1000	577.691	20.305	4.790	0.014	0.296	0.272	2349.143
2260002006	2 Stroke Tampers/Rammers	55	680	560.746	134.661	3.369	0.009	20.435	18.800	1595.631
2260002009	2 Stroke Plate Compactors	55	830	490.399	109.598	5.250	0.014	16.838	15.491	2440.216
2260002021	2 Stroke Paving Equipment	59	830	494.121	109.256	5.250	0.014	16.951	15.595	2437.503
2260002027	2 Stroke Signal Boards/Light Plants	72	830	512.608	128.630	5.250	0.014	17.574	16.168	2422.454
2260002039	2 Stroke Concrete/Industrial Saws	78	630	580.559	136.824	3.520	0.009	21.176	19.482	1645.699
2260002054	2 Stroke Crushing/Proc. Equipment	85	830	512.608	112.601	5.250	0.014	17.574	16.168	2422.453
2260003030	2 Stroke Sweepers/Scrubbers	71	820	512.608	115.210	5.250	0.014	17.574	16.168	2422.454
2260003040	2 Stroke Other General Industrial Equipment	54	830	512.608	113.746	5.250	0.014	17.574	16.168	2422.454
2260004015	2 Stroke Rotary Tillers < 6 HP (Residential)	40	940	454.124	106.991	5.264	0.014	16.250	14.950	2454.995
2260004016	2 Stroke Rotary Tillers < 6 HP (Commercial)	40	900	459.043	93.989	5.264	0.014	16.391	15.080	2451.594
2260004020	2 Stroke Chain Saws < 6 HP (Residential)	70	900	469.592	107.787	5.250	0.014	16.236	14.937	2454.610
2260004021	2 Stroke Chain Saws < 6 HP (Commercial)	70	650	576.681	133.468	3.619	0.010	20.971	19.293	1690.016
2260004025	2 Stroke Trimmers/Edgers/Brush Cutter (Residential)	91	890	433.568	108.103	5.300	0.014	16.873	15.524	2441.871
2260004026	2 Stroke Trimmers/Edgers/Brush Cutter (Commercial)	91	810	494.107	102.824	4.981	0.013	17.165	15.791	2323.606
2260004030	2 Stroke Leaf blowers/Vacuums (Residential)	94	890	459.825	125.583	5.264	0.014	16.413	15.100	2451.060
2260004031	2 Stroke Leaf blowers/Vacuums (Commercial)	94	760	519.602	113.575	4.357	0.012	18.418	16.944	2042.250
2260004035	2 Stroke Snow blowers (Residential)	35	870	529.617	372.393	1.774	0.006	5.889	5.418	1240.099
2260004036	2 Stroke Snow blowers (Commercial)	35	870	617.873	229.438	2.069	0.007	6.871	6.321	1446.782

Table 4-2. Criteria Pollutant Emission Factors for Non-Road Engines and Equipment - 2019 (cont.)

SCC	Equipment Description	Load Factor [a] (% Max Power)	BSFC [b] (lb/1000 hp-hr)	Emission Factors (lb/1000 hp-hr)						
				CO	VOC	NO_x	SO_2	PM_{10} [d]	$PM_{2.5}$ [e,f]	CO_2e [g]
2260004071	2 Stroke Commercial Turf Equipment	60	840	481.210	98.009	5.250	0.014	16.565	15.240	2446.749
2260005035	2 Stroke Sprayers	65	840	423.390	106.057	5.323	0.014	17.356	15.967	2431.240
2260006005	2 Stroke Generator Sets	68	830	483.148	130.915	5.255	0.014	16.809	15.464	2441.126
2260006010	2 Stroke Pumps	69	830	461.702	136.147	5.281	0.014	18.335	16.868	2396.644
2260006015	2 Stroke Air Compressors	56	830	512.607	134.439	5.250	0.014	17.574	16.168	2422.452
2260006035	2 Stroke Hydro Power Units	56	830	512.608	141.646	5.250	0.014	17.574	16.168	2422.454
2260007005	2 Stroke Chain Saws > 6 HP	70	620	586.493	137.018	3.369	0.009	21.491	19.772	1577.851
2265001010	4 Stroke Motorcycles: Off- Road	100	160	60.396	6.978	1.259	0.003	0.147	0.135	504.406
2265001030	4 Stroke ATVs	100	170	81.362	8.158	0.999	0.003	0.147	0.135	533.086
2265001050	4 Stroke Golf Carts	46	740	586.285	13.329	4.945	0.014	0.301	0.277	2345.394
2265001060	4 Stroke Specialty Vehicles/Carts	58	820	646.657	23.756	8.691	0.014	0.249	0.229	2357.595
2265002003	4 Stroke Pavers	66	700	435.927	9.482	4.507	0.013	0.257	0.236	2159.038
2265002006	4 Stroke Tampers/Rammers	55	760	572.177	12.531	4.622	0.014	0.251	0.231	2345.480
2265002009	4 Stroke Plate Compactors	55	830	487.911	14.872	5.173	0.015	0.518	0.476	2585.041
2265002015	4 Stroke Rollers	62	690	448.022	9.811	4.340	0.013	0.254	0.233	2152.850
2265002021	4 Stroke Paving Equipment	59	780	532.157	13.994	4.978	0.014	0.345	0.318	2416.982
2265002024	4 Stroke Surfacing Equipment	49	750	535.017	13.238	4.877	0.014	0.359	0.330	2389.694
2265002027	4 Stroke Signal Boards/Light Plants	72	780	524.742	13.223	5.121	0.015	0.464	0.427	2495.241
2265002030	4 Stroke Trenchers	66	710	418.614	10.314	4.665	0.013	0.324	0.298	2205.774
2265002033	4 Stroke Bore/Drill Rigs	79	790	372.897	14.548	7.720	0.014	0.491	0.452	2417.813
2265002039	4 Stroke Concrete/Industrial Saws	78	710	518.760	11.288	4.653	0.013	0.279	0.257	2250.925
2265002042	4 Stroke Cement & Mortar Mixers	59	820	541.552	18.668	5.366	0.014	0.352	0.323	2453.912

Table 4-2. Criteria Pollutant Emission Factors for Non-Road Engines and Equipment - 2019 (cont.)

SCC	Equipment Description	Load Factor [a] (% Max Power)	BSFC [b] (lb/1000 hp-hr)	Emission Factors (lb/1000 hp-hr)						
				CO	VOC	NO_x	SO_2	PM_{10} [d]	$PM_{2.5}$ [e,f]	CO_2e [g]
2265002045	4 Stroke Cranes	47	590	126.336	4.663	6.573	0.010	0.164	0.151	1670.916
2265002054	4 Stroke Crushing/Proc. Equipment	85	740	498.356	11.995	5.028	0.014	0.327	0.301	2314.643
2265002057	4 Stroke Rough Terrain Forklifts	63	570	47.697	2.242	4.168	0.009	0.154	0.141	1569.691
2265002060	4 Stroke Rubber Tire Loaders	71	550	26.505	1.415	2.900	0.009	0.153	0.141	1544.689
2265002066	4 Stroke Tractors/Loaders/ Backhoes	48	730	541.936	11.196	4.594	0.014	0.263	0.242	2293.743
2265002072	4 Stroke Skid Steer Loaders	58	640	262.842	6.854	5.847	0.011	0.191	0.176	1880.194
2265002078	4 Stroke Dumpers/Tenders	41	800	563.928	19.022	5.898	0.014	0.282	0.260	2375.481
2265002081	4 Stroke Other Construction Equipment	48	580	91.392	4.560	8.269	0.010	0.152	0.140	1614.681
2265003010	4 Stroke Aerial Lifts	46	630	305.489	11.683	16.627	0.011	0.186	0.171	1905.518
2265003020	4 Stroke Forklifts	30	560	33.148	1.612	3.367	0.009	0.158	0.145	1546.551
2265003030	4 Stroke Sweepers/Scrubbers	71	610	205.348	5.294	3.668	0.011	0.224	0.206	1823.463
2265003040	4 Stroke Other General Industrial Equipment	54	760	441.806	13.704	5.142	0.014	0.536	0.493	2400.525
2265003050	4 Stroke Other Material Handling Equipment	53	640	297.728	9.853	12.038	0.011	0.195	0.179	1901.035
2265003060	4 Stroke AC/Refrigeration	46	740	576.352	12.607	4.692	0.014	0.267	0.246	2345.340
2265003070	4 Stroke Terminal Tractors	78	520	25.161	1.339	2.785	0.009	0.158	0.145	1544.030
2265004010	4 Stroke Lawn mowers (Residential)	33	900	426.558	24.966	5.552	0.016	0.658	0.605	2760.110
2265004011	4 Stroke Lawn mowers (Commercial)	33	880	426.493	14.716	5.589	0.016	0.716	0.659	2760.006
2265004015	4 Stroke Rotary Tillers < 6 HP (Residential)	40	910	426.354	21.896	5.548	0.016	0.658	0.605	2760.237
2265004016	4 Stroke Rotary Tillers < 6 HP (Commercial)	40	890	423.656	13.547	5.453	0.016	0.659	0.607	2760.179
2265004025	4 Stroke Trimmers/Edgers/Brush Cutter HP (Residential)	91	900	423.675	19.744	5.454	0.016	0.661	0.608	2760.180
2265004026	4 Stroke Trimmers/Edgers/Brush Cutter (Commercial)	91	820	495.833	12.320	5.145	0.015	0.499	0.459	2566.433
2265004030	4 Stroke Leaf blowers/Vacuums (Residential)	94	900	423.608	25.881	5.452	0.016	0.661	0.608	2760.177

Table 4-2. Criteria Pollutant Emission Factors for Non-Road Engines and Equipment - 2019 (cont.)

SCC	Equipment Description	Load Factor [a] (% Max Power)	BSFC [b] (lb/1000 hp-hr)	Emission Factors (lb/1000 hp-hr)						
				CO	VOC	NO_x	SO_2	PM_{10} [d]	$PM_{2.5}$ [e,f]	CO_2e [g]
2265004031	4 Stroke Leaf blowers/Vacuums (Commercial)	94	700	436.490	8.506	4.501	0.013	0.249	0.229	2157.815
2265004035	4 Stroke Snow blowers (Residential)	35	940	603.644	202.799	4.759	0.009	0.126	0.116	1506.736
2265004036	4 Stroke Snow blowers (Commercial)	35	940	707.616	32.415	5.415	0.010	0.147	0.135	1757.352
2265004040	4 Stroke Rear Engine Riding Mowers (Residential)	38	760	572.896	21.702	4.766	0.014	0.247	0.227	2347.302
2265004041	4 Stroke Rear Engine Riding Mowers (Commercial)	38	740	573.357	11.251	4.625	0.014	0.259	0.238	2346.099
2265004046	4 Stroke Front Mowers	65	790	585.774	13.780	5.634	0.014	0.243	0.224	2348.410
2265004051	4 Stroke Shredders < 6 HP	80	890	424.514	14.390	5.482	0.016	0.657	0.605	2760.200
2265004055	4 Stroke Lawn & Garden Tractors (Residential)	44	760	572.519	16.559	4.752	0.014	0.246	0.227	2346.303
2265004056	4 Stroke Lawn & Garden Tractors (Commercial)	44	740	573.524	10.702	4.623	0.014	0.258	0.237	2345.614
2265004066	4 Stroke Chippers/Stump Grinders	78	640	292.380	6.175	3.753	0.011	0.213	0.196	1930.408
2265004071	4 Stroke Commercial Turf Equipment	60	730	486.183	10.312	4.562	0.014	0.315	0.290	2309.817
2265004075	4 Stroke Other Lawn & Garden Equipment	58	850	513.053	25.003	5.892	0.015	0.453	0.417	2563.131
2265004076	4 Stroke Other Lawn & Garden Equipment	58	850	510.781	23.277	5.937	0.015	0.451	0.415	2557.771
2265005010	4 Stroke 2-Wheel Tractors	62	740	576.158	11.684	4.684	0.014	0.266	0.245	2345.320
2265005015	4 Stroke Agricultural Tractors	62	580	108.359	2.904	3.247	0.010	0.169	0.156	1663.426
2265005020	4 Stroke Combines	74	580	144.271	10.094	13.584	0.010	0.150	0.138	1689.159
2265005025	4 Stroke Balers	62	580	144.477	11.916	13.602	0.010	0.150	0.138	1689.420
2265005030	4 Stroke Agricultural Mowers	48	770	574.057	12.656	4.913	0.014	0.249	0.229	2349.176
2265005035	4 Stroke Sprayers	65	740	404.850	15.695	8.558	0.013	0.298	0.274	2209.283
2265005040	4 Stroke Tillers > 6 HP	71	870	790.887	26.037	8.550	0.015	0.245	0.225	2519.150
2265005045	4 Stroke Swathers	52	580	144.477	10.141	13.602	0.010	0.150	0.138	1689.422
2265005055	4 Stroke Other Agricultural Equipment	55	620	232.042	9.434	11.889	0.011	0.173	0.159	1826.398

Table 4-2. Criteria Pollutant Emission Factors for Non-Road Engines and Equipment - 2019 (cont.)

SCC	Equipment Description	Load Factor [a] (% Max Power)	BSFC [b] (lb/1000 hp-hr)	Emission Factors (lb/1000 hp-hr)						
				CO	VOC	NO_x	SO_2	PM_{10} [d]	$PM_{2.5}$ [e,f]	CO_2e [g]
2265005060	4 Stroke Irrigation Sets	60	550	36.316	1.704	2.830	0.009	0.167	0.154	1571.227
2265006005	4 Stroke Generator Sets	68	780	562.122	15.025	5.042	0.014	0.287	0.264	2385.754
2265006010	4 Stroke Pumps	69	760	440.731	12.353	5.310	0.014	0.414	0.381	2365.151
2265006015	4 Stroke Air Compressors	56	700	361.623	9.548	4.553	0.013	0.336	0.309	2147.228
2265006025	4 Stroke Welders	68	710	473.656	9.902	4.549	0.013	0.259	0.238	2201.093
2265006030	4 Stroke Pressure Washers	85	800	520.314	13.863	4.981	0.015	0.415	0.382	2490.065
2265006035	4 Stroke Hydro Power Units	56	750	539.141	12.426	4.801	0.014	0.334	0.307	2370.863
2265007010	4 Stroke Shredders > 6 HP	80	800	589.675	14.039	5.788	0.014	0.240	0.221	2354.261
2265007015	4 Stroke Forest Equipment - Feller/Bunch/Skidder	70	810	491.110	14.448	5.413	0.015	0.598	0.550	2593.241
2265008005	4 Stroke Airport Ground Support Equipment	56	600	130.262	4.185	3.351	0.010	0.233	0.214	1744.130
2265010010	4 Stroke Other Oil Field Equipment	90	740	592.922	12.456	5.116	0.014	0.323	0.297	2345.441
2267001060	LPG Specialty Vehicle Carts	58	490	59.469	2.626	12.016	0.007	0.126	0.126	1337.252
2267002003	LPG Pavers	66	460	16.152	0.445	2.839	0.006	0.127	0.127	1224.717
2267002015	LPG Rollers	62	450	11.368	0.258	2.097	0.006	0.128	0.128	1216.759
2267002021	LPG Paving Equipment	59	480	33.165	1.137	5.627	0.006	0.126	0.126	1255.248
2267002024	LPG Surfacing Equipment	49	460	15.192	0.417	2.731	0.006	0.127	0.127	1223.829
2267002030	LPG Trenchers	66	460	16.463	0.454	2.870	0.006	0.127	0.127	1224.935
2267002033	LPG Bore/Drill Rigs	79	490	54.343	2.341	10.807	0.006	0.125	0.125	1321.852
2267002039	LPG Concrete/Industrial Saws	78	430	10.710	0.248	2.061	0.006	0.129	0.129	1216.741
2267002045	LPG Cranes	47	480	32.641	1.045	5.189	0.006	0.126	0.126	1248.383
2267002054	LPG Crushing/Proc. Equipment	85	480	29.795	0.940	4.772	0.006	0.126	0.126	1244.132
2267002057	LPG Rough Terrain Forklifts	63	470	18.251	0.521	3.136	0.006	0.127	0.127	1227.714

Table 4-2. Criteria Pollutant Emission Factors for Non-Road Engines and Equipment - 2019 (cont.)

SCC	Equipment Description	Load Factor [a] (% Max Power)	BSFC [b] (lb/1000 hp-hr)	Emission Factors (lb/1000 hp-hr)						
				CO	VOC	NO_x	SO_2	PM_{10} [d]	$PM_{2.5}$ [e,f]	CO_2e [g]
2267002060	LPG Rubber Tire Loaders	71	460	12.281	0.280	2.177	0.006	0.127	0.127	1217.227
2267002066	LPG Tractors/Loaders/ Backhoes	48	450	10.980	0.251	2.073	0.006	0.128	0.128	1216.745
2267002072	LPG Skid Steer Loaders	58	470	29.886	0.997	5.041	0.006	0.126	0.126	1248.582
2267002081	LPG Other Construction Equipment	48	480	37.581	1.318	6.333	0.006	0.126	0.126	1262.968
2267003010	LPG Aerial Lifts	46	480	35.225	1.276	6.210	0.006	0.126	0.126	1263.192
2267003020	LPG Forklifts	30	460	12.321	0.280	2.177	0.006	0.127	0.127	1217.202
2267003030	LPG Sweepers/Scrubbers	71	440	11.381	0.261	2.107	0.006	0.128	0.128	1216.894
2267003040	LPG Other General Industrial Equipment	54	450	11.474	0.259	2.102	0.006	0.128	0.128	1216.762
2267003050	LPG Other Material Handling Equipment	53	480	28.970	0.907	4.642	0.006	0.126	0.126	1242.750
2267003070	LPG Terminal Tractors	78	430	10.645	0.246	2.055	0.006	0.129	0.129	1216.736
2267004066	LPG Chippers/Stump Grinders	78	450	11.704	0.264	2.116	0.006	0.127	0.127	1216.770
2267005055	LPG Other Agricultural Equipment	55	490	63.089	2.837	12.889	0.007	0.126	0.126	1348.570
2267005060	LPG Irrigation Sets	60	450	10.880	0.249	2.067	0.006	0.128	0.128	1216.741
2267006005	LPG Generator Sets	68	480	34.352	1.432	8.794	0.006	0.124	0.124	1298.254
2267006010	LPG Pumps	69	470	22.440	0.761	4.977	0.006	0.125	0.125	1251.114
2267006015	LPG Air Compressors	56	460	14.051	0.351	2.679	0.006	0.126	0.126	1223.542
2267006025	LPG Welders	68	460	15.920	0.421	2.741	0.006	0.126	0.126	1223.301
2267006030	LPG Pressure Washers	85	470	32.003	1.051	5.267	0.006	0.125	0.125	1250.245
2267006035	LPG Hydro Power Units	56	460	13.193	0.331	2.560	0.006	0.127	0.127	1222.403
2267008005	LPG Airport Ground Support Equipment	56	450	11.555	0.260	2.106	0.006	0.127	0.127	1216.762
2268002081	CNG Other Construction Equipment	48	480	37.581	4.737	6.402	0.006	0.126	0.126	1599.261
2268003020	CNG Forklifts	30	460	12.374	1.059	2.275	0.006	0.127	0.127	1175.829

Table 4-2. Criteria Pollutant Emission Factors for Non-Road Engines and Equipment - 2019 (cont.)

SCC	Equipment Description	Load Factor [a] (% Max Power)	BSFC [b] (lb/1000 hp-hr)	Emission Factors (lb/1000 hp-hr)						
				CO	VOC	NO_x	SO_2	PM_{10} [d]	$PM_{2.5}$ [e,f]	CO_2e [g]
2268003030	CNG Sweepers/Scrubbers	71	460	12.131	1.037	2.253	0.006	0.127	0.127	1173.452
2268003040	CNG Other General Industrial Equipment	54	460	11.636	0.991	2.206	0.006	0.127	0.127	1168.414
2268003060	CNG AC\Refrigeration	46	450	12.748	1.189	2.430	0.006	0.128	0.128	1191.530
2268003070	CNG Terminal Tractors	78	430	10.646	0.936	2.152	0.006	0.129	0.129	1162.810
2268005055	CNG Other Agricultural Equipment	55	510	121.817	22.664	27.226	0.006	0.139	0.139	3720.131
2268006005	CNG Generator Sets	68	490	38.344	6.102	10.381	0.006	0.124	0.124	1792.821
2268006010	CNG Pumps	69	480	28.527	3.844	6.759	0.006	0.125	0.125	1515.706
2268006015	CNG Air Compressors	56	470	14.721	1.386	2.900	0.006	0.126	0.126	1217.137
2268006020	CNG Gas Compressors	85	410	11.753	1.087	2.256	0.006	0.139	0.139	1178.200
2268006035	CNG Hydro Power Units	56	470	15.875	1.567	3.186	0.006	0.126	0.126	1239.066
2268010010	CNG Other Oil Field Equipment	90	410	11.077	0.995	2.192	0.006	0.133	0.133	1168.806
2270001060	Diesel Specialty Vehicle Carts	21	450	7.841	2.060	9.564	0.009	1.152	1.118	1438.387
2270002003	Diesel Pavers	59	380	1.307	0.391	3.165	0.006	0.199	0.193	1214.101
2270002006	Diesel Tampers/Rammers	43	1000	9.821	1.447	9.909	0.009	0.873	0.847	1300.264
2270002009	Diesel Plate Compactors	43	410	8.305	1.337	9.881	0.009	0.826	0.801	1300.410
2270002015	Diesel Rollers	59	390	1.821	0.425	3.710	0.007	0.273	0.265	1233.671
2270002018	Diesel Scrapers	59	370	1.406	0.374	2.997	0.006	0.178	0.173	1183.248
2270002021	Diesel Paving Equipment	59	390	2.249	0.492	4.420	0.007	0.350	0.339	1226.988
2270002024	Diesel Surfacing Equipment	59	380	3.042	0.555	6.381	0.007	0.409	0.397	1223.985
2270002027	Diesel Signal Boards/Light Plants	43	410	4.216	0.926	9.138	0.008	0.619	0.600	1293.441
2270002030	Diesel Trenchers	59	400	2.770	0.486	5.920	0.007	0.357	0.347	1273.336
2270002033	Diesel Bore/Drill Rigs	43	370	2.312	0.659	7.641	0.007	0.403	0.391	1190.150

Table 4-2. Criteria Pollutant Emission Factors for Non-Road Engines and Equipment - 2019 (cont.)

SCC	Equipment Description	Load Factor [a] (% Max Power)	BSFC [b] (lb/1000 hp-hr)	Emission Factors (lb/1000 hp-hr)						
				CO	VOC	NO_x	SO_2	PM_{10} [d]	$PM_{2.5}$ [e,f]	CO_2e [g]
2270002036	Diesel Excavators	59	380	0.734	0.365	2.042	0.006	0.103	0.100	1194.568
2270002039	Diesel Concrete/Industrial Saws	59	410	3.059	0.518	6.190	0.007	0.393	0.381	1304.711
2270002042	Diesel Cement & Mortar Mixers	43	390	4.317	0.982	8.792	0.008	0.638	0.618	1244.372
2270002045	Diesel Cranes	43	370	0.959	0.407	3.569	0.006	0.165	0.160	1175.493
2270002048	Diesel Graders	59	370	0.701	0.366	1.980	0.006	0.112	0.109	1185.211
2270002051	Diesel Off-highway Trucks	59	370	0.994	0.425	3.869	0.006	0.104	0.101	1183.236
2270002054	Diesel Crushing/Proc. Equipment	43	380	1.487	0.426	4.737	0.007	0.215	0.209	1202.993
2270002057	Diesel Rough Terrain Forklifts	59	390	2.601	0.456	3.982	0.007	0.380	0.369	1255.558
2270002060	Diesel Rubber Tire Loaders	59	370	1.552	0.422	3.898	0.007	0.234	0.227	1190.218
2270002066	Diesel Tractors/Loaders/ Backhoes	21	460	6.830	1.378	7.271	0.009	1.053	1.022	1466.031
2270002069	Diesel Crawler Tractor/Dozers	59	370	1.250	0.393	3.077	0.006	0.170	0.165	1189.819
2270002072	Diesel Skid Steer Loaders	21	480	9.433	1.906	9.663	0.009	1.395	1.353	1528.419
2270002075	Diesel Off-Highway Tractors	59	370	1.983	0.457	5.181	0.007	0.235	0.228	1183.076
2270002078	Diesel Dumpers/Tenders	21	470	9.647	2.154	10.049	0.009	1.427	1.384	1507.457
2270002081	Diesel Other Construction Equipment	59	370	2.272	0.463	5.142	0.007	0.315	0.305	1185.189
2270003010	Diesel Aerial Lifts	21	480	10.018	2.254	10.571	0.009	1.396	1.354	1528.770
2270003020	Diesel Forklifts	59	400	0.762	0.341	2.430	0.006	0.046	0.045	1265.350
2270003030	Diesel Sweepers/Scrubbers	43	380	0.916	0.385	2.869	0.006	0.142	0.138	1219.098
2270003040	Diesel Other General Industrial Equipment	43	380	1.360	0.443	3.820	0.007	0.239	0.232	1205.250
2270003050	Diesel Other Material Handling Equipment	21	440	5.793	1.549	8.917	0.008	0.935	0.907	1412.488
2270003060	Diesel AC\Refrigeration	43	410	1.866	0.416	6.972	0.007	0.208	0.202	1301.253
2270003070	Diesel Terminal Tractors	59	380	0.529	0.350	1.458	0.006	0.061	0.059	1199.476

Table 4-2. Criteria Pollutant Emission Factors for Non-Road Engines and Equipment - 2019 (cont.)

SCC	Equipment Description	Load Factor [a] (% Max Power)	BSFC [b] (lb/1000 hp-hr)	Emission Factors (lb/1000 hp-hr)						
				CO	VOC	NO_x	SO_2	PM_{10} [d]	$PM_{2.5}$ [e,f]	CO_2e [g]
2270004031	Diesel Leaf blowers/Vacuums	43	410	6.641	1.540	11.127	0.008	0.868	0.842	1298.555
2270004036	Diesel Snow blowers	43	370	1.062	0.336	3.866	0.004	0.173	0.168	682.389
2270004046	Diesel Front Mowers	43	410	3.735	0.842	9.048	0.008	0.579	0.562	1300.632
2270004056	Diesel Lawn & Garden Tractors	43	410	4.966	1.071	9.630	0.009	0.730	0.708	1300.695
2270004066	Diesel Chippers/Stump Grinders	43	380	2.589	0.677	6.915	0.007	0.441	0.428	1215.521
2270004071	Diesel Commercial Turf Equipment	43	400	1.472	0.457	4.926	0.007	0.229	0.222	1263.043
2270004076	Diesel Other Lawn & Garden Equipment	43	410	4.429	0.969	9.099	0.008	0.715	0.693	1292.879
2270005010	Diesel 2-Wheel Tractors	59	410	9.981	1.375	9.523	0.009	0.795	0.771	1313.378
2270005015	Diesel Agricultural Tractors	59	380	2.661	0.578	5.933	0.007	0.429	0.416	1211.017
2270005020	Diesel Combines	59	370	2.706	0.706	7.316	0.007	0.556	0.540	1185.130
2270005025	Diesel Balers	59	400	5.113	1.023	8.314	0.008	0.765	0.742	1269.393
2270005030	Diesel Agricultural Mowers	59	410	6.057	0.900	7.034	0.008	0.920	0.892	1312.632
2270005035	Diesel Sprayers	59	380	3.184	0.827	7.101	0.007	0.529	0.513	1195.479
2270005040	Diesel Tillers > 6 HP	59	370	3.487	0.657	7.094	0.007	0.435	0.422	1186.292
2270005045	Diesel Swathers	59	400	5.351	0.932	7.990	0.008	0.837	0.812	1284.034
2270005055	Diesel Other Agricultural Equipment	59	380	2.915	0.671	6.544	0.007	0.526	0.511	1196.036
2270005060	Diesel Irrigation Sets	43	390	1.987	0.523	4.862	0.007	0.330	0.320	1234.890
2270006005	Diesel Generator Sets	43	390	3.493	0.864	8.281	0.008	0.579	0.562	1253.557
2270006010	Diesel Pumps	43	390	3.673	0.865	8.148	0.008	0.611	0.593	1252.638
2270006015	Diesel Air Compressors	43	400	2.241	0.493	5.219	0.007	0.317	0.307	1265.777
2270006020	Diesel Gas Compressors	43	410	0.600	0.341	2.028	0.006	0.032	0.031	1301.322
2270006025	Diesel Welders	21	480	8.584	1.824	9.829	0.009	1.250	1.212	1528.045

Table 4-2. Criteria Pollutant Emission Factors for Non-Road Engines and Equipment - 2019 (cont.)

SCC	Equipment Description	Load Factor [a] (% Max Power)	BSFC [b] (lb/1000 hp-hr)	Emission Factors (lb/1000 hp-hr)						
				CO	VOC	NO_x	SO_2	PM_{10} [d]	$PM_{2.5}$ [e,f]	CO_2e [g]
2270006030	Diesel Pressure Washers	43	380	3.295	0.951	8.447	0.007	0.513	0.498	1223.677
2270006035	Diesel Hydro Power Units	43	400	2.387	0.527	5.683	0.007	0.344	0.334	1272.007
2270007015	Diesel Forest Equipment - Feller/Bunch/Skidder	59	370	0.543	0.353	1.451	0.006	0.070	0.068	1186.351
2270008005	Diesel Airport Ground Support Equipment	59	380	1.610	0.411	3.549	0.007	0.247	0.240	1195.235
2270009010	Diesel Other Underground Mining Equipment	21	450	9.054	2.152	11.570	0.010	1.109	1.076	1428.169
2270010010	Diesel Other Oil Field Equipment	43	370	1.158	0.435	4.713	0.006	0.169	0.164	1174.466
2282005010	2 Stroke Outboard	21	850	226.082	98.834	13.205	0.013	0.863	0.794	2236.830
2282005015	2 Stroke Personal Water Craft	21	820	255.059	26.918	13.715	0.013	0.298	0.274	2151.606
2282010005	4 Stroke Inboard/Sterndrive	21	630	155.075	26.844	16.093	0.011	0.151	0.139	1879.795
2282020005	Diesel Inboard/Sterndrive	35	370	2.285	0.628	10.889	0.040	0.245	0.238	1173.127
2282020010	Diesel Outboards	35	410	4.535	1.411	8.286	0.044	0.748	0.725	1299.428
2285002015	Diesel Railway Maintenance	21	440	5.313	1.342	8.077	0.008	0.910	0.883	1400.923
2285004015	4 Stroke Railway Maintenance	62	750	531.131	13.422	4.762	0.014	0.294	0.271	2344.892
2285006015	LPG Railway Maintenance	62	480	24.293	0.746	4.020	0.006	0.126	0.126	1236.786

Notes for Table 4-2 follow Table 4-5

Table 4-3. Criteria Pollutant Emission Factors for Non-Road Engines and Equipment - 2020

SCC	Equipment Description	Load Factor [a] (% Max Power)	BSFC [b] (lb/1000 hp-hr)	Emission Factors (lb/1000 hp-hr)						
				CO	VOC	NO_x	SO_2	PM_{10} [d]	$PM_{2.5}$ [e,f]	CO_2e [g]
2260001010	2 Stroke Motorcycles: Off- Road[3]	100	260	79.631	72.428	0.909	0.003	2.659	2.446	569.563
2260001020	2 Stroke Snowmobiles	34	1640	140.998	169.370	5.555	0.013	1.803	1.659	2135.381
2260001030	2 Stroke ATVs[3]	100	210	83.463	22.551	0.921	0.003	0.695	0.639	490.065
2260001060	2 Stroke Specialty Vehicles/Carts	58	1000	576.516	19.952	4.693	0.014	0.296	0.272	2348.715
2260002006	2 Stroke Tampers/Rammers	55	680	560.746	134.661	3.369	0.009	20.435	18.800	1595.631
2260002009	2 Stroke Plate Compactors	55	830	490.399	109.598	5.250	0.014	16.838	15.491	2440.215
2260002021	2 Stroke Paving Equipment	59	830	494.122	109.256	5.250	0.014	16.951	15.595	2437.501
2260002027	2 Stroke Signal Boards/Light Plants	72	830	512.608	128.630	5.250	0.014	17.574	16.168	2422.455
2260002039	2 Stroke Concrete/Industrial Saws	78	630	580.559	136.824	3.520	0.009	21.176	19.482	1645.698
2260002054	2 Stroke Crushing/Proc. Equipment	85	830	512.608	112.601	5.250	0.014	17.574	16.168	2422.456
2260003030	2 Stroke Sweepers/Scrubbers	71	820	512.608	115.211	5.250	0.014	17.574	16.168	2422.455
2260003040	2 Stroke Other General Industrial Equipment	54	830	512.609	113.746	5.250	0.014	17.574	16.168	2422.455
2260004015	2 Stroke Rotary Tillers < 6 HP (Residential)	40	940	454.141	106.656	5.264	0.014	16.250	14.950	2454.982
2260004016	2 Stroke Rotary Tillers < 6 HP (Commercial)	40	900	459.058	93.992	5.264	0.014	16.391	15.080	2451.583
2260004020	2 Stroke Chain Saws < 6 HP (Residential)	70	900	469.607	107.792	5.250	0.014	16.236	14.937	2454.600
2260004021	2 Stroke Chain Saws < 6 HP (Commercial)	70	650	576.681	133.468	3.619	0.010	20.971	19.293	1690.019
2260004025	2 Stroke Trimmers/Edgers/Brush Cutter (Residential)	91	890	433.581	108.014	5.300	0.014	16.874	15.524	2441.861
2260004026	2 Stroke Trimmers/Edgers/Brush Cutter (Commercial)	91	810	494.113	102.826	4.981	0.013	17.165	15.792	2323.600
2260004030	2 Stroke Leaf blowers/Vacuums (Residential)	94	890	459.839	125.522	5.264	0.014	16.414	15.100	2451.048
2260004031	2 Stroke Leaf blowers/Vacuums (Commercial)	94	760	519.607	113.577	4.357	0.012	18.418	16.945	2042.246
2260004035	2 Stroke Snow blowers (Residential)	35	870	529.638	370.785	1.774	0.006	5.889	5.418	1240.088
2260004036	2 Stroke Snow blowers (Commercial)	35	870	617.898	229.318	2.069	0.007	6.871	6.321	1446.768

Table 4-3. Criteria Pollutant Emission Factors for Non-Road Engines and Equipment - 2020 (cont.)

SCC	Equipment Description	Load Factor [a] (% Max Power)	BSFC [b] (lb/1000 hp-hr)	Emission Factors (lb/1000 hp-hr)						
				CO	VOC	NO_x	SO_2	PM_{10} [d]	$PM_{2.5}$ [e,f]	CO_2e [g]
2260004071	2 Stroke Commercial Turf Equipment	60	840	481.217	98.011	5.250	0.014	16.565	15.240	2446.744
2260005035	2 Stroke Sprayers	65	840	423.395	106.059	5.323	0.014	17.356	15.968	2431.235
2260006005	2 Stroke Generator Sets	68	830	483.156	130.918	5.255	0.014	16.809	15.464	2441.120
2260006010	2 Stroke Pumps	69	830	461.507	136.047	5.281	0.014	18.335	16.869	2396.550
2260006015	2 Stroke Air Compressors	56	830	512.609	134.439	5.250	0.014	17.574	16.168	2422.456
2260006035	2 Stroke Hydro Power Units	56	830	512.609	141.646	5.250	0.014	17.574	16.168	2422.459
2260007005	2 Stroke Chain Saws > 6 HP	70	620	586.493	137.018	3.369	0.009	21.491	19.772	1577.855
2265001010	4 Stroke Motorcycles: Off- Road	100	160	59.689	6.880	1.254	0.003	0.147	0.135	504.374
2265001030	4 Stroke ATVs	100	170	81.152	8.028	0.988	0.003	0.147	0.135	533.051
2265001050	4 Stroke Golf Carts	46	740	586.285	13.329	4.945	0.014	0.301	0.277	2345.393
2265001060	4 Stroke Specialty Vehicles/Carts	58	820	627.137	22.504	8.255	0.014	0.246	0.226	2342.655
2265002003	4 Stroke Pavers	66	700	435.135	9.444	4.440	0.013	0.257	0.236	2158.245
2265002006	4 Stroke Tampers/Rammers	55	760	571.819	12.483	4.590	0.014	0.251	0.231	2345.377
2265002009	4 Stroke Plate Compactors	55	830	487.793	14.858	5.162	0.015	0.518	0.476	2585.005
2265002015	4 Stroke Rollers	62	690	447.912	9.807	4.333	0.013	0.254	0.233	2152.855
2265002021	4 Stroke Paving Equipment	59	780	531.386	13.887	4.908	0.014	0.345	0.318	2416.642
2265002024	4 Stroke Surfacing Equipment	49	750	534.931	13.234	4.870	0.014	0.359	0.330	2389.620
2265002027	4 Stroke Signal Boards/Light Plants	72	780	524.738	13.223	5.121	0.015	0.464	0.427	2495.242
2265002030	4 Stroke Trenchers	66	710	417.771	10.274	4.593	0.013	0.324	0.298	2204.919
2265002033	4 Stroke Bore/Drill Rigs	79	790	369.936	14.359	7.443	0.014	0.491	0.452	2414.098
2265002039	4 Stroke Concrete/Industrial Saws	78	710	518.762	11.288	4.653	0.013	0.279	0.257	2250.934
2265002042	4 Stroke Cement & Mortar Mixers	59	820	539.145	18.229	5.199	0.014	0.351	0.323	2452.987

Table 4-3. Criteria Pollutant Emission Factors for Non-Road Engines and Equipment - 2020 (cont.)

SCC	Equipment Description	Load Factor [a] (% Max Power)	BSFC [b] (lb/1000 hp-hr)	Emission Factors (lb/1000 hp-hr)						
				CO	VOC	NO_x	SO_2	PM_{10} [d]	$PM_{2.5}$ [e,f]	CO_2e [g]
2265002045	4 Stroke Cranes	47	590	118.426	4.289	5.911	0.010	0.164	0.151	1663.631
2265002054	4 Stroke Crushing/Proc. Equipment	85	740	497.395	11.950	4.949	0.014	0.327	0.301	2313.824
2265002057	4 Stroke Rough Terrain Forklifts	63	570	43.545	2.051	3.815	0.009	0.154	0.141	1565.432
2265002060	4 Stroke Rubber Tire Loaders	71	550	25.304	1.368	2.808	0.009	0.153	0.141	1544.029
2265002066	4 Stroke Tractors/Loaders/ Backhoes	48	730	541.913	11.195	4.592	0.014	0.263	0.242	2293.740
2265002072	4 Stroke Skid Steer Loaders	58	640	256.861	6.552	5.320	0.011	0.191	0.176	1873.245
2265002078	4 Stroke Dumpers/Tenders	41	800	559.400	18.390	5.658	0.014	0.282	0.259	2372.980
2265002081	4 Stroke Other Construction Equipment	48	580	78.383	3.921	7.117	0.010	0.152	0.140	1599.005
2265003010	4 Stroke Aerial Lifts	46	630	297.825	11.377	16.126	0.011	0.187	0.172	1892.937
2265003020	4 Stroke Forklifts	30	560	29.680	1.480	3.087	0.009	0.158	0.146	1544.037
2265003030	4 Stroke Sweepers/Scrubbers	71	610	204.494	5.262	3.598	0.011	0.225	0.207	1822.910
2265003040	4 Stroke Other General Industrial Equipment	54	760	441.625	13.700	5.128	0.014	0.536	0.493	2400.524
2265003050	4 Stroke Other Material Handling Equipment	53	640	290.507	9.554	11.597	0.011	0.195	0.179	1893.952
2265003060	4 Stroke AC/Refrigeration	46	740	576.618	12.632	4.696	0.014	0.268	0.247	2345.324
2265003070	4 Stroke Terminal Tractors	78	520	25.466	1.351	2.801	0.009	0.159	0.146	1544.031
2265004010	4 Stroke Lawn mowers (Residential)	33	900	424.543	24.077	5.474	0.016	0.650	0.598	2760.062
2265004011	4 Stroke Lawn mowers (Commercial)	33	880	426.495	14.716	5.589	0.016	0.716	0.659	2760.006
2265004015	4 Stroke Rotary Tillers < 6 HP (Residential)	40	910	424.345	21.065	5.471	0.016	0.650	0.598	2760.199
2265004016	4 Stroke Rotary Tillers < 6 HP (Commercial)	40	890	422.971	13.317	5.427	0.016	0.657	0.604	2760.165
2265004025	4 Stroke Trimmers/Edgers/Brush Cutter HP (Residential)	91	900	423.073	19.521	5.431	0.016	0.658	0.606	2760.166
2265004026	4 Stroke Trimmers/Edgers/Brush Cutter (Commercial)	91	820	495.834	12.320	5.145	0.015	0.499	0.459	2566.434
2265004030	4 Stroke Leaf blowers/Vacuums (Residential)	94	900	423.086	25.635	5.432	0.016	0.659	0.606	2760.167

Table 4-3. Criteria Pollutant Emission Factors for Non-Road Engines and Equipment - 2020 (cont.)

SCC	Equipment Description	Load Factor [a] (% Max Power)	BSFC [b] (lb/1000 hp-hr)	Emission Factors (lb/1000 hp-hr)						
				CO	VOC	NO_x	SO_2	PM_{10} [d]	$PM_{2.5}$ [e,f]	CO_2e [g]
2265004031	4 Stroke Leaf blowers/Vacuums (Commercial)	94	700	435.577	8.469	4.424	0.013	0.249	0.229	2156.904
2265004035	4 Stroke Snow blowers (Residential)	35	940	603.675	201.391	4.759	0.009	0.126	0.116	1506.737
2265004036	4 Stroke Snow blowers (Commercial)	35	940	707.653	32.295	5.415	0.010	0.147	0.135	1757.354
2265004040	4 Stroke Rear Engine Riding Mowers (Residential)	38	760	571.610	21.296	4.653	0.014	0.247	0.227	2346.877
2265004041	4 Stroke Rear Engine Riding Mowers (Commercial)	38	740	573.297	11.243	4.619	0.014	0.259	0.238	2346.079
2265004046	4 Stroke Front Mowers	65	790	581.160	13.268	5.393	0.014	0.243	0.223	2346.166
2265004051	4 Stroke Shredders < 6 HP	80	890	423.203	13.960	5.432	0.016	0.652	0.600	2760.174
2265004055	4 Stroke Lawn & Garden Tractors (Residential)	44	760	571.284	16.284	4.640	0.014	0.246	0.227	2345.941
2265004056	4 Stroke Lawn & Garden Tractors (Commercial)	44	740	573.464	10.695	4.618	0.014	0.258	0.237	2345.594
2265004066	4 Stroke Chippers/Stump Grinders	78	640	292.080	6.165	3.732	0.011	0.213	0.196	1930.405
2265004071	4 Stroke Commercial Turf Equipment	60	730	486.183	10.313	4.562	0.014	0.315	0.290	2309.815
2265004075	4 Stroke Other Lawn & Garden Equipment	58	850	507.916	24.038	5.663	0.015	0.449	0.413	2561.194
2265004076	4 Stroke Other Lawn & Garden Equipment	58	850	505.618	22.336	5.703	0.015	0.447	0.411	2555.767
2265005010	4 Stroke 2-Wheel Tractors	62	740	576.160	11.684	4.684	0.014	0.266	0.245	2345.320
2265005015	4 Stroke Agricultural Tractors	62	580	106.960	2.848	3.135	0.010	0.169	0.156	1662.344
2265005020	4 Stroke Combines	74	580	134.664	9.427	12.657	0.010	0.150	0.138	1676.226
2265005025	4 Stroke Balers	62	580	134.880	11.132	12.676	0.010	0.150	0.138	1676.500
2265005030	4 Stroke Agricultural Mowers	48	770	572.359	12.440	4.788	0.014	0.249	0.229	2348.583
2265005035	4 Stroke Sprayers	65	740	398.569	15.091	8.112	0.013	0.298	0.274	2203.175
2265005040	4 Stroke Tillers > 6 HP	71	870	770.592	24.769	8.345	0.015	0.245	0.225	2499.648
2265005045	4 Stroke Swathers	52	580	134.881	9.473	12.676	0.010	0.150	0.138	1676.501
2265005055	4 Stroke Other Agricultural Equipment	55	620	223.655	8.923	11.108	0.011	0.173	0.159	1815.801

Table 4-3. Criteria Pollutant Emission Factors for Non-Road Engines and Equipment - 2020 (cont.)

SCC	Equipment Description	Load Factor [a] (% Max Power)	BSFC [b] (lb/1000 hp-hr)	Emission Factors (lb/1000 hp-hr)						
				CO	VOC	NO_x	SO_2	PM_{10} [d]	$PM_{2.5}$ [e,f]	CO_2e [g]
2265005060	4 Stroke Irrigation Sets	60	550	36.064	1.696	2.813	0.009	0.167	0.154	1571.229
2265006005	4 Stroke Generator Sets	68	780	559.875	14.678	4.879	0.014	0.287	0.264	2384.976
2265006010	4 Stroke Pumps	69	760	439.968	12.303	5.208	0.014	0.414	0.381	2363.803
2265006015	4 Stroke Air Compressors	56	700	360.955	9.512	4.469	0.013	0.336	0.309	2146.186
2265006025	4 Stroke Welders	68	710	473.056	9.874	4.498	0.013	0.259	0.238	2200.510
2265006030	4 Stroke Pressure Washers	85	800	520.079	13.825	4.959	0.015	0.415	0.382	2489.987
2265006035	4 Stroke Hydro Power Units	56	750	539.073	12.420	4.793	0.014	0.334	0.307	2370.787
2265007010	4 Stroke Shredders > 6 HP	80	800	583.177	13.353	5.415	0.014	0.240	0.221	2351.506
2265007015	4 Stroke Forest Equipment - Feller/Bunch/Skidder	70	810	491.112	14.448	5.413	0.015	0.598	0.550	2593.245
2265008005	4 Stroke Airport Ground Support Equipment	56	600	129.744	4.168	3.316	0.010	0.233	0.214	1744.130
2265010010	4 Stroke Other Oil Field Equipment	90	740	592.922	12.456	5.116	0.014	0.323	0.297	2345.442
2267001060	LPG Specialty Vehicle Carts	58	490	56.144	2.443	11.205	0.006	0.126	0.126	1326.968
2267002003	LPG Pavers	66	460	14.836	0.394	2.636	0.006	0.127	0.127	1222.559
2267002015	LPG Rollers	62	450	10.928	0.250	2.070	0.006	0.128	0.128	1216.744
2267002021	LPG Paving Equipment	59	480	28.864	0.987	5.035	0.006	0.126	0.126	1249.496
2267002024	LPG Surfacing Equipment	49	460	14.160	0.377	2.577	0.006	0.127	0.127	1222.214
2267002030	LPG Trenchers	66	460	15.062	0.399	2.653	0.006	0.127	0.127	1222.622
2267002033	LPG Bore/Drill Rigs	79	490	50.905	2.156	9.993	0.006	0.125	0.125	1311.616
2267002039	LPG Concrete/Industrial Saws	78	430	10.710	0.248	2.061	0.006	0.129	0.129	1216.740
2267002045	LPG Cranes	47	480	28.253	0.891	4.587	0.006	0.126	0.126	1242.540
2267002054	LPG Crushing/Proc. Equipment	85	480	25.334	0.793	4.209	0.006	0.126	0.126	1239.017
2267002057	LPG Rough Terrain Forklifts	63	470	16.459	0.450	2.856	0.006	0.127	0.127	1224.721

Table 4-3. Criteria Pollutant Emission Factors for Non-Road Engines and Equipment - 2020 (cont.)

SCC	Equipment Description	Load Factor [a] (% Max Power)	BSFC [b] (lb/1000 hp-hr)	Emission Factors (lb/1000 hp-hr)						
				CO	VOC	NO_x	SO_2	PM_{10} [d]	$PM_{2.5}$ [e,f]	CO_2e [g]
2267002060	LPG Rubber Tire Loaders	71	460	11.482	0.259	2.102	0.006	0.127	0.127	1216.761
2267002066	LPG Tractors/Loaders/ Backhoes	48	450	10.646	0.244	2.052	0.006	0.128	0.128	1216.732
2267002072	LPG Skid Steer Loaders	58	470	26.464	0.833	4.368	0.006	0.126	0.126	1240.541
2267002081	LPG Other Construction Equipment	48	480	33.098	1.095	5.409	0.006	0.126	0.126	1251.694
2267003010	LPG Aerial Lifts	46	480	31.705	1.099	5.469	0.006	0.126	0.126	1254.119
2267003020	LPG Forklifts	30	460	11.511	0.260	2.103	0.006	0.127	0.127	1216.761
2267003030	LPG Sweepers/Scrubbers	71	440	11.012	0.252	2.077	0.006	0.128	0.128	1216.748
2267003040	LPG Other General Industrial Equipment	54	450	10.952	0.250	2.070	0.006	0.128	0.128	1216.743
2267003050	LPG Other Material Handling Equipment	53	480	24.666	0.765	4.098	0.006	0.126	0.126	1237.796
2267003070	LPG Terminal Tractors	78	430	10.645	0.246	2.055	0.006	0.129	0.129	1216.735
2267004066	LPG Chippers/Stump Grinders	78	450	11.078	0.252	2.078	0.006	0.127	0.127	1216.747
2267005055	LPG Other Agricultural Equipment	55	490	59.687	2.647	12.048	0.007	0.126	0.126	1337.858
2267005060	LPG Irrigation Sets	60	450	10.562	0.243	2.047	0.006	0.128	0.128	1216.730
2267006005	LPG Generator Sets	68	480	32.255	1.308	8.074	0.006	0.124	0.124	1289.302
2267006010	LPG Pumps	69	470	20.801	0.674	4.487	0.006	0.125	0.125	1245.159
2267006015	LPG Air Compressors	56	460	13.130	0.317	2.491	0.006	0.126	0.126	1221.460
2267006025	LPG Welders	68	460	14.476	0.368	2.531	0.006	0.126	0.126	1221.155
2267006030	LPG Pressure Washers	85	470	28.136	0.914	4.720	0.006	0.125	0.125	1244.852
2267006035	LPG Hydro Power Units	56	460	12.557	0.308	2.429	0.006	0.127	0.127	1220.945
2267008005	LPG Airport Ground Support Equipment	56	450	10.961	0.249	2.069	0.006	0.127	0.127	1216.742
2268002081	CNG Other Construction Equipment	48	480	33.098	3.944	5.481	0.006	0.126	0.126	1506.368
2268003020	CNG Forklifts	30	460	11.541	0.984	2.200	0.006	0.127	0.127	1167.736

Table 4-3. Criteria Pollutant Emission Factors for Non-Road Engines and Equipment - 2020 (cont.)

SCC	Equipment Description	Load Factor [a] (% Max Power)	BSFC [b] (lb/1000 hp-hr)	Emission Factors (lb/1000 hp-hr)						
				CO	VOC	NO_x	SO_2	PM_{10} [d]	$PM_{2.5}$ [e,f]	CO_2e [g]
2268003030	CNG Sweepers/Scrubbers	71	460	11.340	0.972	2.188	0.006	0.127	0.127	1166.433
2268003040	CNG Other General Industrial Equipment	54	460	11.008	0.949	2.168	0.006	0.127	0.127	1164.148
2268003060	CNG AC\Refrigeration	46	450	12.190	1.113	2.346	0.006	0.128	0.128	1182.805
2268003070	CNG Terminal Tractors	78	430	10.647	0.936	2.152	0.006	0.129	0.129	1162.816
2268005055	CNG Other Agricultural Equipment	55	510	121.817	22.664	27.226	0.006	0.139	0.139	3720.130
2268006005	CNG Generator Sets	68	490	36.224	5.640	9.625	0.006	0.124	0.124	1736.020
2268006010	CNG Pumps	69	480	26.327	3.395	6.048	0.006	0.125	0.125	1460.860
2268006015	CNG Air Compressors	56	470	13.646	1.245	2.677	0.006	0.126	0.126	1200.159
2268006020	CNG Gas Compressors	85	410	11.753	1.087	2.256	0.006	0.139	0.139	1178.205
2268006035	CNG Hydro Power Units	56	470	14.624	1.400	2.923	0.006	0.126	0.126	1219.008
2268010010	CNG Other Oil Field Equipment	90	410	11.077	0.995	2.192	0.006	0.133	0.133	1168.801
2270001060	Diesel Specialty Vehicle Carts	21	450	7.221	1.897	9.068	0.009	1.066	1.034	1438.860
2270002003	Diesel Pavers	59	380	1.057	0.376	2.759	0.006	0.150	0.145	1214.120
2270002006	Diesel Tampers/Rammers	43	1000	9.823	1.427	9.809	0.009	0.838	0.813	1300.351
2270002009	Diesel Plate Compactors	43	410	8.296	1.320	9.807	0.009	0.806	0.782	1300.485
2270002015	Diesel Rollers	59	390	1.544	0.408	3.289	0.007	0.220	0.214	1233.700
2270002018	Diesel Scrapers	59	370	1.209	0.367	2.579	0.006	0.150	0.145	1183.264
2270002021	Diesel Paving Equipment	59	390	2.004	0.468	3.998	0.007	0.306	0.296	1227.031
2270002024	Diesel Surfacing Equipment	59	380	2.765	0.528	5.911	0.007	0.370	0.359	1224.055
2270002027	Diesel Signal Boards/Light Plants	43	410	4.114	0.906	8.990	0.008	0.601	0.583	1293.499
2270002030	Diesel Trenchers	59	400	2.423	0.451	5.540	0.007	0.307	0.298	1273.396
2270002033	Diesel Bore/Drill Rigs	43	370	2.117	0.622	7.107	0.007	0.369	0.358	1190.269

Table 4-3. Criteria Pollutant Emission Factors for Non-Road Engines and Equipment - 2020 (cont.)

SCC	Equipment Description	Load Factor [a] (% Max Power)	BSFC [b] (lb/1000 hp-hr)	Emission Factors (lb/1000 hp-hr)						
				CO	VOC	NO_x	SO_2	PM_{10} [d]	$PM_{2.5}$ [e,f]	CO_2e [g]
2270002036	Diesel Excavators	59	380	0.621	0.359	1.706	0.006	0.080	0.078	1194.575
2270002039	Diesel Concrete/Industrial Saws	59	410	2.691	0.481	5.797	0.007	0.338	0.328	1304.767
2270002042	Diesel Cement & Mortar Mixers	43	390	4.111	0.929	8.303	0.008	0.594	0.576	1244.556
2270002045	Diesel Cranes	43	370	0.829	0.394	3.096	0.006	0.140	0.135	1175.521
2270002048	Diesel Graders	59	370	0.574	0.358	1.614	0.006	0.083	0.081	1185.220
2270002051	Diesel Off-highway Trucks	59	370	0.803	0.402	3.704	0.006	0.089	0.086	1183.254
2270002054	Diesel Crushing/Proc. Equipment	43	380	1.304	0.409	4.304	0.007	0.186	0.180	1203.031
2270002057	Diesel Rough Terrain Forklifts	59	390	2.243	0.430	3.497	0.007	0.320	0.310	1255.608
2270002060	Diesel Rubber Tire Loaders	59	370	1.343	0.407	3.438	0.006	0.198	0.192	1190.252
2270002066	Diesel Tractors/Loaders/ Backhoes	21	460	6.313	1.264	6.673	0.009	0.961	0.932	1466.319
2270002069	Diesel Crawler Tractor/Dozers	59	370	1.049	0.382	2.673	0.006	0.134	0.130	1189.839
2270002072	Diesel Skid Steer Loaders	21	480	8.752	1.747	9.225	0.009	1.279	1.240	1528.849
2270002075	Diesel Off-Highway Tractors	59	370	1.754	0.441	4.769	0.006	0.206	0.200	1183.120
2270002078	Diesel Dumpers/Tenders	21	470	8.940	1.964	9.576	0.009	1.310	1.270	1508.010
2270002081	Diesel Other Construction Equipment	59	370	2.048	0.445	4.632	0.007	0.282	0.274	1185.246
2270003010	Diesel Aerial Lifts	21	480	9.335	2.072	10.146	0.009	1.288	1.249	1529.289
2270003020	Diesel Forklifts	59	400	0.696	0.339	2.326	0.006	0.036	0.035	1265.351
2270003030	Diesel Sweepers/Scrubbers	43	380	0.722	0.372	2.466	0.006	0.103	0.100	1219.113
2270003040	Diesel Other General Industrial Equipment	43	380	1.190	0.421	3.343	0.007	0.205	0.199	1205.290
2270003050	Diesel Other Material Handling Equipment	21	440	5.323	1.432	8.303	0.008	0.861	0.835	1412.814
2270003060	Diesel AC\Refrigeration	43	410	1.520	0.402	6.925	0.007	0.170	0.165	1301.266
2270003070	Diesel Terminal Tractors	59	380	0.456	0.347	1.172	0.006	0.046	0.044	1199.477

Table 4-3. Criteria Pollutant Emission Factors for Non-Road Engines and Equipment - 2020 (cont.)

SCC	Equipment Description	Load Factor [a] (% Max Power)	BSFC [b] (lb/1000 hp-hr)	Emission Factors (lb/1000 hp-hr)						
				CO	VOC	NO_x	SO_2	PM_{10} [d]	$PM_{2.5}$ [e,f]	CO_2e [g]
2270004031	Diesel Leaf blowers/Vacuums	43	410	6.440	1.458	10.829	0.008	0.821	0.796	1298.831
2270004036	Diesel Snow blowers	43	370	0.963	0.318	3.562	0.004	0.158	0.153	682.449
2270004046	Diesel Front Mowers	43	410	3.566	0.808	8.851	0.008	0.546	0.530	1300.722
2270004056	Diesel Lawn & Garden Tractors	43	410	4.928	1.059	9.567	0.009	0.726	0.704	1300.742
2270004066	Diesel Chippers/Stump Grinders	43	380	2.384	0.637	6.412	0.007	0.404	0.392	1215.645
2270004071	Diesel Commercial Turf Equipment	43	400	1.309	0.444	4.625	0.007	0.197	0.191	1263.060
2270004076	Diesel Other Lawn & Garden Equipment	43	410	4.221	0.922	8.825	0.008	0.675	0.654	1293.025
2270005010	Diesel 2-Wheel Tractors	59	410	9.932	1.372	9.521	0.009	0.787	0.764	1313.387
2270005015	Diesel Agricultural Tractors	59	380	2.404	0.542	5.439	0.007	0.385	0.373	1211.112
2270005020	Diesel Combines	59	370	2.464	0.667	6.758	0.007	0.508	0.493	1185.257
2270005025	Diesel Balers	59	400	4.760	0.952	7.916	0.008	0.703	0.682	1269.606
2270005030	Diesel Agricultural Mowers	59	410	5.648	0.840	6.498	0.008	0.843	0.818	1312.810
2270005035	Diesel Sprayers	59	380	2.908	0.772	6.587	0.007	0.483	0.468	1195.651
2270005040	Diesel Tillers > 6 HP	59	370	3.196	0.618	6.577	0.007	0.397	0.385	1186.422
2270005045	Diesel Swathers	59	400	5.010	0.875	7.480	0.008	0.770	0.747	1284.210
2270005055	Diesel Other Agricultural Equipment	59	380	2.671	0.631	6.024	0.007	0.477	0.463	1196.162
2270005060	Diesel Irrigation Sets	43	390	1.777	0.488	4.327	0.007	0.292	0.283	1234.958
2270006005	Diesel Generator Sets	43	390	3.272	0.814	7.870	0.008	0.537	0.521	1253.716
2270006010	Diesel Pumps	43	390	3.447	0.816	7.715	0.008	0.566	0.549	1252.788
2270006015	Diesel Air Compressors	43	400	1.981	0.459	4.755	0.007	0.276	0.267	1265.838
2270006020	Diesel Gas Compressors	43	410	0.600	0.341	2.028	0.006	0.032	0.031	1301.322
2270006025	Diesel Welders	21	480	7.917	1.665	9.474	0.009	1.143	1.109	1528.490

Table 4-3. Criteria Pollutant Emission Factors for Non-Road Engines and Equipment - 2020 (cont.)

SCC	Equipment Description	Load Factor [a] (% Max Power)	BSFC [b] (lb/1000 hp-hr)	Emission Factors (lb/1000 hp-hr)						
				CO	VOC	NO_x	SO_2	PM_{10} [d]	$PM_{2.5}$ [e,f]	CO_2e [g]
2270006030	Diesel Pressure Washers	43	380	3.088	0.896	8.012	0.007	0.478	0.464	1223.855
2270006035	Diesel Hydro Power Units	43	400	2.135	0.492	5.246	0.007	0.303	0.294	1272.067
2270007015	Diesel Forest Equipment - Feller/Bunch/Skidder	59	370	0.451	0.349	1.120	0.006	0.051	0.050	1186.354
2270008005	Diesel Airport Ground Support Equipment	59	380	1.396	0.397	3.100	0.006	0.208	0.202	1195.263
2270009010	Diesel Other Underground Mining Equipment	21	450	8.828	2.099	11.385	0.010	1.069	1.037	1428.400
2270010010	Diesel Other Oil Field Equipment	43	370	1.005	0.420	4.274	0.006	0.145	0.141	1174.503
2282005010	2 Stroke Outboard	21	850	222.871	90.112	13.186	0.013	0.751	0.691	2237.362
2282005015	2 Stroke Personal Water Craft	21	820	254.085	24.037	13.834	0.013	0.248	0.228	2151.555
2282010005	4 Stroke Inboard/Sterndrive	21	630	147.997	25.678	15.233	0.011	0.151	0.139	1872.406
2282020005	Diesel Inboard/Sterndrive	35	370	2.279	0.630	10.636	0.040	0.243	0.236	1173.171
2282020010	Diesel Outboards	35	410	4.394	1.362	7.977	0.044	0.715	0.694	1299.632
2285002015	Diesel Railway Maintenance	21	440	4.851	1.240	7.484	0.008	0.835	0.810	1401.199
2285004015	4 Stroke Railway Maintenance	62	750	530.528	13.360	4.711	0.014	0.294	0.271	2344.532
2285006015	LPG Railway Maintenance	62	480	20.298	0.621	3.543	0.006	0.126	0.126	1232.657

Notes for Table 4-3 follow Table 4-5

Table 4-4. Criteria Pollutant Emission Factors for Non-Road Engines and Equipment - 2021

SCC	Equipment Description	Load Factor [a] (% Max Power)	BSFC [b] (lb/1000 hp-hr)	Emission Factors (lb/1000 hp-hr)						
				CO	VOC	NO_x	SO_2	PM_{10} [d]	$PM_{2.5}$ [e,f]	CO_2e [g]
2260001010	2 Stroke Motorcycles: Off- Road[3]	100	260	79.223	71.219	0.914	0.003	2.614	2.405	571.015
2260001020	2 Stroke Snowmobiles	34	1640	136.975	162.644	5.741	0.013	1.718	1.581	2123.120
2260001030	2 Stroke ATVs[3]	100	210	82.942	19.435	0.930	0.003	0.577	0.531	494.815
2260001060	2 Stroke Specialty Vehicles/Carts	58	1000	575.997	19.783	4.656	0.014	0.296	0.272	2348.512
2260002006	2 Stroke Tampers/Rammers	55	680	560.746	134.661	3.369	0.009	20.435	18.800	1595.631
2260002009	2 Stroke Plate Compactors	55	830	490.399	109.598	5.250	0.014	16.838	15.491	2440.214
2260002021	2 Stroke Paving Equipment	59	830	494.121	109.256	5.250	0.014	16.951	15.595	2437.502
2260002027	2 Stroke Signal Boards/Light Plants	72	830	512.609	128.630	5.250	0.014	17.574	16.168	2422.456
2260002039	2 Stroke Concrete/Industrial Saws	78	630	580.559	136.824	3.520	0.009	21.176	19.482	1645.700
2260002054	2 Stroke Crushing/Proc. Equipment	85	830	512.608	112.601	5.250	0.014	17.574	16.168	2422.452
2260003030	2 Stroke Sweepers/Scrubbers	71	820	512.608	115.211	5.250	0.014	17.574	16.168	2422.454
2260003040	2 Stroke Other General Industrial Equipment	54	830	512.608	113.746	5.250	0.014	17.574	16.168	2422.456
2260004015	2 Stroke Rotary Tillers < 6 HP (Residential)	40	940	454.159	106.485	5.264	0.014	16.251	14.951	2454.969
2260004016	2 Stroke Rotary Tillers < 6 HP (Commercial)	40	900	459.072	93.997	5.264	0.014	16.392	15.081	2451.573
2260004020	2 Stroke Chain Saws < 6 HP (Residential)	70	900	469.621	107.797	5.250	0.014	16.236	14.937	2454.590
2260004021	2 Stroke Chain Saws < 6 HP (Commercial)	70	650	576.681	133.469	3.619	0.010	20.971	19.293	1690.015
2260004025	2 Stroke Trimmers/Edgers/Brush Cutter (Residential)	91	890	433.594	108.019	5.300	0.014	16.874	15.524	2441.849
2260004026	2 Stroke Trimmers/Edgers/Brush Cutter (Commercial)	91	810	494.119	102.827	4.981	0.013	17.165	15.792	2323.596
2260004030	2 Stroke Leaf blowers/Vacuums (Residential)	94	890	459.852	125.526	5.264	0.014	16.414	15.101	2451.038
2260004031	2 Stroke Leaf blowers/Vacuums (Commercial)	94	760	519.613	113.579	4.357	0.012	18.418	16.945	2042.242
2260004035	2 Stroke Snow blowers (Residential)	35	870	529.659	370.791	1.774	0.006	5.890	5.418	1240.076
2260004036	2 Stroke Snow blowers (Commercial)	35	870	617.922	229.325	2.069	0.007	6.871	6.322	1446.755

Table 4-4. Criteria Pollutant Emission Factors for Non-Road Engines and Equipment - 2021 (cont.)

SCC	Equipment Description	Load Factor [a] (% Max Power)	BSFC [b] (lb/1000 hp-hr)	Emission Factors (lb/1000 hp-hr)						
				CO	VOC	NO_x	SO_2	PM_{10} [d]	$PM_{2.5}$ [e,f]	CO_2e [g]
2260004071	2 Stroke Commercial Turf Equipment	60	840	481.223	98.013	5.250	0.014	16.565	15.240	2446.740
2260005035	2 Stroke Sprayers	65	840	423.401	106.061	5.323	0.014	17.356	15.968	2431.231
2260006005	2 Stroke Generator Sets	68	830	483.164	130.921	5.255	0.014	16.809	15.464	2441.113
2260006010	2 Stroke Pumps	69	830	461.336	135.958	5.281	0.014	18.336	16.869	2396.466
2260006015	2 Stroke Air Compressors	56	830	512.609	134.439	5.250	0.014	17.574	16.168	2422.459
2260006035	2 Stroke Hydro Power Units	56	830	512.609	141.646	5.250	0.014	17.574	16.168	2422.455
2260007005	2 Stroke Chain Saws > 6 HP	70	620	586.493	137.018	3.369	0.009	21.491	19.772	1577.853
2265001010	4 Stroke Motorcycles: Off- Road	100	160	59.151	6.821	1.250	0.003	0.147	0.135	504.350
2265001030	4 Stroke ATVs	100	170	80.991	7.954	0.980	0.003	0.147	0.135	533.023
2265001050	4 Stroke Golf Carts	46	740	586.286	13.329	4.945	0.014	0.301	0.277	2345.394
2265001060	4 Stroke Specialty Vehicles/Carts	58	820	610.455	21.335	7.848	0.014	0.244	0.224	2330.063
2265002003	4 Stroke Pavers	66	700	434.510	9.415	4.386	0.013	0.257	0.236	2157.602
2265002006	4 Stroke Tampers/Rammers	55	760	571.645	12.460	4.575	0.014	0.251	0.231	2345.326
2265002009	4 Stroke Plate Compactors	55	830	487.728	14.849	5.156	0.015	0.518	0.476	2584.987
2265002015	4 Stroke Rollers	62	690	447.843	9.805	4.328	0.013	0.254	0.233	2152.854
2265002021	4 Stroke Paving Equipment	59	780	530.841	13.815	4.860	0.014	0.345	0.318	2416.385
2265002024	4 Stroke Surfacing Equipment	49	750	534.867	13.230	4.864	0.014	0.359	0.330	2389.551
2265002027	4 Stroke Signal Boards/Light Plants	72	780	524.736	13.222	5.121	0.015	0.464	0.427	2495.240
2265002030	4 Stroke Trenchers	66	710	417.093	10.243	4.536	0.013	0.324	0.298	2204.236
2265002033	4 Stroke Bore/Drill Rigs	79	790	367.119	14.185	7.179	0.014	0.491	0.452	2410.532
2265002039	4 Stroke Concrete/Industrial Saws	78	710	518.760	11.288	4.653	0.013	0.279	0.257	2250.924
2265002042	4 Stroke Cement & Mortar Mixers	59	820	537.414	17.890	5.070	0.014	0.351	0.323	2452.335

Table 4-4. Criteria Pollutant Emission Factors for Non-Road Engines and Equipment - 2021 (cont.)

SCC	Equipment Description	Load Factor [a] (% Max Power)	BSFC [b] (lb/1000 hp-hr)	Emission Factors (lb/1000 hp-hr)						
				CO	VOC	NO_x	SO_2	PM_{10} [d]	$PM_{2.5}$ [e,f]	CO_2e [g]
2265002045	4 Stroke Cranes	47	590	111.536	3.966	5.346	0.010	0.164	0.151	1657.808
2265002054	4 Stroke Crushing/Proc. Equipment	85	740	496.553	11.912	4.881	0.014	0.327	0.301	2313.141
2265002057	4 Stroke Rough Terrain Forklifts	63	570	40.144	1.895	3.525	0.009	0.154	0.141	1561.937
2265002060	4 Stroke Rubber Tire Loaders	71	550	24.728	1.349	2.769	0.009	0.153	0.141	1544.028
2265002066	4 Stroke Tractors/Loaders/ Backhoes	48	730	541.908	11.195	4.592	0.014	0.263	0.242	2293.746
2265002072	4 Stroke Skid Steer Loaders	58	640	252.887	6.357	4.986	0.011	0.191	0.176	1869.534
2265002078	4 Stroke Dumpers/Tenders	41	800	555.674	17.874	5.462	0.014	0.282	0.259	2370.894
2265002081	4 Stroke Other Construction Equipment	48	580	69.303	3.484	6.345	0.009	0.152	0.140	1589.924
2265003010	4 Stroke Aerial Lifts	46	630	287.332	11.015	15.646	0.011	0.186	0.172	1876.400
2265003020	4 Stroke Forklifts	30	560	27.953	1.433	2.967	0.009	0.160	0.147	1544.035
2265003030	4 Stroke Sweepers/Scrubbers	71	610	203.001	5.236	3.565	0.011	0.225	0.207	1821.067
2265003040	4 Stroke Other General Industrial Equipment	54	760	440.704	13.683	5.116	0.014	0.536	0.493	2398.598
2265003050	4 Stroke Other Material Handling Equipment	53	640	280.685	9.246	11.240	0.011	0.195	0.179	1883.295
2265003060	4 Stroke AC/Refrigeration	46	740	577.404	12.710	4.716	0.014	0.271	0.249	2345.331
2265003070	4 Stroke Terminal Tractors	78	520	25.559	1.355	2.805	0.009	0.159	0.147	1544.031
2265004010	4 Stroke Lawn mowers (Residential)	33	900	423.207	23.473	5.423	0.016	0.645	0.593	2760.030
2265004011	4 Stroke Lawn mowers (Commercial)	33	880	426.496	14.717	5.589	0.016	0.716	0.659	2760.005
2265004015	4 Stroke Rotary Tillers < 6 HP (Residential)	40	910	423.078	20.528	5.423	0.016	0.645	0.594	2760.174
2265004016	4 Stroke Rotary Tillers < 6 HP (Commercial)	40	890	422.901	13.296	5.424	0.016	0.656	0.604	2760.164
2265004025	4 Stroke Trimmers/Edgers/Brush Cutter HP (Residential)	91	900	423.010	19.503	5.429	0.016	0.658	0.606	2760.165
2265004026	4 Stroke Trimmers/Edgers/Brush Cutter (Commercial)	91	820	495.836	12.321	5.145	0.015	0.499	0.459	2566.434
2265004030	4 Stroke Leaf blowers/Vacuums (Residential)	94	900	423.023	25.616	5.430	0.016	0.659	0.606	2760.166

Table 4-4. Criteria Pollutant Emission Factors for Non-Road Engines and Equipment - 2021 (cont.)

SCC	Equipment Description	Load Factor [a] (% Max Power)	BSFC [b] (lb/1000 hp-hr)	Emission Factors (lb/1000 hp-hr)						
				CO	VOC	NO_x	SO_2	PM_{10} [d]	$PM_{2.5}$ [e,f]	CO_2e [g]
2265004031	4 Stroke Leaf blowers/Vacuums (Commercial)	94	700	434.848	8.440	4.362	0.013	0.249	0.229	2156.178
2265004035	4 Stroke Snow blowers (Residential)	35	940	603.705	200.637	4.759	0.009	0.126	0.116	1506.738
2265004036	4 Stroke Snow blowers (Commercial)	35	940	707.689	32.233	5.415	0.010	0.147	0.135	1757.355
2265004040	4 Stroke Rear Engine Riding Mowers (Residential)	38	760	570.876	21.070	4.592	0.014	0.247	0.227	2346.621
2265004041	4 Stroke Rear Engine Riding Mowers (Commercial)	38	740	573.299	11.243	4.619	0.014	0.259	0.238	2346.077
2265004046	4 Stroke Front Mowers	65	790	577.336	12.850	5.196	0.014	0.242	0.223	2344.323
2265004051	4 Stroke Shredders < 6 HP	80	890	422.533	13.733	5.406	0.016	0.649	0.597	2760.162
2265004055	4 Stroke Lawn & Garden Tractors (Residential)	44	760	570.600	16.130	4.579	0.014	0.246	0.227	2345.742
2265004056	4 Stroke Lawn & Garden Tractors (Commercial)	44	740	573.467	10.695	4.618	0.014	0.258	0.237	2345.594
2265004066	4 Stroke Chippers/Stump Grinders	78	640	291.890	6.159	3.719	0.011	0.213	0.196	1930.404
2265004071	4 Stroke Commercial Turf Equipment	60	730	486.184	10.313	4.562	0.014	0.315	0.290	2309.811
2265004075	4 Stroke Other Lawn & Garden Equipment	58	850	503.756	23.258	5.465	0.015	0.446	0.411	2559.611
2265004076	4 Stroke Other Lawn & Garden Equipment	58	850	501.427	21.575	5.502	0.015	0.444	0.409	2554.121
2265005010	4 Stroke 2-Wheel Tractors	62	740	576.161	11.684	4.684	0.014	0.266	0.245	2345.321
2265005015	4 Stroke Agricultural Tractors	62	580	106.106	2.817	3.069	0.010	0.169	0.156	1661.886
2265005020	4 Stroke Combines	74	580	125.214	8.774	11.755	0.010	0.150	0.138	1663.667
2265005025	4 Stroke Balers	62	580	125.441	10.366	11.775	0.010	0.150	0.138	1663.954
2265005030	4 Stroke Agricultural Mowers	48	770	571.337	12.302	4.709	0.014	0.249	0.229	2348.239
2265005035	4 Stroke Sprayers	65	740	392.793	14.545	7.694	0.013	0.298	0.274	2197.470
2265005040	4 Stroke Tillers > 6 HP	71	870	751.009	23.586	8.118	0.014	0.244	0.224	2481.630
2265005045	4 Stroke Swathers	52	580	125.441	8.818	11.775	0.010	0.150	0.138	1663.956
2265005055	4 Stroke Other Agricultural Equipment	55	620	215.561	8.440	10.356	0.011	0.172	0.159	1805.575

Table 4-4. Criteria Pollutant Emission Factors for Non-Road Engines and Equipment - 2021 (cont.)

SCC	Equipment Description	Load Factor [a] (% Max Power)	BSFC [b] (lb/1000 hp-hr)	Emission Factors (lb/1000 hp-hr)						
				CO	VOC	NO_x	SO_2	PM_{10} [d]	$PM_{2.5}$ [e,f]	CO_2e [g]
2265005060	4 Stroke Irrigation Sets	60	550	36.064	1.696	2.813	0.009	0.167	0.154	1571.228
2265006005	4 Stroke Generator Sets	68	780	558.720	14.504	4.799	0.014	0.287	0.264	2384.572
2265006010	4 Stroke Pumps	69	760	439.274	12.261	5.115	0.014	0.414	0.381	2362.548
2265006015	4 Stroke Air Compressors	56	700	360.435	9.484	4.403	0.013	0.336	0.309	2145.367
2265006025	4 Stroke Welders	68	710	472.598	9.853	4.460	0.013	0.259	0.238	2200.067
2265006030	4 Stroke Pressure Washers	85	800	519.947	13.804	4.947	0.015	0.415	0.382	2489.939
2265006035	4 Stroke Hydro Power Units	56	750	539.039	12.419	4.789	0.014	0.334	0.307	2370.723
2265007010	4 Stroke Shredders > 6 HP	80	800	578.805	12.850	5.150	0.014	0.240	0.220	2349.686
2265007015	4 Stroke Forest Equipment - Feller/Bunch/Skidder	70	810	491.114	14.448	5.413	0.015	0.598	0.550	2593.246
2265008005	4 Stroke Airport Ground Support Equipment	56	600	129.454	4.159	3.297	0.010	0.233	0.214	1744.129
2265010010	4 Stroke Other Oil Field Equipment	90	740	592.921	12.456	5.116	0.014	0.323	0.297	2345.440
2267001060	LPG Specialty Vehicle Carts	58	490	52.854	2.262	10.415	0.006	0.126	0.126	1316.958
2267002003	LPG Pavers	66	460	13.793	0.352	2.473	0.006	0.127	0.127	1220.812
2267002015	LPG Rollers	62	450	10.662	0.245	2.054	0.006	0.128	0.128	1216.734
2267002021	LPG Paving Equipment	59	480	24.967	0.854	4.516	0.006	0.126	0.126	1244.560
2267002024	LPG Surfacing Equipment	49	460	13.366	0.346	2.451	0.006	0.127	0.127	1220.852
2267002030	LPG Trenchers	66	460	13.919	0.354	2.478	0.006	0.127	0.127	1220.778
2267002033	LPG Bore/Drill Rigs	79	490	47.531	1.975	9.210	0.006	0.125	0.125	1301.790
2267002039	LPG Concrete/Industrial Saws	78	430	10.710	0.248	2.061	0.006	0.129	0.129	1216.740
2267002045	LPG Cranes	47	480	24.152	0.758	4.074	0.006	0.126	0.126	1237.904
2267002054	LPG Crushing/Proc. Equipment	85	480	21.296	0.666	3.725	0.006	0.126	0.126	1234.792
2267002057	LPG Rough Terrain Forklifts	63	470	15.010	0.393	2.630	0.006	0.127	0.127	1222.294

Table 4-4. Criteria Pollutant Emission Factors for Non-Road Engines and Equipment - 2021 (cont.)

SCC	Equipment Description	Load Factor [a] (% Max Power)	BSFC [b] (lb/1000 hp-hr)	Emission Factors (lb/1000 hp-hr)						
				CO	VOC	NO_x	SO_2	PM_{10} [d]	$PM_{2.5}$ [e,f]	CO_2e [g]
2267002060	LPG Rubber Tire Loaders	71	460	10.940	0.249	2.069	0.006	0.127	0.127	1216.741
2267002066	LPG Tractors/Loaders/ Backhoes	48	450	10.552	0.243	2.046	0.006	0.128	0.128	1216.729
2267002072	LPG Skid Steer Loaders	58	470	23.394	0.723	3.936	0.006	0.126	0.126	1236.262
2267002081	LPG Other Construction Equipment	48	480	28.985	0.938	4.785	0.006	0.126	0.126	1245.201
2267003010	LPG Aerial Lifts	46	480	28.352	0.934	4.788	0.006	0.126	0.126	1245.867
2267003020	LPG Forklifts	30	460	10.948	0.249	2.069	0.006	0.127	0.127	1216.741
2267003030	LPG Sweepers/Scrubbers	71	440	10.781	0.248	2.062	0.006	0.128	0.128	1216.740
2267003040	LPG Other General Industrial Equipment	54	450	10.636	0.244	2.051	0.006	0.128	0.128	1216.731
2267003050	LPG Other Material Handling Equipment	53	480	20.773	0.643	3.635	0.006	0.126	0.126	1233.786
2267003070	LPG Terminal Tractors	78	430	10.646	0.246	2.055	0.006	0.129	0.129	1216.735
2267004066	LPG Chippers/Stump Grinders	78	450	10.682	0.244	2.053	0.006	0.127	0.127	1216.732
2267005055	LPG Other Agricultural Equipment	55	490	56.287	2.458	11.221	0.006	0.126	0.126	1327.327
2267005060	LPG Irrigation Sets	60	450	10.562	0.243	2.047	0.006	0.128	0.128	1216.730
2267006005	LPG Generator Sets	68	480	30.208	1.187	7.384	0.006	0.124	0.124	1280.736
2267006010	LPG Pumps	69	470	19.253	0.592	4.030	0.006	0.125	0.125	1239.592
2267006015	LPG Air Compressors	56	460	12.413	0.291	2.346	0.006	0.126	0.126	1219.843
2267006025	LPG Welders	68	460	13.342	0.326	2.369	0.006	0.126	0.126	1219.531
2267006030	LPG Pressure Washers	85	470	24.543	0.793	4.250	0.006	0.125	0.125	1240.458
2267006035	LPG Hydro Power Units	56	460	12.062	0.289	2.324	0.006	0.127	0.127	1219.759
2267008005	LPG Airport Ground Support Equipment	56	450	10.631	0.243	2.049	0.006	0.127	0.127	1216.731
2268002081	CNG Other Construction Equipment	48	480	28.985	3.388	4.862	0.006	0.126	0.126	1442.798
2268003020	CNG Forklifts	30	460	10.963	0.946	2.165	0.006	0.127	0.127	1163.812

Table 4-4. Criteria Pollutant Emission Factors for Non-Road Engines and Equipment - 2021 (cont.)

SCC	Equipment Description	Load Factor [a] (% Max Power)	BSFC [b] (lb/1000 hp-hr)	Emission Factors (lb/1000 hp-hr)						
				CO	VOC	NO_x	SO_2	PM_{10} [d]	$PM_{2.5}$ [e,f]	CO_2e [g]
2268003030	CNG Sweepers/Scrubbers	71	460	10.845	0.939	2.158	0.006	0.127	0.127	1163.073
2268003040	CNG Other General Industrial Equipment	54	460	10.628	0.924	2.145	0.006	0.127	0.127	1161.569
2268003060	CNG AC\Refrigeration	46	450	11.738	1.053	2.280	0.006	0.128	0.128	1175.974
2268003070	CNG Terminal Tractors	78	430	10.647	0.936	2.152	0.006	0.129	0.129	1162.823
2268005055	CNG Other Agricultural Equipment	55	510	121.817	22.663	27.226	0.006	0.139	0.139	3720.129
2268006005	CNG Generator Sets	68	490	34.149	5.191	8.897	0.006	0.125	0.125	1680.932
2268006010	CNG Pumps	69	480	24.191	2.964	5.372	0.006	0.125	0.125	1408.357
2268006015	CNG Air Compressors	56	470	12.804	1.135	2.504	0.006	0.126	0.126	1186.937
2268006020	CNG Gas Compressors	85	410	11.753	1.087	2.256	0.006	0.139	0.139	1178.195
2268006035	CNG Hydro Power Units	56	470	13.643	1.265	2.710	0.006	0.126	0.126	1202.721
2268010010	CNG Other Oil Field Equipment	90	410	11.077	0.995	2.192	0.006	0.133	0.133	1168.802
2270001060	Diesel Specialty Vehicle Carts	21	450	6.648	1.746	8.603	0.009	0.983	0.954	1439.300
2270002003	Diesel Pavers	59	380	0.858	0.365	2.429	0.006	0.110	0.107	1214.135
2270002006	Diesel Tampers/Rammers	43	1000	9.819	1.412	9.731	0.009	0.820	0.795	1300.422
2270002009	Diesel Plate Compactors	43	410	8.285	1.307	9.749	0.009	0.795	0.771	1300.545
2270002015	Diesel Rollers	59	390	1.289	0.394	2.914	0.006	0.171	0.166	1233.720
2270002018	Diesel Scrapers	59	370	1.029	0.361	2.207	0.006	0.123	0.120	1183.274
2270002021	Diesel Paving Equipment	59	390	1.780	0.450	3.625	0.007	0.262	0.254	1227.065
2270002024	Diesel Surfacing Equipment	59	380	2.518	0.506	5.484	0.007	0.336	0.326	1224.117
2270002027	Diesel Signal Boards/Light Plants	43	410	4.023	0.890	8.856	0.008	0.585	0.567	1293.544
2270002030	Diesel Trenchers	59	400	2.124	0.424	5.224	0.007	0.264	0.256	1273.444
2270002033	Diesel Bore/Drill Rigs	43	370	1.946	0.590	6.613	0.007	0.337	0.327	1190.369

Table 4-4. Criteria Pollutant Emission Factors for Non-Road Engines and Equipment - 2021 (cont.)

SCC	Equipment Description	Load Factor [a] (% Max Power)	BSFC [b] (lb/1000 hp-hr)	Emission Factors (lb/1000 hp-hr)						
				CO	VOC	NO_x	SO_2	PM_{10} [d]	$PM_{2.5}$ [e,f]	CO_2e [g]
2270002036	Diesel Excavators	59	380	0.534	0.355	1.431	0.006	0.062	0.060	1194.581
2270002039	Diesel Concrete/Industrial Saws	59	410	2.393	0.453	5.491	0.007	0.295	0.286	1304.811
2270002042	Diesel Cement & Mortar Mixers	43	390	3.922	0.881	7.847	0.008	0.553	0.537	1244.719
2270002045	Diesel Cranes	43	370	0.707	0.382	2.662	0.006	0.116	0.112	1175.544
2270002048	Diesel Graders	59	370	0.495	0.353	1.320	0.006	0.066	0.064	1185.224
2270002051	Diesel Off-highway Trucks	59	370	0.631	0.381	3.580	0.006	0.076	0.074	1183.268
2270002054	Diesel Crushing/Proc. Equipment	43	380	1.133	0.395	3.911	0.006	0.159	0.154	1203.062
2270002057	Diesel Rough Terrain Forklifts	59	390	1.908	0.409	3.065	0.007	0.260	0.252	1255.644
2270002060	Diesel Rubber Tire Loaders	59	370	1.150	0.394	3.019	0.006	0.163	0.158	1190.281
2270002066	Diesel Tractors/Loaders/ Backhoes	21	460	5.819	1.157	6.100	0.008	0.871	0.845	1466.586
2270002069	Diesel Crawler Tractor/Dozers	59	370	0.899	0.374	2.337	0.006	0.110	0.107	1189.852
2270002072	Diesel Skid Steer Loaders	21	480	8.101	1.596	8.806	0.009	1.167	1.132	1529.251
2270002075	Diesel Off-Highway Tractors	59	370	1.542	0.427	4.403	0.006	0.179	0.174	1183.157
2270002078	Diesel Dumpers/Tenders	21	470	8.309	1.800	9.139	0.009	1.204	1.168	1508.485
2270002081	Diesel Other Construction Equipment	59	370	1.847	0.430	4.173	0.007	0.253	0.245	1185.292
2270003010	Diesel Aerial Lifts	21	480	8.674	1.897	9.739	0.009	1.183	1.147	1529.785
2270003020	Diesel Forklifts	59	400	0.669	0.339	2.270	0.006	0.032	0.031	1265.352
2270003030	Diesel Sweepers/Scrubbers	43	380	0.612	0.364	2.164	0.006	0.081	0.079	1219.123
2270003040	Diesel Other General Industrial Equipment	43	380	1.029	0.404	2.924	0.006	0.171	0.166	1205.323
2270003050	Diesel Other Material Handling Equipment	21	440	4.893	1.325	7.726	0.008	0.791	0.767	1413.112
2270003060	Diesel AC\Refrigeration	43	410	1.249	0.391	6.894	0.007	0.140	0.136	1301.276
2270003070	Diesel Terminal Tractors	59	380	0.409	0.345	1.046	0.006	0.036	0.035	1199.480

Table 4-4. Criteria Pollutant Emission Factors for Non-Road Engines and Equipment - 2021 (cont.)

SCC	Equipment Description	Load Factor [a] (% Max Power)	BSFC [b] (lb/1000 hp-hr)	Emission Factors (lb/1000 hp-hr)						
				CO	VOC	NO_x	SO_2	PM_{10} [d]	$PM_{2.5}$ [e,f]	CO_2e [g]
2270004031	Diesel Leaf blowers/Vacuums	43	410	6.247	1.380	10.544	0.008	0.775	0.752	1299.094
2270004036	Diesel Snow blowers	43	370	0.878	0.304	3.284	0.004	0.144	0.140	682.497
2270004046	Diesel Front Mowers	43	410	3.414	0.781	8.675	0.008	0.519	0.503	1300.793
2270004056	Diesel Lawn & Garden Tractors	43	410	4.898	1.051	9.515	0.009	0.723	0.701	1300.774
2270004066	Diesel Chippers/Stump Grinders	43	380	2.201	0.603	5.945	0.007	0.369	0.358	1215.752
2270004071	Diesel Commercial Turf Equipment	43	400	1.166	0.434	4.365	0.007	0.169	0.164	1263.072
2270004076	Diesel Other Lawn & Garden Equipment	43	410	4.023	0.879	8.566	0.008	0.636	0.617	1293.159
2270005010	Diesel 2-Wheel Tractors	59	410	9.899	1.371	9.522	0.009	0.782	0.758	1313.389
2270005015	Diesel Agricultural Tractors	59	380	2.173	0.511	4.987	0.007	0.346	0.335	1211.187
2270005020	Diesel Combines	59	370	2.254	0.632	6.241	0.007	0.464	0.450	1185.368
2270005025	Diesel Balers	59	400	4.421	0.886	7.533	0.008	0.644	0.624	1269.806
2270005030	Diesel Agricultural Mowers	59	410	5.265	0.786	5.989	0.008	0.772	0.749	1312.967
2270005035	Diesel Sprayers	59	380	2.665	0.724	6.109	0.007	0.440	0.427	1195.803
2270005040	Diesel Tillers > 6 HP	59	370	2.943	0.587	6.102	0.007	0.364	0.353	1186.527
2270005045	Diesel Swathers	59	400	4.680	0.820	6.990	0.008	0.706	0.685	1284.377
2270005055	Diesel Other Agricultural Equipment	59	380	2.448	0.595	5.533	0.007	0.431	0.418	1196.274
2270005060	Diesel Irrigation Sets	43	390	1.582	0.458	3.841	0.007	0.256	0.249	1235.015
2270006005	Diesel Generator Sets	43	390	3.067	0.768	7.482	0.007	0.498	0.483	1253.862
2270006010	Diesel Pumps	43	390	3.237	0.771	7.307	0.007	0.523	0.507	1252.926
2270006015	Diesel Air Compressors	43	400	1.741	0.430	4.344	0.007	0.237	0.230	1265.890
2270006020	Diesel Gas Compressors	43	410	0.600	0.341	2.028	0.006	0.032	0.031	1301.323
2270006025	Diesel Welders	21	480	7.290	1.519	9.137	0.009	1.042	1.011	1528.896

Table 4-4. Criteria Pollutant Emission Factors for Non-Road Engines and Equipment - 2021 (cont.)

SCC	Equipment Description	Load Factor [a] (% Max Power)	BSFC [b] (lb/1000 hp-hr)	Emission Factors (lb/1000 hp-hr)						
				CO	VOC	NO_x	SO_2	PM_{10} [d]	$PM_{2.5}$ [e,f]	CO_2e [g]
2270006030	Diesel Pressure Washers	43	380	2.898	0.846	7.604	0.007	0.445	0.432	1224.019
2270006035	Diesel Hydro Power Units	43	400	1.912	0.464	4.871	0.007	0.267	0.259	1272.116
2270007015	Diesel Forest Equipment - Feller/Bunch/Skidder	59	370	0.397	0.347	0.955	0.006	0.040	0.039	1186.355
2270008005	Diesel Airport Ground Support Equipment	59	380	1.197	0.385	2.690	0.006	0.171	0.166	1195.285
2270009010	Diesel Other Underground Mining Equipment	21	450	8.632	2.054	11.224	0.010	1.036	1.005	1428.595
2270010010	Diesel Other Oil Field Equipment	43	370	0.871	0.408	3.890	0.006	0.126	0.122	1174.533
2282005010	2 Stroke Outboard	21	850	220.046	81.951	13.153	0.013	0.649	0.597	2238.082
2282005015	2 Stroke Personal Water Craft	21	820	253.443	22.169	13.913	0.013	0.214	0.197	2151.534
2282010005	4 Stroke Inboard/Sterndrive	21	630	141.111	24.522	14.343	0.011	0.151	0.139	1865.550
2282020005	Diesel Inboard/Sterndrive	35	370	2.273	0.631	10.392	0.040	0.241	0.233	1173.214
2282020010	Diesel Outboards	35	410	4.276	1.323	7.688	0.044	0.687	0.666	1299.806
2285002015	Diesel Railway Maintenance	21	440	4.468	1.153	6.945	0.008	0.767	0.744	1401.430
2285004015	4 Stroke Railway Maintenance	62	750	530.146	13.322	4.677	0.014	0.294	0.271	2344.245
2285006015	LPG Railway Maintenance	62	480	18.302	0.541	3.227	0.006	0.126	0.126	1229.232

Notes for Table 4-4 follow Table 4-5

Table 4-5. Criteria Pollutant Emission Factors for Non-Road Engines and Equipment - 2022

SCC	Equipment Description	Load Factor [a] (% Max Power)	BSFC [b] (lb/1000 hp-hr)	Emission Factors (lb/1000 hp-hr)						
				CO	VOC	NO_x	SO_2	PM_{10} [d]	$PM_{2.5}$ [e,f]	CO_2e [g]
2260001010	2 Stroke Motorcycles: Off- Road[3]	100	260	78.896	70.251	0.919	0.003	2.578	2.371	572.180
2260001020	2 Stroke Snowmobiles	34	1640	133.487	158.207	5.909	0.012	1.641	1.509	2111.829
2260001030	2 Stroke ATVs[3]	100	210	82.586	17.227	0.937	0.003	0.494	0.454	498.177
2260001060	2 Stroke Specialty Vehicles/Carts	58	1000	575.737	19.689	4.642	0.014	0.296	0.272	2348.400
2260002006	2 Stroke Tampers/Rammers	55	680	560.746	134.661	3.369	0.009	20.435	18.800	1595.630
2260002009	2 Stroke Plate Compactors	55	830	490.399	109.598	5.250	0.014	16.838	15.491	2440.213
2260002021	2 Stroke Paving Equipment	59	830	494.121	109.256	5.250	0.014	16.951	15.595	2437.502
2260002027	2 Stroke Signal Boards/Light Plants	72	830	512.608	128.630	5.250	0.014	17.574	16.168	2422.454
2260002039	2 Stroke Concrete/Industrial Saws	78	630	580.558	136.824	3.520	0.009	21.176	19.482	1645.700
2260002054	2 Stroke Crushing/Proc. Equipment	85	830	512.609	112.601	5.250	0.014	17.574	16.168	2422.455
2260003030	2 Stroke Sweepers/Scrubbers	71	820	512.608	115.211	5.250	0.014	17.574	16.168	2422.455
2260003040	2 Stroke Other General Industrial Equipment	54	830	512.608	113.746	5.250	0.014	17.574	16.168	2422.453
2260004015	2 Stroke Rotary Tillers < 6 HP (Residential)	40	940	454.180	106.402	5.264	0.014	16.251	14.951	2454.954
2260004016	2 Stroke Rotary Tillers < 6 HP (Commercial)	40	900	459.085	94.001	5.264	0.014	16.392	15.081	2451.563
2260004020	2 Stroke Chain Saws < 6 HP (Residential)	70	900	469.635	107.801	5.250	0.014	16.237	14.938	2454.580
2260004021	2 Stroke Chain Saws < 6 HP (Commercial)	70	650	576.681	133.468	3.619	0.010	20.971	19.293	1690.016
2260004025	2 Stroke Trimmers/Edgers/Brush Cutter (Residential)	91	890	433.606	108.023	5.300	0.014	16.875	15.525	2441.839
2260004026	2 Stroke Trimmers/Edgers/Brush Cutter (Commercial)	91	810	494.125	102.830	4.981	0.013	17.165	15.792	2323.592
2260004030	2 Stroke Leaf blowers/Vacuums (Residential)	94	890	459.866	125.531	5.264	0.014	16.414	15.101	2451.028
2260004031	2 Stroke Leaf blowers/Vacuums (Commercial)	94	760	519.619	113.581	4.357	0.012	18.418	16.945	2042.238
2260004035	2 Stroke Snow blowers (Residential)	35	870	529.679	370.797	1.774	0.006	5.890	5.419	1240.064
2260004036	2 Stroke Snow blowers (Commercial)	35	870	617.946	229.332	2.069	0.007	6.871	6.322	1446.741

Table 4-5. Criteria Pollutant Emission Factors for Non-Road Engines and Equipment - 2022 (cont.)

SCC	Equipment Description	Load Factor [a] (% Max Power)	BSFC [b] (lb/1000 hp-hr)	Emission Factors (lb/1000 hp-hr)						
				CO	VOC	NO_x	SO_2	PM_{10} [d]	$PM_{2.5}$ [e,f]	CO_2e [g]
2260004071	2 Stroke Commercial Turf Equipment	60	840	481.230	98.016	5.250	0.014	16.566	15.240	2446.734
2260005035	2 Stroke Sprayers	65	840	423.405	106.063	5.323	0.014	17.357	15.968	2431.226
2260006005	2 Stroke Generator Sets	68	830	483.172	130.924	5.255	0.014	16.809	15.465	2441.108
2260006010	2 Stroke Pumps	69	830	461.190	135.884	5.281	0.014	18.336	16.869	2396.399
2260006015	2 Stroke Air Compressors	56	830	512.608	134.439	5.250	0.014	17.574	16.168	2422.454
2260006035	2 Stroke Hydro Power Units	56	830	512.608	141.646	5.250	0.014	17.574	16.168	2422.454
2260007005	2 Stroke Chain Saws > 6 HP	70	620	586.493	137.018	3.369	0.009	21.491	19.772	1577.851
2265001010	4 Stroke Motorcycles: Off- Road	100	160	58.720	6.775	1.247	0.003	0.147	0.135	504.330
2265001030	4 Stroke ATVs	100	170	80.861	7.896	0.973	0.003	0.147	0.135	533.000
2265001050	4 Stroke Golf Carts	46	740	586.285	13.329	4.945	0.014	0.301	0.277	2345.393
2265001060	4 Stroke Specialty Vehicles/Carts	58	820	596.019	20.263	7.477	0.014	0.242	0.223	2319.255
2265002003	4 Stroke Pavers	66	700	434.009	9.393	4.344	0.013	0.257	0.236	2157.101
2265002006	4 Stroke Tampers/Rammers	55	760	571.566	12.449	4.568	0.014	0.251	0.231	2345.303
2265002009	4 Stroke Plate Compactors	55	830	487.701	14.846	5.154	0.015	0.518	0.476	2584.979
2265002015	4 Stroke Rollers	62	690	447.818	9.804	4.327	0.013	0.254	0.233	2152.852
2265002021	4 Stroke Paving Equipment	59	780	530.453	13.764	4.825	0.014	0.345	0.318	2416.178
2265002024	4 Stroke Surfacing Equipment	49	750	534.815	13.228	4.860	0.014	0.359	0.330	2389.497
2265002027	4 Stroke Signal Boards/Light Plants	72	780	524.736	13.222	5.121	0.015	0.464	0.427	2495.242
2265002030	4 Stroke Trenchers	66	710	416.542	10.218	4.489	0.013	0.324	0.298	2203.682
2265002033	4 Stroke Bore/Drill Rigs	79	790	364.507	14.025	6.936	0.014	0.491	0.452	2407.257
2265002039	4 Stroke Concrete/Industrial Saws	78	710	518.761	11.288	4.653	0.013	0.279	0.257	2250.933
2265002042	4 Stroke Cement & Mortar Mixers	59	820	536.125	17.638	4.976	0.014	0.351	0.323	2451.846

Table 4-5. Criteria Pollutant Emission Factors for Non-Road Engines and Equipment - 2022 (cont.)

SCC	Equipment Description	Load Factor [a] (% Max Power)	BSFC [b] (lb/1000 hp-hr)	Emission Factors (lb/1000 hp-hr)						
				CO	VOC	NO_x	SO_2	PM_{10} [d]	$PM_{2.5}$ [e,f]	CO_2e [g]
2265002045	4 Stroke Cranes	47	590	105.521	3.686	4.855	0.010	0.164	0.151	1652.880
2265002054	4 Stroke Crushing/Proc. Equipment	85	740	495.982	11.885	4.832	0.014	0.327	0.301	2312.564
2265002057	4 Stroke Rough Terrain Forklifts	63	570	37.425	1.771	3.295	0.009	0.154	0.141	1559.207
2265002060	4 Stroke Rubber Tire Loaders	71	550	24.394	1.337	2.746	0.009	0.153	0.141	1544.028
2265002066	4 Stroke Tractors/Loaders/ Backhoes	48	730	541.907	11.195	4.592	0.014	0.263	0.242	2293.741
2265002072	4 Stroke Skid Steer Loaders	58	640	249.523	6.195	4.709	0.011	0.191	0.176	1866.646
2265002078	4 Stroke Dumpers/Tenders	41	800	552.459	17.434	5.291	0.014	0.281	0.259	2369.105
2265002081	4 Stroke Other Construction Equipment	48	580	61.718	3.123	5.716	0.009	0.152	0.140	1583.154
2265003010	4 Stroke Aerial Lifts	46	630	274.213	10.675	15.342	0.011	0.186	0.171	1855.906
2265003020	4 Stroke Forklifts	30	560	26.643	1.398	2.874	0.009	0.161	0.148	1544.033
2265003030	4 Stroke Sweepers/Scrubbers	71	610	198.157	5.138	3.530	0.011	0.224	0.206	1813.674
2265003040	4 Stroke Other General Industrial Equipment	54	760	436.506	13.571	5.093	0.014	0.533	0.490	2389.690
2265003050	4 Stroke Other Material Handling Equipment	53	640	268.883	9.023	11.156	0.011	0.194	0.179	1865.449
2265003060	4 Stroke AC/Refrigeration	46	740	578.107	12.780	4.734	0.014	0.273	0.251	2345.337
2265003070	4 Stroke Terminal Tractors	78	520	25.752	1.363	2.816	0.009	0.160	0.148	1544.031
2265004010	4 Stroke Lawn mowers (Residential)	33	900	422.426	23.115	5.394	0.016	0.642	0.590	2760.007
2265004011	4 Stroke Lawn mowers (Commercial)	33	880	426.497	14.717	5.589	0.016	0.716	0.659	2760.006
2265004015	4 Stroke Rotary Tillers < 6 HP (Residential)	40	910	422.303	20.193	5.393	0.016	0.642	0.591	2760.158
2265004016	4 Stroke Rotary Tillers < 6 HP (Commercial)	40	890	422.874	13.287	5.423	0.016	0.656	0.604	2760.163
2265004025	4 Stroke Trimmers/Edgers/Brush Cutter HP (Residential)	91	900	422.987	19.495	5.428	0.016	0.658	0.606	2760.165
2265004026	4 Stroke Trimmers/Edgers/Brush Cutter (Commercial)	91	820	495.838	12.321	5.145	0.015	0.499	0.459	2566.434
2265004030	4 Stroke Leaf blowers/Vacuums (Residential)	94	900	423.004	25.610	5.429	0.016	0.659	0.606	2760.165

Table 4-5. Criteria Pollutant Emission Factors for Non-Road Engines and Equipment - 2022 (cont.)

SCC	Equipment Description	Load Factor [a] (% Max Power)	BSFC [b] (lb/1000 hp-hr)	Emission Factors (lb/1000 hp-hr)						
				CO	VOC	NO_x	SO_2	PM_{10} [d]	$PM_{2.5}$ [e,f]	CO_2e [g]
2265004031	4 Stroke Leaf blowers/Vacuums (Commercial)	94	700	434.264	8.417	4.313	0.013	0.249	0.229	2155.598
2265004035	4 Stroke Snow blowers (Residential)	35	940	603.735	200.330	4.759	0.009	0.126	0.116	1506.737
2265004036	4 Stroke Snow blowers (Commercial)	35	940	707.724	32.206	5.415	0.010	0.147	0.135	1757.355
2265004040	4 Stroke Rear Engine Riding Mowers (Residential)	38	760	570.507	20.958	4.563	0.014	0.247	0.227	2346.483
2265004041	4 Stroke Rear Engine Riding Mowers (Commercial)	38	740	573.301	11.243	4.619	0.014	0.259	0.238	2346.076
2265004046	4 Stroke Front Mowers	65	790	574.110	12.536	5.028	0.014	0.242	0.223	2342.805
2265004051	4 Stroke Shredders < 6 HP	80	890	422.475	13.716	5.404	0.016	0.649	0.597	2760.160
2265004055	4 Stroke Lawn & Garden Tractors (Residential)	44	760	570.279	16.056	4.550	0.014	0.246	0.227	2345.648
2265004056	4 Stroke Lawn & Garden Tractors (Commercial)	44	740	573.469	10.695	4.618	0.014	0.258	0.237	2345.593
2265004066	4 Stroke Chippers/Stump Grinders	78	640	291.808	6.156	3.714	0.011	0.213	0.196	1930.404
2265004071	4 Stroke Commercial Turf Equipment	60	730	486.186	10.313	4.562	0.014	0.315	0.290	2309.813
2265004075	4 Stroke Other Lawn & Garden Equipment	58	850	500.508	22.658	5.302	0.015	0.445	0.409	2558.353
2265004076	4 Stroke Other Lawn & Garden Equipment	58	850	498.143	20.991	5.334	0.015	0.443	0.407	2552.797
2265005010	4 Stroke 2-Wheel Tractors	62	740	576.163	11.684	4.684	0.014	0.266	0.245	2345.319
2265005015	4 Stroke Agricultural Tractors	62	580	105.697	2.805	3.041	0.010	0.169	0.156	1661.885
2265005020	4 Stroke Combines	74	580	115.935	8.137	10.878	0.010	0.150	0.138	1651.473
2265005025	4 Stroke Balers	62	580	116.171	9.619	10.899	0.010	0.150	0.138	1651.772
2265005030	4 Stroke Agricultural Mowers	48	770	570.690	12.204	4.654	0.014	0.249	0.229	2348.037
2265005035	4 Stroke Sprayers	65	740	387.403	14.046	7.297	0.013	0.298	0.274	2192.096
2265005040	4 Stroke Tillers > 6 HP	71	870	732.483	22.533	7.850	0.014	0.243	0.223	2465.665
2265005045	4 Stroke Swathers	52	580	116.171	8.179	10.899	0.010	0.150	0.138	1651.773
2265005055	4 Stroke Other Agricultural Equipment	55	620	207.789	7.991	9.637	0.011	0.172	0.159	1795.715

Table 4-5. Criteria Pollutant Emission Factors for Non-Road Engines and Equipment - 2022 (cont.)

SCC	Equipment Description	Load Factor [a] (% Max Power)	BSFC [b] (lb/1000 hp-hr)	Emission Factors (lb/1000 hp-hr)						
				CO	VOC	NO_x	SO_2	PM_{10} [d]	$PM_{2.5}$ [e,f]	CO_2e [g]
2265005060	4 Stroke Irrigation Sets	60	550	36.065	1.696	2.813	0.009	0.167	0.154	1571.228
2265006005	4 Stroke Generator Sets	68	780	557.958	14.382	4.743	0.014	0.287	0.264	2384.315
2265006010	4 Stroke Pumps	69	760	438.640	12.222	5.030	0.014	0.414	0.381	2361.420
2265006015	4 Stroke Air Compressors	56	700	360.025	9.462	4.352	0.013	0.336	0.309	2144.730
2265006025	4 Stroke Welders	68	710	472.242	9.836	4.430	0.013	0.259	0.238	2199.741
2265006030	4 Stroke Pressure Washers	85	800	519.866	13.791	4.940	0.015	0.415	0.382	2489.904
2265006035	4 Stroke Hydro Power Units	56	750	539.012	12.417	4.785	0.014	0.334	0.307	2370.678
2265007010	4 Stroke Shredders > 6 HP	80	800	575.956	12.514	4.980	0.014	0.240	0.220	2348.480
2265007015	4 Stroke Forest Equipment - Feller/Bunch/Skidder	70	810	491.115	14.448	5.413	0.015	0.598	0.550	2593.246
2265008005	4 Stroke Airport Ground Support Equipment	56	600	129.314	4.154	3.287	0.010	0.233	0.214	1744.130
2265010010	4 Stroke Other Oil Field Equipment	90	740	592.922	12.456	5.116	0.014	0.323	0.297	2345.441
2267001060	LPG Specialty Vehicle Carts	58	490	49.617	2.085	9.644	0.006	0.126	0.126	1307.217
2267002003	LPG Pavers	66	460	12.943	0.320	2.344	0.006	0.127	0.127	1219.461
2267002015	LPG Rollers	62	450	10.563	0.243	2.048	0.006	0.128	0.128	1216.729
2267002021	LPG Paving Equipment	59	480	22.732	0.759	4.135	0.006	0.126	0.126	1240.308
2267002024	LPG Surfacing Equipment	49	460	12.733	0.320	2.348	0.006	0.127	0.127	1219.733
2267002030	LPG Trenchers	66	460	12.996	0.319	2.338	0.006	0.127	0.127	1219.303
2267002033	LPG Bore/Drill Rigs	79	490	44.258	1.806	8.482	0.006	0.125	0.125	1292.789
2267002039	LPG Concrete/Industrial Saws	78	430	10.711	0.248	2.061	0.006	0.129	0.129	1216.741
2267002045	LPG Cranes	47	480	20.517	0.642	3.634	0.006	0.126	0.126	1234.022
2267002054	LPG Crushing/Proc. Equipment	85	480	19.140	0.582	3.395	0.006	0.126	0.126	1231.310
2267002057	LPG Rough Terrain Forklifts	63	470	13.831	0.347	2.451	0.006	0.127	0.127	1220.418

Table 4-5. Criteria Pollutant Emission Factors for Non-Road Engines and Equipment - 2022 (cont.)

SCC	Equipment Description	Load Factor [a] (% Max Power)	BSFC [b] (lb/1000 hp-hr)	Emission Factors (lb/1000 hp-hr)						
				CO	VOC	NO_x	SO_2	PM_{10} [d]	$PM_{2.5}$ [e,f]	CO_2e [g]
2267002060	LPG Rubber Tire Loaders	71	460	10.629	0.243	2.050	0.006	0.127	0.127	1216.730
2267002066	LPG Tractors/Loaders/ Backhoes	48	450	10.553	0.243	2.047	0.006	0.128	0.128	1216.729
2267002072	LPG Skid Steer Loaders	58	470	20.572	0.629	3.576	0.006	0.126	0.126	1232.951
2267002081	LPG Other Construction Equipment	48	480	25.143	0.807	4.277	0.006	0.126	0.126	1240.394
2267003010	LPG Aerial Lifts	46	480	25.209	0.792	4.211	0.006	0.126	0.126	1239.160
2267003020	LPG Forklifts	30	460	10.607	0.243	2.048	0.006	0.127	0.127	1216.729
2267003030	LPG Sweepers/Scrubbers	71	440	10.657	0.246	2.055	0.006	0.128	0.128	1216.734
2267003040	LPG Other General Industrial Equipment	54	450	10.519	0.242	2.043	0.006	0.128	0.128	1216.727
2267003050	LPG Other Material Handling Equipment	53	480	18.707	0.563	3.321	0.006	0.126	0.126	1230.486
2267003070	LPG Terminal Tractors	78	430	10.647	0.246	2.055	0.006	0.129	0.129	1216.735
2267004066	LPG Chippers/Stump Grinders	78	450	10.508	0.241	2.043	0.006	0.127	0.127	1216.726
2267005055	LPG Other Agricultural Equipment	55	490	52.906	2.270	10.407	0.006	0.126	0.126	1316.978
2267005060	LPG Irrigation Sets	60	450	10.562	0.243	2.047	0.006	0.128	0.128	1216.730
2267006005	LPG Generator Sets	68	480	28.232	1.072	6.730	0.006	0.124	0.124	1272.634
2267006010	LPG Pumps	69	470	17.816	0.518	3.616	0.006	0.125	0.125	1234.575
2267006015	LPG Air Compressors	56	460	11.832	0.271	2.231	0.006	0.126	0.126	1218.590
2267006025	LPG Welders	68	460	12.433	0.294	2.245	0.006	0.126	0.126	1218.306
2267006030	LPG Pressure Washers	85	470	21.387	0.688	3.843	0.006	0.125	0.125	1236.697
2267006035	LPG Hydro Power Units	56	460	11.658	0.274	2.240	0.006	0.127	0.127	1218.829
2267008005	LPG Airport Ground Support Equipment	56	450	10.470	0.240	2.039	0.006	0.127	0.127	1216.724
2268002081	CNG Other Construction Equipment	48	480	25.143	2.923	4.357	0.006	0.126	0.126	1390.360
2268003020	CNG Forklifts	30	460	10.613	0.923	2.144	0.006	0.127	0.127	1161.439

Table 4-5. Criteria Pollutant Emission Factors for Non-Road Engines and Equipment - 2022 (cont.)

SCC	Equipment Description	Load Factor [a] (% Max Power)	BSFC [b] (lb/1000 hp-hr)	Emission Factors (lb/1000 hp-hr)						
				CO	VOC	NO_x	SO_2	PM_{10} [d]	$PM_{2.5}$ [e,f]	CO_2e [g]
2268003030	CNG Sweepers/Scrubbers	71	460	10.580	0.921	2.142	0.006	0.127	0.127	1161.275
2268003040	CNG Other General Industrial Equipment	54	460	10.489	0.915	2.137	0.006	0.127	0.127	1160.625
2268003060	CNG AC\Refrigeration	46	450	11.385	1.007	2.230	0.006	0.128	0.128	1170.737
2268003070	CNG Terminal Tractors	78	430	10.648	0.936	2.152	0.006	0.129	0.129	1162.829
2268005055	CNG Other Agricultural Equipment	55	510	121.817	22.663	27.226	0.006	0.139	0.139	3720.129
2268006005	CNG Generator Sets	68	490	32.128	4.755	8.195	0.006	0.125	0.125	1627.549
2268006010	CNG Pumps	69	480	22.156	2.561	4.746	0.006	0.125	0.125	1359.400
2268006015	CNG Air Compressors	56	470	12.119	1.049	2.367	0.006	0.126	0.126	1176.594
2268006020	CNG Gas Compressors	85	410	11.753	1.087	2.256	0.006	0.139	0.139	1178.200
2268006035	CNG Hydro Power Units	56	470	12.837	1.158	2.541	0.006	0.126	0.126	1189.842
2268010010	CNG Other Oil Field Equipment	90	410	11.077	0.995	2.192	0.006	0.133	0.133	1168.804
2270001060	Diesel Specialty Vehicle Carts	21	450	6.128	1.607	8.172	0.009	0.906	0.879	1439.701
2270002003	Diesel Pavers	59	380	0.733	0.357	2.174	0.006	0.087	0.085	1214.145
2270002006	Diesel Tampers/Rammers	43	1000	9.816	1.399	9.668	0.009	0.806	0.782	1300.479
2270002009	Diesel Plate Compactors	43	410	8.278	1.297	9.707	0.009	0.787	0.764	1300.591
2270002015	Diesel Rollers	59	390	1.076	0.383	2.596	0.006	0.130	0.126	1233.734
2270002018	Diesel Scrapers	59	370	0.867	0.356	1.874	0.006	0.099	0.096	1183.281
2270002021	Diesel Paving Equipment	59	390	1.572	0.435	3.295	0.006	0.219	0.213	1227.091
2270002024	Diesel Surfacing Equipment	59	380	2.298	0.487	5.094	0.007	0.304	0.295	1224.168
2270002027	Diesel Signal Boards/Light Plants	43	410	3.942	0.876	8.737	0.008	0.571	0.554	1293.579
2270002030	Diesel Trenchers	59	400	1.860	0.405	4.965	0.007	0.223	0.216	1273.482
2270002033	Diesel Bore/Drill Rigs	43	370	1.793	0.564	6.152	0.007	0.309	0.300	1190.454

Table 4-5. Criteria Pollutant Emission Factors for Non-Road Engines and Equipment - 2022 (cont.)

SCC	Equipment Description	Load Factor [a] (% Max Power)	BSFC [b] (lb/1000 hp-hr)	Emission Factors (lb/1000 hp-hr)						
				CO	VOC	NO_x	SO_2	PM_{10} [d]	$PM_{2.5}$ [e,f]	CO_2e [g]
2270002036	Diesel Excavators	59	380	0.477	0.352	1.282	0.006	0.050	0.049	1194.582
2270002039	Diesel Concrete/Industrial Saws	59	410	2.126	0.434	5.241	0.007	0.253	0.246	1304.846
2270002042	Diesel Cement & Mortar Mixers	43	390	3.756	0.841	7.437	0.007	0.518	0.502	1244.858
2270002045	Diesel Cranes	43	370	0.605	0.373	2.284	0.006	0.096	0.093	1175.563
2270002048	Diesel Graders	59	370	0.433	0.349	1.078	0.006	0.053	0.051	1185.229
2270002051	Diesel Off-highway Trucks	59	370	0.490	0.364	3.516	0.006	0.066	0.064	1183.280
2270002054	Diesel Crushing/Proc. Equipment	43	380	0.972	0.383	3.553	0.006	0.134	0.130	1203.086
2270002057	Diesel Rough Terrain Forklifts	59	390	1.594	0.393	2.674	0.006	0.203	0.197	1255.672
2270002060	Diesel Rubber Tire Loaders	59	370	0.991	0.384	2.675	0.006	0.135	0.131	1190.302
2270002066	Diesel Tractors/Loaders/ Backhoes	21	460	5.349	1.055	5.557	0.008	0.784	0.761	1466.834
2270002069	Diesel Crawler Tractor/Dozers	59	370	0.770	0.368	2.047	0.006	0.089	0.087	1189.861
2270002072	Diesel Skid Steer Loaders	21	480	7.485	1.456	8.406	0.009	1.060	1.029	1529.625
2270002075	Diesel Off-Highway Tractors	59	370	1.343	0.415	4.077	0.006	0.154	0.149	1183.186
2270002078	Diesel Dumpers/Tenders	21	470	7.748	1.659	8.744	0.009	1.111	1.078	1508.889
2270002081	Diesel Other Construction Equipment	59	370	1.660	0.417	3.750	0.006	0.225	0.218	1185.331
2270003010	Diesel Aerial Lifts	21	480	8.036	1.730	9.350	0.009	1.082	1.049	1530.258
2270003020	Diesel Forklifts	59	400	0.662	0.338	2.242	0.006	0.031	0.030	1265.351
2270003030	Diesel Sweepers/Scrubbers	43	380	0.544	0.359	1.920	0.006	0.068	0.066	1219.127
2270003040	Diesel Other General Industrial Equipment	43	380	0.877	0.391	2.551	0.006	0.140	0.135	1205.345
2270003050	Diesel Other Material Handling Equipment	21	440	4.521	1.230	7.197	0.008	0.726	0.705	1413.372
2270003060	Diesel AC\Refrigeration	43	410	1.138	0.386	6.877	0.007	0.127	0.123	1301.281
2270003070	Diesel Terminal Tractors	59	380	0.378	0.343	0.961	0.006	0.029	0.028	1199.479

Table 4-5. Criteria Pollutant Emission Factors for Non-Road Engines and Equipment - 2022 (cont.)

SCC	Equipment Description	Load Factor [a] (% Max Power)	BSFC [b] (lb/1000 hp-hr)	Emission Factors (lb/1000 hp-hr)						
				CO	VOC	NO_x	SO_2	PM_{10} [d]	$PM_{2.5}$ [e,f]	CO_2e [g]
2270004031	Diesel Leaf blowers/Vacuums	43	410	6.063	1.305	10.271	0.008	0.731	0.709	1299.345
2270004036	Diesel Snow blowers	43	370	0.807	0.293	3.031	0.004	0.133	0.129	682.534
2270004046	Diesel Front Mowers	43	410	3.273	0.757	8.513	0.008	0.494	0.479	1300.851
2270004056	Diesel Lawn & Garden Tractors	43	410	4.874	1.046	9.471	0.009	0.721	0.699	1300.797
2270004066	Diesel Chippers/Stump Grinders	43	380	2.042	0.575	5.515	0.007	0.339	0.329	1215.838
2270004071	Diesel Commercial Turf Equipment	43	400	1.053	0.427	4.148	0.006	0.146	0.142	1263.080
2270004076	Diesel Other Lawn & Garden Equipment	43	410	3.836	0.839	8.322	0.008	0.600	0.582	1293.283
2270005010	Diesel 2-Wheel Tractors	59	410	9.880	1.370	9.524	0.009	0.779	0.755	1313.388
2270005015	Diesel Agricultural Tractors	59	380	1.966	0.485	4.575	0.007	0.311	0.302	1211.248
2270005020	Diesel Combines	59	370	2.084	0.604	5.769	0.007	0.425	0.412	1185.460
2270005025	Diesel Balers	59	400	4.106	0.825	7.173	0.007	0.587	0.570	1269.990
2270005030	Diesel Agricultural Mowers	59	410	4.898	0.735	5.502	0.008	0.704	0.683	1313.114
2270005035	Diesel Sprayers	59	380	2.459	0.682	5.670	0.007	0.402	0.390	1195.932
2270005040	Diesel Tillers > 6 HP	59	370	2.726	0.563	5.666	0.007	0.335	0.325	1186.611
2270005045	Diesel Swathers	59	400	4.368	0.769	6.525	0.007	0.645	0.626	1284.534
2270005055	Diesel Other Agricultural Equipment	59	380	2.245	0.564	5.070	0.007	0.390	0.378	1196.370
2270005060	Diesel Irrigation Sets	43	390	1.396	0.434	3.409	0.007	0.222	0.216	1235.063
2270006005	Diesel Generator Sets	43	390	2.879	0.727	7.122	0.007	0.460	0.446	1253.988
2270006010	Diesel Pumps	43	390	3.043	0.730	6.926	0.007	0.482	0.468	1253.050
2270006015	Diesel Air Compressors	43	400	1.513	0.410	4.007	0.007	0.199	0.193	1265.930
2270006020	Diesel Gas Compressors	43	410	0.600	0.341	2.028	0.006	0.032	0.031	1301.323
2270006025	Diesel Welders	21	480	6.699	1.383	8.817	0.009	0.946	0.917	1529.270

Table 4-5. Criteria Pollutant Emission Factors for Non-Road Engines and Equipment - 2022 (cont.)

SCC	Equipment Description	Load Factor [a] (% Max Power)	BSFC [b] (lb/1000 hp-hr)	Emission Factors (lb/1000 hp-hr)						
				CO	VOC	NO_x	SO_2	PM_{10} [d]	$PM_{2.5}$ [e,f]	CO_2e [g]
2270006030	Diesel Pressure Washers	43	380	2.727	0.800	7.228	0.007	0.415	0.402	1224.168
2270006035	Diesel Hydro Power Units	43	400	1.701	0.444	4.564	0.007	0.231	0.224	1272.156
2270007015	Diesel Forest Equipment - Feller/Bunch/Skidder	59	370	0.361	0.345	0.836	0.006	0.032	0.031	1186.356
2270008005	Diesel Airport Ground Support Equipment	59	380	1.023	0.375	2.328	0.006	0.138	0.134	1195.302
2270009010	Diesel Other Underground Mining Equipment	21	450	8.457	2.015	11.082	0.010	1.006	0.976	1428.767
2270010010	Diesel Other Oil Field Equipment	43	370	0.752	0.398	3.550	0.006	0.108	0.105	1174.556
2282005010	2 Stroke Outboard	21	850	217.645	74.478	13.104	0.013	0.557	0.513	2239.113
2282005015	2 Stroke Personal Water Craft	21	820	253.021	20.852	13.967	0.013	0.191	0.175	2151.760
2282010005	4 Stroke Inboard/Sterndrive	21	630	134.607	23.398	13.447	0.011	0.151	0.139	1859.354
2282020005	Diesel Inboard/Sterndrive	35	370	2.268	0.633	10.158	0.040	0.238	0.231	1173.254
2282020010	Diesel Outboards	35	410	4.172	1.288	7.415	0.044	0.660	0.640	1299.962
2285002015	Diesel Railway Maintenance	21	440	4.128	1.075	6.439	0.008	0.704	0.683	1401.631
2285004015	4 Stroke Railway Maintenance	62	750	529.886	13.300	4.655	0.014	0.294	0.271	2344.017
2285006015	LPG Railway Maintenance	62	480	16.715	0.475	2.965	0.006	0.126	0.126	1226.346

a. 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.

b. 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 consider NONROAD model deterioration and transient adjustment factors across the model years.

c. Activities for off-road motorcycles and all-terrain vehicles are in units of miles per year instead of hours per year.

d. PM_{10} is assumed to be equivalent to total PM for gasoline engines.

e. For gasoline engines, $PM_{2.5}$ is assumed to be 92% of the PM_{10} value.

f. For LPG and CNG engines, all PM is assumed to be $PM_{2.5}$.

g. The Carbon Dioxide Equivalent (CO_2e) emission factors are the total of CO_2 and CH_4 converted to equivalent CO_2 (CO_2e) using a global warming potential (GWP) value of 25 for CH_4. The converted CH_4 value was added to the CO_2 emission factor and presented as a CO_2e emission factor in unites of lb/1000lb. 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. N_2O is not included in these calculations because there is no N_2O pollutant output for the Nonroad module within MOVES2014a.

Table 4-6. Pre-1998 Non-Road CI Engine Criteria Pollutant Emission Factors (Power Rating >50 hp)

Equipment Description	Emission Factors (lb/1000 hp-hr)						
	CO	VOC [a]	NO_X	SO_X	PM_{10} [b]	$PM_{2.5}$ [c]	CO_2e [d]
Construction Equipment							
Asphalt Pavers	7.05	1.39	22.71	0.42	1.98	1.92	1323.47
Plate Compactors	6.83	1.86	20.50	0.42	1.98	1.92	1323.47
Concrete Pavers	10.08	2.55	22.09	0.42	1.98	1.92	1323.47
Rollers	6.83	1.86	20.50	0.42	1.72	1.67	1323.47
Scrapers	11.02	1.63	19.18	0.42	2.78	2.69	1323.47
Paving Equipment	10.14	2.34	24.27	0.42	1.98	1.92	1323.47
Signal Boards	11.02	2.79	17.64	0.42	2.20	2.14	1323.47
Trenchers	20.15	3.58	22.09	0.42	3.17	3.08	1323.47
Bore/Drill Rigs	20.28	3.27	24.27	0.42	3.17	3.08	1323.47
Excavators	11.46	1.63	23.70	0.42	3.17	3.08	1323.47
Concrete/Industrial Saws	20.28	3.27	24.27	0.42	3.17	3.08	1323.47
Cement and Mortar Mixers	10.14	2.34	24.27	0.42	1.98	1.92	1323.47
Cranes	9.26	2.93	22.71	0.42	3.17	3.08	1323.47
Graders	8.38	3.58	21.16	0.42	2.20	2.14	1323.47
Off-Highway Trucks	6.17	1.95	21.16	0.42	1.76	1.71	1323.47
Crushing/Processing Equipment	20.28	3.27	24.27	0.42	3.17	3.08	1323.47
Rough Terrain Forklifts	22.05	3.90	17.64	0.42	3.53	3.42	1323.47
Rubber Tired Dozers	6.17	1.95	22.71	0.42	1.46	1.41	1323.47
Tractors/Loaders/Backhoes	14.99	3.25	22.27	0.42	2.31	2.25	1323.47
Crawler Tractors	10.58	2.93	22.71	0.42	2.45	2.37	1323.47
Skid Steer Loaders	19.84	4.88	21.16	0.42	3.17	3.08	1323.47
Off-Highway Tractors	32.36	4.78	26.26	0.42	4.48	4.34	1323.47
Dumpers/Tenders	6.17	1.95	21.16	0.42	3.17	3.08	1323.47
Other Construction Equipment	20.28	3.27	24.27	0.42	3.17	3.08	1323.47
Industrial Equipment							
Aerial Lifts	13.36	3.64	30.86	0.42	3.53	3.42	1323.47
Forklifts	13.36	3.64	30.86	0.42	3.53	3.42	1323.47
Sweepers/Scrubbers	13.36	3.64	30.86	0.42	3.53	3.42	1323.47
Other General Equipment	13.36	3.64	30.86	0.42	3.53	3.42	1323.47
Other Material Handling Equipment	13.36	3.64	30.86	0.42	3.53	3.42	1323.47
Lawn and Garden Equipment							
Rear Engine Riding Mowers	11.02	2.79	17.64	0.42	2.20	2.14	1323.47
Lawn and Garden Tractors	11.02	2.79	17.64	0.42	2.20	2.14	1323.47
Wood Splitters	11.02	2.79	17.64	0.42	2.20	2.14	1323.47
Chippers/Stump Grinders	11.02	2.79	17.64	0.42	2.20	2.14	1323.47
Other Equipment	11.02	2.79	17.64	0.42	2.20	2.14	1323.47

Table 4-6. Pre-1998 Non-Road CI Engine Criteria Pollutant Emission Factors (continued)

Equipment Description	Emission Factors (lb/1000 hp-hr)						
	CO	VOC [a]	NO_X	SO_X	PM_{10} [b]	$PM_{2.5}$ [c]	CO_2e [d]
Agricultural Equipment							
Tractors	19.71	5.32	24.71	0.42	4.52	4.38	1323.47
Sprayers	8.33	5.18	17.15	0.42	3.33	3.23	1323.47
Tillers	11.02	2.79	17.64	0.42	2.20	2.14	1323.47
Hydro Power Units	8.33	5.18	17.15	0.42	3.33	3.23	1323.47
Other Equipment	9.63	4.23	24.52	0.42	3.33	3.23	1323.47
Logging Equipment							
Skidders	11.46	1.95	24.91	0.42	3.17	3.08	1323.47
Fellers/Bunchers	11.46	1.95	24.91	0.42	3.17	3.08	1323.47
Recreational Equipment							
Specialty Vehicles/Carts	11.02	2.79	17.64	0.42	2.20	2.14	1323.47

SOURCE: *Nonroad Engine and Vehicle Emission Study – Report*, EPA 460/3-91-02, 21A-2001, November 1991.

a. Reported as hydrocarbon (HC) and converted to VOC by multiplying value by a conversion factor (1.053). This value recommended by the document "Conversion Factors for Hydrocarbon Emission Components", U.S. Environmental Protection Agency (EPA), Office of Transportation and Air Quality, July 2010.

b. Reported as particulate matter (PM) in the source document and assumed to be equal to PM_{10}.

c. 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.

d. The Greenhouse gas (GHG) emission factors calculated by summing the product of the emission factors for CO_2, CH_4, and N_2O and their respective global warming potentials (GWP). The GWP for CO_2, CH_4, and N_2O are 1, 25, and 298 respectively. Emission factors for individual GHG calculated by taking the product of the default emission factor provided in Tables C-1 and C-2 of Title 40 Code of Federal Regulations (CFR) Part 98 and the brake-specific fuel consumption (BSFC) for diesel engines provided in Table 3-1.

Table 4-7. Weight Percent Speciation of VOC Emissions Non-Road Engines

Compound	HAP	Gasoline [a]	Diesel [b]	Natural Gas [c]			LPG [d]
				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 [a]	Diesel [b]	Natural Gas [c]			LPG [d]
				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%

a. SOURCE: Emission factors used to calculate weight percent taken from EPA's SPECIATE profile #4738.

b. SOURCE: Emission factors used to calculate weight percent taken from Section 3.3 of AP-42

c. SOURCE: Emission factors used to calculate weight percent taken from Section 3.2 of AP-42.

d. SOURCE: Emission factors used to calculate weight percent taken from Mojave Desert AQMD.

"X" Indicates the compound is a HAP.

"---" Indicates No Data Available.

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]

Figure 4-1. Example Data Collection Form for Non-Road Vehicles and Equipment

a. 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. 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 USAF 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. Tactical vehicles are 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 USAF 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. HAPs include: 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 PM 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 consider 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 USAF policy, GHG emissions are to be reported as part of the mobile AEI. Specifically, CO_2 and CH_4 emissions should be estimated for all mobile sources when EFs are available. Since CO_2 and CH_4 EFs are attainable for on-road vehicles, emissions should be estimated for a mobile AEI as part of USAF policy. 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 to ensure a consistent USAF response.

Since 1978, the 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. Several 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 GHGs, 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). This announcement marks 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. Note that the state of California does not use the MOVES model for on-road vehicle use emissions estimates. Rather, the state has its own model that it uses known as EMFAC. The EMFAC model is approved by the U.S. EPA and estimates emission factors for each county in the state.

The EPA has historically classified on-road vehicles 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.**

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 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 USAF 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 USAF 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 the vehicles in question. This approximation should be based on fuel type and vehicle weight. Table 5-2, provides a breakdown of the fleet characterization for the typical POV and GOV vehicle mix at a USAF 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

Tactical vehicles are defined as any motor vehicle designed to military specifications to meet direct transportation support of combat, tactical or relief operations, or for training of personnel for such purposes. This also includes a commercially designed motor vehicle modified to military specifications. Tactical vehicles are a subset of GOVs, and Table 5-3 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	HDGV2a	Class 2b Heavy-Duty Gasoline Vehicles (8,501-10,000 lbs. GVWR)
	HDDV2b	Class 2b Heavy-Duty Diesel 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	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 (%)[a]	GOV Vehicle Mix (%)[b]
Air Force	MOVES				
Gas/Diesel					
LDGV	LDGV	34.86	34.86	46.70	7.74
LDDV	LDDV	0.03	0.03	1.17	0.61
LDGT	LDGT1	9.57	56.00	42.01	46.23
	LDGT2	31.86			
	LDGT3	9.98			
	LDGT4	4.59			
LDDT	LDDT1/2	0.00	0.19	1.37	17.23
	LDDT3/4	0.19			
HDGV	HDGV2a	2.88	3.46	1.04	4.81
	HDGV2b				
	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	HDDV2b	0.72	3.70	2.54	21.45
	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	3.40	0.00
HYBRID					
LDGV (H)	---	---	---	1.56	1.64
LDGT (H)	---	---	---	0.16	0.13
CNG					
LDGV (C)	---	---	---	0.04	0.00
LDGT (C)	---	---	---	0.01	0.13
HDGV (C)	---	---	---	0.00	0.03

a. SOURCE: POV vehicle mix was based on available Employee-Certification and Reporting System (ECARS) data collected on 3/2018.

b. 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	8.05
LDDV	LDDV	0.00	0.63
LDGT	LDGT1	0.07	48.01
	LDGT2		
	LDGT3		
	LDGT4		
LDDT	LDDT1/2	0.32	17.59
	LDDT3/4		
HDGV	HDGV2a	0.12	4.88
	HDGV2b		
	HDGV3		
	HDGV4		
	HDGV5		
	HDGV6		
	HDGV7		
	HDGV8a		
	HDGV8b		
	HDGB		
HDDV	HDDV2b	3.34	18.83
	HDDV3		
	HDDV4		
	HDDV5		
	HDDV6		
	HDDV7		
	HDDV8a		
	HDDV8b		
	HDDBT		
	HDDBS		
MC	MC	0.00	0.00
HYBRID			
LDGV (H)	---	0.00	1.70
LDGT (H)	---	0.00	0.14
HDGV(H)	---	0.00	0.00
CNG			
LDGV (C)	---	0.00	0.00
LDGT (C)	---	0.00	0.13
HDGV (C)	---	0.00	0.03

SOURCE: GOV vehicle mix was based on information provided by the Air Force Vehicle and Equipment Management Office (VEMSO).

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 not 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 normal vehicle 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

EFs 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 MOVES2014a was used for all calculations and derivations. The MOVES2014a model was run for each state for calendar years 2017 through 2021 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 EFs 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. Like the MOVES2014 model, EMFAC2014 calculates emissions for all motor vehicles in the state using data stored in its default database. County and vehicle specific EFs for California are presented in Table 5-36 through Table 5-40.

Additionally, there are composite EFs 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 EFs are provided in Table 5-11 through Table 5-20 depending on the calendar year. Furthermore, since the calculation of the composite EFs account for Air Force vehicle mix data, the tables are further subdivided into POV and GOV. The composite EFs 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 EFs 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	2018-2022
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 EFs 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 EFs. The EFs 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	2018-2022
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. EFs 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, EFs already include vehicle idling in proportion to normal driving. For this reason, the EFs given here are presented for 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} [a]	$PM_{2.5}$ [b]
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 Reid Vapor Pressure (RVP) gasoline.

a. PM_{10} is an average of HDDV particulate emissions.

b. $PM_{2.5}$ 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} [a]	$PM_{2.5}$ [b]
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.

a. PM_{10} is an average of HDDV particulate emissions.

b. $PM_{2.5}$ 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 EPAct, Presidential Executive Orders, 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, CNG, or B20, 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 several advantages over gasoline (USDOE 2002). There is limited data for emissions reductions that CNG 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). The EPA 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 regarding HAP emissions.

Hybrid Electric Vehicles (HEVs) produce fewer criteria pollutant, HAP, and CO_2 emissions than comparable dedicated gasoline-powered vehicles. This is because HEVs 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 several 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 [a]	PM_{10}	$PM_{2.5}$	CO_2
CNG (Gasoline) [b]	LDGV, LDGT, HDGV	90	35	50	90 [c]	90 [c]	25
B20 (Diesel) [d]	LDDV, LDDT, HDDV	0	0	0	0	0	0
HEVs (Gasoline) [e]	LDGV, LDGT	50	75	35	---	---	30

a. Source provided EFs for hydrocarbons (HC) or non-methane HCs which are assumed to be equivalent to VOC emissions reduction.

b. SOURCE: "Clean Alternative Fuels: Compressed Natural Gas (EPA 420- F-00-033)," U.S. Environmental Protection Agency, March 2002.

c. SOURCE: Arkansas Gas Association, Natural Gas Vehicles

d. Based on emission factors using a default of 15 parts per million (ppm) sulfur for diesel, and results of the Department of Defense Environmental Security Technology Certification Program 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/Ultra Low Sulfur Diesel (ULSD) vs. ULSD emissions.

e. EFs represent the difference in CO_2 emissions associated with the combustion of one gallon of gasoline and one gallon gasoline equivalent of Compressed Natural Gas (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 *Air Emissions Guide for Air Force Transitory Sources*.** 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 EFs 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 13.2.1 (Jan 2011) and AP-42 Chapter 13.2.2 (Nov 2006):

$$EF(Pol)_P = k(Pol) \times (sL)^{0.91} \times W^{1.02}$$ 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 EF 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 EF listed above, the total vehicle miles traveled, and a precipitation correction term. When accounting for precipitation, the fugitive PM EFs must be corrected. The corrected EFs for both paved and unpaved roads are calculated as follows:

$$\boldsymbol{EF(\mathrm{Pol})_{CP} = EF(Pol)_{P} \times \left(1 - \frac{P}{4N}\right)}$$

Equation 5-1

$$\boldsymbol{EF(\mathrm{Pol})_{CU} = EF(Pol)_{U} \times \left(1 - \frac{P}{N}\right)}$$

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.

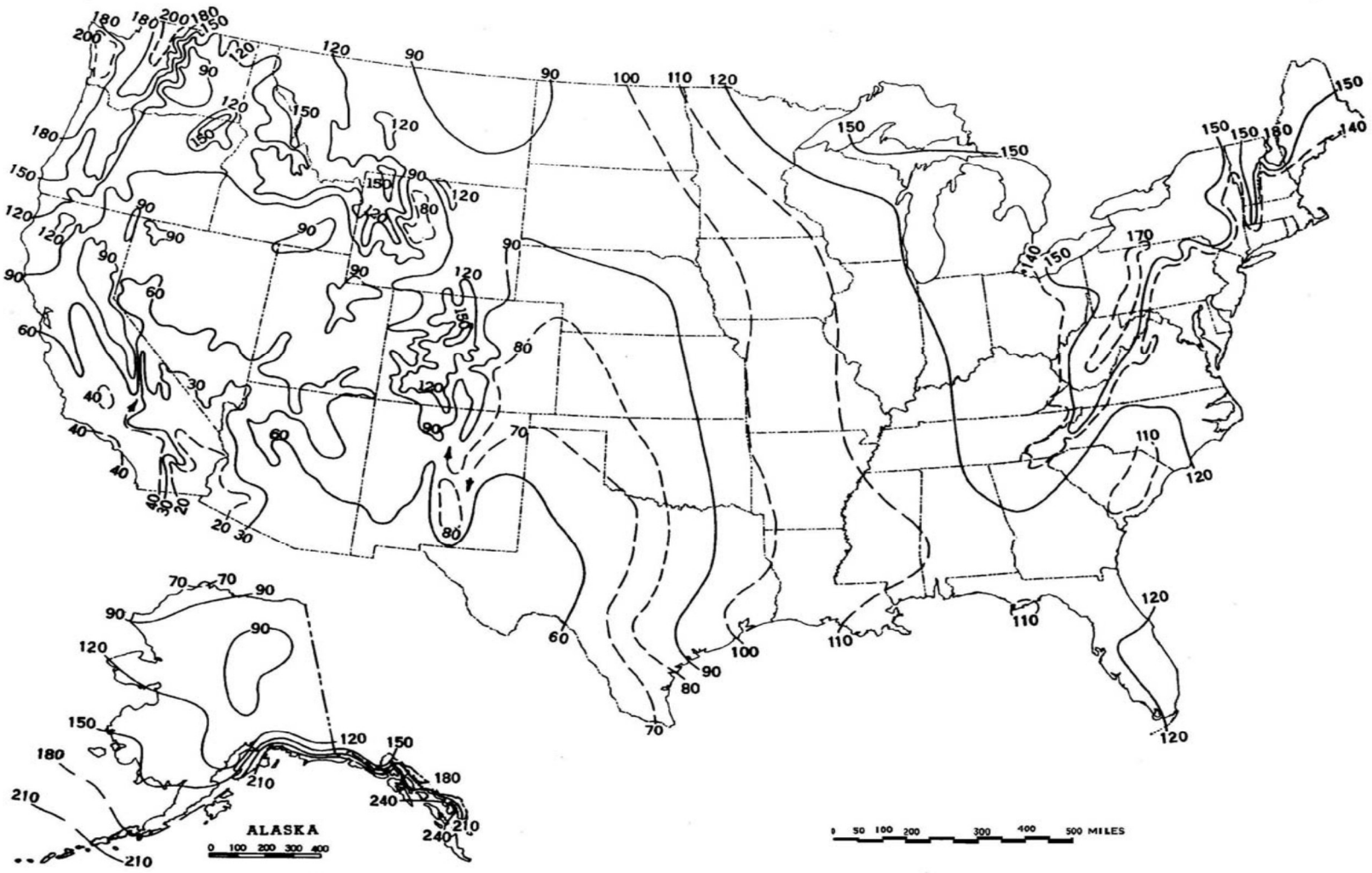

Figure 5-1. Mean Number of Days in the Year with Precipitation of 0.01 Inches or More

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 EFs. Method 2 uses POV and GOV fleet mix from recent traffic studies. Method 3 uses the typical USAF 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. If the vehicle mix is 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 EFs 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 EFs ($EF(Pol)_{Comp}$) 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 note that these EFs **have already been adjusted** to reflect the reduction in emissions because of vehicles that operate on alternative fuels. Therefore, 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:

$$\boldsymbol{E(Pol)_{Total} = VMT_{Total} \times EF(Pol)_{Comp} \times 0.002205}$$

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 operates their vehicles on the installation during the week. Using this information, the VMT_{Total} for POVs is estimated as follows:

$$\boldsymbol{VMT_{Total} = D \times 520 \times 0.7 \times P}$$

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 EFs 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 EFs 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 VMT 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)

To accurately account for the reduction of emissions using alternative fuels, the VMT_i for each hybrid and CNG 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 year in question.

a. **GOV Fleet MIX Data:** If a GOV is driven both on and off base during 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. This is 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 at the end of this chapter 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 USAF 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 EFs are selected based on the vehicle category, the calendar year you are performing the emissions calculation, and the installation's location. Vehicle exhaust EFs ($EF(Pol)_i$) are selected from Table 5-21 through Table 5-25 for most states, Table 5-36 through Table 5-40 for California, or Table 5-41 through 5-42 for OCONUS.

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 USAF Typical Vehicle Mix Data

Another method for calculating on-road vehicle emissions is to calculate the emissions from each vehicle category using the typical USAF vehicle mix. The method of calculation is like that of calculating emissions using specific vehicle mix data. The EFs 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 EF considers any reduction in emissions because 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.** 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 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 EF 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 in), and the installation's altitude. The EFs are selected from Table 5-21 through Table 5-25 (Table 5-36 through Table 5-40 for California or Table 5-41 through 5-42 for OCONUS).

Once the appropriate pollutant-specific EFs ($EF(Pol)_i$) 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 like 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 USAF 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 EFs used for this method ($EF(Pol)_i$) are provided in Table 5-6 through Table 5-8. Idling emissions are estimated as follows:

$$\boldsymbol{E(Pol)_{Total} = \sum_{i=1}^{n} \left\{ VIT_i \times EF(Pol)_i \times \left[1 - \frac{FERF(Pol)}{100} \right] \times 0.002205 \right\}}$$

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:

$$VIT_i = AVIT_i \times n_i = AVIT_i \times N \times \frac{MIX_i}{100}$$

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 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 EFs 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:

$$E(Pol)_{Total} = VIT_{Total} \times EF(Pol)_{Total} \times 0.002205$$

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 considers any reduction in emissions because of alternative fuel use. This is calculated as shown:

$$EF(Pol)_{Total} = \sum_{i=1}^{n} \left\{ EF(Pol)_i \times \frac{MIX_i}{100} \times \left[1 - \frac{FERF(Pol)}{100} \right] \right\}$$

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 CE 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 surface. 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 EF 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 number 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 the 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 AEI 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

A USAF base is inventorying its calendar year (CY) 2018 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 CY2017 if the Base is 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 CY2018 in Alabama, the CO EF ($EF(CO)_{Alabama}$) for POVs is **4.903 g/mi**. Similarly, the CO EF ($EF(CO)_{Alabama}$) for GOVs, according to Table 5-16, is **5.027 g/mi**.

Step 3 – Calculate emissions. Emissions are calculated using the adjusted EFs from Step 2, the VMT_{Total} calculated from Step 1, and Equation 5-3 as shown:

$$E(Pol)_{Total} = VMT_{Total} \times EF(Pol)_{Total} \times 0.002205$$

For POVs:

$$E(CO)_{Total} = 1{,}925{,}586\,\frac{\cancel{miles}}{yr} \times 4.903\,\frac{\cancel{g}}{\cancel{mi}} \times 0.002205\,\frac{lb}{\cancel{g}}$$

$$\boxed{E(CO)_{Total} = 20,817.73 \frac{lb}{yr}}$$

For GOVs:

$$E(CO)_{Total} = 173{,}394 \frac{\cancel{miles}}{yr} \times 5.027 \frac{\cancel{g}}{\cancel{mi}} \times 0.002205 \frac{lb}{\cancel{g}}$$

$$\boxed{E(CO)_{Total} = 1,921.99 \frac{lb}{yr}}$$

5.5.2 Problem 2 – Calculating GOV Emissions – Method 2

A USAF base is inventorying its CY2018 CO emissions for their 15 GOVs operated by the facility during the year. The Air Force Base is 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:** 2018	
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**

<u>Step 3</u> – Select emission factors: For vehicles in CY 2018 in Alabama, the CO EFs for each vehicle category are given in Table 5-21. The EFs are provided in the table below.

Vehicle Category	CO Emission Factor (g/mi)
LDGV	3.761
LDGT	5.577
HDGV	17.368
LDDV	2.566
LDDT	5.042
HDDV	1.961
MC	13.453

Step 4 – Calculate emissions. No information was provided regarding whether 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:

$$E(Pol)_{Total} = \sum_{i=1}^{7}\left\{VMT_i \times EF(Pol)_i \times \left[1 - \frac{FERF(Pol)}{100}\right] \times 0.002205\right\}$$

$$\boldsymbol{E(CO)_{LDGV}} = 34{,}888\frac{\cancel{mi}}{yr} \times 3.761\frac{\cancel{g}}{\cancel{mi}} \times \left[1 - \frac{0\%}{100\%}\right] \times 0.002205\frac{lb}{\cancel{g}} = \boldsymbol{289.33\frac{lb}{yr}}$$

$$\boldsymbol{E(CO)_{LDGT}} = 19{,}500\frac{\cancel{mi}}{yr} \times 5.577\frac{\cancel{g}}{\cancel{mi}} \times \left[1 - \frac{0\%}{100\%}\right] \times 0.002205\frac{lb}{\cancel{g}} = \boldsymbol{239.80\frac{lb}{yr}}$$

$$\boldsymbol{E(CO)_{HDGV}} = 4{,}450\frac{\cancel{mi}}{yr} \times 17.368\frac{\cancel{g}}{\cancel{mi}} \times \left[1 - \frac{0\%}{100\%}\right] \times 0.002205\frac{lb}{\cancel{g}} = \boldsymbol{170.42\frac{lb}{yr}}$$

$$\boldsymbol{E(CO)_{LDDV}} = 0\frac{\cancel{mi}}{yr} \times 2.566\frac{\cancel{g}}{\cancel{mi}} \times \left[1 - \frac{0\%}{100\%}\right] \times 0.002205\frac{lb}{\cancel{g}} = \boldsymbol{0.0\frac{lb}{yr}}$$

$$\boldsymbol{E(CO)_{LDDT}} = 4{,}300\frac{\cancel{mi}}{yr} \times 5.042\frac{\cancel{g}}{\cancel{mi}} \times \left[1 - \frac{0\%}{100\%}\right] \times 0.002205\frac{lb}{\cancel{g}} = \boldsymbol{47.81\frac{lb}{yr}}$$

$$\boldsymbol{E(CO)_{HDDV}} = 5{,}300\frac{\cancel{mi}}{yr} \times 1.961\frac{\cancel{g}}{\cancel{mi}} \times \left[1 - \frac{0\%}{100\%}\right] \times 0.002205\frac{lb}{\cancel{g}} = \boldsymbol{22.92\frac{lb}{yr}}$$

$$\boldsymbol{E(CO)_{MC}} = 0\frac{\cancel{mi}}{yr} \times 13.453\frac{\cancel{g}}{\cancel{mi}} \times \left[1 - \frac{0\%}{100\%}\right] \times 0.002205\frac{lb}{\cancel{g}} = \boldsymbol{0.0\frac{lb}{yr}}$$

Finally, the total CO emissions are calculated by summing the contributing CO emissions from each vehicle category.

$$E(Pol)_{Total} = \sum_{i=1}^{7} E(Pol)_i$$

$$E(CO)_{TOTAL} = (289.33 + 239.80 + 170.42 + 0 + 47.81 + 22.92 + 0)\frac{lb}{yr}$$

$$\boxed{\boldsymbol{E(CO)_{TOTAL} = 770.28\frac{lb}{yr}}}$$

5.5.3 Problem 3 – Calculating POV Emissions – Method 2

A USAF Base (located in Alabama) is conducting an emissions inventory to quantify CY 2018 emissions attributable to the operation of POVs. Using the information provided by the Security Forces Squadron, the following data was used to calculate the CY2018 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:

$$N = Registered + Unregistered$$

$$\boldsymbol{N} = 1{,}675 + 125 = \boldsymbol{1{,}800\ vehicles}$$

Installation Name: Anytown AFB	**Inventory Year:** 2018
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 travel on the installation during a typical weekday (Monday-Friday)?	75
What is the estimated percentage of registered vehicles which 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:

$$AVM_i = \frac{52\ weeks}{yr} \times \left[\left(\frac{75\%}{100\%} \times 6\frac{mi}{day} \times 5\frac{day}{week}\right) + \left(\frac{50\%}{100\%} \times 4\frac{mi}{day} \times 2\frac{day}{week}\right)\right]$$

$$AVM_i = \frac{52\ weeks}{yr} \times \left[\left(0.75 \times 6\frac{mi}{\cancel{day}} \times 5\frac{\cancel{day}}{week}\right) + \left(0.5 \times 4\frac{mi}{\cancel{day}} \times 2\frac{\cancel{day}}{week}\right)\right]$$

$$AVM_i = \frac{52\ weeks}{yr} \times \left[\left(22.5\frac{mi}{week}\right) + \left(4\frac{mi}{week}\right)\right]$$

$$\boldsymbol{AVM_i} = \frac{52\ \cancel{weeks}}{yr} \times \left[\left(26.5\frac{mi}{\cancel{week}}\right)\right] = \mathbf{1{,}378\frac{mi}{yr}}$$

Finally, the total annual VMT for each category (VMT_i) is calculated using Equation 5-7.

$$VMT_i = AVM_i \times n_i$$

$$\mathbf{VMT_{LDGV}} = 1378\frac{\text{mi}}{\text{yr}} \times 648\ \text{vehicles} = \mathbf{892{,}944\frac{mi}{yr}}$$

$$\mathbf{VMT_{LDDV}} = 1378\frac{\text{mi}}{\text{yr}} \times 18\ \text{vehicles} = \mathbf{24{,}804\frac{mi}{yr}}$$

$$\mathbf{VMT_{LDGT}} = 1378\frac{\text{mi}}{\text{yr}} \times 972 \text{ vehicles} = \mathbf{1,339,416}\frac{\mathbf{mi}}{\mathbf{yr}}$$

$$\mathbf{VMT_{LDDT}} = 1378\frac{\text{mi}}{\text{yr}} \times 18 \text{ vehicles} = \mathbf{24,804}\frac{\mathbf{mi}}{\mathbf{yr}}$$

$$\mathbf{VMT_{HDGV}} = 1378\frac{\text{mi}}{\text{yr}} \times 72 \text{ vehicles} = \mathbf{99,216}\frac{\mathbf{mi}}{\mathbf{yr}}$$

$$\mathbf{VMT_{HDDV}} = 1378\frac{\text{mi}}{\text{yr}} \times 54 \text{ vehicles} = \mathbf{74,412}\frac{\mathbf{mi}}{\mathbf{yr}}$$

$$\mathbf{VMT_{MC}} = 1378\frac{\text{mi}}{\text{yr}} \times 18 \text{ vehicles} = \mathbf{24,804}\frac{\mathbf{mi}}{\mathbf{yr}}$$

Step 3 – Select emission factors. EFs for vehicles in CY2018 are provided in Table 5-21. The CO EFs for a base in Alabama for 2018 are provided in the sub-table below.

Vehicle Category	CO Emission Factor (g/mi)
LDGV	3.761
LDGT	5.577
HDGV	17.368
LDDV	2.566
LDDT	5.042
HDDV	1.961
MC	13.453

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.

$$E(Pol)_{Total} = \sum_{i=1}^{n}\left[VMT_i \times EF(Pol)_i \times \frac{FERF(Pol)}{100} \times 0.002205\right]$$

$$\mathbf{E(CO)_{LDGV}} = 892{,}944\frac{\cancel{\text{mi}}}{\text{yr}} \times 3.761\frac{\text{g}}{\cancel{\text{mi}}} \times \left[1 - \frac{0\%}{100\%}\right] \times 0.002205\ \frac{\text{lb}}{\text{g}} = \mathbf{7{,}405.19}\ \frac{\mathbf{lb}}{\mathbf{yr}}$$

$$\mathbf{E(CO)_{LDDV}} = 24{,}804\frac{\cancel{\text{mi}}}{\text{yr}} \times 2.566\frac{\text{g}}{\cancel{\text{mi}}} \times \left[1 - \frac{0\%}{100\%}\right] \times 0.002205\ \frac{\text{lb}}{\text{g}} = \mathbf{140.34}\ \frac{\mathbf{lb}}{\mathbf{yr}}$$

$$\mathbf{E(CO)_{LDGT}} = 1{,}339{,}416\frac{\cancel{\text{mi}}}{\text{yr}} \times 5.577\frac{\text{g}}{\cancel{\text{mi}}} \times \left[1 - \frac{0\%}{100\%}\right] \times 0.002205\ \frac{\text{lb}}{\text{g}} = \mathbf{16{,}471.18}\ \frac{\mathbf{lb}}{\mathbf{yr}}$$

$$\mathbf{E(CO)_{LDDT}} = 24{,}804\,\frac{\cancel{mi}}{yr} \times 5.042\,\frac{\cancel{g}}{\cancel{mi}} \times \left[1 - \frac{0\%}{100\%}\right] \times 0.002205\,\frac{lb}{\cancel{g}} = \mathbf{275.76}\,\frac{\mathbf{lb}}{\mathbf{yr}}$$

$$\mathbf{E(CO)_{HDGV}} = 99{,}216\,\frac{\cancel{mi}}{yr} \times\ 17.368\,\frac{\cancel{g}}{\cancel{mi}} \times \left[1 - \frac{0\%}{100\%}\right] \times 0.002205\,\frac{lb}{\cancel{g}} = \mathbf{3{,}799.62}\,\frac{\mathbf{lb}}{\mathbf{yr}}$$

$$\mathbf{E(CO)_{HDDV}} = 74{,}412\,\frac{\cancel{mi}}{yr} \times 1.961\,\frac{\cancel{g}}{\cancel{mi}} \times \left[1 - \frac{0\%}{100\%}\right] \times 0.002205\,\frac{lb}{\cancel{g}} = \mathbf{321.76}\,\frac{\mathbf{lb}}{\mathbf{yr}}$$

$$\mathbf{E(CO)_{MC}} = 24{,}804\,\frac{\cancel{mi}}{yr} \times 13.453\,\frac{\cancel{g}}{\cancel{mi}} \times \left[1 - \frac{0\%}{100\%}\right] \times 0.002205\,\frac{lb}{\cancel{g}} = \mathbf{735.78}\,\frac{\mathbf{lb}}{\mathbf{yr}}$$

The total CO emissions are calculated by summing the CO emissions from each contributing vehicle category:

$$E(Pol)_{Total} = \sum_{i=1}^{n} E(Pol)_i$$

$$E(CO)_{Total} = (7{,}405.19 + 140.34 + 16{,}471.18 + 275.76 + 3{,}799.62 + 321.76 + 735.78)\,\frac{lb}{yr}$$

$$\boxed{\boldsymbol{E(CO)_{TOTAL} = 29{,}149.63\,\frac{lb}{yr}}}$$

5.5.4 Problem 4 – Calculating POV Emissions – Method 3

A USAF 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 USAF vehicle mix, determine the NO_X generated by the operation of these vehicles on base for CY2018. The base is 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 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	46.70
LDDV	1.17
LDGT	42.01
LDDT	1.37
HDGV	1.04
HDDV	2.54
MC	3.40
LDGV (H)	1.56
LDGT (H)	0.16
LDGV (C)	0.04
LDGT (C)	0.01
HDGV (C)	0.00

Step 3 – Select emission factors. The EFs for CY2018 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	0.302
LDDV	0.153
LDGT	0.520
LDDT	0.502
HDGV	1.404
HDDV	6.134
MC	0.838

Step 4 – Calculate emissions. First, a total composite EF 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:

$$EF(Pol)_{Total} = \sum_{i=1}^{n} \left\{ EF(Pol)_i \times \frac{MIX_i}{100} \times \left[1 - \frac{FERF(Pol)}{100} \right] \right\}$$

$$\boldsymbol{EF(NO_X)_{LDGV}} = 0.302 \frac{g}{mi} \times \left(\frac{46.70\%}{100\%} \right) \times \left[1 - \frac{0\%}{100\%} \right] = \boldsymbol{0.141} \frac{\boldsymbol{g}}{\boldsymbol{mi}}$$

$$\boldsymbol{EF(NO_X)_{LDDV}} = 0.153 \frac{g}{mi} \times \left(\frac{1.17\%}{100\%} \right) \times \left[1 - \frac{0\%}{100\%} \right] = \boldsymbol{0.0018} \frac{\boldsymbol{g}}{\boldsymbol{mi}}$$

$$\boldsymbol{EF(NO_X)_{LDGT}} = 0.520 \frac{g}{mi} \times \left(\frac{42.01\%}{100\%} \right) \times \left[1 - \frac{0\%}{100\%} \right] = \boldsymbol{0.218} \frac{\boldsymbol{g}}{\boldsymbol{mi}}$$

$$\boldsymbol{EF(NO_X)_{LDDT}} = 0.502 \frac{g}{mi} \times \left(\frac{1.37\%}{100\%} \right) \times \left[1 - \frac{0\%}{100\%} \right] = \boldsymbol{0.00688} \frac{\boldsymbol{g}}{\boldsymbol{mi}}$$

$$\boldsymbol{EF(NO_X)_{HDGV}} = 1.404 \frac{g}{mi} \times \left(\frac{1.04\%}{100\%} \right) \times \left[1 - \frac{0\%}{100\%} \right] = \boldsymbol{0.0146} \frac{\boldsymbol{g}}{\boldsymbol{mi}}$$

$$\boldsymbol{EF(NO_X)_{HDDV}} = 6.134 \frac{g}{mi} \times \left(\frac{2.54\%}{100\%} \right) \times \left[1 - \frac{0\%}{100\%} \right] = \boldsymbol{0.156} \frac{\boldsymbol{g}}{\boldsymbol{mi}}$$

$$\boldsymbol{EF(NO_X)_{MC}} = 0.838 \frac{g}{mi} \times \left(\frac{3.40\%}{100\%} \right) \times \left[1 - \frac{0\%}{100\%} \right] = \boldsymbol{0.0285} \frac{\boldsymbol{g}}{\boldsymbol{mi}}$$

$$\boldsymbol{EF(NO_X)_{LDGV(H)}} = 0.302 \frac{g}{mi} \times \left(\frac{1.56\%}{100\%} \right) \times \left[1 - \frac{75\%}{100\%} \right] = \boldsymbol{0.00118} \frac{\boldsymbol{g}}{\boldsymbol{mi}}$$

$$\boldsymbol{EF(NO_X)_{LDGT(H)}} = 0.520 \frac{g}{mi} \times \left(\frac{0.16\%}{100\%} \right) \times \left[1 - \frac{75\%}{100\%} \right] = \boldsymbol{0.000208} \frac{\boldsymbol{g}}{\boldsymbol{mi}}$$

$$\boldsymbol{EF(NO_X)_{LDGV\,(C)}} = 0.302 \frac{g}{mi} \times \left(\frac{0.04\%}{100\%} \right) \times \left[1 - \frac{35\%}{100\%} \right] = \boldsymbol{0.000079} \frac{\boldsymbol{g}}{\boldsymbol{mi}}$$

$$\boldsymbol{EF(NO_X)_{LDGT\,(C)}} = 0.520 \frac{g}{mi} \times \left(\frac{0.00\%}{100\%} \right) \times \left[1 - \frac{35\%}{100\%} \right] = \boldsymbol{0.00} \frac{\boldsymbol{g}}{\boldsymbol{mi}}$$

$$\boldsymbol{EF(NO_X)_{HDGV\,(C)}} = 1.404 \frac{g}{mi} \times \left(\frac{0.00\%}{100\%} \right) \times \left[1 - \frac{35\%}{100\%} \right] = \boldsymbol{0.00} \frac{\boldsymbol{g}}{\boldsymbol{mi}}$$

Next, sum these values for a total composite emission factor ($EF(Pol)_{Total}$) as shown:

$$EF(Pol)_{Total} = \sum_{i=1}^{n} EF(Pol)_i$$

$$\boldsymbol{EF(NO_X)_{Total}} = (0.141 + 0.0018 + 0.218 + 0.00688 + 0.0146 + 0.156 + 0.0285 + 0.00118 + 0.000208 + 0.000079 + 0.00 + 0.00) \frac{g}{mi} = \boldsymbol{0.5682} \frac{\boldsymbol{g}}{\boldsymbol{mi}}$$

Finally, using the total vehicle miles traveled (VMT_{Total}) from Step 2 and the total composite EF, the total NO_X emissions are calculated using Equation 5-8 as shown:

$$E(Pol)_{Total} = VMT_{Total} \times EF(Pol)_{Total} \times 0.002205$$

$$E(NO_X)_{Total} = 2{,}220{,}000 \frac{\cancel{mi}}{yr} \times 0.5682 \frac{\cancel{g}}{\cancel{mi}} \times 0.002205 \frac{lb}{\cancel{g}}$$

$$\boxed{\boldsymbol{E(NO_X)_{Total} = 2{,}781.40 \frac{lb}{yr}}}$$

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 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 EFs must be corrected to account for precipitation at the base. It is given that the base is 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:

$$EF(\text{Pol})_{CP} = EF(Pol)_P \times \left(1 - \frac{P}{4N}\right)$$

$$EF(\text{PM}_{10})_{CP} = 0.058\frac{g}{mi} \times \left(1 - \frac{110}{4\times365}\right)$$

$$\boldsymbol{EF(\text{PM}_{10})_{CP}} = 0.058\frac{g}{mi} \times \left(1 - \frac{110}{1460}\right) = \mathbf{0.054}\frac{\boldsymbol{g}}{\boldsymbol{mi}}$$

For GOVs:

$$EF(\text{PM}_{10})_{CP} = 0.069\frac{g}{mi} \times \left(1 - \frac{110}{4\times365}\right)$$

$$\boldsymbol{EF(\text{PM}_{10})_{CP}} = 0.069\frac{g}{mi} \times \left(1 - \frac{110}{1460}\right) = \mathbf{0.064}\frac{\boldsymbol{g}}{\boldsymbol{mi}}$$

$$EF(\text{Pol})_{CU} = EF(Pol)_U \times \left(1 - \frac{P}{N}\right)$$

$$\boldsymbol{EF(\text{PM}_{10})_{CU}} = 505.981\frac{g}{mi} \times \left(1 - \frac{110}{365}\right) = \mathbf{353.494}\frac{\boldsymbol{g}}{\boldsymbol{mi}}$$

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:

$$E(PM_{10})_{Total} = 1{,}925{,}586\frac{mi}{yr} \times \left[\left(\frac{100\%}{100\%} \times 0.054\frac{g}{mi}\right) + (0)\right] \times 0.002205\frac{lb}{g}$$

$$E(PM_{10})_{Total} = 1{,}925{,}586\frac{\cancel{mi}}{yr} \times \left[\left(1 \times 0.054\frac{\cancel{g}}{\cancel{mi}}\right)\right] \times 0.002205\frac{lb}{\cancel{g}}$$

$$\boxed{\boldsymbol{E(PM_{10})_{Total} = 229.28\frac{lb}{yr}}}$$

For GOVs:

$$E(PM_{10})_{Total} = 173{,}394\frac{mi}{yr} \times \left[\left(\frac{90\%}{100\%} \times 0.064\frac{g}{mi}\right) + \left(\frac{10\%}{100\%} \times 353.494\frac{g}{mi}\right)\right] \times 0.002205\frac{lb}{g}$$

$$E(PM_{10})_{Total} = 173{,}394\frac{mi}{yr} \times \left[\left(0.9 \times 0.064\frac{g}{mi}\right) + \left(0.1 \times 353.494\frac{g}{mi}\right)\right] \times 0.002205\frac{lb}{g}$$

$$E(PM_{10})_{Total} = 173{,}394\frac{mi}{yr} \times \left[\left(0.0576\frac{g}{mi}\right) + \left(35.3494\frac{g}{mi}\right)\right] \times 0.002205\frac{lb}{g}$$

$$E(PM_{10})_{Total} = 173{,}394\frac{\cancel{mi}}{yr} \times \left[35.407\frac{\cancel{g}}{\cancel{mi}}\right] \times 0.002205\frac{lb}{\cancel{g}}$$

$$\boxed{\boldsymbol{E(PM_{10})_{Total} = 13{,}537.29\frac{lb}{yr}}}$$

Table 5-11. 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							
		CO	VOC	NO_X	SO_2	PM_{10}	$PM_{2.5}$	CO_2e	NH_3
ALABAMA	All Vehicles	4.903	0.487	0.548	0.003	0.014	0.013	421.592	0.026
ALASKA	All Vehicles	5.347	0.524	0.616	0.003	0.023	0.021	417.721	0.026
ARIZONA	All Vehicles	4.843	0.481	0.566	0.003	0.014	0.012	431.461	0.026
ARKANSAS	All Vehicles	5.114	0.481	0.576	0.003	0.015	0.013	414.727	0.026
COLORADO	All Vehicles	4.819	0.475	0.570	0.003	0.018	0.016	419.195	0.026
CONNECTICUT	All Vehicles	4.428	0.412	0.498	0.003	0.017	0.015	419.019	0.026
DELAWARE	All Vehicles	4.320	0.419	0.504	0.003	0.015	0.014	421.276	0.026
DISTRICT OF COLUMBIA	All Vehicles	4.335	0.414	0.480	0.003	0.016	0.014	439.308	0.025
FLORIDA	All Vehicles	5.184	0.505	0.517	0.003	0.013	0.012	441.908	0.026
GEORGIA	All Vehicles	4.650	0.458	0.537	0.003	0.015	0.013	417.160	0.026
HAWAII	All Vehicles	5.060	0.477	0.502	0.003	0.013	0.011	429.402	0.026
IDAHO	All Vehicles	4.981	0.488	0.602	0.003	0.018	0.016	414.869	0.026
ILLINOIS	All Vehicles	4.824	0.468	0.523	0.003	0.017	0.015	432.207	0.026
INDIANA	All Vehicles	4.984	0.482	0.570	0.003	0.017	0.015	423.191	0.026
IOWA	All Vehicles	5.195	0.503	0.597	0.003	0.018	0.016	414.145	0.026
KANSAS	All Vehicles	5.125	0.488	0.578	0.003	0.016	0.014	415.615	0.026
KENTUCKY	All Vehicles	5.050	0.478	0.590	0.003	0.016	0.014	413.505	0.026
LOUISIANA	All Vehicles	5.012	0.487	0.540	0.003	0.014	0.012	424.338	0.026
MAINE	All Vehicles	4.811	0.490	0.593	0.003	0.019	0.017	405.446	0.026
MARYLAND	All Vehicles	4.467	0.429	0.527	0.003	0.016	0.014	418.506	0.026
MASSACHUSETTS	All Vehicles	4.535	0.440	0.534	0.003	0.017	0.016	417.031	0.026
MICHIGAN	All Vehicles	5.175	0.495	0.584	0.003	0.018	0.016	420.738	0.026
MINNESOTA	All Vehicles	5.248	0.508	0.574	0.003	0.020	0.018	415.642	0.026
MISSISSIPPI	All Vehicles	4.887	0.484	0.544	0.003	0.014	0.012	415.880	0.026
MISSOURI	All Vehicles	4.961	0.465	0.565	0.003	0.016	0.014	409.828	0.026
MONTANA	All Vehicles	5.233	0.510	0.634	0.003	0.019	0.017	408.246	0.026
NEBRASKA	All Vehicles	5.250	0.505	0.611	0.003	0.018	0.016	414.738	0.026
NEVADA	All Vehicles	4.633	0.479	0.573	0.003	0.015	0.014	431.265	0.026
NEW HAMPSHIRE	All Vehicles	4.476	0.449	0.535	0.003	0.018	0.016	412.966	0.026
NEW JERSEY	All Vehicles	4.406	0.416	0.564	0.003	0.016	0.015	410.304	0.026
NEW MEXICO	All Vehicles	4.902	0.495	0.610	0.003	0.016	0.014	414.756	0.026
NEW YORK	All Vehicles	4.244	0.412	0.495	0.003	0.017	0.015	420.349	0.026
NORTH CAROLINA	All Vehicles	4.804	0.476	0.543	0.003	0.015	0.013	418.586	0.026
NORTH DAKOTA	All Vehicles	5.442	0.540	0.613	0.003	0.022	0.020	409.127	0.026
OHIO	All Vehicles	4.806	0.463	0.538	0.003	0.017	0.015	422.668	0.025
OKLAHOMA	All Vehicles	5.120	0.489	0.570	0.003	0.015	0.013	420.605	0.026
OREGON	All Vehicles	4.636	0.448	0.567	0.003	0.016	0.014	410.734	0.026
PACIFIC ISLANDS	All Vehicles	4.668	0.451	0.544	0.003	0.015	0.014	419.050	0.026
PENNSYLVANIA	All Vehicles	4.567	0.448	0.544	0.003	0.017	0.015	420.897	0.026
PUERTO RICO	All Vehicles	5.624	0.505	0.492	0.003	0.013	0.012	444.781	0.026
RHODE ISLAND	All Vehicles	4.398	0.418	0.508	0.003	0.017	0.015	423.469	0.026
SOUTH CAROLINA	All Vehicles	4.974	0.489	0.569	0.003	0.015	0.013	420.577	0.026
SOUTH DAKOTA	All Vehicles	5.313	0.518	0.621	0.003	0.020	0.017	408.964	0.026
TENNESSEE	All Vehicles	4.813	0.471	0.555	0.003	0.015	0.014	420.653	0.026
TEXAS	All Vehicles	4.695	0.450	0.513	0.003	0.014	0.012	423.271	0.026
UTAH	All Vehicles	4.890	0.477	0.568	0.003	0.018	0.016	425.127	0.026
VERMONT	All Vehicles	4.560	0.474	0.566	0.003	0.019	0.017	406.475	0.026
VIRGIN ISLANDS	All Vehicles	5.260	0.478	0.470	0.003	0.011	0.010	421.613	0.026
VIRGINIA	All Vehicles	4.761	0.459	0.555	0.003	0.016	0.014	419.582	0.026
WASHINGTON	All Vehicles	4.763	0.448	0.558	0.003	0.017	0.015	415.970	0.026
WEST VIRGINIA	All Vehicles	4.977	0.482	0.586	0.003	0.016	0.015	409.321	0.026
WISCONSIN	All Vehicles	5.050	0.492	0.575	0.003	0.019	0.017	413.708	0.026
WYOMING	All Vehicles	5.370	0.524	0.652	0.003	0.020	0.018	411.007	0.026

Table 5-12. 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							
		CO	VOC	NO_X	SO_2	PM_{10}	$PM_{2.5}$	CO_2e	NH_3
ALABAMA	All Vehicles	4.592	0.442	0.481	0.003	0.013	0.012	411.070	0.025
ALASKA	All Vehicles	5.005	0.480	0.546	0.003	0.021	0.019	407.449	0.025
ARIZONA	All Vehicles	4.544	0.440	0.498	0.003	0.012	0.011	420.670	0.025
ARKANSAS	All Vehicles	4.797	0.441	0.509	0.003	0.013	0.012	404.414	0.025
COLORADO	All Vehicles	4.520	0.438	0.504	0.003	0.016	0.014	408.802	0.025
CONNECTICUT	All Vehicles	4.155	0.378	0.439	0.003	0.015	0.014	408.620	0.025
DELAWARE	All Vehicles	4.044	0.383	0.439	0.003	0.014	0.012	410.774	0.025
DISTRICT OF COLUMBIA	All Vehicles	4.072	0.380	0.420	0.003	0.014	0.013	428.335	0.024
FLORIDA	All Vehicles	4.855	0.458	0.452	0.003	0.012	0.011	430.819	0.025
GEORGIA	All Vehicles	4.357	0.417	0.473	0.003	0.013	0.012	406.770	0.025
HAWAII	All Vehicles	4.743	0.434	0.438	0.003	0.012	0.010	418.626	0.025
IDAHO	All Vehicles	4.657	0.446	0.532	0.003	0.016	0.014	404.595	0.025
ILLINOIS	All Vehicles	4.497	0.425	0.457	0.003	0.015	0.014	421.450	0.025
INDIANA	All Vehicles	4.659	0.439	0.502	0.003	0.015	0.014	412.672	0.025
IOWA	All Vehicles	4.866	0.460	0.528	0.003	0.016	0.015	403.897	0.025
KANSAS	All Vehicles	4.803	0.447	0.509	0.003	0.015	0.013	405.294	0.025
KENTUCKY	All Vehicles	4.727	0.435	0.522	0.003	0.014	0.013	403.249	0.025
LOUISIANA	All Vehicles	4.697	0.442	0.474	0.003	0.013	0.011	413.740	0.025
MAINE	All Vehicles	4.495	0.447	0.524	0.003	0.017	0.015	395.448	0.025
MARYLAND	All Vehicles	4.181	0.391	0.461	0.003	0.014	0.013	408.104	0.025
MASSACHUSETTS	All Vehicles	4.220	0.400	0.468	0.003	0.016	0.014	406.693	0.025
MICHIGAN	All Vehicles	4.834	0.451	0.515	0.003	0.017	0.015	410.309	0.025
MINNESOTA	All Vehicles	4.891	0.464	0.506	0.003	0.018	0.016	405.366	0.025
MISSISSIPPI	All Vehicles	4.578	0.440	0.477	0.003	0.013	0.011	405.509	0.025
MISSOURI	All Vehicles	4.646	0.425	0.498	0.003	0.014	0.013	399.671	0.025
MONTANA	All Vehicles	4.894	0.466	0.562	0.003	0.017	0.015	398.179	0.025
NEBRASKA	All Vehicles	4.920	0.463	0.541	0.003	0.016	0.014	404.477	0.025
NEVADA	All Vehicles	4.339	0.438	0.502	0.003	0.014	0.012	420.496	0.025
NEW HAMPSHIRE	All Vehicles	4.167	0.408	0.470	0.003	0.016	0.015	402.743	0.025
NEW JERSEY	All Vehicles	4.130	0.380	0.500	0.003	0.015	0.013	400.149	0.025
NEW MEXICO	All Vehicles	4.595	0.455	0.539	0.003	0.014	0.013	404.456	0.025
NEW YORK	All Vehicles	3.986	0.378	0.437	0.003	0.016	0.014	409.911	0.025
NORTH CAROLINA	All Vehicles	4.496	0.433	0.476	0.003	0.014	0.012	408.155	0.025
NORTH DAKOTA	All Vehicles	5.068	0.493	0.542	0.003	0.020	0.018	399.061	0.025
OHIO	All Vehicles	4.495	0.422	0.474	0.003	0.016	0.014	412.164	0.024
OKLAHOMA	All Vehicles	4.800	0.448	0.502	0.003	0.014	0.012	410.128	0.025
OREGON	All Vehicles	4.336	0.408	0.500	0.003	0.014	0.013	400.542	0.025
PACIFIC ISLANDS	All Vehicles	4.372	0.412	0.478	0.003	0.014	0.012	408.622	0.025
PENNSYLVANIA	All Vehicles	4.268	0.408	0.479	0.003	0.016	0.014	410.446	0.025
PUERTO RICO	All Vehicles	5.275	0.460	0.430	0.003	0.012	0.011	433.611	0.025
RHODE ISLAND	All Vehicles	4.136	0.384	0.449	0.003	0.016	0.014	412.952	0.025
SOUTH CAROLINA	All Vehicles	4.661	0.445	0.501	0.003	0.013	0.012	410.097	0.025
SOUTH DAKOTA	All Vehicles	4.953	0.473	0.550	0.003	0.018	0.016	398.884	0.025
TENNESSEE	All Vehicles	4.503	0.428	0.488	0.003	0.014	0.013	410.184	0.025
TEXAS	All Vehicles	4.402	0.411	0.451	0.003	0.012	0.011	412.704	0.025
UTAH	All Vehicles	4.577	0.437	0.500	0.003	0.016	0.014	414.568	0.025
VERMONT	All Vehicles	4.244	0.430	0.499	0.003	0.017	0.016	396.455	0.025
VIRGIN ISLANDS	All Vehicles	4.929	0.434	0.409	0.003	0.010	0.009	411.030	0.025
VIRGINIA	All Vehicles	4.462	0.419	0.489	0.003	0.014	0.013	409.147	0.025
WASHINGTON	All Vehicles	4.460	0.410	0.494	0.003	0.015	0.014	405.651	0.025
WEST VIRGINIA	All Vehicles	4.657	0.439	0.517	0.003	0.015	0.013	399.181	0.025
WISCONSIN	All Vehicles	4.705	0.447	0.507	0.003	0.017	0.015	403.481	0.025
WYOMING	All Vehicles	5.024	0.480	0.579	0.003	0.018	0.016	400.880	0.025

Table 5-13. 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							
		CO	VOC	NO_X	SO_2	PM_{10}	$PM_{2.5}$	CO_2e	NH_3
ALABAMA	All Vehicles	4.331	0.407	0.426	0.003	0.012	0.011	400.578	0.024
ALASKA	All Vehicles	4.716	0.444	0.487	0.003	0.019	0.017	397.207	0.024
ARIZONA	All Vehicles	4.294	0.408	0.441	0.003	0.011	0.010	409.911	0.024
ARKANSAS	All Vehicles	4.531	0.406	0.452	0.003	0.012	0.011	394.132	0.024
COLORADO	All Vehicles	4.267	0.406	0.449	0.003	0.015	0.013	398.439	0.024
CONNECTICUT	All Vehicles	3.923	0.350	0.389	0.003	0.014	0.013	398.252	0.024
DELAWARE	All Vehicles	3.809	0.353	0.386	0.003	0.013	0.011	400.301	0.024
DISTRICT OF COLUMBIA	All Vehicles	3.848	0.352	0.370	0.003	0.013	0.012	417.394	0.023
FLORIDA	All Vehicles	4.580	0.421	0.399	0.003	0.011	0.010	419.761	0.024
GEORGIA	All Vehicles	4.110	0.385	0.420	0.003	0.012	0.011	396.411	0.024
HAWAII	All Vehicles	4.481	0.400	0.385	0.003	0.011	0.010	407.880	0.024
IDAHO	All Vehicles	4.386	0.412	0.473	0.003	0.015	0.013	394.351	0.024
ILLINOIS	All Vehicles	4.224	0.391	0.403	0.003	0.014	0.012	410.724	0.024
INDIANA	All Vehicles	4.385	0.404	0.446	0.003	0.014	0.012	402.184	0.024
IOWA	All Vehicles	4.588	0.424	0.471	0.003	0.015	0.013	393.679	0.024
KANSAS	All Vehicles	4.533	0.412	0.452	0.003	0.013	0.012	395.004	0.024
KENTUCKY	All Vehicles	4.456	0.401	0.465	0.003	0.013	0.012	393.023	0.024
LOUISIANA	All Vehicles	4.434	0.407	0.420	0.003	0.012	0.011	403.172	0.024
MAINE	All Vehicles	4.228	0.412	0.467	0.003	0.016	0.014	385.478	0.024
MARYLAND	All Vehicles	3.940	0.360	0.407	0.003	0.013	0.012	397.731	0.024
MASSACHUSETTS	All Vehicles	3.955	0.367	0.413	0.003	0.014	0.013	396.385	0.024
MICHIGAN	All Vehicles	4.548	0.415	0.458	0.003	0.015	0.014	399.911	0.024
MINNESOTA	All Vehicles	4.591	0.426	0.449	0.003	0.017	0.015	395.119	0.024
MISSISSIPPI	All Vehicles	4.319	0.404	0.423	0.003	0.012	0.010	395.167	0.024
MISSOURI	All Vehicles	4.382	0.391	0.443	0.003	0.013	0.012	389.544	0.024
MONTANA	All Vehicles	4.610	0.431	0.502	0.003	0.015	0.014	388.142	0.024
NEBRASKA	All Vehicles	4.642	0.427	0.483	0.003	0.015	0.013	394.247	0.024
NEVADA	All Vehicles	4.093	0.406	0.443	0.003	0.013	0.011	409.761	0.024
NEW HAMPSHIRE	All Vehicles	3.905	0.374	0.415	0.003	0.015	0.013	392.549	0.024
NEW JERSEY	All Vehicles	3.894	0.351	0.446	0.003	0.014	0.012	390.025	0.024
NEW MEXICO	All Vehicles	4.336	0.419	0.479	0.003	0.013	0.012	394.188	0.024
NEW YORK	All Vehicles	3.766	0.350	0.387	0.003	0.014	0.013	399.503	0.024
NORTH CAROLINA	All Vehicles	4.237	0.398	0.421	0.003	0.012	0.011	397.753	0.024
NORTH DAKOTA	All Vehicles	4.754	0.453	0.484	0.003	0.018	0.016	389.022	0.024
OHIO	All Vehicles	4.233	0.390	0.420	0.003	0.014	0.013	401.690	0.023
OKLAHOMA	All Vehicles	4.531	0.413	0.445	0.003	0.012	0.011	399.683	0.024
OREGON	All Vehicles	4.085	0.377	0.444	0.003	0.013	0.012	390.382	0.024
PACIFIC ISLANDS	All Vehicles	4.123	0.380	0.424	0.003	0.013	0.011	398.225	0.024
PENNSYLVANIA	All Vehicles	4.015	0.375	0.424	0.003	0.014	0.013	400.027	0.024
PUERTO RICO	All Vehicles	4.986	0.424	0.378	0.003	0.011	0.010	422.469	0.024
RHODE ISLAND	All Vehicles	3.912	0.356	0.399	0.003	0.014	0.013	402.466	0.024
SOUTH CAROLINA	All Vehicles	4.398	0.409	0.445	0.003	0.012	0.011	399.647	0.024
SOUTH DAKOTA	All Vehicles	4.652	0.434	0.491	0.003	0.016	0.014	388.834	0.024
TENNESSEE	All Vehicles	4.243	0.394	0.433	0.003	0.013	0.012	399.745	0.024
TEXAS	All Vehicles	4.156	0.379	0.399	0.003	0.011	0.010	402.166	0.024
UTAH	All Vehicles	4.314	0.404	0.444	0.003	0.015	0.013	404.042	0.024
VERMONT	All Vehicles	3.977	0.395	0.443	0.003	0.016	0.014	386.464	0.024
VIRGIN ISLANDS	All Vehicles	4.655	0.398	0.359	0.003	0.010	0.009	400.471	0.024
VIRGINIA	All Vehicles	4.209	0.386	0.434	0.003	0.013	0.012	398.743	0.024
WASHINGTON	All Vehicles	4.206	0.378	0.440	0.003	0.014	0.012	395.365	0.024
WEST VIRGINIA	All Vehicles	4.388	0.404	0.460	0.003	0.014	0.012	389.071	0.024
WISCONSIN	All Vehicles	4.415	0.411	0.450	0.003	0.015	0.014	393.282	0.024
WYOMING	All Vehicles	4.734	0.444	0.518	0.003	0.016	0.014	390.782	0.024

Table 5-14. Air Force/State/Territory-Specific On-Road Vehicle Composite Emission Factors – 2021 POV

State	Vehicle Type	Emission Factors (g/mi)							
		Criteria Pollutants and Ozone Precursors							
		CO	VOC	NO_X	SO_2	PM_{10}	$PM_{2.5}$	CO_2e	NH_3
ALABAMA	All Vehicles	4.067	0.375	0.378	0.003	0.011	0.010	389.683	0.024
ALASKA	All Vehicles	4.431	0.411	0.437	0.003	0.017	0.015	386.571	0.024
ARIZONA	All Vehicles	4.040	0.379	0.393	0.003	0.010	0.009	398.739	0.024
ARKANSAS	All Vehicles	4.261	0.373	0.404	0.003	0.011	0.010	383.455	0.024
COLORADO	All Vehicles	4.015	0.377	0.403	0.003	0.013	0.012	387.679	0.024
CONNECTICUT	All Vehicles	3.693	0.326	0.347	0.003	0.013	0.011	387.482	0.024
DELAWARE	All Vehicles	3.574	0.327	0.341	0.003	0.011	0.010	389.422	0.024
DISTRICT OF COLUMBIA	All Vehicles	3.618	0.328	0.328	0.003	0.012	0.011	406.031	0.022
FLORIDA	All Vehicles	4.300	0.387	0.352	0.003	0.011	0.009	408.277	0.024
GEORGIA	All Vehicles	3.861	0.355	0.374	0.003	0.011	0.010	385.654	0.024
HAWAII	All Vehicles	4.213	0.368	0.339	0.003	0.010	0.009	396.718	0.024
IDAHO	All Vehicles	4.117	0.381	0.423	0.003	0.013	0.012	383.715	0.024
ILLINOIS	All Vehicles	3.957	0.360	0.356	0.003	0.013	0.011	399.585	0.024
INDIANA	All Vehicles	4.114	0.373	0.398	0.003	0.013	0.011	391.294	0.024
IOWA	All Vehicles	4.312	0.391	0.421	0.003	0.013	0.012	383.070	0.024
KANSAS	All Vehicles	4.261	0.379	0.403	0.003	0.012	0.011	384.318	0.024
KENTUCKY	All Vehicles	4.184	0.370	0.416	0.003	0.012	0.011	382.407	0.024
LOUISIANA	All Vehicles	4.166	0.375	0.373	0.003	0.011	0.010	392.198	0.024
MAINE	All Vehicles	3.966	0.380	0.418	0.003	0.014	0.013	375.127	0.024
MARYLAND	All Vehicles	3.702	0.334	0.361	0.003	0.012	0.011	386.959	0.024
MASSACHUSETTS	All Vehicles	3.703	0.339	0.367	0.003	0.013	0.012	385.679	0.024
MICHIGAN	All Vehicles	4.265	0.383	0.409	0.003	0.014	0.012	389.113	0.024
MINNESOTA	All Vehicles	4.299	0.394	0.400	0.003	0.015	0.013	384.475	0.024
MISSISSIPPI	All Vehicles	4.057	0.372	0.375	0.003	0.011	0.010	384.427	0.024
MISSOURI	All Vehicles	4.117	0.360	0.395	0.003	0.012	0.011	379.027	0.024
MONTANA	All Vehicles	4.328	0.397	0.451	0.003	0.014	0.013	377.722	0.024
NEBRASKA	All Vehicles	4.363	0.393	0.433	0.003	0.013	0.012	383.626	0.024
NEVADA	All Vehicles	3.849	0.376	0.394	0.003	0.011	0.010	398.613	0.024
NEW HAMPSHIRE	All Vehicles	3.657	0.345	0.370	0.003	0.013	0.012	381.963	0.024
NEW JERSEY	All Vehicles	3.658	0.326	0.402	0.003	0.012	0.011	379.516	0.024
NEW MEXICO	All Vehicles	4.077	0.386	0.429	0.003	0.012	0.011	383.527	0.024
NEW YORK	All Vehicles	3.548	0.326	0.346	0.003	0.013	0.012	388.695	0.024
NORTH CAROLINA	All Vehicles	3.978	0.367	0.373	0.003	0.011	0.010	386.951	0.024
NORTH DAKOTA	All Vehicles	4.448	0.418	0.433	0.003	0.016	0.014	378.597	0.024
OHIO	All Vehicles	3.973	0.360	0.375	0.003	0.013	0.012	390.814	0.022
OKLAHOMA	All Vehicles	4.259	0.379	0.397	0.003	0.011	0.010	388.836	0.024
OREGON	All Vehicles	3.836	0.348	0.397	0.003	0.012	0.011	379.833	0.024
PACIFIC ISLANDS	All Vehicles	3.875	0.351	0.378	0.003	0.012	0.010	387.427	0.024
PENNSYLVANIA	All Vehicles	3.767	0.347	0.379	0.003	0.013	0.012	389.208	0.024
PUERTO RICO	All Vehicles	4.688	0.391	0.333	0.003	0.010	0.009	410.895	0.024
RHODE ISLAND	All Vehicles	3.681	0.331	0.357	0.003	0.013	0.012	391.577	0.024
SOUTH CAROLINA	All Vehicles	4.131	0.377	0.396	0.003	0.011	0.010	388.798	0.024
SOUTH DAKOTA	All Vehicles	4.356	0.401	0.441	0.003	0.015	0.013	378.398	0.024
TENNESSEE	All Vehicles	3.983	0.364	0.385	0.003	0.012	0.011	388.906	0.024
TEXAS	All Vehicles	3.908	0.349	0.355	0.003	0.011	0.009	391.223	0.024
UTAH	All Vehicles	4.053	0.375	0.396	0.003	0.013	0.012	393.110	0.024
VERMONT	All Vehicles	3.724	0.364	0.397	0.003	0.014	0.013	376.089	0.024
VIRGIN ISLANDS	All Vehicles	4.374	0.366	0.316	0.003	0.009	0.008	389.499	0.023
VIRGINIA	All Vehicles	3.956	0.357	0.387	0.003	0.012	0.011	387.940	0.024
WASHINGTON	All Vehicles	3.951	0.350	0.394	0.003	0.013	0.011	384.684	0.024
WEST VIRGINIA	All Vehicles	4.119	0.373	0.412	0.003	0.012	0.011	378.574	0.024
WISCONSIN	All Vehicles	4.133	0.379	0.402	0.003	0.014	0.013	382.691	0.024
WYOMING	All Vehicles	4.446	0.410	0.466	0.003	0.015	0.013	380.300	0.024

Table 5-15. Air Force/State/Territory-Specific On-Road Vehicle Composite Emission Factors – 2022 POV

State	Vehicle Type	Emission Factors (g/mi)							
		Criteria Pollutants and Ozone Precursors							
		CO	VOC	NO_X	SO_2	PM_{10}	$PM_{2.5}$	CO_2e	NH_3
ALABAMA	All Vehicles	3.839	0.350	0.338	0.003	0.010	0.009	378.734	0.023
ALASKA	All Vehicles	4.180	0.383	0.396	0.003	0.015	0.014	375.882	0.023
ARIZONA	All Vehicles	3.816	0.352	0.353	0.003	0.010	0.009	387.512	0.023
ARKANSAS	All Vehicles	4.023	0.347	0.363	0.003	0.010	0.009	372.725	0.023
COLORADO	All Vehicles	3.791	0.351	0.363	0.003	0.012	0.011	376.863	0.023
CONNECTICUT	All Vehicles	3.489	0.306	0.312	0.003	0.012	0.011	376.655	0.023
DELAWARE	All Vehicles	3.370	0.305	0.303	0.003	0.011	0.009	378.487	0.023
DISTRICT OF COLUMBIA	All Vehicles	3.412	0.308	0.293	0.003	0.011	0.010	394.610	0.022
FLORIDA	All Vehicles	4.059	0.361	0.313	0.003	0.010	0.009	396.736	0.023
GEORGIA	All Vehicles	3.646	0.332	0.336	0.003	0.011	0.009	374.843	0.023
HAWAII	All Vehicles	3.979	0.341	0.301	0.003	0.009	0.008	385.500	0.023
IDAHO	All Vehicles	3.881	0.354	0.381	0.003	0.012	0.011	373.025	0.023
ILLINOIS	All Vehicles	3.726	0.335	0.318	0.003	0.012	0.010	388.387	0.023
INDIANA	All Vehicles	3.879	0.346	0.357	0.003	0.012	0.010	380.349	0.023
IOWA	All Vehicles	4.069	0.364	0.380	0.003	0.012	0.011	372.407	0.023
KANSAS	All Vehicles	4.022	0.353	0.362	0.003	0.011	0.010	373.578	0.023
KENTUCKY	All Vehicles	3.949	0.343	0.375	0.003	0.011	0.010	371.739	0.023
LOUISIANA	All Vehicles	3.934	0.350	0.334	0.003	0.010	0.009	381.170	0.023
MAINE	All Vehicles	3.740	0.353	0.377	0.003	0.013	0.012	364.724	0.023
MARYLAND	All Vehicles	3.492	0.312	0.323	0.003	0.011	0.010	376.130	0.023
MASSACHUSETTS	All Vehicles	3.483	0.316	0.329	0.003	0.012	0.011	374.918	0.023
MICHIGAN	All Vehicles	4.020	0.355	0.367	0.003	0.013	0.011	378.260	0.023
MINNESOTA	All Vehicles	4.048	0.366	0.360	0.003	0.014	0.012	373.776	0.023
MISSISSIPPI	All Vehicles	3.830	0.347	0.336	0.003	0.010	0.009	373.634	0.023
MISSOURI	All Vehicles	3.885	0.335	0.355	0.003	0.011	0.010	368.457	0.023
MONTANA	All Vehicles	4.081	0.369	0.408	0.003	0.013	0.012	367.250	0.023
NEBRASKA	All Vehicles	4.119	0.366	0.391	0.003	0.012	0.011	372.951	0.023
NEVADA	All Vehicles	3.634	0.349	0.352	0.003	0.011	0.010	387.410	0.023
NEW HAMPSHIRE	All Vehicles	3.442	0.322	0.332	0.003	0.012	0.011	371.322	0.023
NEW JERSEY	All Vehicles	3.452	0.305	0.364	0.003	0.011	0.010	368.956	0.023
NEW MEXICO	All Vehicles	3.848	0.360	0.386	0.003	0.011	0.010	372.814	0.023
NEW YORK	All Vehicles	3.356	0.306	0.311	0.003	0.012	0.011	377.830	0.023
NORTH CAROLINA	All Vehicles	3.754	0.342	0.333	0.003	0.011	0.009	376.093	0.023
NORTH DAKOTA	All Vehicles	4.184	0.389	0.391	0.003	0.015	0.013	368.120	0.023
OHIO	All Vehicles	3.747	0.335	0.336	0.003	0.012	0.011	379.882	0.022
OKLAHOMA	All Vehicles	4.020	0.353	0.356	0.003	0.011	0.009	377.934	0.023
OREGON	All Vehicles	3.617	0.323	0.357	0.003	0.011	0.010	369.230	0.023
PACIFIC ISLANDS	All Vehicles	3.658	0.327	0.339	0.003	0.011	0.010	376.572	0.023
PENNSYLVANIA	All Vehicles	3.552	0.323	0.340	0.003	0.012	0.011	378.335	0.023
PUERTO RICO	All Vehicles	4.429	0.361	0.296	0.003	0.009	0.008	399.263	0.023
RHODE ISLAND	All Vehicles	3.480	0.311	0.321	0.003	0.012	0.011	380.631	0.023
SOUTH CAROLINA	All Vehicles	3.901	0.352	0.356	0.003	0.010	0.009	377.895	0.023
SOUTH DAKOTA	All Vehicles	4.100	0.372	0.399	0.003	0.013	0.012	367.912	0.023
TENNESSEE	All Vehicles	3.758	0.337	0.346	0.003	0.011	0.010	378.013	0.023
TEXAS	All Vehicles	3.690	0.326	0.318	0.003	0.010	0.009	380.224	0.023
UTAH	All Vehicles	3.822	0.349	0.356	0.003	0.012	0.011	382.122	0.023
VERMONT	All Vehicles	3.504	0.339	0.358	0.003	0.013	0.012	365.663	0.023
VIRGIN ISLANDS	All Vehicles	4.130	0.337	0.280	0.003	0.008	0.007	378.474	0.023
VIRGINIA	All Vehicles	3.735	0.333	0.348	0.003	0.011	0.010	377.082	0.023
WASHINGTON	All Vehicles	3.726	0.326	0.355	0.003	0.012	0.010	373.949	0.023
WEST VIRGINIA	All Vehicles	3.886	0.345	0.371	0.003	0.012	0.010	368.024	0.023
WISCONSIN	All Vehicles	3.888	0.352	0.362	0.003	0.013	0.012	372.046	0.023
WYOMING	All Vehicles	4.192	0.381	0.423	0.003	0.013	0.012	369.767	0.023

Table 5-16. 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							
		CO	VOC	NO_X	SO_2	PM_{10}	$PM_{2.5}$	CO_2e	NH_3
ALABAMA	All Vehicles	5.027	0.450	1.605	0.005	0.054	0.050	686.272	0.024
ALASKA	All Vehicles	5.178	0.518	1.909	0.005	0.062	0.057	677.897	0.025
ARIZONA	All Vehicles	5.171	0.448	1.794	0.005	0.055	0.051	707.333	0.024
ARKANSAS	All Vehicles	5.204	0.462	1.730	0.005	0.054	0.050	681.593	0.024
COLORADO	All Vehicles	4.921	0.449	1.737	0.005	0.057	0.052	680.019	0.024
CONNECTICUT	All Vehicles	4.651	0.387	1.494	0.005	0.055	0.051	674.782	0.024
DELAWARE	All Vehicles	4.502	0.375	1.391	0.005	0.054	0.049	672.325	0.024
DISTRICT OF COLUMBIA	All Vehicles	4.635	0.380	1.417	0.005	0.058	0.054	703.411	0.024
FLORIDA	All Vehicles	5.390	0.455	1.496	0.006	0.056	0.051	718.024	0.024
GEORGIA	All Vehicles	4.858	0.438	1.652	0.005	0.054	0.050	682.828	0.024
HAWAII	All Vehicles	5.209	0.411	1.349	0.005	0.053	0.048	692.581	0.024
IDAHO	All Vehicles	4.997	0.472	1.835	0.005	0.057	0.052	675.657	0.024
ILLINOIS	All Vehicles	4.968	0.429	1.493	0.005	0.058	0.053	692.610	0.024
INDIANA	All Vehicles	5.038	0.461	1.693	0.005	0.057	0.052	685.203	0.024
IOWA	All Vehicles	5.137	0.486	1.800	0.005	0.057	0.052	675.792	0.024
KANSAS	All Vehicles	5.143	0.458	1.682	0.005	0.055	0.050	676.587	0.024
KENTUCKY	All Vehicles	5.147	0.478	1.840	0.005	0.056	0.051	681.637	0.025
LOUISIANA	All Vehicles	5.188	0.455	1.615	0.005	0.054	0.050	694.956	0.024
MAINE	All Vehicles	4.773	0.480	1.823	0.005	0.057	0.052	662.911	0.024
MARYLAND	All Vehicles	4.695	0.408	1.570	0.005	0.055	0.050	678.059	0.024
MASSACHUSETTS	All Vehicles	4.718	0.423	1.605	0.005	0.056	0.051	673.996	0.024
MICHIGAN	All Vehicles	5.163	0.476	1.728	0.005	0.058	0.053	681.688	0.024
MINNESOTA	All Vehicles	5.116	0.468	1.635	0.005	0.058	0.053	669.167	0.024
MISSISSIPPI	All Vehicles	4.988	0.443	1.581	0.005	0.053	0.048	678.393	0.024
MISSOURI	All Vehicles	5.048	0.447	1.689	0.005	0.054	0.050	671.216	0.024
MONTANA	All Vehicles	5.140	0.502	1.956	0.005	0.058	0.053	670.494	0.024
NEBRASKA	All Vehicles	5.239	0.497	1.884	0.005	0.058	0.053	681.229	0.025
NEVADA	All Vehicles	4.918	0.446	1.773	0.005	0.057	0.052	701.372	0.024
NEW HAMPSHIRE	All Vehicles	4.590	0.431	1.634	0.005	0.056	0.051	667.154	0.024
NEW JERSEY	All Vehicles	4.679	0.451	1.936	0.005	0.057	0.052	681.870	0.025
NEW MEXICO	All Vehicles	5.016	0.474	1.893	0.005	0.056	0.051	681.208	0.024
NEW YORK	All Vehicles	4.453	0.393	1.542	0.005	0.056	0.052	677.059	0.024
NORTH CAROLINA	All Vehicles	4.909	0.434	1.554	0.005	0.054	0.049	677.749	0.024
NORTH DAKOTA	All Vehicles	5.224	0.515	1.856	0.005	0.059	0.054	667.483	0.024
OHIO	All Vehicles	4.892	0.437	1.606	0.005	0.057	0.052	681.812	0.024
OKLAHOMA	All Vehicles	5.202	0.457	1.672	0.005	0.055	0.050	685.710	0.024
OREGON	All Vehicles	4.743	0.436	1.722	0.005	0.055	0.050	668.137	0.024
PACIFIC ISLANDS	All Vehicles	4.849	0.433	1.653	0.005	0.055	0.051	681.483	0.024
PENNSYLVANIA	All Vehicles	4.754	0.442	1.704	0.005	0.057	0.052	683.692	0.024
PUERTO RICO	All Vehicles	5.801	0.435	1.335	0.006	0.054	0.050	721.472	0.024
RHODE ISLAND	All Vehicles	4.634	0.404	1.585	0.005	0.057	0.052	683.768	0.024
SOUTH CAROLINA	All Vehicles	5.126	0.471	1.739	0.005	0.055	0.051	690.638	0.024
SOUTH DAKOTA	All Vehicles	5.234	0.512	1.941	0.005	0.058	0.053	673.989	0.025
TENNESSEE	All Vehicles	4.984	0.453	1.700	0.005	0.056	0.051	687.092	0.024
TEXAS	All Vehicles	4.971	0.420	1.560	0.005	0.053	0.049	691.381	0.024
UTAH	All Vehicles	5.019	0.448	1.715	0.005	0.058	0.053	687.816	0.024
VERMONT	All Vehicles	4.619	0.471	1.820	0.005	0.057	0.052	665.413	0.024
VIRGIN ISLANDS	All Vehicles	5.310	0.392	1.192	0.005	0.048	0.044	681.640	0.023
VIRGINIA	All Vehicles	4.925	0.445	1.689	0.005	0.056	0.051	683.963	0.024
WASHINGTON	All Vehicles	4.896	0.443	1.737	0.005	0.057	0.052	676.984	0.024
WEST VIRGINIA	All Vehicles	5.011	0.469	1.774	0.005	0.055	0.051	671.115	0.024
WISCONSIN	All Vehicles	5.016	0.472	1.728	0.005	0.057	0.052	671.304	0.024
WYOMING	All Vehicles	5.297	0.525	2.067	0.005	0.059	0.054	678.895	0.025

Table 5-17. 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							
		CO	VOC	NO_X	SO_2	PM_{10}	$PM_{2.5}$	CO_2e	NH_3
ALABAMA	All Vehicles	4.652	0.401	1.439	0.005	0.048	0.044	672.593	0.023
ALASKA	All Vehicles	4.800	0.469	1.726	0.005	0.055	0.050	664.438	0.024
ARIZONA	All Vehicles	4.797	0.401	1.614	0.005	0.049	0.045	693.275	0.024
ARKANSAS	All Vehicles	4.827	0.415	1.559	0.005	0.048	0.044	668.030	0.024
COLORADO	All Vehicles	4.562	0.404	1.561	0.005	0.050	0.046	666.512	0.024
CONNECTICUT	All Vehicles	4.309	0.347	1.329	0.005	0.049	0.045	661.409	0.023
DELAWARE	All Vehicles	4.159	0.334	1.228	0.005	0.047	0.043	658.929	0.023
DISTRICT OF COLUMBIA	All Vehicles	4.295	0.339	1.253	0.005	0.051	0.047	689.503	0.023
FLORIDA	All Vehicles	4.988	0.404	1.335	0.005	0.049	0.045	703.763	0.024
GEORGIA	All Vehicles	4.499	0.393	1.486	0.005	0.048	0.044	669.237	0.023
HAWAII	All Vehicles	4.821	0.363	1.194	0.005	0.046	0.042	678.796	0.023
IDAHO	All Vehicles	4.623	0.424	1.653	0.005	0.050	0.046	662.206	0.024
ILLINOIS	All Vehicles	4.582	0.381	1.323	0.005	0.051	0.046	678.897	0.023
INDIANA	All Vehicles	4.657	0.413	1.520	0.005	0.050	0.046	671.565	0.024
IOWA	All Vehicles	4.761	0.438	1.624	0.005	0.050	0.046	662.340	0.024
KANSAS	All Vehicles	4.766	0.411	1.511	0.005	0.048	0.044	663.122	0.023
KENTUCKY	All Vehicles	4.768	0.430	1.665	0.005	0.049	0.045	668.086	0.024
LOUISIANA	All Vehicles	4.806	0.406	1.451	0.005	0.048	0.044	681.124	0.024
MAINE	All Vehicles	4.414	0.433	1.646	0.005	0.050	0.046	649.719	0.024
MARYLAND	All Vehicles	4.343	0.364	1.401	0.005	0.048	0.044	664.596	0.023
MASSACHUSETTS	All Vehicles	4.347	0.378	1.433	0.005	0.049	0.045	660.617	0.023
MICHIGAN	All Vehicles	4.772	0.427	1.552	0.005	0.051	0.047	668.140	0.024
MINNESOTA	All Vehicles	4.718	0.420	1.463	0.005	0.051	0.046	655.860	0.023
MISSISSIPPI	All Vehicles	4.617	0.395	1.417	0.005	0.046	0.043	664.861	0.023
MISSOURI	All Vehicles	4.676	0.401	1.519	0.005	0.048	0.044	657.884	0.023
MONTANA	All Vehicles	4.760	0.453	1.772	0.005	0.051	0.047	657.160	0.024
NEBRASKA	All Vehicles	4.859	0.449	1.705	0.005	0.051	0.046	667.689	0.024
NEVADA	All Vehicles	4.551	0.398	1.589	0.005	0.050	0.046	687.434	0.024
NEW HAMPSHIRE	All Vehicles	4.230	0.385	1.463	0.005	0.049	0.045	653.874	0.023
NEW JERSEY	All Vehicles	4.339	0.407	1.760	0.005	0.050	0.046	668.332	0.024
NEW MEXICO	All Vehicles	4.650	0.427	1.710	0.005	0.049	0.045	667.647	0.024
NEW YORK	All Vehicles	4.129	0.353	1.378	0.005	0.049	0.045	663.608	0.023
NORTH CAROLINA	All Vehicles	4.539	0.387	1.388	0.005	0.047	0.043	664.251	0.023
NORTH DAKOTA	All Vehicles	4.822	0.465	1.677	0.005	0.052	0.048	654.213	0.024
OHIO	All Vehicles	4.523	0.391	1.437	0.005	0.050	0.046	668.253	0.023
OKLAHOMA	All Vehicles	4.821	0.410	1.502	0.005	0.048	0.044	672.058	0.023
OREGON	All Vehicles	4.386	0.391	1.548	0.005	0.048	0.044	654.827	0.023
PACIFIC ISLANDS	All Vehicles	4.488	0.387	1.483	0.005	0.049	0.044	667.927	0.023
PENNSYLVANIA	All Vehicles	4.393	0.396	1.531	0.005	0.050	0.046	670.099	0.024
PUERTO RICO	All Vehicles	5.376	0.385	1.185	0.005	0.048	0.044	707.181	0.023
RHODE ISLAND	All Vehicles	4.303	0.363	1.418	0.005	0.050	0.046	670.207	0.023
SOUTH CAROLINA	All Vehicles	4.749	0.422	1.568	0.005	0.049	0.045	676.891	0.024
SOUTH DAKOTA	All Vehicles	4.836	0.462	1.760	0.005	0.052	0.047	660.606	0.024
TENNESSEE	All Vehicles	4.610	0.405	1.529	0.005	0.049	0.045	673.424	0.024
TEXAS	All Vehicles	4.606	0.375	1.397	0.005	0.047	0.043	677.638	0.023
UTAH	All Vehicles	4.644	0.401	1.537	0.005	0.051	0.046	674.167	0.023
VERMONT	All Vehicles	4.259	0.423	1.644	0.005	0.051	0.046	652.177	0.024
VIRGIN ISLANDS	All Vehicles	4.916	0.346	1.052	0.005	0.042	0.038	667.990	0.022
VIRGINIA	All Vehicles	4.562	0.399	1.518	0.005	0.049	0.045	670.364	0.024
WASHINGTON	All Vehicles	4.532	0.398	1.563	0.005	0.050	0.046	663.536	0.024
WEST VIRGINIA	All Vehicles	4.638	0.421	1.600	0.005	0.049	0.045	657.763	0.024
WISCONSIN	All Vehicles	4.627	0.423	1.554	0.005	0.050	0.046	657.953	0.023
WYOMING	All Vehicles	4.909	0.475	1.878	0.005	0.052	0.048	665.417	0.024

Table 5-18. 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							
		CO	VOC	NO_X	SO_2	PM_{10}	$PM_{2.5}$	CO_2e	NH_3
ALABAMA	All Vehicles	4.339	0.361	1.294	0.005	0.042	0.038	659.631	0.023
ALASKA	All Vehicles	4.481	0.428	1.565	0.005	0.048	0.044	651.694	0.023
ARIZONA	All Vehicles	4.484	0.361	1.456	0.005	0.043	0.039	679.955	0.023
ARKANSAS	All Vehicles	4.511	0.375	1.410	0.005	0.042	0.039	655.182	0.023
COLORADO	All Vehicles	4.260	0.366	1.406	0.005	0.044	0.041	653.717	0.023
CONNECTICUT	All Vehicles	4.020	0.313	1.185	0.005	0.043	0.039	648.738	0.023
DELAWARE	All Vehicles	3.871	0.299	1.086	0.005	0.041	0.038	646.233	0.022
DISTRICT OF COLUMBIA	All Vehicles	4.008	0.304	1.109	0.005	0.045	0.041	676.327	0.023
FLORIDA	All Vehicles	4.651	0.361	1.195	0.005	0.043	0.040	690.247	0.023
GEORGIA	All Vehicles	4.198	0.355	1.341	0.005	0.042	0.039	656.361	0.023
HAWAII	All Vehicles	4.499	0.324	1.059	0.005	0.041	0.037	665.729	0.022
IDAHO	All Vehicles	4.310	0.384	1.495	0.005	0.044	0.040	649.466	0.023
ILLINOIS	All Vehicles	4.257	0.341	1.175	0.005	0.044	0.041	665.904	0.023
INDIANA	All Vehicles	4.339	0.373	1.368	0.005	0.044	0.040	658.648	0.023
IOWA	All Vehicles	4.445	0.397	1.470	0.005	0.044	0.041	649.601	0.023
KANSAS	All Vehicles	4.450	0.371	1.361	0.005	0.043	0.039	650.366	0.023
KENTUCKY	All Vehicles	4.450	0.389	1.511	0.005	0.044	0.040	655.251	0.023
LOUISIANA	All Vehicles	4.486	0.365	1.307	0.005	0.042	0.039	668.017	0.023
MAINE	All Vehicles	4.112	0.393	1.491	0.005	0.044	0.040	637.225	0.023
MARYLAND	All Vehicles	4.046	0.328	1.254	0.005	0.042	0.039	651.839	0.023
MASSACHUSETTS	All Vehicles	4.034	0.339	1.283	0.005	0.043	0.040	647.942	0.023
MICHIGAN	All Vehicles	4.445	0.386	1.398	0.005	0.045	0.041	655.307	0.023
MINNESOTA	All Vehicles	4.386	0.379	1.313	0.005	0.045	0.041	643.253	0.023
MISSISSIPPI	All Vehicles	4.307	0.355	1.274	0.005	0.041	0.037	652.037	0.023
MISSOURI	All Vehicles	4.365	0.362	1.370	0.005	0.042	0.038	645.255	0.023
MONTANA	All Vehicles	4.442	0.412	1.610	0.005	0.045	0.041	644.534	0.023
NEBRASKA	All Vehicles	4.540	0.407	1.548	0.005	0.045	0.041	654.867	0.023
NEVADA	All Vehicles	4.245	0.358	1.428	0.005	0.044	0.040	674.230	0.023
NEW HAMPSHIRE	All Vehicles	3.927	0.347	1.313	0.005	0.043	0.040	641.294	0.023
NEW JERSEY	All Vehicles	4.052	0.370	1.605	0.005	0.044	0.041	655.513	0.024
NEW MEXICO	All Vehicles	4.342	0.387	1.549	0.005	0.043	0.040	654.805	0.023
NEW YORK	All Vehicles	3.855	0.319	1.233	0.005	0.044	0.040	650.864	0.023
NORTH CAROLINA	All Vehicles	4.229	0.347	1.242	0.005	0.042	0.038	651.461	0.023
NORTH DAKOTA	All Vehicles	4.485	0.422	1.520	0.005	0.046	0.042	641.644	0.023
OHIO	All Vehicles	4.212	0.353	1.289	0.005	0.044	0.040	655.408	0.023
OKLAHOMA	All Vehicles	4.502	0.369	1.353	0.005	0.042	0.039	659.123	0.023
OREGON	All Vehicles	4.086	0.353	1.395	0.005	0.043	0.039	642.221	0.023
PACIFIC ISLANDS	All Vehicles	4.186	0.349	1.335	0.005	0.043	0.039	655.085	0.023
PENNSYLVANIA	All Vehicles	4.089	0.357	1.380	0.005	0.044	0.041	657.225	0.023
PUERTO RICO	All Vehicles	5.022	0.343	1.053	0.005	0.042	0.038	693.629	0.023
RHODE ISLAND	All Vehicles	4.022	0.329	1.271	0.005	0.044	0.040	657.361	0.023
SOUTH CAROLINA	All Vehicles	4.433	0.380	1.419	0.005	0.043	0.039	663.868	0.023
SOUTH DAKOTA	All Vehicles	4.503	0.420	1.601	0.005	0.046	0.042	647.931	0.023
TENNESSEE	All Vehicles	4.297	0.365	1.380	0.005	0.043	0.040	660.477	0.023
TEXAS	All Vehicles	4.300	0.337	1.255	0.005	0.041	0.038	664.614	0.023
UTAH	All Vehicles	4.330	0.362	1.380	0.005	0.045	0.041	661.237	0.023
VERMONT	All Vehicles	3.956	0.383	1.490	0.005	0.045	0.041	639.644	0.023
VIRGIN ISLANDS	All Vehicles	4.588	0.308	0.930	0.005	0.037	0.033	655.037	0.022
VIRGINIA	All Vehicles	4.257	0.360	1.368	0.005	0.043	0.040	657.482	0.023
WASHINGTON	All Vehicles	4.227	0.360	1.410	0.005	0.044	0.040	650.799	0.023
WEST VIRGINIA	All Vehicles	4.326	0.381	1.448	0.005	0.043	0.039	645.117	0.023
WISCONSIN	All Vehicles	4.301	0.383	1.401	0.005	0.044	0.041	645.305	0.023
WYOMING	All Vehicles	4.584	0.433	1.713	0.005	0.046	0.042	652.656	0.023

Table 5-19. Air Force/State/Territory-Specific On-Road Vehicle Composite Emission Factors – 2021 GOV

State	Vehicle Type	Emission Factors (g/mi)							
		Criteria Pollutants and Ozone Precursors							
		CO	VOC	NO_X	SO_2	PM_{10}	$PM_{2.5}$	CO_2e	NH_3
ALABAMA	All Vehicles	4.041	0.325	1.169	0.005	0.037	0.034	646.705	0.022
ALASKA	All Vehicles	4.183	0.391	1.427	0.005	0.042	0.039	638.988	0.023
ARIZONA	All Vehicles	4.188	0.327	1.321	0.005	0.038	0.035	666.677	0.023
ARKANSAS	All Vehicles	4.210	0.339	1.282	0.005	0.037	0.034	642.381	0.023
COLORADO	All Vehicles	3.976	0.332	1.274	0.005	0.039	0.036	640.953	0.023
CONNECTICUT	All Vehicles	3.750	0.283	1.063	0.005	0.038	0.034	636.081	0.022
DELAWARE	All Vehicles	3.600	0.269	0.965	0.005	0.036	0.033	633.546	0.022
DISTRICT OF COLUMBIA	All Vehicles	3.735	0.274	0.987	0.005	0.039	0.036	663.157	0.022
FLORIDA	All Vehicles	4.332	0.323	1.075	0.005	0.038	0.035	676.761	0.023
GEORGIA	All Vehicles	3.911	0.321	1.216	0.005	0.037	0.034	643.525	0.023
HAWAII	All Vehicles	4.192	0.289	0.942	0.005	0.036	0.033	652.679	0.022
IDAHO	All Vehicles	4.016	0.348	1.359	0.005	0.039	0.036	636.766	0.023
ILLINOIS	All Vehicles	3.958	0.307	1.049	0.005	0.039	0.036	652.922	0.022
INDIANA	All Vehicles	4.039	0.337	1.238	0.005	0.039	0.036	645.760	0.023
IOWA	All Vehicles	4.148	0.361	1.338	0.005	0.039	0.036	636.903	0.023
KANSAS	All Vehicles	4.151	0.336	1.232	0.005	0.038	0.034	637.645	0.022
KENTUCKY	All Vehicles	4.150	0.353	1.379	0.005	0.038	0.035	642.468	0.023
LOUISIANA	All Vehicles	4.182	0.329	1.184	0.005	0.037	0.034	654.952	0.023
MAINE	All Vehicles	3.830	0.357	1.358	0.005	0.039	0.036	624.776	0.023
MARYLAND	All Vehicles	3.769	0.296	1.128	0.005	0.037	0.034	639.107	0.022
MASSACHUSETTS	All Vehicles	3.749	0.306	1.156	0.005	0.038	0.035	635.290	0.022
MICHIGAN	All Vehicles	4.137	0.349	1.266	0.005	0.040	0.036	642.505	0.023
MINNESOTA	All Vehicles	4.076	0.343	1.184	0.005	0.039	0.036	630.668	0.022
MISSISSIPPI	All Vehicles	4.012	0.320	1.151	0.005	0.036	0.033	639.252	0.022
MISSOURI	All Vehicles	4.071	0.328	1.242	0.005	0.037	0.034	632.664	0.022
MONTANA	All Vehicles	4.143	0.375	1.472	0.005	0.040	0.036	631.959	0.023
NEBRASKA	All Vehicles	4.238	0.370	1.414	0.005	0.040	0.036	642.094	0.023
NEVADA	All Vehicles	3.958	0.324	1.291	0.005	0.039	0.036	661.059	0.023
NEW HAMPSHIRE	All Vehicles	3.650	0.314	1.186	0.005	0.038	0.035	628.741	0.022
NEW JERSEY	All Vehicles	3.781	0.338	1.473	0.005	0.039	0.036	642.755	0.023
NEW MEXICO	All Vehicles	4.052	0.350	1.412	0.005	0.038	0.035	642.010	0.023
NEW YORK	All Vehicles	3.599	0.290	1.110	0.005	0.038	0.035	638.140	0.022
NORTH CAROLINA	All Vehicles	3.937	0.312	1.117	0.005	0.037	0.034	638.697	0.022
NORTH DAKOTA	All Vehicles	4.171	0.384	1.386	0.005	0.041	0.037	629.119	0.023
OHIO	All Vehicles	3.922	0.319	1.162	0.005	0.039	0.035	642.587	0.022
OKLAHOMA	All Vehicles	4.199	0.333	1.225	0.005	0.037	0.034	646.226	0.022
OREGON	All Vehicles	3.806	0.320	1.265	0.005	0.038	0.034	629.649	0.022
PACIFIC ISLANDS	All Vehicles	3.902	0.316	1.207	0.005	0.038	0.035	642.275	0.022
PENNSYLVANIA	All Vehicles	3.808	0.323	1.250	0.005	0.039	0.036	644.383	0.023
PUERTO RICO	All Vehicles	4.684	0.306	0.940	0.005	0.037	0.034	680.100	0.022
RHODE ISLAND	All Vehicles	3.754	0.299	1.146	0.005	0.039	0.036	644.535	0.022
SOUTH CAROLINA	All Vehicles	4.133	0.343	1.290	0.005	0.038	0.035	650.892	0.023
SOUTH DAKOTA	All Vehicles	4.190	0.382	1.465	0.005	0.040	0.037	635.311	0.023
TENNESSEE	All Vehicles	4.003	0.330	1.251	0.005	0.038	0.035	647.568	0.023
TEXAS	All Vehicles	4.010	0.303	1.134	0.005	0.037	0.033	651.625	0.022
UTAH	All Vehicles	4.036	0.328	1.246	0.005	0.039	0.036	648.333	0.023
VERMONT	All Vehicles	3.679	0.348	1.358	0.005	0.040	0.036	627.155	0.023
VIRGIN ISLANDS	All Vehicles	4.274	0.274	0.825	0.005	0.032	0.029	642.112	0.022
VIRGINIA	All Vehicles	3.969	0.326	1.240	0.005	0.038	0.035	644.635	0.023
WASHINGTON	All Vehicles	3.939	0.326	1.279	0.005	0.039	0.035	638.096	0.023
WEST VIRGINIA	All Vehicles	4.030	0.345	1.318	0.005	0.038	0.035	632.516	0.023
WISCONSIN	All Vehicles	3.999	0.347	1.270	0.005	0.039	0.036	632.691	0.022
WYOMING	All Vehicles	4.278	0.395	1.571	0.005	0.041	0.037	639.953	0.023

Table 5-20. Air Force/State/Territory-Specific On-Road Vehicle Composite Emission Factors – 2022 GOV

State	Vehicle Type	Emission Factors (g/mi)							
		Criteria Pollutants and Ozone Precursors							
		CO	VOC	NO_X	SO_2	PM_{10}	$PM_{2.5}$	CO_2e	NH_3
ALABAMA	All Vehicles	3.784	0.295	1.062	0.005	0.033	0.030	634.244	0.022
ALASKA	All Vehicles	3.921	0.360	1.309	0.005	0.038	0.035	626.747	0.022
ARIZONA	All Vehicles	3.927	0.297	1.204	0.005	0.034	0.031	653.880	0.022
ARKANSAS	All Vehicles	3.947	0.309	1.172	0.005	0.033	0.030	630.047	0.022
COLORADO	All Vehicles	3.726	0.304	1.160	0.005	0.035	0.032	628.647	0.022
CONNECTICUT	All Vehicles	3.514	0.259	0.957	0.005	0.033	0.031	623.867	0.022
DELAWARE	All Vehicles	3.364	0.243	0.860	0.005	0.032	0.029	621.297	0.022
DISTRICT OF COLUMBIA	All Vehicles	3.494	0.249	0.882	0.005	0.035	0.032	650.442	0.022
FLORIDA	All Vehicles	4.055	0.292	0.972	0.005	0.034	0.031	663.753	0.022
GEORGIA	All Vehicles	3.664	0.292	1.108	0.005	0.033	0.030	631.154	0.022
HAWAII	All Vehicles	3.924	0.259	0.843	0.005	0.032	0.029	640.084	0.022
IDAHO	All Vehicles	3.759	0.319	1.242	0.005	0.035	0.032	624.528	0.022
ILLINOIS	All Vehicles	3.697	0.278	0.941	0.005	0.035	0.032	640.390	0.022
INDIANA	All Vehicles	3.780	0.307	1.126	0.005	0.035	0.032	633.336	0.022
IOWA	All Vehicles	3.887	0.330	1.225	0.005	0.035	0.032	624.670	0.022
KANSAS	All Vehicles	3.889	0.306	1.121	0.005	0.033	0.031	625.383	0.022
KENTUCKY	All Vehicles	3.889	0.323	1.266	0.005	0.034	0.031	630.158	0.022
LOUISIANA	All Vehicles	3.918	0.299	1.078	0.005	0.033	0.030	642.359	0.022
MAINE	All Vehicles	3.585	0.327	1.244	0.005	0.035	0.032	612.784	0.022
MARYLAND	All Vehicles	3.528	0.270	1.020	0.005	0.033	0.030	626.826	0.022
MASSACHUSETTS	All Vehicles	3.501	0.279	1.046	0.005	0.034	0.031	623.087	0.022
MICHIGAN	All Vehicles	3.871	0.318	1.153	0.005	0.035	0.032	630.163	0.022
MINNESOTA	All Vehicles	3.808	0.313	1.073	0.005	0.035	0.032	618.532	0.022
MISSISSIPPI	All Vehicles	3.757	0.290	1.045	0.005	0.032	0.029	626.927	0.022
MISSOURI	All Vehicles	3.813	0.299	1.133	0.005	0.033	0.030	620.531	0.022
MONTANA	All Vehicles	3.881	0.344	1.352	0.005	0.035	0.032	619.851	0.022
NEBRASKA	All Vehicles	3.974	0.339	1.298	0.005	0.035	0.032	629.793	0.022
NEVADA	All Vehicles	3.708	0.294	1.173	0.005	0.034	0.032	648.360	0.022
NEW HAMPSHIRE	All Vehicles	3.410	0.286	1.076	0.005	0.034	0.031	616.637	0.022
NEW JERSEY	All Vehicles	3.545	0.311	1.359	0.005	0.035	0.032	630.476	0.023
NEW MEXICO	All Vehicles	3.798	0.320	1.293	0.005	0.034	0.031	629.686	0.022
NEW YORK	All Vehicles	3.374	0.265	1.003	0.005	0.034	0.031	625.865	0.022
NORTH CAROLINA	All Vehicles	3.683	0.283	1.010	0.005	0.033	0.030	626.387	0.022
NORTH DAKOTA	All Vehicles	3.899	0.352	1.270	0.005	0.036	0.033	617.056	0.022
OHIO	All Vehicles	3.669	0.290	1.053	0.005	0.034	0.031	630.222	0.022
OKLAHOMA	All Vehicles	3.934	0.303	1.115	0.005	0.033	0.030	633.794	0.022
OREGON	All Vehicles	3.561	0.291	1.152	0.005	0.034	0.031	617.533	0.022
PACIFIC ISLANDS	All Vehicles	3.654	0.287	1.097	0.005	0.034	0.031	629.922	0.022
PENNSYLVANIA	All Vehicles	3.563	0.295	1.139	0.005	0.035	0.032	632.003	0.022
PUERTO RICO	All Vehicles	4.389	0.275	0.843	0.005	0.033	0.030	667.043	0.022
RHODE ISLAND	All Vehicles	3.520	0.274	1.038	0.005	0.035	0.032	632.163	0.022
SOUTH CAROLINA	All Vehicles	3.872	0.313	1.180	0.005	0.034	0.031	638.390	0.022
SOUTH DAKOTA	All Vehicles	3.919	0.350	1.347	0.005	0.036	0.033	623.161	0.022
TENNESSEE	All Vehicles	3.747	0.300	1.141	0.005	0.034	0.031	635.127	0.022
TEXAS	All Vehicles	3.757	0.276	1.029	0.005	0.032	0.030	639.102	0.022
UTAH	All Vehicles	3.777	0.299	1.131	0.005	0.035	0.032	635.889	0.022
VERMONT	All Vehicles	3.438	0.319	1.245	0.005	0.035	0.032	615.128	0.022
VIRGIN ISLANDS	All Vehicles	4.000	0.246	0.735	0.005	0.028	0.026	629.641	0.021
VIRGINIA	All Vehicles	3.719	0.297	1.130	0.005	0.034	0.031	632.252	0.022
WASHINGTON	All Vehicles	3.686	0.298	1.166	0.005	0.035	0.032	625.850	0.022
WEST VIRGINIA	All Vehicles	3.774	0.315	1.205	0.005	0.034	0.031	620.376	0.022
WISCONSIN	All Vehicles	3.736	0.317	1.158	0.005	0.035	0.032	620.534	0.022
WYOMING	All Vehicles	4.010	0.363	1.449	0.005	0.037	0.033	627.727	0.023

Table 5-21. On-Road Vehicle Emission Factors – 2018

State	Fuel Type	Vehicle Type		Emission Factors (g/mi)							
				Criteria Pollutants and Ozone Precursors							
				CO	VOC	NO_X	SO_2	PM_{10}	$PM_{2.5}$	CO_2e	NH_3
Alabama	Gasoline	LDGV	Light-Duty Vehicles (Passenger Cars)	3.761	0.356	0.300	0.002	0.007	0.007	343.542	0.025
	Gasoline	LDGT	Light-Duty Trucks (0-8,500 lbs)	5.577	0.463	0.518	0.003	0.009	0.008	442.881	0.026
	Gasoline	HDGV	Heavy-Duty Vehicles (8,501 + lbs)	17.368	0.875	1.265	0.005	0.020	0.018	773.279	0.045
	Diesel	LDDV	Light-Duty Vehicles (Passenger Cars)	2.566	0.107	0.148	0.003	0.004	0.004	336.997	0.008
	Diesel	LDDT	Light-Duty Trucks (0-8,500 lbs)	5.042	0.297	0.479	0.004	0.007	0.006	489.536	0.008
	Diesel	HDDV	Heavy-Duty Vehicles (8,501 + lbs)	1.961	0.503	5.574	0.013	0.220	0.202	1524.615	0.028
	NA	MC	Motorcycles	13.453	2.733	0.707	0.003	0.026	0.023	393.105	0.053
Alaska	Gasoline	LDGV	Light-Duty Vehicles (Passenger Cars)	4.414	0.436	0.329	0.002	0.016	0.014	340.419	0.025
	Gasoline	LDGT	Light-Duty Trucks (0-8,500 lbs)	5.819	0.508	0.552	0.003	0.019	0.017	438.511	0.026
	Gasoline	HDGV	Heavy-Duty Vehicles (8,501 + lbs)	17.994	0.813	1.394	0.005	0.043	0.038	758.236	0.044
	Diesel	LDDV	Light-Duty Vehicles (Passenger Cars)	2.275	0.168	0.152	0.003	0.004	0.004	327.193	0.008
	Diesel	LDDT	Light-Duty Trucks (0-8,500 lbs)	4.492	0.362	0.495	0.004	0.007	0.007	475.804	0.008
	Diesel	HDDV	Heavy-Duty Vehicles (8,501 + lbs)	2.206	0.649	6.862	0.013	0.224	0.206	1510.982	0.030
	NA	MC	Motorcycles	14.396	1.991	0.869	0.003	0.030	0.027	401.022	0.053
Arizona	Gasoline	LDGV	Light-Duty Vehicles (Passenger Cars)	3.704	0.339	0.291	0.002	0.007	0.006	350.632	0.025
	Gasoline	LDGT	Light-Duty Trucks (0-8,500 lbs)	5.455	0.431	0.509	0.003	0.008	0.007	453.530	0.026
	Gasoline	HDGV	Heavy-Duty Vehicles (8,501 + lbs)	19.259	0.923	1.395	0.005	0.020	0.018	801.677	0.045
	Diesel	LDDV	Light-Duty Vehicles (Passenger Cars)	2.779	0.098	0.160	0.003	0.004	0.004	345.089	0.008
	Diesel	LDDT	Light-Duty Trucks (0-8,500 lbs)	5.508	0.297	0.525	0.004	0.007	0.007	502.007	0.008
	Diesel	HDDV	Heavy-Duty Vehicles (8,501 + lbs)	2.114	0.562	6.409	0.013	0.227	0.209	1580.256	0.029
	NA	MC	Motorcycles	13.018	3.147	0.805	0.002	0.025	0.022	393.653	0.052
Arkansas	Gasoline	LDGV	Light-Duty Vehicles (Passenger Cars)	3.976	0.358	0.312	0.002	0.008	0.007	336.157	0.025
	Gasoline	LDGT	Light-Duty Trucks (0-8,500 lbs)	5.811	0.457	0.537	0.003	0.010	0.009	435.067	0.026
	Gasoline	HDGV	Heavy-Duty Vehicles (8,501 + lbs)	17.685	0.827	1.285	0.005	0.022	0.020	765.075	0.044
	Diesel	LDDV	Light-Duty Vehicles (Passenger Cars)	2.591	0.114	0.152	0.003	0.004	0.004	329.239	0.008
	Diesel	LDDT	Light-Duty Trucks (0-8,500 lbs)	5.074	0.302	0.490	0.004	0.007	0.007	479.677	0.008
	Diesel	HDDV	Heavy-Duty Vehicles (8,501 + lbs)	2.104	0.580	6.095	0.013	0.218	0.201	1532.714	0.029
	NA	MC	Motorcycles	13.559	2.560	0.746	0.003	0.026	0.023	394.966	0.054
Colorado	Gasoline	LDGV	Light-Duty Vehicles (Passenger Cars)	3.767	0.358	0.302	0.002	0.011	0.010	341.039	0.025
	Gasoline	LDGT	Light-Duty Trucks (0-8,500 lbs)	5.313	0.439	0.520	0.003	0.013	0.012	441.198	0.026
	Gasoline	HDGV	Heavy-Duty Vehicles (8,501 + lbs)	18.475	0.850	1.404	0.005	0.031	0.027	770.392	0.045
	Diesel	LDDV	Light-Duty Vehicles (Passenger Cars)	2.422	0.131	0.153	0.003	0.004	0.004	331.662	0.008
	Diesel	LDDT	Light-Duty Trucks (0-8,500 lbs)	4.809	0.330	0.502	0.004	0.007	0.007	483.193	0.008
	Diesel	HDDV	Heavy-Duty Vehicles (8,501 + lbs)	1.977	0.526	6.134	0.013	0.221	0.203	1506.027	0.028
	NA	MC	Motorcycles	13.956	2.620	0.838	0.003	0.029	0.026	397.815	0.053
Connecticut	Gasoline	LDGV	Light-Duty Vehicles (Passenger Cars)	3.391	0.308	0.261	0.002	0.010	0.009	340.773	0.025
	Gasoline	LDGT	Light-Duty Trucks (0-8,500 lbs)	4.876	0.381	0.461	0.003	0.013	0.011	442.622	0.026
	Gasoline	HDGV	Heavy-Duty Vehicles (8,501 + lbs)	18.531	0.837	1.370	0.005	0.031	0.027	776.429	0.045
	Diesel	LDDV	Light-Duty Vehicles (Passenger Cars)	2.468	0.126	0.150	0.003	0.004	0.004	331.947	0.008
	Diesel	LDDT	Light-Duty Trucks (0-8,500 lbs)	4.940	0.331	0.495	0.004	0.008	0.007	484.904	0.008
	Diesel	HDDV	Heavy-Duty Vehicles (8,501 + lbs)	1.682	0.387	5.155	0.013	0.214	0.197	1475.907	0.026
	NA	MC	Motorcycles	13.212	2.297	0.779	0.003	0.028	0.025	398.605	0.053
Delaware	Gasoline	LDGV	Light-Duty Vehicles (Passenger Cars)	3.323	0.315	0.282	0.002	0.009	0.008	345.240	0.025
	Gasoline	LDGT	Light-Duty Trucks (0-8,500 lbs)	4.731	0.392	0.486	0.003	0.010	0.009	444.368	0.026
	Gasoline	HDGV	Heavy-Duty Vehicles (8,501 + lbs)	18.277	0.842	1.332	0.005	0.021	0.019	767.309	0.046
	Diesel	LDDV	Light-Duty Vehicles (Passenger Cars)	2.393	0.119	0.146	0.003	0.004	0.004	337.077	0.008
	Diesel	LDDT	Light-Duty Trucks (0-8,500 lbs)	4.725	0.312	0.474	0.004	0.007	0.006	489.534	0.008
	Diesel	HDDV	Heavy-Duty Vehicles (8,501 + lbs)	1.560	0.322	4.639	0.012	0.214	0.197	1457.011	0.025
	NA	MC	Motorcycles	13.050	2.313	0.752	0.003	0.025	0.023	393.789	0.052
District of Columbia	Gasoline	LDGV	Light-Duty Vehicles (Passenger Cars)	3.309	0.300	0.257	0.002	0.009	0.008	359.663	0.025
	Gasoline	LDGT	Light-Duty Trucks (0-8,500 lbs)	4.731	0.376	0.446	0.003	0.011	0.009	464.521	0.027
	Gasoline	HDGV	Heavy-Duty Vehicles (8,501 + lbs)	19.568	0.926	1.381	0.005	0.023	0.021	809.207	0.047
	Diesel	LDDV	Light-Duty Vehicles (Passenger Cars)	2.469	0.114	0.144	0.003	0.004	0.004	351.487	0.008
	Diesel	LDDT	Light-Duty Trucks (0-8,500 lbs)	4.967	0.322	0.475	0.004	0.007	0.007	511.813	0.008
	Diesel	HDDV	Heavy-Duty Vehicles (8,501 + lbs)	1.699	0.358	4.846	0.013	0.235	0.216	1524.744	0.026
	NA	MC	Motorcycles	13.053	2.540	0.717	0.003	0.026	0.023	394.294	0.050

Table 5-21. On-Road Vehicle Emission Factors – 2018 (cont.)

State	Fuel Type	Vehicle Type		Emission Factors (g/mi)							
				Criteria Pollutants and Ozone Precursors							
				CO	VOC	NO_X	SO_2	PM_{10}	$PM_{2.5}$	CO_2e	NH_3
Florida	Gasoline	LDGV	Light-Duty Vehicles (Passenger Cars)	3.941	0.350	0.283	0.002	0.006	0.006	360.949	0.025
	Gasoline	LDGT	Light-Duty Trucks (0-8,500 lbs)	5.995	0.483	0.499	0.003	0.008	0.007	465.353	0.026
	Gasoline	HDGV	Heavy-Duty Vehicles (8,501 + lbs)	18.735	0.988	1.242	0.005	0.018	0.016	817.793	0.046
	Diesel	LDDV	Light-Duty Vehicles (Passenger Cars)	2.800	0.089	0.144	0.003	0.004	0.004	355.723	0.008
	Diesel	LDDT	Light-Duty Trucks (0-8,500 lbs)	5.560	0.289	0.472	0.004	0.007	0.007	516.462	0.008
	Diesel	HDDV	Heavy-Duty Vehicles (8,501 + lbs)	1.953	0.467	5.122	0.013	0.231	0.213	1584.765	0.028
	NA	MC	Motorcycles	13.328	3.088	0.626	0.003	0.026	0.023	391.564	0.051
Georgia	Gasoline	LDGV	Light-Duty Vehicles (Passenger Cars)	3.532	0.332	0.284	0.002	0.008	0.007	338.676	0.025
	Gasoline	LDGT	Light-Duty Trucks (0-8,500 lbs)	5.237	0.428	0.492	0.003	0.010	0.008	438.065	0.026
	Gasoline	HDGV	Heavy-Duty Vehicles (8,501 + lbs)	17.097	0.847	1.270	0.005	0.022	0.020	769.432	0.045
	Diesel	LDDV	Light-Duty Vehicles (Passenger Cars)	2.584	0.109	0.151	0.003	0.004	0.004	332.026	0.008
	Diesel	LDDT	Light-Duty Trucks (0-8,500 lbs)	5.077	0.300	0.487	0.004	0.007	0.007	483.434	0.008
	Diesel	HDDV	Heavy-Duty Vehicles (8,501 + lbs)	2.028	0.540	5.846	0.013	0.218	0.201	1526.882	0.029
	NA	MC	Motorcycles	13.404	2.616	0.724	0.003	0.027	0.024	394.506	0.053
Hawaii	Gasoline	LDGV	Light-Duty Vehicles (Passenger Cars)	3.849	0.338	0.284	0.002	0.006	0.005	350.877	0.025
	Gasoline	LDGT	Light-Duty Trucks (0-8,500 lbs)	5.822	0.461	0.499	0.003	0.007	0.006	452.707	0.026
	Gasoline	HDGV	Heavy-Duty Vehicles (8,501 + lbs)	19.086	0.948	1.248	0.005	0.016	0.014	792.555	0.046
	Diesel	LDDV	Light-Duty Vehicles (Passenger Cars)	2.686	0.084	0.144	0.003	0.004	0.004	346.102	0.008
	Diesel	LDDT	Light-Duty Trucks (0-8,500 lbs)	5.307	0.277	0.468	0.004	0.007	0.007	502.895	0.008
	Diesel	HDDV	Heavy-Duty Vehicles (8,501 + lbs)	1.645	0.332	4.441	0.013	0.218	0.200	1514.455	0.026
	NA	MC	Motorcycles	13.365	2.841	0.677	0.003	0.025	0.022	391.070	0.052
Idaho	Gasoline	LDGV	Light-Duty Vehicles (Passenger Cars)	3.940	0.378	0.323	0.002	0.011	0.010	337.700	0.025
	Gasoline	LDGT	Light-Duty Trucks (0-8,500 lbs)	5.514	0.461	0.549	0.003	0.013	0.011	435.344	0.026
	Gasoline	HDGV	Heavy-Duty Vehicles (8,501 + lbs)	17.886	0.816	1.386	0.005	0.028	0.025	756.195	0.044
	Diesel	LDDV	Light-Duty Vehicles (Passenger Cars)	2.362	0.137	0.154	0.003	0.004	0.004	327.986	0.008
	Diesel	LDDT	Light-Duty Trucks (0-8,500 lbs)	4.639	0.326	0.498	0.004	0.007	0.006	476.968	0.008
	Diesel	HDDV	Heavy-Duty Vehicles (8,501 + lbs)	2.102	0.589	6.525	0.013	0.221	0.203	1508.003	0.029
	NA	MC	Motorcycles	13.997	2.416	0.858	0.003	0.028	0.024	396.707	0.053
Illinois	Gasoline	LDGV	Light-Duty Vehicles (Passenger Cars)	3.718	0.342	0.286	0.002	0.010	0.009	353.180	0.025
	Gasoline	LDGT	Light-Duty Trucks (0-8,500 lbs)	5.437	0.458	0.503	0.003	0.012	0.011	456.882	0.027
	Gasoline	HDGV	Heavy-Duty Vehicles (8,501 + lbs)	19.128	0.901	1.356	0.005	0.028	0.025	796.217	0.046
	Diesel	LDDV	Light-Duty Vehicles (Passenger Cars)	2.445	0.125	0.146	0.003	0.004	0.004	344.010	0.008
	Diesel	LDDT	Light-Duty Trucks (0-8,500 lbs)	4.913	0.332	0.482	0.004	0.007	0.007	501.367	0.008
	Diesel	HDDV	Heavy-Duty Vehicles (8,501 + lbs)	1.719	0.387	5.065	0.013	0.227	0.209	1505.085	0.026
	NA	MC	Motorcycles	13.172	2.475	0.737	0.003	0.027	0.023	396.683	0.051
Indiana	Gasoline	LDGV	Light-Duty Vehicles (Passenger Cars)	3.898	0.362	0.306	0.002	0.010	0.009	345.441	0.025
	Gasoline	LDGT	Light-Duty Trucks (0-8,500 lbs)	5.586	0.464	0.524	0.003	0.012	0.011	444.933	0.026
	Gasoline	HDGV	Heavy-Duty Vehicles (8,501 + lbs)	18.126	0.858	1.328	0.005	0.026	0.023	772.526	0.045
	Diesel	LDDV	Light-Duty Vehicles (Passenger Cars)	2.403	0.128	0.148	0.003	0.004	0.004	336.387	0.008
	Diesel	LDDT	Light-Duty Trucks (0-8,500 lbs)	4.756	0.323	0.481	0.004	0.007	0.007	488.631	0.008
	Diesel	HDDV	Heavy-Duty Vehicles (8,501 + lbs)	2.008	0.532	5.927	0.013	0.225	0.207	1515.326	0.028
	NA	MC	Motorcycles	13.738	2.435	0.763	0.003	0.027	0.024	395.725	0.052
Iowa	Gasoline	LDGV	Light-Duty Vehicles (Passenger Cars)	4.168	0.397	0.326	0.002	0.011	0.010	336.913	0.025
	Gasoline	LDGT	Light-Duty Trucks (0-8,500 lbs)	5.779	0.483	0.550	0.003	0.013	0.012	434.339	0.026
	Gasoline	HDGV	Heavy-Duty Vehicles (8,501 + lbs)	17.599	0.805	1.326	0.005	0.029	0.026	754.847	0.044
	Diesel	LDDV	Light-Duty Vehicles (Passenger Cars)	2.388	0.138	0.151	0.003	0.004	0.004	327.052	0.008
	Diesel	LDDT	Light-Duty Trucks (0-8,500 lbs)	4.678	0.325	0.487	0.004	0.007	0.006	475.704	0.008
	Diesel	HDDV	Heavy-Duty Vehicles (8,501 + lbs)	2.132	0.603	6.383	0.013	0.220	0.202	1512.474	0.029
	NA	MC	Motorcycles	13.895	2.274	0.799	0.003	0.027	0.024	396.836	0.053
Kansas	Gasoline	LDGV	Light-Duty Vehicles (Passenger Cars)	4.029	0.371	0.318	0.002	0.009	0.008	337.990	0.025
	Gasoline	LDGT	Light-Duty Trucks (0-8,500 lbs)	5.780	0.469	0.546	0.003	0.011	0.010	436.718	0.026
	Gasoline	HDGV	Heavy-Duty Vehicles (8,501 + lbs)	17.887	0.827	1.323	0.005	0.026	0.023	762.571	0.045
	Diesel	LDDV	Light-Duty Vehicles (Passenger Cars)	2.494	0.124	0.151	0.003	0.004	0.004	329.750	0.008
	Diesel	LDDT	Light-Duty Trucks (0-8,500 lbs)	4.897	0.314	0.490	0.004	0.007	0.007	480.064	0.008
	Diesel	HDDV	Heavy-Duty Vehicles (8,501 + lbs)	1.962	0.519	5.844	0.013	0.216	0.199	1505.286	0.028
	NA	MC	Motorcycles	13.671	2.459	0.776	0.003	0.027	0.024	395.767	0.053

Table 5-21. On-Road Vehicle Emission Factors – 2018 (cont.)

State	Fuel Type	Vehicle Type		Emission Factors (g/mi)							
				Criteria Pollutants and Ozone Precursors							
				CO	VOC	NO_X	SO_2	PM_{10}	$PM_{2.5}$	CO_2e	NH_3
Kentucky	Gasoline	LDGV	Light-Duty Vehicles (Passenger Cars)	3.935	0.358	0.312	0.002	0.009	0.008	334.769	0.025
	Gasoline	LDGT	Light-Duty Trucks (0-8,500 lbs)	5.725	0.458	0.538	0.003	0.011	0.009	433.389	0.026
	Gasoline	HDGV	Heavy-Duty Vehicles (8,501 + lbs)	17.272	0.803	1.285	0.005	0.026	0.023	762.511	0.044
	Diesel	LDDV	Light-Duty Vehicles (Passenger Cars)	2.515	0.122	0.153	0.003	0.004	0.004	326.857	0.008
	Diesel	LDDT	Light-Duty Trucks (0-8,500 lbs)	4.937	0.313	0.494	0.004	0.007	0.007	476.356	0.008
	Diesel	HDDV	Heavy-Duty Vehicles (8,501 + lbs)	2.245	0.649	6.602	0.013	0.222	0.204	1540.430	0.030
	NA	MC	Motorcycles	13.414	2.408	0.763	0.003	0.027	0.024	396.518	0.054
Louisiana	Gasoline	LDGV	Light-Duty Vehicles (Passenger Cars)	3.828	0.349	0.292	0.002	0.007	0.006	344.906	0.025
	Gasoline	LDGT	Light-Duty Trucks (0-8,500 lbs)	5.741	0.461	0.508	0.003	0.009	0.008	445.662	0.026
	Gasoline	HDGV	Heavy-Duty Vehicles (8,501 + lbs)	17.556	0.892	1.239	0.005	0.020	0.018	784.514	0.045
	Diesel	LDDV	Light-Duty Vehicles (Passenger Cars)	2.721	0.101	0.149	0.003	0.004	0.004	339.151	0.008
	Diesel	LDDT	Light-Duty Trucks (0-8,500 lbs)	5.352	0.293	0.483	0.004	0.007	0.007	493.175	0.008
	Diesel	HDDV	Heavy-Duty Vehicles (8,501 + lbs)	2.040	0.536	5.646	0.013	0.221	0.203	1553.028	0.029
	NA	MC	Motorcycles	13.394	2.824	0.677	0.003	0.027	0.024	393.360	0.053
Maine	Gasoline	LDGV	Light-Duty Vehicles (Passenger Cars)	3.849	0.397	0.320	0.002	0.012	0.011	329.110	0.025
	Gasoline	LDGT	Light-Duty Trucks (0-8,500 lbs)	5.276	0.470	0.535	0.003	0.015	0.013	424.934	0.026
	Gasoline	HDGV	Heavy-Duty Vehicles (8,501 + lbs)	16.222	0.769	1.313	0.005	0.031	0.028	737.136	0.044
	Diesel	LDDV	Light-Duty Vehicles (Passenger Cars)	2.293	0.148	0.153	0.003	0.004	0.004	318.528	0.008
	Diesel	LDDT	Light-Duty Trucks (0-8,500 lbs)	4.462	0.328	0.489	0.004	0.007	0.006	464.403	0.008
	Diesel	HDDV	Heavy-Duty Vehicles (8,501 + lbs)	2.123	0.609	6.523	0.013	0.216	0.198	1489.257	0.029
	NA	MC	Motorcycles	13.795	2.078	0.829	0.003	0.029	0.025	397.481	0.054
Maryland	Gasoline	LDGV	Light-Duty Vehicles (Passenger Cars)	3.416	0.316	0.281	0.002	0.009	0.008	340.221	0.025
	Gasoline	LDGT	Light-Duty Trucks (0-8,500 lbs)	4.954	0.404	0.492	0.003	0.011	0.010	441.045	0.026
	Gasoline	HDGV	Heavy-Duty Vehicles (8,501 + lbs)	17.837	0.834	1.333	0.005	0.027	0.024	773.864	0.045
	Diesel	LDDV	Light-Duty Vehicles (Passenger Cars)	2.521	0.119	0.150	0.003	0.004	0.004	332.275	0.008
	Diesel	LDDT	Light-Duty Trucks (0-8,500 lbs)	5.006	0.319	0.494	0.004	0.007	0.007	484.639	0.008
	Diesel	HDDV	Heavy-Duty Vehicles (8,501 + lbs)	1.814	0.445	5.447	0.013	0.215	0.198	1495.601	0.027
	NA	MC	Motorcycles	13.101	2.370	0.759	0.003	0.028	0.024	396.893	0.053
Massachusetts	Gasoline	LDGV	Light-Duty Vehicles (Passenger Cars)	3.486	0.331	0.283	0.002	0.010	0.009	339.225	0.025
	Gasoline	LDGT	Light-Duty Trucks (0-8,500 lbs)	5.027	0.424	0.495	0.003	0.013	0.011	439.556	0.026
	Gasoline	HDGV	Heavy-Duty Vehicles (8,501 + lbs)	18.126	0.814	1.362	0.005	0.031	0.027	768.173	0.045
	Diesel	LDDV	Light-Duty Vehicles (Passenger Cars)	2.419	0.131	0.150	0.003	0.004	0.004	329.951	0.008
	Diesel	LDDT	Light-Duty Trucks (0-8,500 lbs)	4.811	0.331	0.493	0.004	0.007	0.007	481.278	0.008
	Diesel	HDDV	Heavy-Duty Vehicles (8,501 + lbs)	1.830	0.459	5.596	0.013	0.216	0.199	1484.327	0.027
	NA	MC	Motorcycles	13.243	2.228	0.794	0.003	0.028	0.025	398.260	0.053
Michigan	Gasoline	LDGV	Light-Duty Vehicles (Passenger Cars)	4.073	0.378	0.318	0.002	0.011	0.010	342.823	0.025
	Gasoline	LDGT	Light-Duty Trucks (0-8,500 lbs)	5.832	0.487	0.547	0.003	0.014	0.012	442.600	0.026
	Gasoline	HDGV	Heavy-Duty Vehicles (8,501 + lbs)	18.075	0.846	1.347	0.005	0.031	0.028	770.203	0.045
	Diesel	LDDV	Light-Duty Vehicles (Passenger Cars)	2.395	0.135	0.150	0.003	0.004	0.004	332.986	0.008
	Diesel	LDDT	Light-Duty Trucks (0-8,500 lbs)	4.749	0.333	0.488	0.004	0.007	0.007	484.526	0.008
	Diesel	HDDV	Heavy-Duty Vehicles (8,501 + lbs)	2.008	0.540	6.047	0.013	0.222	0.205	1508.975	0.028
	NA	MC	Motorcycles	13.895	2.322	0.789	0.003	0.029	0.026	397.614	0.052
Minnesota	Gasoline	LDGV	Light-Duty Vehicles (Passenger Cars)	4.212	0.403	0.322	0.002	0.013	0.012	339.200	0.025
	Gasoline	LDGT	Light-Duty Trucks (0-8,500 lbs)	5.840	0.495	0.542	0.003	0.016	0.014	437.509	0.026
	Gasoline	HDGV	Heavy-Duty Vehicles (8,501 + lbs)	18.005	0.853	1.344	0.005	0.035	0.031	756.872	0.045
	Diesel	LDDV	Light-Duty Vehicles (Passenger Cars)	2.352	0.144	0.150	0.003	0.004	0.004	328.362	0.008
	Diesel	LDDT	Light-Duty Trucks (0-8,500 lbs)	4.630	0.337	0.487	0.004	0.007	0.007	477.826	0.008
	Diesel	HDDV	Heavy-Duty Vehicles (8,501 + lbs)	1.833	0.470	5.628	0.013	0.214	0.197	1471.595	0.027
	NA	MC	Motorcycles	14.220	2.294	0.806	0.003	0.029	0.026	398.009	0.053
Mississippi	Gasoline	LDGV	Light-Duty Vehicles (Passenger Cars)	3.759	0.358	0.300	0.002	0.007	0.006	338.345	0.025
	Gasoline	LDGT	Light-Duty Trucks (0-8,500 lbs)	5.550	0.457	0.515	0.003	0.009	0.008	436.671	0.026
	Gasoline	HDGV	Heavy-Duty Vehicles (8,501 + lbs)	17.053	0.855	1.242	0.005	0.019	0.017	762.371	0.045
	Diesel	LDDV	Light-Duty Vehicles (Passenger Cars)	2.572	0.107	0.149	0.003	0.004	0.004	332.075	0.008
	Diesel	LDDT	Light-Duty Trucks (0-8,500 lbs)	5.023	0.292	0.478	0.004	0.007	0.006	482.957	0.008
	Diesel	HDDV	Heavy-Duty Vehicles (8,501 + lbs)	1.922	0.491	5.471	0.013	0.214	0.197	1511.316	0.028
	NA	MC	Motorcycles	13.467	2.701	0.708	0.003	0.026	0.023	392.740	0.053

Table 5-21. On-Road Vehicle Emission Factors – 2018 (cont.)

State	Fuel Type	Vehicle Type		Emission Factors (g/mi)							
				Criteria Pollutants and Ozone Precursors							
				CO	VOC	NO_X	SO_2	PM_{10}	$PM_{2.5}$	CO_2e	NH_3
Missouri	Gasoline	LDGV	Light-Duty Vehicles (Passenger Cars)	3.871	0.351	0.304	0.002	0.009	0.008	331.741	0.025
	Gasoline	LDGT	Light-Duty Trucks (0-8,500 lbs)	5.596	0.446	0.527	0.003	0.011	0.010	430.614	0.026
	Gasoline	HDGV	Heavy-Duty Vehicles (8,501 + lbs)	17.542	0.796	1.300	0.005	0.027	0.024	757.918	0.044
	Diesel	LDDV	Light-Duty Vehicles (Passenger Cars)	2.544	0.123	0.153	0.003	0.004	0.004	323.802	0.008
	Diesel	LDDT	Light-Duty Trucks (0-8,500 lbs)	4.992	0.315	0.497	0.004	0.007	0.007	472.884	0.008
	Diesel	HDDV	Heavy-Duty Vehicles (8,501 + lbs)	1.979	0.531	5.921	0.013	0.212	0.195	1502.994	0.028
	NA	MC	Motorcycles	13.363	2.346	0.773	0.003	0.027	0.024	397.144	0.054
Montana	Gasoline	LDGV	Light-Duty Vehicles (Passenger Cars)	4.224	0.409	0.341	0.002	0.012	0.011	331.109	0.025
	Gasoline	LDGT	Light-Duty Trucks (0-8,500 lbs)	5.795	0.485	0.572	0.003	0.014	0.013	427.441	0.026
	Gasoline	HDGV	Heavy-Duty Vehicles (8,501 + lbs)	17.297	0.772	1.366	0.005	0.031	0.028	743.966	0.044
	Diesel	LDDV	Light-Duty Vehicles (Passenger Cars)	2.335	0.148	0.156	0.003	0.004	0.004	320.513	0.008
	Diesel	LDDT	Light-Duty Trucks (0-8,500 lbs)	4.549	0.331	0.501	0.004	0.007	0.006	467.025	0.008
	Diesel	HDDV	Heavy-Duty Vehicles (8,501 + lbs)	2.260	0.670	7.035	0.013	0.220	0.203	1514.670	0.030
	NA	MC	Motorcycles	14.101	2.251	0.877	0.003	0.028	0.025	397.822	0.054
Nebraska	Gasoline	LDGV	Light-Duty Vehicles (Passenger Cars)	4.181	0.392	0.327	0.002	0.011	0.010	336.381	0.025
	Gasoline	LDGT	Light-Duty Trucks (0-8,500 lbs)	5.885	0.483	0.558	0.003	0.013	0.012	434.736	0.026
	Gasoline	HDGV	Heavy-Duty Vehicles (8,501 + lbs)	17.594	0.804	1.335	0.005	0.030	0.027	761.146	0.044
	Diesel	LDDV	Light-Duty Vehicles (Passenger Cars)	2.460	0.135	0.154	0.003	0.004	0.004	326.966	0.008
	Diesel	LDDT	Light-Duty Trucks (0-8,500 lbs)	4.829	0.325	0.496	0.004	0.007	0.007	476.146	0.008
	Diesel	HDDV	Heavy-Duty Vehicles (8,501 + lbs)	2.251	0.657	6.747	0.013	0.223	0.205	1535.421	0.030
	NA	MC	Motorcycles	13.853	2.379	0.804	0.003	0.028	0.024	397.628	0.054
Nevada	Gasoline	LDGV	Light-Duty Vehicles (Passenger Cars)	3.517	0.340	0.298	0.002	0.008	0.007	351.471	0.025
	Gasoline	LDGT	Light-Duty Trucks (0-8,500 lbs)	5.153	0.434	0.524	0.003	0.010	0.009	453.861	0.026
	Gasoline	HDGV	Heavy-Duty Vehicles (8,501 + lbs)	18.902	0.921	1.446	0.005	0.023	0.020	795.383	0.045
	Diesel	LDDV	Light-Duty Vehicles (Passenger Cars)	2.576	0.110	0.156	0.003	0.004	0.004	344.389	0.008
	Diesel	LDDT	Light-Duty Trucks (0-8,500 lbs)	5.130	0.310	0.512	0.004	0.007	0.007	500.799	0.008
	Diesel	HDDV	Heavy-Duty Vehicles (8,501 + lbs)	2.043	0.531	6.275	0.013	0.230	0.211	1553.805	0.029
	NA	MC	Motorcycles	13.572	3.028	0.828	0.003	0.027	0.024	394.386	0.051
New Hampshire	Gasoline	LDGV	Light-Duty Vehicles (Passenger Cars)	3.496	0.350	0.284	0.002	0.011	0.010	336.617	0.025
	Gasoline	LDGT	Light-Duty Trucks (0-8,500 lbs)	4.880	0.426	0.486	0.003	0.014	0.012	434.308	0.026
	Gasoline	HDGV	Heavy-Duty Vehicles (8,501 + lbs)	17.458	0.795	1.344	0.005	0.030	0.026	752.238	0.045
	Diesel	LDDV	Light-Duty Vehicles (Passenger Cars)	2.335	0.139	0.150	0.003	0.004	0.004	326.606	0.008
	Diesel	LDDT	Light-Duty Trucks (0-8,500 lbs)	4.590	0.329	0.487	0.004	0.007	0.007	475.370	0.008
	Diesel	HDDV	Heavy-Duty Vehicles (8,501 + lbs)	1.876	0.488	5.761	0.013	0.214	0.197	1473.255	0.028
	NA	MC	Motorcycles	13.450	2.156	0.811	0.003	0.027	0.024	397.067	0.053
New Jersey	Gasoline	LDGV	Light-Duty Vehicles (Passenger Cars)	3.427	0.315	0.283	0.002	0.009	0.008	330.984	0.025
	Gasoline	LDGT	Light-Duty Trucks (0-8,500 lbs)	4.793	0.376	0.470	0.003	0.011	0.010	429.360	0.026
	Gasoline	HDGV	Heavy-Duty Vehicles (8,501 + lbs)	16.747	0.741	1.305	0.005	0.028	0.025	759.512	0.044
	Diesel	LDDV	Light-Duty Vehicles (Passenger Cars)	2.493	0.126	0.155	0.003	0.004	0.004	322.756	0.008
	Diesel	LDDT	Light-Duty Trucks (0-8,500 lbs)	4.894	0.314	0.500	0.004	0.007	0.007	471.083	0.008
	Diesel	HDDV	Heavy-Duty Vehicles (8,501 + lbs)	2.415	0.732	7.202	0.013	0.225	0.207	1556.809	0.031
	NA	MC	Motorcycles	13.083	2.154	0.796	0.003	0.027	0.024	397.747	0.054
New Mexico	Gasoline	LDGV	Light-Duty Vehicles (Passenger Cars)	3.818	0.370	0.322	0.002	0.009	0.008	336.501	0.025
	Gasoline	LDGT	Light-Duty Trucks (0-8,500 lbs)	5.485	0.457	0.555	0.003	0.011	0.009	434.813	0.026
	Gasoline	HDGV	Heavy-Duty Vehicles (8,501 + lbs)	17.557	0.820	1.380	0.005	0.024	0.022	761.624	0.044
	Diesel	LDDV	Light-Duty Vehicles (Passenger Cars)	2.473	0.121	0.157	0.003	0.004	0.004	328.625	0.008
	Diesel	LDDT	Light-Duty Trucks (0-8,500 lbs)	4.853	0.310	0.507	0.004	0.007	0.007	478.339	0.008
	Diesel	HDDV	Heavy-Duty Vehicles (8,501 + lbs)	2.198	0.626	6.779	0.013	0.222	0.204	1533.192	0.030
	NA	MC	Motorcycles	13.640	2.743	0.846	0.003	0.027	0.024	395.550	0.053
New York	Gasoline	LDGV	Light-Duty Vehicles (Passenger Cars)	3.302	0.314	0.258	0.002	0.010	0.009	342.780	0.025
	Gasoline	LDGT	Light-Duty Trucks (0-8,500 lbs)	4.528	0.370	0.441	0.003	0.013	0.011	443.130	0.026
	Gasoline	HDGV	Heavy-Duty Vehicles (8,501 + lbs)	18.011	0.845	1.356	0.005	0.029	0.026	771.398	0.045
	Diesel	LDDV	Light-Duty Vehicles (Passenger Cars)	2.400	0.129	0.148	0.003	0.004	0.004	333.604	0.008
	Diesel	LDDT	Light-Duty Trucks (0-8,500 lbs)	4.773	0.328	0.486	0.004	0.007	0.007	485.882	0.008
	Diesel	HDDV	Heavy-Duty Vehicles (8,501 + lbs)	1.798	0.439	5.438	0.013	0.218	0.201	1484.892	0.027
	NA	MC	Motorcycles	13.474	2.306	0.777	0.003	0.028	0.025	397.048	0.052

Table 5-21. On-Road Vehicle Emission Factors – 2018 (cont.)

State	Fuel Type	Vehicle Type		Emission Factors (g/mi)							
				Criteria Pollutants and Ozone Precursors							
				CO	VOC	NO_X	SO_2	PM_{10}	$PM_{2.5}$	CO_2e	NH_3
North Carolina	Gasoline	LDGV	Light-Duty Vehicles (Passenger Cars)	3.677	0.349	0.300	0.002	0.008	0.007	341.134	0.025
	Gasoline	LDGT	Light-Duty Trucks (0-8,500 lbs)	5.441	0.458	0.520	0.003	0.010	0.009	440.487	0.026
	Gasoline	HDGV	Heavy-Duty Vehicles (8,501 + lbs)	17.417	0.866	1.295	0.005	0.022	0.019	768.327	0.045
	Diesel	LDDV	Light-Duty Vehicles (Passenger Cars)	2.503	0.112	0.149	0.003	0.004	0.004	333.949	0.008
	Diesel	LDDT	Light-Duty Trucks (0-8,500 lbs)	4.930	0.304	0.482	0.004	0.007	0.007	485.812	0.008
	Diesel	HDDV	Heavy-Duty Vehicles (8,501 + lbs)	1.817	0.442	5.323	0.013	0.216	0.198	1495.234	0.027
	NA	MC	Motorcycles	13.522	2.630	0.732	0.003	0.027	0.024	394.209	0.053
North Dakota	Gasoline	LDGV	Light-Duty Vehicles (Passenger Cars)	4.472	0.446	0.334	0.002	0.015	0.013	332.644	0.025
	Gasoline	LDGT	Light-Duty Trucks (0-8,500 lbs)	6.007	0.520	0.558	0.003	0.018	0.016	428.807	0.026
	Gasoline	HDGV	Heavy-Duty Vehicles (8,501 + lbs)	17.212	0.805	1.328	0.005	0.038	0.033	742.344	0.044
	Diesel	LDDV	Light-Duty Vehicles (Passenger Cars)	2.319	0.157	0.154	0.003	0.004	0.004	320.748	0.008
	Diesel	LDDT	Light-Duty Trucks (0-8,500 lbs)	4.513	0.338	0.493	0.004	0.007	0.006	467.182	0.008
	Diesel	HDDV	Heavy-Duty Vehicles (8,501 + lbs)	2.147	0.623	6.618	0.013	0.217	0.199	1497.281	0.030
	NA	MC	Motorcycles	14.336	2.182	0.842	0.003	0.029	0.026	398.592	0.054
Ohio	Gasoline	LDGV	Light-Duty Vehicles (Passenger Cars)	3.740	0.348	0.290	0.002	0.010	0.009	345.052	0.025
	Gasoline	LDGT	Light-Duty Trucks (0-8,500 lbs)	5.334	0.440	0.499	0.003	0.012	0.011	445.062	0.026
	Gasoline	HDGV	Heavy-Duty Vehicles (8,501 + lbs)	18.300	0.867	1.339	0.005	0.027	0.024	773.136	0.045
	Diesel	LDDV	Light-Duty Vehicles (Passenger Cars)	2.402	0.128	0.148	0.003	0.004	0.004	335.939	0.008
	Diesel	LDDT	Light-Duty Trucks (0-8,500 lbs)	4.765	0.325	0.482	0.004	0.007	0.007	488.498	0.008
	Diesel	HDDV	Heavy-Duty Vehicles (8,501 + lbs)	1.884	0.476	5.604	0.013	0.222	0.204	1499.379	0.028
	NA	MC	Motorcycles	13.839	2.443	0.766	0.003	0.028	0.025	396.154	0.052
Oklahoma	Gasoline	LDGV	Light-Duty Vehicles (Passenger Cars)	3.981	0.362	0.312	0.002	0.008	0.007	342.286	0.025
	Gasoline	LDGT	Light-Duty Trucks (0-8,500 lbs)	5.814	0.466	0.538	0.003	0.010	0.009	441.865	0.026
	Gasoline	HDGV	Heavy-Duty Vehicles (8,501 + lbs)	18.142	0.857	1.312	0.005	0.022	0.020	773.091	0.045
	Diesel	LDDV	Light-Duty Vehicles (Passenger Cars)	2.568	0.114	0.151	0.003	0.004	0.004	335.091	0.008
	Diesel	LDDT	Light-Duty Trucks (0-8,500 lbs)	5.051	0.305	0.488	0.004	0.007	0.007	487.262	0.008
	Diesel	HDDV	Heavy-Duty Vehicles (8,501 + lbs)	2.000	0.527	5.819	0.013	0.220	0.202	1526.634	0.028
	NA	MC	Motorcycles	13.581	2.660	0.747	0.003	0.026	0.023	394.432	0.053
Oregon	Gasoline	LDGV	Light-Duty Vehicles (Passenger Cars)	3.584	0.338	0.305	0.002	0.009	0.008	333.990	0.025
	Gasoline	LDGT	Light-Duty Trucks (0-8,500 lbs)	5.123	0.423	0.515	0.003	0.011	0.010	431.386	0.026
	Gasoline	HDGV	Heavy-Duty Vehicles (8,501 + lbs)	17.682	0.807	1.355	0.005	0.025	0.022	750.543	0.045
	Diesel	LDDV	Light-Duty Vehicles (Passenger Cars)	2.333	0.128	0.151	0.003	0.004	0.004	325.388	0.008
	Diesel	LDDT	Light-Duty Trucks (0-8,500 lbs)	4.586	0.317	0.489	0.004	0.007	0.007	473.804	0.008
	Diesel	HDDV	Heavy-Duty Vehicles (8,501 + lbs)	1.986	0.533	6.094	0.013	0.217	0.200	1486.909	0.028
	NA	MC	Motorcycles	13.794	2.298	0.835	0.003	0.028	0.024	395.928	0.053
Pacific Islands	Gasoline	LDGV	Light-Duty Vehicles (Passenger Cars)	3.583	0.331	0.289	0.002	0.008	0.007	340.865	0.025
	Gasoline	LDGT	Light-Duty Trucks (0-8,500 lbs)	5.217	0.425	0.500	0.003	0.010	0.009	440.738	0.026
	Gasoline	HDGV	Heavy-Duty Vehicles (8,501 + lbs)	17.903	0.845	1.319	0.005	0.024	0.021	771.258	0.045
	Diesel	LDDV	Light-Duty Vehicles (Passenger Cars)	2.480	0.117	0.150	0.003	0.004	0.004	333.201	0.008
	Diesel	LDDT	Light-Duty Trucks (0-8,500 lbs)	4.908	0.312	0.488	0.004	0.007	0.007	485.135	0.008
	Diesel	HDDV	Heavy-Duty Vehicles (8,501 + lbs)	1.963	0.510	5.821	0.013	0.220	0.203	1512.120	0.028
	NA	MC	Motorcycles	13.360	2.490	0.761	0.003	0.027	0.024	395.574	0.053
Pennsylvania	Gasoline	LDGV	Light-Duty Vehicles (Passenger Cars)	3.508	0.332	0.283	0.002	0.010	0.009	342.694	0.025
	Gasoline	LDGT	Light-Duty Trucks (0-8,500 lbs)	5.048	0.422	0.492	0.003	0.012	0.011	442.597	0.026
	Gasoline	HDGV	Heavy-Duty Vehicles (8,501 + lbs)	17.725	0.840	1.338	0.005	0.028	0.025	772.013	0.045
	Diesel	LDDV	Light-Duty Vehicles (Passenger Cars)	2.423	0.128	0.149	0.003	0.004	0.004	333.695	0.008
	Diesel	LDDT	Light-Duty Trucks (0-8,500 lbs)	4.806	0.325	0.488	0.004	0.007	0.007	485.579	0.008
	Diesel	HDDV	Heavy-Duty Vehicles (8,501 + lbs)	2.037	0.549	6.073	0.013	0.223	0.206	1517.108	0.029
	NA	MC	Motorcycles	13.599	2.376	0.772	0.003	0.028	0.025	396.814	0.052
Puerto Rico	Gasoline	LDGV	Light-Duty Vehicles (Passenger Cars)	4.306	0.348	0.277	0.002	0.006	0.005	362.817	0.025
	Gasoline	LDGT	Light-Duty Trucks (0-8,500 lbs)	6.587	0.488	0.493	0.003	0.007	0.007	469.501	0.027
	Gasoline	HDGV	Heavy-Duty Vehicles (8,501 + lbs)	20.214	1.016	1.214	0.006	0.018	0.016	831.632	0.046
	Diesel	LDDV	Light-Duty Vehicles (Passenger Cars)	3.033	0.081	0.144	0.003	0.004	0.004	358.433	0.008
	Diesel	LDDT	Light-Duty Trucks (0-8,500 lbs)	6.024	0.284	0.472	0.004	0.007	0.007	521.624	0.008
	Diesel	HDDV	Heavy-Duty Vehicles (8,501 + lbs)	1.743	0.364	4.396	0.013	0.224	0.206	1583.782	0.026
	NA	MC	Motorcycles	13.361	3.150	0.606	0.003	0.026	0.023	391.892	0.051

Table 5-21. On-Road Vehicle Emission Factors – 2018 (cont.)

State	Fuel Type	Vehicle Type		Emission Factors (g/mi)							
				Criteria Pollutants and Ozone Precursors							
				CO	VOC	NO_X	SO_2	PM_{10}	$PM_{2.5}$	CO_2e	NH_3
Rhode Island	Gasoline	LDGV	Light-Duty Vehicles (Passenger Cars)	3.402	0.314	0.262	0.002	0.010	0.009	344.774	0.025
	Gasoline	LDGT	Light-Duty Trucks (0-8,500 lbs)	4.785	0.381	0.458	0.003	0.013	0.011	446.733	0.026
	Gasoline	HDGV	Heavy-Duty Vehicles (8,501 + lbs)	18.529	0.843	1.370	0.005	0.030	0.026	781.285	0.045
	Diesel	LDDV	Light-Duty Vehicles (Passenger Cars)	2.429	0.127	0.148	0.003	0.004	0.004	335.694	0.008
	Diesel	LDDT	Light-Duty Trucks (0-8,500 lbs)	4.865	0.332	0.489	0.004	0.007	0.007	489.622	0.008
	Diesel	HDDV	Heavy-Duty Vehicles (8,501 + lbs)	1.859	0.463	5.592	0.013	0.222	0.204	1502.284	0.027
	NA	MC	Motorcycles	13.208	2.312	0.772	0.003	0.028	0.025	397.902	0.052
South Carolina	Gasoline	LDGV	Light-Duty Vehicles (Passenger Cars)	3.810	0.354	0.304	0.002	0.008	0.007	341.463	0.025
	Gasoline	LDGT	Light-Duty Trucks (0-8,500 lbs)	5.676	0.465	0.527	0.003	0.009	0.008	441.222	0.026
	Gasoline	HDGV	Heavy-Duty Vehicles (8,501 + lbs)	17.222	0.863	1.272	0.005	0.022	0.019	775.699	0.045
	Diesel	LDDV	Light-Duty Vehicles (Passenger Cars)	2.600	0.108	0.150	0.003	0.004	0.004	334.855	0.008
	Diesel	LDDT	Light-Duty Trucks (0-8,500 lbs)	5.118	0.300	0.487	0.004	0.007	0.007	487.082	0.008
	Diesel	HDDV	Heavy-Duty Vehicles (8,501 + lbs)	2.162	0.599	6.169	0.013	0.224	0.206	1550.906	0.030
	NA	MC	Motorcycles	13.489	2.722	0.717	0.003	0.027	0.024	394.392	0.053
South Dakota	Gasoline	LDGV	Light-Duty Vehicles (Passenger Cars)	4.259	0.411	0.331	0.002	0.013	0.011	331.065	0.025
	Gasoline	LDGT	Light-Duty Trucks (0-8,500 lbs)	5.943	0.497	0.559	0.003	0.015	0.013	428.201	0.026
	Gasoline	HDGV	Heavy-Duty Vehicles (8,501 + lbs)	17.036	0.792	1.320	0.005	0.034	0.030	749.187	0.044
	Diesel	LDDV	Light-Duty Vehicles (Passenger Cars)	2.409	0.146	0.156	0.003	0.004	0.004	320.679	0.008
	Diesel	LDDT	Light-Duty Trucks (0-8,500 lbs)	4.699	0.331	0.500	0.004	0.007	0.007	467.716	0.008
	Diesel	HDDV	Heavy-Duty Vehicles (8,501 + lbs)	2.301	0.688	7.009	0.013	0.221	0.203	1527.615	0.031
	NA	MC	Motorcycles	14.115	2.309	0.826	0.003	0.029	0.026	398.558	0.054
Tennessee	Gasoline	LDGV	Light-Duty Vehicles (Passenger Cars)	3.685	0.342	0.295	0.002	0.008	0.007	341.907	0.025
	Gasoline	LDGT	Light-Duty Trucks (0-8,500 lbs)	5.424	0.445	0.512	0.003	0.010	0.009	441.932	0.026
	Gasoline	HDGV	Heavy-Duty Vehicles (8,501 + lbs)	17.680	0.860	1.299	0.005	0.024	0.021	774.972	0.045
	Diesel	LDDV	Light-Duty Vehicles (Passenger Cars)	2.541	0.115	0.150	0.003	0.004	0.004	334.469	0.008
	Diesel	LDDT	Light-Duty Trucks (0-8,500 lbs)	5.019	0.310	0.488	0.004	0.007	0.007	486.748	0.008
	Diesel	HDDV	Heavy-Duty Vehicles (8,501 + lbs)	2.070	0.558	6.018	0.013	0.222	0.205	1533.095	0.029
	NA	MC	Motorcycles	13.597	2.626	0.738	0.003	0.028	0.024	395.385	0.053
Texas	Gasoline	LDGV	Light-Duty Vehicles (Passenger Cars)	3.566	0.319	0.272	0.002	0.007	0.006	343.786	0.025
	Gasoline	LDGT	Light-Duty Trucks (0-8,500 lbs)	5.320	0.417	0.477	0.003	0.009	0.008	445.260	0.026
	Gasoline	HDGV	Heavy-Duty Vehicles (8,501 + lbs)	17.829	0.871	1.264	0.005	0.021	0.018	786.013	0.045
	Diesel	LDDV	Light-Duty Vehicles (Passenger Cars)	2.747	0.101	0.151	0.003	0.004	0.004	338.034	0.008
	Diesel	LDDT	Light-Duty Trucks (0-8,500 lbs)	5.417	0.296	0.492	0.004	0.007	0.007	492.346	0.008
	Diesel	HDDV	Heavy-Duty Vehicles (8,501 + lbs)	1.918	0.481	5.452	0.013	0.217	0.200	1538.052	0.028
	NA	MC	Motorcycles	12.888	2.740	0.697	0.003	0.026	0.023	394.157	0.053
Utah	Gasoline	LDGV	Light-Duty Vehicles (Passenger Cars)	3.783	0.353	0.300	0.002	0.011	0.009	346.265	0.025
	Gasoline	LDGT	Light-Duty Trucks (0-8,500 lbs)	5.448	0.447	0.525	0.003	0.013	0.012	448.043	0.026
	Gasoline	HDGV	Heavy-Duty Vehicles (8,501 + lbs)	18.974	0.884	1.434	0.005	0.031	0.027	783.047	0.045
	Diesel	LDDV	Light-Duty Vehicles (Passenger Cars)	2.463	0.128	0.153	0.003	0.004	0.004	337.109	0.008
	Diesel	LDDT	Light-Duty Trucks (0-8,500 lbs)	4.917	0.332	0.505	0.004	0.007	0.007	491.134	0.008
	Diesel	HDDV	Heavy-Duty Vehicles (8,501 + lbs)	1.936	0.499	6.014	0.013	0.224	0.206	1516.059	0.028
	NA	MC	Motorcycles	13.956	2.666	0.839	0.003	0.029	0.025	397.540	0.052
Vermont	Gasoline	LDGV	Light-Duty Vehicles (Passenger Cars)	3.603	0.379	0.293	0.002	0.013	0.011	329.827	0.025
	Gasoline	LDGT	Light-Duty Trucks (0-8,500 lbs)	4.937	0.445	0.495	0.003	0.015	0.013	425.952	0.026
	Gasoline	HDGV	Heavy-Duty Vehicles (8,501 + lbs)	16.367	0.776	1.316	0.005	0.032	0.029	739.991	0.044
	Diesel	LDDV	Light-Duty Vehicles (Passenger Cars)	2.318	0.148	0.154	0.003	0.004	0.004	319.147	0.008
	Diesel	LDDT	Light-Duty Trucks (0-8,500 lbs)	4.513	0.330	0.491	0.004	0.007	0.006	465.307	0.008
	Diesel	HDDV	Heavy-Duty Vehicles (8,501 + lbs)	2.156	0.624	6.608	0.013	0.217	0.199	1497.039	0.030
	NA	MC	Motorcycles	13.925	2.150	0.827	0.003	0.029	0.025	397.802	0.054
Virgin Islands	Gasoline	LDGV	Light-Duty Vehicles (Passenger Cars)	4.081	0.365	0.281	0.002	0.005	0.005	344.279	0.024
	Gasoline	LDGT	Light-Duty Trucks (0-8,500 lbs)	6.053	0.452	0.472	0.003	0.006	0.006	443.987	0.026
	Gasoline	HDGV	Heavy-Duty Vehicles (8,501 + lbs)	18.408	0.905	1.118	0.005	0.011	0.010	771.117	0.045
	Diesel	LDDV	Light-Duty Vehicles (Passenger Cars)	2.854	0.084	0.146	0.003	0.004	0.004	340.779	0.007
	Diesel	LDDT	Light-Duty Trucks (0-8,500 lbs)	5.548	0.259	0.458	0.004	0.006	0.006	495.396	0.008
	Diesel	HDDV	Heavy-Duty Vehicles (8,501 + lbs)	1.483	0.277	3.801	0.013	0.198	0.182	1495.992	0.025
	NA	MC	Motorcycles	13.340	2.639	0.627	0.003	0.023	0.021	388.004	0.053

Table 5-21. On-Road Vehicle Emission Factors – 2018 (cont.)

State	Fuel Type	Vehicle Type		Emission Factors (g/mi)							
				Criteria Pollutants and Ozone Precursors							
				CO	VOC	NO_X	SO_2	PM_{10}	$PM_{2.5}$	CO_2e	NH_3
Virginia	Gasoline	LDGV	Light-Duty Vehicles (Passenger Cars)	3.663	0.338	0.295	0.002	0.009	0.008	341.026	0.025
	Gasoline	LDGT	Light-Duty Trucks (0-8,500 lbs)	5.363	0.437	0.514	0.003	0.011	0.009	441.115	0.026
	Gasoline	HDGV	Heavy-Duty Vehicles (8,501 + lbs)	17.500	0.835	1.312	0.005	0.025	0.022	773.184	0.045
	Diesel	LDDV	Light-Duty Vehicles (Passenger Cars)	2.504	0.118	0.150	0.003	0.004	0.004	333.231	0.008
	Diesel	LDDT	Light-Duty Trucks (0-8,500 lbs)	4.958	0.314	0.489	0.004	0.007	0.007	485.259	0.008
	Diesel	HDDV	Heavy-Duty Vehicles (8,501 + lbs)	2.024	0.540	5.956	0.013	0.221	0.204	1522.269	0.029
	NA	MC	Motorcycles	13.259	2.454	0.747	0.003	0.027	0.024	396.027	0.053
Washington	Gasoline	LDGV	Light-Duty Vehicles (Passenger Cars)	3.662	0.331	0.292	0.002	0.010	0.008	337.767	0.025
	Gasoline	LDGT	Light-Duty Trucks (0-8,500 lbs)	5.308	0.427	0.504	0.003	0.012	0.011	437.615	0.026
	Gasoline	HDGV	Heavy-Duty Vehicles (8,501 + lbs)	18.254	0.834	1.377	0.005	0.029	0.025	766.390	0.045
	Diesel	LDDV	Light-Duty Vehicles (Passenger Cars)	2.377	0.128	0.151	0.003	0.004	0.004	328.947	0.008
	Diesel	LDDT	Light-Duty Trucks (0-8,500 lbs)	4.733	0.328	0.494	0.004	0.007	0.007	479.730	0.008
	Diesel	HDDV	Heavy-Duty Vehicles (8,501 + lbs)	2.023	0.546	6.183	0.013	0.222	0.204	1504.728	0.029
	NA	MC	Motorcycles	13.888	2.342	0.821	0.003	0.029	0.025	397.890	0.053
West Virginia	Gasoline	LDGV	Light-Duty Vehicles (Passenger Cars)	3.887	0.366	0.316	0.002	0.010	0.008	331.775	0.025
	Gasoline	LDGT	Light-Duty Trucks (0-8,500 lbs)	5.601	0.463	0.541	0.003	0.012	0.010	429.353	0.026
	Gasoline	HDGV	Heavy-Duty Vehicles (8,501 + lbs)	17.013	0.800	1.296	0.005	0.027	0.023	751.334	0.044
	Diesel	LDDV	Light-Duty Vehicles (Passenger Cars)	2.428	0.128	0.152	0.003	0.004	0.004	323.286	0.008
	Diesel	LDDT	Light-Duty Trucks (0-8,500 lbs)	4.752	0.315	0.490	0.004	0.007	0.007	471.373	0.008
	Diesel	HDDV	Heavy-Duty Vehicles (8,501 + lbs)	2.104	0.590	6.290	0.013	0.217	0.200	1507.938	0.029
	NA	MC	Motorcycles	13.745	2.384	0.782	0.003	0.028	0.025	396.480	0.054
Wisconsin	Gasoline	LDGV	Light-Duty Vehicles (Passenger Cars)	4.019	0.386	0.311	0.002	0.012	0.011	336.810	0.025
	Gasoline	LDGT	Light-Duty Trucks (0-8,500 lbs)	5.621	0.477	0.530	0.003	0.015	0.013	434.654	0.026
	Gasoline	HDGV	Heavy-Duty Vehicles (8,501 + lbs)	17.574	0.815	1.325	0.005	0.032	0.028	754.437	0.044
	Diesel	LDDV	Light-Duty Vehicles (Passenger Cars)	2.359	0.142	0.151	0.003	0.004	0.004	326.441	0.008
	Diesel	LDDT	Light-Duty Trucks (0-8,500 lbs)	4.636	0.332	0.489	0.004	0.007	0.007	475.176	0.008
	Diesel	HDDV	Heavy-Duty Vehicles (8,501 + lbs)	2.000	0.546	6.095	0.013	0.217	0.200	1491.448	0.029
	NA	MC	Motorcycles	13.794	2.226	0.802	0.003	0.028	0.025	397.792	0.053
Wyoming	Gasoline	LDGV	Light-Duty Vehicles (Passenger Cars)	4.331	0.416	0.344	0.002	0.012	0.011	332.658	0.025
	Gasoline	LDGT	Light-Duty Trucks (0-8,500 lbs)	5.982	0.498	0.581	0.003	0.015	0.013	430.043	0.026
	Gasoline	HDGV	Heavy-Duty Vehicles (8,501 + lbs)	17.393	0.780	1.378	0.005	0.035	0.031	753.172	0.044
	Diesel	LDDV	Light-Duty Vehicles (Passenger Cars)	2.394	0.148	0.158	0.003	0.004	0.004	321.997	0.008
	Diesel	LDDT	Light-Duty Trucks (0-8,500 lbs)	4.684	0.335	0.510	0.004	0.007	0.007	469.294	0.008
	Diesel	HDDV	Heavy-Duty Vehicles (8,501 + lbs)	2.420	0.741	7.521	0.013	0.225	0.207	1543.653	0.031
	NA	MC	Motorcycles	14.144	2.356	0.880	0.003	0.029	0.025	399.144	0.054

Table 5-22. On-Road Vehicle Emission Factors – 2019

State	Fuel Type	Vehicle Type		Emission Factors (g/mi)							
				Criteria Pollutants and Ozone Precursors							
				CO	VOC	NO_X	SO_2	PM_{10}	$PM_{2.5}$	CO_2e	NH_3
Alabama	Gasoline	LDGV	Light-Duty Vehicles (Passenger Cars)	3.551	0.318	0.256	0.002	0.007	0.006	334.488	0.024
	Gasoline	LDGT	Light-Duty Trucks (0-8,500 lbs)	5.139	0.410	0.447	0.003	0.009	0.008	430.101	0.025
	Gasoline	HDGV	Heavy-Duty Vehicles (8,501 + lbs)	16.088	0.791	1.114	0.005	0.019	0.016	769.408	0.045
	Diesel	LDDV	Light-Duty Vehicles (Passenger Cars)	2.564	0.100	0.138	0.003	0.004	0.004	326.534	0.008
	Diesel	LDDT	Light-Duty Trucks (0-8,500 lbs)	4.690	0.260	0.420	0.004	0.007	0.006	467.975	0.008
	Diesel	HDDV	Heavy-Duty Vehicles (8,501 + lbs)	1.810	0.456	5.053	0.013	0.191	0.176	1510.675	0.028
	NA	MC	Motorcycles	13.275	2.693	0.705	0.003	0.026	0.023	393.209	0.053
Alaska	Gasoline	LDGV	Light-Duty Vehicles (Passenger Cars)	4.152	0.396	0.285	0.002	0.014	0.013	331.600	0.024
	Gasoline	LDGT	Light-Duty Trucks (0-8,500 lbs)	5.370	0.458	0.478	0.003	0.018	0.016	426.045	0.025
	Gasoline	HDGV	Heavy-Duty Vehicles (8,501 + lbs)	16.676	0.737	1.230	0.005	0.039	0.034	754.249	0.044
	Diesel	LDDV	Light-Duty Vehicles (Passenger Cars)	2.274	0.160	0.142	0.003	0.004	0.004	317.163	0.008
	Diesel	LDDT	Light-Duty Trucks (0-8,500 lbs)	4.178	0.324	0.434	0.004	0.007	0.006	455.059	0.008
	Diesel	HDDV	Heavy-Duty Vehicles (8,501 + lbs)	2.056	0.596	6.271	0.013	0.195	0.180	1496.654	0.030
	NA	MC	Motorcycles	14.184	1.977	0.866	0.003	0.030	0.026	401.120	0.054
Arizona	Gasoline	LDGV	Light-Duty Vehicles (Passenger Cars)	3.506	0.304	0.247	0.002	0.006	0.005	341.361	0.024
	Gasoline	LDGT	Light-Duty Trucks (0-8,500 lbs)	5.035	0.382	0.438	0.003	0.008	0.007	440.415	0.025
	Gasoline	HDGV	Heavy-Duty Vehicles (8,501 + lbs)	17.910	0.835	1.228	0.005	0.019	0.017	797.739	0.045
	Diesel	LDDV	Light-Duty Vehicles (Passenger Cars)	2.777	0.092	0.148	0.003	0.004	0.004	334.348	0.008
	Diesel	LDDT	Light-Duty Trucks (0-8,500 lbs)	5.129	0.260	0.460	0.004	0.007	0.007	479.935	0.008
	Diesel	HDDV	Heavy-Duty Vehicles (8,501 + lbs)	1.959	0.512	5.830	0.013	0.198	0.182	1565.797	0.029
	NA	MC	Motorcycles	12.850	3.128	0.802	0.002	0.025	0.022	393.757	0.053
Arkansas	Gasoline	LDGV	Light-Duty Vehicles (Passenger Cars)	3.761	0.322	0.268	0.002	0.007	0.006	327.323	0.023
	Gasoline	LDGT	Light-Duty Trucks (0-8,500 lbs)	5.365	0.407	0.465	0.003	0.009	0.008	422.539	0.025
	Gasoline	HDGV	Heavy-Duty Vehicles (8,501 + lbs)	16.406	0.750	1.133	0.005	0.021	0.019	761.178	0.044
	Diesel	LDDV	Light-Duty Vehicles (Passenger Cars)	2.589	0.107	0.142	0.003	0.004	0.004	319.023	0.008
	Diesel	LDDT	Light-Duty Trucks (0-8,500 lbs)	4.725	0.266	0.430	0.004	0.007	0.006	458.595	0.008
	Diesel	HDDV	Heavy-Duty Vehicles (8,501 + lbs)	1.956	0.530	5.557	0.013	0.190	0.175	1518.295	0.029
	NA	MC	Motorcycles	13.377	2.567	0.744	0.003	0.026	0.023	395.072	0.054
Colorado	Gasoline	LDGV	Light-Duty Vehicles (Passenger Cars)	3.553	0.324	0.261	0.002	0.010	0.009	332.112	0.024
	Gasoline	LDGT	Light-Duty Trucks (0-8,500 lbs)	4.910	0.395	0.452	0.003	0.012	0.011	428.553	0.025
	Gasoline	HDGV	Heavy-Duty Vehicles (8,501 + lbs)	17.112	0.769	1.238	0.005	0.029	0.025	766.478	0.045
	Diesel	LDDV	Light-Duty Vehicles (Passenger Cars)	2.421	0.125	0.142	0.003	0.004	0.004	321.417	0.008
	Diesel	LDDT	Light-Duty Trucks (0-8,500 lbs)	4.475	0.293	0.440	0.004	0.007	0.007	462.042	0.008
	Diesel	HDDV	Heavy-Duty Vehicles (8,501 + lbs)	1.828	0.478	5.563	0.013	0.192	0.176	1492.220	0.028
	NA	MC	Motorcycles	13.762	2.623	0.835	0.003	0.029	0.025	397.916	0.053
Connecticut	Gasoline	LDGV	Light-Duty Vehicles (Passenger Cars)	3.204	0.279	0.225	0.002	0.009	0.008	331.840	0.024
	Gasoline	LDGT	Light-Duty Trucks (0-8,500 lbs)	4.504	0.342	0.399	0.003	0.012	0.010	429.926	0.025
	Gasoline	HDGV	Heavy-Duty Vehicles (8,501 + lbs)	17.204	0.757	1.209	0.005	0.029	0.025	772.560	0.045
	Diesel	LDDV	Light-Duty Vehicles (Passenger Cars)	2.466	0.119	0.139	0.003	0.004	0.004	321.676	0.008
	Diesel	LDDT	Light-Duty Trucks (0-8,500 lbs)	4.599	0.293	0.435	0.004	0.007	0.007	463.697	0.008
	Diesel	HDDV	Heavy-Duty Vehicles (8,501 + lbs)	1.535	0.346	4.623	0.012	0.185	0.171	1462.875	0.026
	NA	MC	Motorcycles	13.029	2.277	0.776	0.003	0.028	0.025	398.706	0.053
Delaware	Gasoline	LDGV	Light-Duty Vehicles (Passenger Cars)	3.133	0.284	0.240	0.002	0.008	0.007	336.163	0.024
	Gasoline	LDGT	Light-Duty Trucks (0-8,500 lbs)	4.351	0.349	0.417	0.003	0.010	0.009	431.577	0.025
	Gasoline	HDGV	Heavy-Duty Vehicles (8,501 + lbs)	16.995	0.761	1.174	0.005	0.020	0.018	763.495	0.045
	Diesel	LDDV	Light-Duty Vehicles (Passenger Cars)	2.392	0.113	0.135	0.003	0.004	0.004	326.643	0.008
	Diesel	LDDT	Light-Duty Trucks (0-8,500 lbs)	4.390	0.275	0.415	0.004	0.007	0.006	467.989	0.008
	Diesel	HDDV	Heavy-Duty Vehicles (8,501 + lbs)	1.410	0.283	4.128	0.012	0.185	0.170	1444.396	0.025
	NA	MC	Motorcycles	12.872	2.291	0.750	0.003	0.025	0.022	393.889	0.052
District of Columbia	Gasoline	LDGV	Light-Duty Vehicles (Passenger Cars)	3.128	0.271	0.220	0.002	0.008	0.007	350.177	0.024
	Gasoline	LDGT	Light-Duty Trucks (0-8,500 lbs)	4.377	0.338	0.385	0.003	0.010	0.009	451.129	0.025
	Gasoline	HDGV	Heavy-Duty Vehicles (8,501 + lbs)	18.200	0.836	1.217	0.005	0.022	0.019	805.338	0.046
	Diesel	LDDV	Light-Duty Vehicles (Passenger Cars)	2.468	0.108	0.133	0.003	0.004	0.004	340.603	0.008
	Diesel	LDDT	Light-Duty Trucks (0-8,500 lbs)	4.613	0.283	0.416	0.004	0.007	0.007	489.332	0.008
	Diesel	HDDV	Heavy-Duty Vehicles (8,501 + lbs)	1.537	0.314	4.313	0.013	0.203	0.187	1511.991	0.026
	NA	MC	Motorcycles	12.876	2.516	0.715	0.003	0.026	0.023	394.387	0.050

Table 5-22. On-Road Vehicle Emission Factors – 2019 (cont.)

State	Fuel Type	Vehicle Type		Emission Factors (g/mi)							
				Criteria Pollutants and Ozone Precursors							
				CO	VOC	NO_X	SO_2	PM_{10}	$PM_{2.5}$	CO_2e	NH_3
Florida	Gasoline	LDGV	Light-Duty Vehicles (Passenger Cars)	3.726	0.312	0.241	0.002	0.006	0.005	351.380	0.024
	Gasoline	LDGT	Light-Duty Trucks (0-8,500 lbs)	5.524	0.427	0.430	0.003	0.008	0.007	451.868	0.025
	Gasoline	HDGV	Heavy-Duty Vehicles (8,501 + lbs)	17.374	0.892	1.093	0.005	0.017	0.015	813.883	0.046
	Diesel	LDDV	Light-Duty Vehicles (Passenger Cars)	2.797	0.083	0.134	0.003	0.004	0.004	344.644	0.008
	Diesel	LDDT	Light-Duty Trucks (0-8,500 lbs)	5.171	0.251	0.413	0.004	0.007	0.006	493.706	0.008
	Diesel	HDDV	Heavy-Duty Vehicles (8,501 + lbs)	1.793	0.419	4.622	0.013	0.201	0.185	1570.837	0.028
	NA	MC	Motorcycles	13.155	3.039	0.624	0.003	0.026	0.023	391.665	0.051
Georgia	Gasoline	LDGV	Light-Duty Vehicles (Passenger Cars)	3.334	0.297	0.243	0.002	0.007	0.006	329.762	0.024
	Gasoline	LDGT	Light-Duty Trucks (0-8,500 lbs)	4.827	0.381	0.426	0.003	0.009	0.008	425.438	0.025
	Gasoline	HDGV	Heavy-Duty Vehicles (8,501 + lbs)	15.824	0.765	1.118	0.005	0.021	0.018	765.549	0.044
	Diesel	LDDV	Light-Duty Vehicles (Passenger Cars)	2.582	0.103	0.140	0.003	0.004	0.004	321.718	0.008
	Diesel	LDDT	Light-Duty Trucks (0-8,500 lbs)	4.726	0.264	0.427	0.004	0.007	0.006	462.179	0.008
	Diesel	HDDV	Heavy-Duty Vehicles (8,501 + lbs)	1.879	0.492	5.315	0.013	0.190	0.175	1512.716	0.029
	NA	MC	Motorcycles	13.226	2.582	0.721	0.003	0.027	0.024	394.613	0.054
Hawaii	Gasoline	LDGV	Light-Duty Vehicles (Passenger Cars)	3.643	0.302	0.242	0.002	0.005	0.005	341.574	0.024
	Gasoline	LDGT	Light-Duty Trucks (0-8,500 lbs)	5.368	0.408	0.430	0.003	0.007	0.006	439.582	0.025
	Gasoline	HDGV	Heavy-Duty Vehicles (8,501 + lbs)	17.756	0.858	1.100	0.005	0.015	0.013	788.735	0.046
	Diesel	LDDV	Light-Duty Vehicles (Passenger Cars)	2.683	0.078	0.134	0.003	0.004	0.004	335.317	0.008
	Diesel	LDDT	Light-Duty Trucks (0-8,500 lbs)	4.936	0.241	0.410	0.004	0.007	0.006	480.704	0.008
	Diesel	HDDV	Heavy-Duty Vehicles (8,501 + lbs)	1.491	0.292	3.964	0.013	0.189	0.174	1501.375	0.026
	NA	MC	Motorcycles	13.196	2.823	0.675	0.003	0.025	0.022	391.173	0.052
Idaho	Gasoline	LDGV	Light-Duty Vehicles (Passenger Cars)	3.707	0.340	0.277	0.002	0.010	0.009	328.877	0.024
	Gasoline	LDGT	Light-Duty Trucks (0-8,500 lbs)	5.074	0.411	0.474	0.003	0.012	0.011	422.872	0.025
	Gasoline	HDGV	Heavy-Duty Vehicles (8,501 + lbs)	16.559	0.739	1.222	0.005	0.026	0.023	752.283	0.044
	Diesel	LDDV	Light-Duty Vehicles (Passenger Cars)	2.361	0.130	0.143	0.003	0.004	0.004	317.867	0.008
	Diesel	LDDT	Light-Duty Trucks (0-8,500 lbs)	4.315	0.290	0.437	0.004	0.007	0.006	456.054	0.008
	Diesel	HDDV	Heavy-Duty Vehicles (8,501 + lbs)	1.953	0.539	5.946	0.013	0.192	0.177	1493.845	0.029
	NA	MC	Motorcycles	13.801	2.403	0.856	0.003	0.028	0.024	396.809	0.054
Illinois	Gasoline	LDGV	Light-Duty Vehicles (Passenger Cars)	3.492	0.306	0.244	0.002	0.009	0.008	343.901	0.024
	Gasoline	LDGT	Light-Duty Trucks (0-8,500 lbs)	4.984	0.406	0.432	0.003	0.011	0.010	443.756	0.025
	Gasoline	HDGV	Heavy-Duty Vehicles (8,501 + lbs)	17.759	0.813	1.196	0.005	0.026	0.023	792.330	0.046
	Diesel	LDDV	Light-Duty Vehicles (Passenger Cars)	2.443	0.118	0.135	0.003	0.004	0.004	333.374	0.008
	Diesel	LDDT	Light-Duty Trucks (0-8,500 lbs)	4.567	0.294	0.423	0.004	0.007	0.007	479.399	0.008
	Diesel	HDDV	Heavy-Duty Vehicles (8,501 + lbs)	1.562	0.343	4.528	0.013	0.196	0.181	1492.162	0.026
	NA	MC	Motorcycles	12.987	2.449	0.734	0.003	0.026	0.023	396.779	0.051
Indiana	Gasoline	LDGV	Light-Duty Vehicles (Passenger Cars)	3.666	0.325	0.262	0.002	0.009	0.008	336.382	0.024
	Gasoline	LDGT	Light-Duty Trucks (0-8,500 lbs)	5.139	0.413	0.453	0.003	0.011	0.010	432.155	0.025
	Gasoline	HDGV	Heavy-Duty Vehicles (8,501 + lbs)	16.776	0.775	1.171	0.005	0.024	0.021	768.617	0.045
	Diesel	LDDV	Light-Duty Vehicles (Passenger Cars)	2.401	0.121	0.137	0.003	0.004	0.004	325.993	0.008
	Diesel	LDDT	Light-Duty Trucks (0-8,500 lbs)	4.420	0.285	0.422	0.004	0.007	0.006	467.186	0.008
	Diesel	HDDV	Heavy-Duty Vehicles (8,501 + lbs)	1.855	0.484	5.376	0.013	0.195	0.180	1501.491	0.028
	NA	MC	Motorcycles	13.546	2.404	0.761	0.003	0.027	0.024	395.825	0.053
Iowa	Gasoline	LDGV	Light-Duty Vehicles (Passenger Cars)	3.930	0.359	0.281	0.002	0.010	0.009	328.119	0.023
	Gasoline	LDGT	Light-Duty Trucks (0-8,500 lbs)	5.331	0.432	0.476	0.003	0.012	0.011	421.902	0.025
	Gasoline	HDGV	Heavy-Duty Vehicles (8,501 + lbs)	16.319	0.729	1.169	0.005	0.027	0.024	750.929	0.044
	Diesel	LDDV	Light-Duty Vehicles (Passenger Cars)	2.387	0.131	0.141	0.003	0.004	0.004	316.964	0.008
	Diesel	LDDT	Light-Duty Trucks (0-8,500 lbs)	4.351	0.289	0.427	0.004	0.007	0.006	454.846	0.008
	Diesel	HDDV	Heavy-Duty Vehicles (8,501 + lbs)	1.983	0.553	5.823	0.013	0.192	0.176	1498.183	0.029
	NA	MC	Motorcycles	13.699	2.276	0.797	0.003	0.027	0.024	396.938	0.054
Kansas	Gasoline	LDGV	Light-Duty Vehicles (Passenger Cars)	3.804	0.335	0.274	0.002	0.008	0.007	329.129	0.024
	Gasoline	LDGT	Light-Duty Trucks (0-8,500 lbs)	5.334	0.419	0.472	0.003	0.010	0.009	424.173	0.025
	Gasoline	HDGV	Heavy-Duty Vehicles (8,501 + lbs)	16.599	0.750	1.167	0.005	0.024	0.021	758.688	0.044
	Diesel	LDDV	Light-Duty Vehicles (Passenger Cars)	2.493	0.117	0.141	0.003	0.004	0.004	319.543	0.008
	Diesel	LDDT	Light-Duty Trucks (0-8,500 lbs)	4.558	0.278	0.430	0.004	0.007	0.006	458.987	0.008
	Diesel	HDDV	Heavy-Duty Vehicles (8,501 + lbs)	1.815	0.472	5.304	0.013	0.188	0.173	1491.365	0.028
	NA	MC	Motorcycles	13.484	2.464	0.774	0.003	0.027	0.024	395.871	0.054

Table 5-22. On-Road Vehicle Emission Factors – 2019 (cont.)

State	Fuel Type	Vehicle Type		Emission Factors (g/mi)							
				Criteria Pollutants and Ozone Precursors							
				CO	VOC	NO_X	SO_2	PM_{10}	$PM_{2.5}$	CO_2e	NH_3
Kentucky	Gasoline	LDGV	Light-Duty Vehicles (Passenger Cars)	3.711	0.321	0.268	0.002	0.008	0.007	325.994	0.024
	Gasoline	LDGT	Light-Duty Trucks (0-8,500 lbs)	5.275	0.407	0.466	0.003	0.010	0.009	420.938	0.025
	Gasoline	HDGV	Heavy-Duty Vehicles (8,501 + lbs)	15.970	0.726	1.132	0.005	0.024	0.021	758.580	0.044
	Diesel	LDDV	Light-Duty Vehicles (Passenger Cars)	2.513	0.116	0.142	0.003	0.004	0.004	316.736	0.008
	Diesel	LDDT	Light-Duty Trucks (0-8,500 lbs)	4.597	0.276	0.434	0.004	0.007	0.006	455.465	0.008
	Diesel	HDDV	Heavy-Duty Vehicles (8,501 + lbs)	2.096	0.596	6.043	0.013	0.194	0.178	1525.725	0.030
	NA	MC	Motorcycles	13.229	2.378	0.761	0.003	0.027	0.024	396.624	0.054
Louisiana	Gasoline	LDGV	Light-Duty Vehicles (Passenger Cars)	3.619	0.312	0.249	0.002	0.006	0.006	335.802	0.024
	Gasoline	LDGT	Light-Duty Trucks (0-8,500 lbs)	5.294	0.407	0.438	0.003	0.008	0.007	432.787	0.025
	Gasoline	HDGV	Heavy-Duty Vehicles (8,501 + lbs)	16.259	0.807	1.091	0.005	0.019	0.017	780.615	0.045
	Diesel	LDDV	Light-Duty Vehicles (Passenger Cars)	2.719	0.094	0.139	0.003	0.004	0.004	328.600	0.008
	Diesel	LDDT	Light-Duty Trucks (0-8,500 lbs)	4.983	0.256	0.423	0.004	0.007	0.006	471.467	0.008
	Diesel	HDDV	Heavy-Duty Vehicles (8,501 + lbs)	1.888	0.487	5.131	0.013	0.192	0.177	1538.729	0.029
	NA	MC	Motorcycles	13.218	2.782	0.675	0.003	0.027	0.024	393.466	0.053
Maine	Gasoline	LDGV	Light-Duty Vehicles (Passenger Cars)	3.614	0.358	0.275	0.002	0.011	0.010	320.553	0.023
	Gasoline	LDGT	Light-Duty Trucks (0-8,500 lbs)	4.852	0.420	0.463	0.003	0.013	0.012	412.795	0.025
	Gasoline	HDGV	Heavy-Duty Vehicles (8,501 + lbs)	14.991	0.695	1.157	0.005	0.029	0.025	733.249	0.044
	Diesel	LDDV	Light-Duty Vehicles (Passenger Cars)	2.292	0.141	0.143	0.003	0.004	0.004	308.722	0.008
	Diesel	LDDT	Light-Duty Trucks (0-8,500 lbs)	4.151	0.292	0.429	0.004	0.007	0.006	444.050	0.008
	Diesel	HDDV	Heavy-Duty Vehicles (8,501 + lbs)	1.977	0.558	5.957	0.013	0.188	0.173	1475.012	0.029
	NA	MC	Motorcycles	13.599	2.057	0.827	0.003	0.028	0.025	397.587	0.055
Maryland	Gasoline	LDGV	Light-Duty Vehicles (Passenger Cars)	3.223	0.284	0.239	0.002	0.008	0.007	331.287	0.024
	Gasoline	LDGT	Light-Duty Trucks (0-8,500 lbs)	4.558	0.359	0.422	0.003	0.010	0.009	428.368	0.025
	Gasoline	HDGV	Heavy-Duty Vehicles (8,501 + lbs)	16.543	0.754	1.175	0.005	0.025	0.022	769.991	0.045
	Diesel	LDDV	Light-Duty Vehicles (Passenger Cars)	2.519	0.113	0.140	0.003	0.004	0.004	321.979	0.008
	Diesel	LDDT	Light-Duty Trucks (0-8,500 lbs)	4.661	0.281	0.433	0.004	0.007	0.007	463.398	0.008
	Diesel	HDDV	Heavy-Duty Vehicles (8,501 + lbs)	1.666	0.401	4.913	0.013	0.187	0.172	1482.134	0.027
	NA	MC	Motorcycles	12.923	2.346	0.756	0.003	0.027	0.024	396.996	0.053
Massachusetts	Gasoline	LDGV	Light-Duty Vehicles (Passenger Cars)	3.267	0.296	0.241	0.002	0.009	0.008	330.346	0.024
	Gasoline	LDGT	Light-Duty Trucks (0-8,500 lbs)	4.591	0.375	0.424	0.003	0.012	0.011	426.959	0.025
	Gasoline	HDGV	Heavy-Duty Vehicles (8,501 + lbs)	16.822	0.736	1.201	0.005	0.028	0.025	764.288	0.045
	Diesel	LDDV	Light-Duty Vehicles (Passenger Cars)	2.417	0.124	0.140	0.003	0.004	0.004	319.755	0.008
	Diesel	LDDT	Light-Duty Trucks (0-8,500 lbs)	4.478	0.293	0.433	0.004	0.007	0.007	460.219	0.008
	Diesel	HDDV	Heavy-Duty Vehicles (8,501 + lbs)	1.682	0.415	5.051	0.012	0.188	0.173	1470.912	0.027
	NA	MC	Motorcycles	13.058	2.208	0.791	0.003	0.028	0.025	398.361	0.053
Michigan	Gasoline	LDGV	Light-Duty Vehicles (Passenger Cars)	3.828	0.339	0.273	0.002	0.010	0.009	333.856	0.024
	Gasoline	LDGT	Light-Duty Trucks (0-8,500 lbs)	5.365	0.434	0.474	0.003	0.013	0.011	429.920	0.025
	Gasoline	HDGV	Heavy-Duty Vehicles (8,501 + lbs)	16.714	0.764	1.188	0.005	0.029	0.025	766.281	0.045
	Diesel	LDDV	Light-Duty Vehicles (Passenger Cars)	2.393	0.128	0.139	0.003	0.004	0.004	322.710	0.008
	Diesel	LDDT	Light-Duty Trucks (0-8,500 lbs)	4.417	0.295	0.428	0.004	0.007	0.007	463.311	0.008
	Diesel	HDDV	Heavy-Duty Vehicles (8,501 + lbs)	1.857	0.491	5.489	0.013	0.193	0.178	1495.123	0.028
	NA	MC	Motorcycles	13.697	2.296	0.787	0.003	0.029	0.025	397.714	0.053
Minnesota	Gasoline	LDGV	Light-Duty Vehicles (Passenger Cars)	3.945	0.364	0.277	0.002	0.012	0.011	330.361	0.024
	Gasoline	LDGT	Light-Duty Trucks (0-8,500 lbs)	5.361	0.442	0.471	0.003	0.015	0.013	425.009	0.025
	Gasoline	HDGV	Heavy-Duty Vehicles (8,501 + lbs)	16.607	0.772	1.184	0.005	0.032	0.028	752.987	0.045
	Diesel	LDDV	Light-Duty Vehicles (Passenger Cars)	2.350	0.137	0.140	0.003	0.004	0.004	318.247	0.008
	Diesel	LDDT	Light-Duty Trucks (0-8,500 lbs)	4.306	0.299	0.427	0.004	0.007	0.006	456.905	0.008
	Diesel	HDDV	Heavy-Duty Vehicles (8,501 + lbs)	1.686	0.425	5.084	0.012	0.186	0.171	1458.177	0.027
	NA	MC	Motorcycles	14.008	2.279	0.803	0.003	0.029	0.026	398.110	0.054
Mississippi	Gasoline	LDGV	Light-Duty Vehicles (Passenger Cars)	3.549	0.320	0.257	0.002	0.007	0.006	329.434	0.023
	Gasoline	LDGT	Light-Duty Trucks (0-8,500 lbs)	5.116	0.405	0.444	0.003	0.008	0.007	424.072	0.025
	Gasoline	HDGV	Heavy-Duty Vehicles (8,501 + lbs)	15.797	0.774	1.093	0.005	0.018	0.016	758.527	0.044
	Diesel	LDDV	Light-Duty Vehicles (Passenger Cars)	2.570	0.100	0.139	0.003	0.004	0.004	321.760	0.008
	Diesel	LDDT	Light-Duty Trucks (0-8,500 lbs)	4.674	0.256	0.419	0.004	0.007	0.006	461.664	0.008
	Diesel	HDDV	Heavy-Duty Vehicles (8,501 + lbs)	1.774	0.445	4.959	0.013	0.186	0.171	1497.386	0.028
	NA	MC	Motorcycles	13.288	2.660	0.706	0.003	0.026	0.023	392.847	0.054

Table 5-22. On-Road Vehicle Emission Factors – 2019 (cont.)

State	Fuel Type	Vehicle Type		Emission Factors (g/mi)							
				Criteria Pollutants and Ozone Precursors							
				CO	VOC	NO_X	SO_2	PM_{10}	$PM_{2.5}$	CO_2e	NH_3
Missouri	Gasoline	LDGV	Light-Duty Vehicles (Passenger Cars)	3.653	0.316	0.261	0.002	0.008	0.007	323.052	0.023
	Gasoline	LDGT	Light-Duty Trucks (0-8,500 lbs)	5.157	0.397	0.456	0.003	0.010	0.009	418.254	0.025
	Gasoline	HDGV	Heavy-Duty Vehicles (8,501 + lbs)	16.271	0.722	1.146	0.005	0.025	0.022	754.039	0.044
	Diesel	LDDV	Light-Duty Vehicles (Passenger Cars)	2.543	0.117	0.143	0.003	0.004	0.004	313.771	0.008
	Diesel	LDDT	Light-Duty Trucks (0-8,500 lbs)	4.651	0.278	0.436	0.004	0.007	0.007	452.156	0.008
	Diesel	HDDV	Heavy-Duty Vehicles (8,501 + lbs)	1.834	0.485	5.383	0.013	0.185	0.170	1488.940	0.028
	NA	MC	Motorcycles	13.180	2.346	0.770	0.003	0.027	0.024	397.251	0.055
Montana	Gasoline	LDGV	Light-Duty Vehicles (Passenger Cars)	3.973	0.369	0.294	0.002	0.011	0.010	322.498	0.023
	Gasoline	LDGT	Light-Duty Trucks (0-8,500 lbs)	5.339	0.434	0.496	0.003	0.013	0.012	415.231	0.025
	Gasoline	HDGV	Heavy-Duty Vehicles (8,501 + lbs)	15.996	0.700	1.204	0.005	0.029	0.025	740.036	0.044
	Diesel	LDDV	Light-Duty Vehicles (Passenger Cars)	2.334	0.141	0.146	0.003	0.004	0.004	310.646	0.008
	Diesel	LDDT	Light-Duty Trucks (0-8,500 lbs)	4.233	0.294	0.440	0.004	0.007	0.006	446.572	0.008
	Diesel	HDDV	Heavy-Duty Vehicles (8,501 + lbs)	2.112	0.617	6.445	0.013	0.192	0.177	1500.036	0.030
	NA	MC	Motorcycles	13.900	2.238	0.874	0.003	0.028	0.025	397.927	0.055
Nebraska	Gasoline	LDGV	Light-Duty Vehicles (Passenger Cars)	3.945	0.354	0.282	0.002	0.010	0.009	327.595	0.024
	Gasoline	LDGT	Light-Duty Trucks (0-8,500 lbs)	5.433	0.432	0.484	0.003	0.012	0.011	422.284	0.025
	Gasoline	HDGV	Heavy-Duty Vehicles (8,501 + lbs)	16.303	0.729	1.177	0.005	0.028	0.025	757.194	0.044
	Diesel	LDDV	Light-Duty Vehicles (Passenger Cars)	2.458	0.128	0.143	0.003	0.004	0.004	316.870	0.008
	Diesel	LDDT	Light-Duty Trucks (0-8,500 lbs)	4.495	0.289	0.436	0.004	0.007	0.006	455.294	0.008
	Diesel	HDDV	Heavy-Duty Vehicles (8,501 + lbs)	2.102	0.604	6.175	0.013	0.194	0.179	1520.752	0.030
	NA	MC	Motorcycles	13.658	2.384	0.802	0.003	0.028	0.024	397.732	0.054
Nevada	Gasoline	LDGV	Light-Duty Vehicles (Passenger Cars)	3.321	0.305	0.253	0.002	0.007	0.006	342.201	0.024
	Gasoline	LDGT	Light-Duty Trucks (0-8,500 lbs)	4.742	0.385	0.448	0.003	0.009	0.008	440.768	0.025
	Gasoline	HDGV	Heavy-Duty Vehicles (8,501 + lbs)	17.556	0.833	1.274	0.005	0.021	0.019	791.461	0.045
	Diesel	LDDV	Light-Duty Vehicles (Passenger Cars)	2.574	0.103	0.144	0.003	0.004	0.004	333.704	0.008
	Diesel	LDDT	Light-Duty Trucks (0-8,500 lbs)	4.771	0.273	0.449	0.004	0.007	0.007	478.798	0.008
	Diesel	HDDV	Heavy-Duty Vehicles (8,501 + lbs)	1.886	0.481	5.689	0.013	0.200	0.184	1539.795	0.028
	NA	MC	Motorcycles	13.394	3.012	0.826	0.003	0.027	0.023	394.486	0.052
New Hampshire	Gasoline	LDGV	Light-Duty Vehicles (Passenger Cars)	3.274	0.314	0.242	0.002	0.010	0.009	327.830	0.023
	Gasoline	LDGT	Light-Duty Trucks (0-8,500 lbs)	4.461	0.378	0.416	0.003	0.013	0.011	421.877	0.025
	Gasoline	HDGV	Heavy-Duty Vehicles (8,501 + lbs)	16.190	0.719	1.185	0.005	0.027	0.024	748.368	0.045
	Diesel	LDDV	Light-Duty Vehicles (Passenger Cars)	2.334	0.132	0.140	0.003	0.004	0.004	316.533	0.008
	Diesel	LDDT	Light-Duty Trucks (0-8,500 lbs)	4.269	0.292	0.427	0.004	0.007	0.006	454.531	0.008
	Diesel	HDDV	Heavy-Duty Vehicles (8,501 + lbs)	1.730	0.442	5.213	0.012	0.186	0.171	1459.723	0.028
	NA	MC	Motorcycles	13.260	2.135	0.809	0.003	0.027	0.024	397.169	0.054
New Jersey	Gasoline	LDGV	Light-Duty Vehicles (Passenger Cars)	3.235	0.284	0.242	0.002	0.008	0.007	322.322	0.024
	Gasoline	LDGT	Light-Duty Trucks (0-8,500 lbs)	4.416	0.334	0.405	0.003	0.011	0.009	417.038	0.025
	Gasoline	HDGV	Heavy-Duty Vehicles (8,501 + lbs)	15.498	0.671	1.150	0.005	0.026	0.023	755.546	0.044
	Diesel	LDDV	Light-Duty Vehicles (Passenger Cars)	2.492	0.119	0.144	0.003	0.004	0.004	312.766	0.008
	Diesel	LDDT	Light-Duty Trucks (0-8,500 lbs)	4.560	0.277	0.440	0.004	0.007	0.007	450.453	0.008
	Diesel	HDDV	Heavy-Duty Vehicles (8,501 + lbs)	2.266	0.675	6.620	0.013	0.197	0.181	1541.636	0.031
	NA	MC	Motorcycles	12.903	2.134	0.793	0.003	0.027	0.024	397.855	0.055
New Mexico	Gasoline	LDGV	Light-Duty Vehicles (Passenger Cars)	3.606	0.334	0.276	0.002	0.008	0.007	327.673	0.024
	Gasoline	LDGT	Light-Duty Trucks (0-8,500 lbs)	5.058	0.408	0.479	0.003	0.010	0.009	422.313	0.025
	Gasoline	HDGV	Heavy-Duty Vehicles (8,501 + lbs)	16.278	0.743	1.216	0.005	0.023	0.020	757.706	0.044
	Diesel	LDDV	Light-Duty Vehicles (Passenger Cars)	2.471	0.114	0.146	0.003	0.004	0.004	318.451	0.008
	Diesel	LDDT	Light-Duty Trucks (0-8,500 lbs)	4.517	0.274	0.445	0.004	0.007	0.006	457.336	0.008
	Diesel	HDDV	Heavy-Duty Vehicles (8,501 + lbs)	2.048	0.574	6.194	0.013	0.194	0.178	1518.660	0.030
	NA	MC	Motorcycles	13.455	2.761	0.843	0.003	0.027	0.023	395.655	0.054
New York	Gasoline	LDGV	Light-Duty Vehicles (Passenger Cars)	3.116	0.284	0.222	0.002	0.009	0.008	333.797	0.024
	Gasoline	LDGT	Light-Duty Trucks (0-8,500 lbs)	4.191	0.333	0.381	0.003	0.012	0.010	430.416	0.025
	Gasoline	HDGV	Heavy-Duty Vehicles (8,501 + lbs)	16.701	0.763	1.195	0.005	0.027	0.023	767.520	0.045
	Diesel	LDDV	Light-Duty Vehicles (Passenger Cars)	2.399	0.122	0.138	0.003	0.004	0.004	323.295	0.008
	Diesel	LDDT	Light-Duty Trucks (0-8,500 lbs)	4.439	0.291	0.427	0.004	0.007	0.007	464.591	0.008
	Diesel	HDDV	Heavy-Duty Vehicles (8,501 + lbs)	1.648	0.395	4.897	0.012	0.189	0.174	1471.623	0.027
	NA	MC	Motorcycles	13.286	2.283	0.775	0.003	0.028	0.025	397.148	0.053

Table 5-22. On-Road Vehicle Emission Factors – 2019 (cont.)

State	Fuel Type	Vehicle Type		Emission Factors (g/mi)							
				Criteria Pollutants and Ozone Precursors							
				CO	VOC	NO_X	SO_2	PM_{10}	$PM_{2.5}$	CO_2e	NH_3
North Carolina	Gasoline	LDGV	Light-Duty Vehicles (Passenger Cars)	3.469	0.312	0.256	0.002	0.007	0.007	332.158	0.024
	Gasoline	LDGT	Light-Duty Trucks (0-8,500 lbs)	5.008	0.405	0.448	0.003	0.009	0.008	427.796	0.025
	Gasoline	HDGV	Heavy-Duty Vehicles (8,501 + lbs)	16.133	0.783	1.141	0.005	0.021	0.018	764.478	0.045
	Diesel	LDDV	Light-Duty Vehicles (Passenger Cars)	2.501	0.106	0.138	0.003	0.004	0.004	323.592	0.008
	Diesel	LDDT	Light-Duty Trucks (0-8,500 lbs)	4.586	0.268	0.423	0.004	0.007	0.006	464.444	0.008
	Diesel	HDDV	Heavy-Duty Vehicles (8,501 + lbs)	1.668	0.398	4.801	0.013	0.187	0.172	1481.751	0.027
	NA	MC	Motorcycles	13.342	2.593	0.730	0.003	0.027	0.024	394.312	0.053
North Dakota	Gasoline	LDGV	Light-Duty Vehicles (Passenger Cars)	4.179	0.403	0.288	0.002	0.014	0.012	324.021	0.023
	Gasoline	LDGT	Light-Duty Trucks (0-8,500 lbs)	5.516	0.466	0.484	0.003	0.016	0.015	416.590	0.025
	Gasoline	HDGV	Heavy-Duty Vehicles (8,501 + lbs)	15.853	0.730	1.170	0.005	0.034	0.030	738.422	0.044
	Diesel	LDDV	Light-Duty Vehicles (Passenger Cars)	2.318	0.150	0.144	0.003	0.004	0.004	310.895	0.008
	Diesel	LDDT	Light-Duty Trucks (0-8,500 lbs)	4.199	0.302	0.433	0.004	0.007	0.006	446.740	0.008
	Diesel	HDDV	Heavy-Duty Vehicles (8,501 + lbs)	2.001	0.572	6.047	0.013	0.189	0.174	1482.948	0.029
	NA	MC	Motorcycles	14.119	2.167	0.839	0.003	0.029	0.026	398.696	0.055
Ohio	Gasoline	LDGV	Light-Duty Vehicles (Passenger Cars)	3.519	0.312	0.249	0.002	0.009	0.008	336.004	0.024
	Gasoline	LDGT	Light-Duty Trucks (0-8,500 lbs)	4.910	0.392	0.431	0.003	0.011	0.010	432.284	0.025
	Gasoline	HDGV	Heavy-Duty Vehicles (8,501 + lbs)	16.935	0.783	1.180	0.005	0.025	0.022	769.246	0.045
	Diesel	LDDV	Light-Duty Vehicles (Passenger Cars)	2.401	0.121	0.137	0.003	0.004	0.004	325.557	0.008
	Diesel	LDDT	Light-Duty Trucks (0-8,500 lbs)	4.430	0.288	0.423	0.004	0.007	0.006	467.070	0.008
	Diesel	HDDV	Heavy-Duty Vehicles (8,501 + lbs)	1.732	0.430	5.061	0.013	0.192	0.177	1485.889	0.027
	NA	MC	Motorcycles	13.645	2.412	0.764	0.003	0.028	0.025	396.253	0.053
Oklahoma	Gasoline	LDGV	Light-Duty Vehicles (Passenger Cars)	3.762	0.326	0.268	0.002	0.007	0.006	333.282	0.024
	Gasoline	LDGT	Light-Duty Trucks (0-8,500 lbs)	5.365	0.415	0.465	0.003	0.009	0.008	429.137	0.025
	Gasoline	HDGV	Heavy-Duty Vehicles (8,501 + lbs)	16.842	0.777	1.156	0.005	0.021	0.018	769.199	0.045
	Diesel	LDDV	Light-Duty Vehicles (Passenger Cars)	2.566	0.107	0.140	0.003	0.004	0.004	324.697	0.008
	Diesel	LDDT	Light-Duty Trucks (0-8,500 lbs)	4.700	0.269	0.428	0.004	0.007	0.006	465.838	0.008
	Diesel	HDDV	Heavy-Duty Vehicles (8,501 + lbs)	1.850	0.479	5.283	0.013	0.191	0.176	1512.578	0.028
	NA	MC	Motorcycles	13.398	2.669	0.745	0.003	0.026	0.023	394.536	0.053
Oregon	Gasoline	LDGV	Light-Duty Vehicles (Passenger Cars)	3.376	0.304	0.262	0.002	0.008	0.007	325.242	0.024
	Gasoline	LDGT	Light-Duty Trucks (0-8,500 lbs)	4.710	0.376	0.445	0.003	0.010	0.009	419.000	0.025
	Gasoline	HDGV	Heavy-Duty Vehicles (8,501 + lbs)	16.376	0.730	1.195	0.005	0.023	0.020	746.678	0.044
	Diesel	LDDV	Light-Duty Vehicles (Passenger Cars)	2.332	0.121	0.141	0.003	0.004	0.004	315.331	0.008
	Diesel	LDDT	Light-Duty Trucks (0-8,500 lbs)	4.265	0.280	0.429	0.004	0.007	0.006	453.004	0.008
	Diesel	HDDV	Heavy-Duty Vehicles (8,501 + lbs)	1.839	0.486	5.535	0.013	0.189	0.174	1473.089	0.028
	NA	MC	Motorcycles	13.607	2.286	0.832	0.003	0.027	0.024	396.032	0.054
Pacific Islands	Gasoline	LDGV	Light-Duty Vehicles (Passenger Cars)	3.381	0.298	0.247	0.002	0.008	0.007	331.904	0.024
	Gasoline	LDGT	Light-Duty Trucks (0-8,500 lbs)	4.807	0.378	0.432	0.003	0.010	0.009	428.054	0.025
	Gasoline	HDGV	Heavy-Duty Vehicles (8,501 + lbs)	16.594	0.764	1.162	0.005	0.022	0.020	767.372	0.045
	Diesel	LDDV	Light-Duty Vehicles (Passenger Cars)	2.478	0.110	0.139	0.003	0.004	0.004	322.877	0.008
	Diesel	LDDT	Light-Duty Trucks (0-8,500 lbs)	4.567	0.275	0.429	0.004	0.007	0.007	463.838	0.008
	Diesel	HDDV	Heavy-Duty Vehicles (8,501 + lbs)	1.812	0.463	5.276	0.013	0.191	0.176	1498.294	0.028
	NA	MC	Motorcycles	13.179	2.476	0.758	0.003	0.027	0.024	395.677	0.053
Pennsylvania	Gasoline	LDGV	Light-Duty Vehicles (Passenger Cars)	3.299	0.298	0.242	0.002	0.009	0.008	333.712	0.024
	Gasoline	LDGT	Light-Duty Trucks (0-8,500 lbs)	4.637	0.375	0.423	0.003	0.011	0.010	429.894	0.025
	Gasoline	HDGV	Heavy-Duty Vehicles (8,501 + lbs)	16.407	0.759	1.179	0.005	0.026	0.023	768.096	0.045
	Diesel	LDDV	Light-Duty Vehicles (Passenger Cars)	2.422	0.121	0.139	0.003	0.004	0.004	323.382	0.008
	Diesel	LDDT	Light-Duty Trucks (0-8,500 lbs)	4.470	0.288	0.428	0.004	0.007	0.007	464.298	0.008
	Diesel	HDDV	Heavy-Duty Vehicles (8,501 + lbs)	1.886	0.500	5.517	0.013	0.194	0.179	1503.157	0.029
	NA	MC	Motorcycles	13.411	2.350	0.769	0.003	0.028	0.025	396.915	0.053
Puerto Rico	Gasoline	LDGV	Light-Duty Vehicles (Passenger Cars)	4.079	0.310	0.236	0.002	0.006	0.005	353.186	0.024
	Gasoline	LDGT	Light-Duty Trucks (0-8,500 lbs)	6.082	0.431	0.425	0.003	0.007	0.006	455.882	0.025
	Gasoline	HDGV	Heavy-Duty Vehicles (8,501 + lbs)	18.807	0.920	1.069	0.005	0.017	0.015	827.739	0.046
	Diesel	LDDV	Light-Duty Vehicles (Passenger Cars)	3.030	0.075	0.133	0.003	0.004	0.004	347.242	0.008
	Diesel	LDDT	Light-Duty Trucks (0-8,500 lbs)	5.610	0.246	0.414	0.004	0.007	0.007	498.655	0.008
	Diesel	HDDV	Heavy-Duty Vehicles (8,501 + lbs)	1.585	0.321	3.935	0.013	0.194	0.178	1570.197	0.026
	NA	MC	Motorcycles	13.193	3.129	0.604	0.003	0.026	0.023	391.995	0.052

Table 5-22. On-Road Vehicle Emission Factors – 2019 (cont.)

State	Fuel Type	Vehicle Type		Emission Factors (g/mi)							
				Criteria Pollutants and Ozone Precursors							
				CO	VOC	NO_X	SO_2	PM_{10}	$PM_{2.5}$	CO_2e	NH_3
Rhode Island	Gasoline	LDGV	Light-Duty Vehicles (Passenger Cars)	3.218	0.284	0.226	0.002	0.009	0.008	335.732	0.024
	Gasoline	LDGT	Light-Duty Trucks (0-8,500 lbs)	4.436	0.343	0.397	0.003	0.012	0.010	433.913	0.025
	Gasoline	HDGV	Heavy-Duty Vehicles (8,501 + lbs)	17.201	0.762	1.208	0.005	0.028	0.024	777.384	0.045
	Diesel	LDDV	Light-Duty Vehicles (Passenger Cars)	2.427	0.121	0.138	0.003	0.004	0.004	325.316	0.008
	Diesel	LDDT	Light-Duty Trucks (0-8,500 lbs)	4.526	0.294	0.429	0.004	0.007	0.007	468.195	0.008
	Diesel	HDDV	Heavy-Duty Vehicles (8,501 + lbs)	1.707	0.418	5.044	0.013	0.193	0.177	1488.872	0.027
	NA	MC	Motorcycles	13.024	2.291	0.770	0.003	0.028	0.025	398.001	0.052
South Carolina	Gasoline	LDGV	Light-Duty Vehicles (Passenger Cars)	3.599	0.317	0.259	0.002	0.007	0.006	332.471	0.024
	Gasoline	LDGT	Light-Duty Trucks (0-8,500 lbs)	5.234	0.412	0.455	0.003	0.009	0.008	428.500	0.025
	Gasoline	HDGV	Heavy-Duty Vehicles (8,501 + lbs)	15.934	0.780	1.119	0.005	0.020	0.018	771.782	0.044
	Diesel	LDDV	Light-Duty Vehicles (Passenger Cars)	2.598	0.102	0.140	0.003	0.004	0.004	324.460	0.008
	Diesel	LDDT	Light-Duty Trucks (0-8,500 lbs)	4.764	0.264	0.427	0.004	0.007	0.006	465.668	0.008
	Diesel	HDDV	Heavy-Duty Vehicles (8,501 + lbs)	2.011	0.547	5.628	0.013	0.195	0.179	1536.389	0.029
	NA	MC	Motorcycles	13.310	2.683	0.714	0.003	0.027	0.024	394.497	0.054
South Dakota	Gasoline	LDGV	Light-Duty Vehicles (Passenger Cars)	3.989	0.370	0.285	0.002	0.011	0.010	322.454	0.023
	Gasoline	LDGT	Light-Duty Trucks (0-8,500 lbs)	5.460	0.443	0.485	0.003	0.014	0.012	415.971	0.025
	Gasoline	HDGV	Heavy-Duty Vehicles (8,501 + lbs)	15.678	0.718	1.162	0.005	0.031	0.027	745.239	0.044
	Diesel	LDDV	Light-Duty Vehicles (Passenger Cars)	2.408	0.139	0.145	0.003	0.004	0.004	310.799	0.008
	Diesel	LDDT	Light-Duty Trucks (0-8,500 lbs)	4.375	0.294	0.439	0.004	0.007	0.006	447.254	0.008
	Diesel	HDDV	Heavy-Duty Vehicles (8,501 + lbs)	2.154	0.634	6.428	0.013	0.193	0.177	1512.801	0.030
	NA	MC	Motorcycles	13.907	2.296	0.824	0.003	0.029	0.026	398.664	0.055
Tennessee	Gasoline	LDGV	Light-Duty Vehicles (Passenger Cars)	3.474	0.306	0.251	0.002	0.008	0.007	332.918	0.024
	Gasoline	LDGT	Light-Duty Trucks (0-8,500 lbs)	4.990	0.394	0.441	0.003	0.010	0.009	429.209	0.025
	Gasoline	HDGV	Heavy-Duty Vehicles (8,501 + lbs)	16.356	0.778	1.144	0.005	0.023	0.020	771.063	0.045
	Diesel	LDDV	Light-Duty Vehicles (Passenger Cars)	2.539	0.109	0.139	0.003	0.004	0.004	324.100	0.008
	Diesel	LDDT	Light-Duty Trucks (0-8,500 lbs)	4.671	0.273	0.428	0.004	0.007	0.007	465.377	0.008
	Diesel	HDDV	Heavy-Duty Vehicles (8,501 + lbs)	1.918	0.509	5.475	0.013	0.193	0.178	1518.912	0.029
	NA	MC	Motorcycles	13.413	2.589	0.735	0.003	0.028	0.024	395.489	0.053
Texas	Gasoline	LDGV	Light-Duty Vehicles (Passenger Cars)	3.373	0.286	0.232	0.002	0.006	0.006	334.712	0.024
	Gasoline	LDGT	Light-Duty Trucks (0-8,500 lbs)	4.906	0.370	0.411	0.003	0.008	0.007	432.402	0.025
	Gasoline	HDGV	Heavy-Duty Vehicles (8,501 + lbs)	16.546	0.788	1.114	0.005	0.019	0.017	782.129	0.045
	Diesel	LDDV	Light-Duty Vehicles (Passenger Cars)	2.745	0.094	0.140	0.003	0.004	0.004	327.514	0.008
	Diesel	LDDT	Light-Duty Trucks (0-8,500 lbs)	5.046	0.259	0.432	0.004	0.007	0.007	470.697	0.008
	Diesel	HDDV	Heavy-Duty Vehicles (8,501 + lbs)	1.768	0.435	4.936	0.013	0.189	0.174	1524.069	0.028
	NA	MC	Motorcycles	12.718	2.743	0.695	0.003	0.026	0.023	394.263	0.053
Utah	Gasoline	LDGV	Light-Duty Vehicles (Passenger Cars)	3.564	0.318	0.257	0.002	0.009	0.008	337.185	0.024
	Gasoline	LDGT	Light-Duty Trucks (0-8,500 lbs)	5.020	0.399	0.453	0.003	0.012	0.011	435.187	0.025
	Gasoline	HDGV	Heavy-Duty Vehicles (8,501 + lbs)	17.583	0.799	1.264	0.005	0.028	0.025	779.127	0.045
	Diesel	LDDV	Light-Duty Vehicles (Passenger Cars)	2.462	0.122	0.142	0.003	0.004	0.004	326.688	0.008
	Diesel	LDDT	Light-Duty Trucks (0-8,500 lbs)	4.574	0.294	0.443	0.004	0.007	0.007	469.634	0.008
	Diesel	HDDV	Heavy-Duty Vehicles (8,501 + lbs)	1.784	0.452	5.440	0.013	0.194	0.179	1502.397	0.028
	NA	MC	Motorcycles	13.762	2.652	0.837	0.003	0.029	0.025	397.639	0.052
Vermont	Gasoline	LDGV	Light-Duty Vehicles (Passenger Cars)	3.368	0.340	0.250	0.002	0.011	0.010	321.253	0.023
	Gasoline	LDGT	Light-Duty Trucks (0-8,500 lbs)	4.514	0.395	0.425	0.003	0.014	0.012	413.787	0.025
	Gasoline	HDGV	Heavy-Duty Vehicles (8,501 + lbs)	15.124	0.703	1.159	0.005	0.030	0.026	736.089	0.044
	Diesel	LDDV	Light-Duty Vehicles (Passenger Cars)	2.317	0.141	0.143	0.003	0.004	0.004	309.323	0.008
	Diesel	LDDT	Light-Duty Trucks (0-8,500 lbs)	4.199	0.293	0.431	0.004	0.007	0.006	444.925	0.008
	Diesel	HDDV	Heavy-Duty Vehicles (8,501 + lbs)	2.010	0.573	6.040	0.013	0.189	0.174	1482.684	0.030
	NA	MC	Motorcycles	13.727	2.124	0.825	0.003	0.028	0.025	397.907	0.055
Virgin Islands	Gasoline	LDGV	Light-Duty Vehicles (Passenger Cars)	3.859	0.326	0.240	0.002	0.005	0.004	335.160	0.023
	Gasoline	LDGT	Light-Duty Trucks (0-8,500 lbs)	5.582	0.399	0.407	0.003	0.006	0.005	431.111	0.025
	Gasoline	HDGV	Heavy-Duty Vehicles (8,501 + lbs)	17.154	0.821	0.985	0.005	0.011	0.010	767.356	0.045
	Diesel	LDDV	Light-Duty Vehicles (Passenger Cars)	2.851	0.078	0.136	0.003	0.004	0.004	330.128	0.007
	Diesel	LDDT	Light-Duty Trucks (0-8,500 lbs)	5.162	0.225	0.402	0.004	0.006	0.006	473.392	0.008
	Diesel	HDDV	Heavy-Duty Vehicles (8,501 + lbs)	1.339	0.241	3.383	0.013	0.171	0.157	1482.759	0.025
	NA	MC	Motorcycles	13.170	2.619	0.625	0.003	0.023	0.021	388.114	0.054

Table 5-22. On-Road Vehicle Emission Factors – 2019 (cont.)

State	Fuel Type	Vehicle Type		Emission Factors (g/mi)							
				Criteria Pollutants and Ozone Precursors							
				CO	VOC	NO_X	SO_2	PM_{10}	$PM_{2.5}$	CO_2e	NH_3
Virginia	Gasoline	LDGV	Light-Duty Vehicles (Passenger Cars)	3.459	0.304	0.253	0.002	0.008	0.007	332.067	0.024
	Gasoline	LDGT	Light-Duty Trucks (0-8,500 lbs)	4.945	0.389	0.444	0.003	0.010	0.009	428.427	0.025
	Gasoline	HDGV	Heavy-Duty Vehicles (8,501 + lbs)	16.212	0.755	1.156	0.005	0.023	0.021	769.281	0.045
	Diesel	LDDV	Light-Duty Vehicles (Passenger Cars)	2.503	0.111	0.139	0.003	0.004	0.004	322.907	0.008
	Diesel	LDDT	Light-Duty Trucks (0-8,500 lbs)	4.614	0.277	0.429	0.004	0.007	0.007	463.970	0.008
	Diesel	HDDV	Heavy-Duty Vehicles (8,501 + lbs)	1.874	0.491	5.411	0.013	0.193	0.177	1508.250	0.028
	NA	MC	Motorcycles	13.080	2.427	0.744	0.003	0.027	0.024	396.130	0.053
Washington	Gasoline	LDGV	Light-Duty Vehicles (Passenger Cars)	3.454	0.299	0.251	0.002	0.009	0.008	328.916	0.024
	Gasoline	LDGT	Light-Duty Trucks (0-8,500 lbs)	4.890	0.380	0.437	0.003	0.011	0.010	425.057	0.025
	Gasoline	HDGV	Heavy-Duty Vehicles (8,501 + lbs)	16.899	0.754	1.214	0.005	0.027	0.023	762.484	0.045
	Diesel	LDDV	Light-Duty Vehicles (Passenger Cars)	2.376	0.122	0.140	0.003	0.004	0.004	318.778	0.008
	Diesel	LDDT	Light-Duty Trucks (0-8,500 lbs)	4.404	0.290	0.434	0.004	0.007	0.007	458.731	0.008
	Diesel	HDDV	Heavy-Duty Vehicles (8,501 + lbs)	1.874	0.497	5.618	0.013	0.193	0.177	1490.846	0.028
	NA	MC	Motorcycles	13.699	2.329	0.818	0.003	0.029	0.025	397.992	0.053
West Virginia	Gasoline	LDGV	Light-Duty Vehicles (Passenger Cars)	3.662	0.329	0.272	0.002	0.009	0.008	323.095	0.023
	Gasoline	LDGT	Light-Duty Trucks (0-8,500 lbs)	5.159	0.411	0.468	0.003	0.011	0.010	417.034	0.025
	Gasoline	HDGV	Heavy-Duty Vehicles (8,501 + lbs)	15.723	0.724	1.142	0.005	0.025	0.022	747.445	0.044
	Diesel	LDDV	Light-Duty Vehicles (Passenger Cars)	2.427	0.121	0.142	0.003	0.004	0.004	313.289	0.008
	Diesel	LDDT	Light-Duty Trucks (0-8,500 lbs)	4.423	0.279	0.430	0.004	0.007	0.006	450.694	0.008
	Diesel	HDDV	Heavy-Duty Vehicles (8,501 + lbs)	1.958	0.540	5.739	0.013	0.189	0.174	1493.658	0.029
	NA	MC	Motorcycles	13.555	2.352	0.780	0.003	0.028	0.025	396.587	0.054
Wisconsin	Gasoline	LDGV	Light-Duty Vehicles (Passenger Cars)	3.764	0.347	0.267	0.002	0.011	0.010	328.029	0.024
	Gasoline	LDGT	Light-Duty Trucks (0-8,500 lbs)	5.155	0.425	0.458	0.003	0.013	0.012	422.225	0.025
	Gasoline	HDGV	Heavy-Duty Vehicles (8,501 + lbs)	16.227	0.737	1.167	0.005	0.029	0.026	750.537	0.044
	Diesel	LDDV	Light-Duty Vehicles (Passenger Cars)	2.358	0.135	0.141	0.003	0.004	0.004	316.379	0.008
	Diesel	LDDT	Light-Duty Trucks (0-8,500 lbs)	4.313	0.295	0.429	0.004	0.007	0.006	454.367	0.008
	Diesel	HDDV	Heavy-Duty Vehicles (8,501 + lbs)	1.853	0.498	5.539	0.013	0.189	0.174	1477.555	0.028
	NA	MC	Motorcycles	13.592	2.200	0.800	0.003	0.028	0.025	397.895	0.054
Wyoming	Gasoline	LDGV	Light-Duty Vehicles (Passenger Cars)	4.074	0.376	0.297	0.002	0.011	0.010	324.007	0.023
	Gasoline	LDGT	Light-Duty Trucks (0-8,500 lbs)	5.515	0.446	0.504	0.003	0.014	0.012	417.765	0.025
	Gasoline	HDGV	Heavy-Duty Vehicles (8,501 + lbs)	16.070	0.707	1.215	0.005	0.032	0.028	749.186	0.044
	Diesel	LDDV	Light-Duty Vehicles (Passenger Cars)	2.393	0.141	0.147	0.003	0.004	0.004	312.083	0.008
	Diesel	LDDT	Light-Duty Trucks (0-8,500 lbs)	4.360	0.298	0.448	0.004	0.007	0.006	448.784	0.008
	Diesel	HDDV	Heavy-Duty Vehicles (8,501 + lbs)	2.270	0.685	6.913	0.013	0.197	0.181	1528.568	0.031
	NA	MC	Motorcycles	13.942	2.343	0.877	0.003	0.029	0.025	399.249	0.055

Table 5-23. On-Road Vehicle Emission Factors – 2020

State	Fuel Type	Vehicle Type		Emission Factors (g/mi)							
				Criteria Pollutants and Ozone Precursors							
				CO	VOC	NO_X	SO_2	PM_{10}	$PM_{2.5}$	CO_2e	NH_3
Alabama	Gasoline	LDGV	Light-Duty Vehicles (Passenger Cars)	3.372	0.288	0.221	0.002	0.006	0.006	324.955	0.023
	Gasoline	LDGT	Light-Duty Trucks (0-8,500 lbs)	4.775	0.367	0.388	0.003	0.008	0.007	417.799	0.024
	Gasoline	HDGV	Heavy-Duty Vehicles (8,501 + lbs)	15.011	0.718	0.982	0.005	0.018	0.016	766.021	0.045
	Diesel	LDDV	Light-Duty Vehicles (Passenger Cars)	2.584	0.096	0.131	0.003	0.004	0.004	316.390	0.008
	Diesel	LDDT	Light-Duty Trucks (0-8,500 lbs)	4.394	0.229	0.371	0.004	0.007	0.006	448.251	0.008
	Diesel	HDDV	Heavy-Duty Vehicles (8,501 + lbs)	1.678	0.415	4.584	0.013	0.166	0.153	1497.653	0.028
	NA	MC	Motorcycles	13.109	2.680	0.703	0.003	0.026	0.023	393.304	0.054
Alaska	Gasoline	LDGV	Light-Duty Vehicles (Passenger Cars)	3.925	0.362	0.248	0.002	0.013	0.011	322.311	0.023
	Gasoline	LDGT	Light-Duty Trucks (0-8,500 lbs)	4.995	0.415	0.418	0.003	0.016	0.014	414.045	0.024
	Gasoline	HDGV	Heavy-Duty Vehicles (8,501 + lbs)	15.575	0.670	1.087	0.005	0.035	0.031	750.761	0.044
	Diesel	LDDV	Light-Duty Vehicles (Passenger Cars)	2.292	0.155	0.135	0.003	0.004	0.004	307.430	0.008
	Diesel	LDDT	Light-Duty Trucks (0-8,500 lbs)	3.914	0.292	0.384	0.004	0.007	0.006	436.084	0.008
	Diesel	HDDV	Heavy-Duty Vehicles (8,501 + lbs)	1.925	0.549	5.739	0.013	0.170	0.157	1483.299	0.030
	NA	MC	Motorcycles	13.994	1.973	0.863	0.003	0.029	0.026	401.208	0.054
Arizona	Gasoline	LDGV	Light-Duty Vehicles (Passenger Cars)	3.338	0.276	0.212	0.002	0.006	0.005	331.601	0.023
	Gasoline	LDGT	Light-Duty Trucks (0-8,500 lbs)	4.686	0.343	0.379	0.003	0.007	0.006	427.791	0.024
	Gasoline	HDGV	Heavy-Duty Vehicles (8,501 + lbs)	16.786	0.759	1.082	0.005	0.018	0.016	794.301	0.045
	Diesel	LDDV	Light-Duty Vehicles (Passenger Cars)	2.798	0.088	0.141	0.003	0.004	0.004	323.935	0.008
	Diesel	LDDT	Light-Duty Trucks (0-8,500 lbs)	4.810	0.228	0.407	0.004	0.007	0.006	459.736	0.008
	Diesel	HDDV	Heavy-Duty Vehicles (8,501 + lbs)	1.823	0.468	5.309	0.013	0.172	0.158	1552.295	0.029
	NA	MC	Motorcycles	12.701	3.144	0.800	0.002	0.025	0.022	393.851	0.053
Arkansas	Gasoline	LDGV	Light-Duty Vehicles (Passenger Cars)	3.577	0.292	0.232	0.002	0.007	0.006	318.021	0.023
	Gasoline	LDGT	Light-Duty Trucks (0-8,500 lbs)	4.995	0.365	0.405	0.003	0.009	0.008	410.480	0.024
	Gasoline	HDGV	Heavy-Duty Vehicles (8,501 + lbs)	15.332	0.682	1.000	0.005	0.020	0.017	757.770	0.044
	Diesel	LDDV	Light-Duty Vehicles (Passenger Cars)	2.608	0.103	0.135	0.003	0.004	0.004	309.119	0.008
	Diesel	LDDT	Light-Duty Trucks (0-8,500 lbs)	4.432	0.236	0.381	0.004	0.007	0.006	439.312	0.008
	Diesel	HDDV	Heavy-Duty Vehicles (8,501 + lbs)	1.826	0.487	5.074	0.013	0.165	0.152	1504.829	0.029
	NA	MC	Motorcycles	13.209	2.555	0.742	0.003	0.026	0.023	395.170	0.055
Colorado	Gasoline	LDGV	Light-Duty Vehicles (Passenger Cars)	3.370	0.295	0.228	0.002	0.009	0.008	322.713	0.023
	Gasoline	LDGT	Light-Duty Trucks (0-8,500 lbs)	4.573	0.357	0.396	0.003	0.011	0.010	416.382	0.024
	Gasoline	HDGV	Heavy-Duty Vehicles (8,501 + lbs)	15.974	0.698	1.093	0.005	0.026	0.023	763.061	0.045
	Diesel	LDDV	Light-Duty Vehicles (Passenger Cars)	2.440	0.120	0.135	0.003	0.004	0.004	311.479	0.008
	Diesel	LDDT	Light-Duty Trucks (0-8,500 lbs)	4.194	0.261	0.389	0.004	0.007	0.006	442.693	0.008
	Diesel	HDDV	Heavy-Duty Vehicles (8,501 + lbs)	1.697	0.436	5.051	0.013	0.167	0.153	1479.339	0.028
	NA	MC	Motorcycles	13.588	2.623	0.833	0.003	0.029	0.025	398.006	0.054
Connecticut	Gasoline	LDGV	Light-Duty Vehicles (Passenger Cars)	3.043	0.254	0.195	0.002	0.008	0.007	322.434	0.023
	Gasoline	LDGT	Light-Duty Trucks (0-8,500 lbs)	4.190	0.310	0.348	0.003	0.011	0.010	417.706	0.024
	Gasoline	HDGV	Heavy-Duty Vehicles (8,501 + lbs)	16.092	0.687	1.068	0.005	0.026	0.023	769.191	0.045
	Diesel	LDDV	Light-Duty Vehicles (Passenger Cars)	2.485	0.115	0.132	0.003	0.004	0.004	311.714	0.008
	Diesel	LDDT	Light-Duty Trucks (0-8,500 lbs)	4.312	0.261	0.384	0.004	0.007	0.007	444.295	0.008
	Diesel	HDDV	Heavy-Duty Vehicles (8,501 + lbs)	1.407	0.310	4.146	0.012	0.161	0.148	1450.709	0.026
	NA	MC	Motorcycles	12.861	2.267	0.774	0.003	0.028	0.025	398.796	0.053
Delaware	Gasoline	LDGV	Light-Duty Vehicles (Passenger Cars)	2.970	0.259	0.207	0.002	0.007	0.006	326.609	0.023
	Gasoline	LDGT	Light-Duty Trucks (0-8,500 lbs)	4.033	0.314	0.361	0.003	0.009	0.008	419.268	0.024
	Gasoline	HDGV	Heavy-Duty Vehicles (8,501 + lbs)	15.921	0.690	1.037	0.005	0.018	0.016	760.165	0.045
	Diesel	LDDV	Light-Duty Vehicles (Passenger Cars)	2.411	0.108	0.128	0.003	0.004	0.004	316.523	0.008
	Diesel	LDDT	Light-Duty Trucks (0-8,500 lbs)	4.109	0.244	0.366	0.004	0.007	0.006	448.282	0.008
	Diesel	HDDV	Heavy-Duty Vehicles (8,501 + lbs)	1.280	0.249	3.671	0.012	0.160	0.147	1432.612	0.025
	NA	MC	Motorcycles	12.708	2.281	0.748	0.003	0.025	0.022	393.979	0.053
District of Columbia	Gasoline	LDGV	Light-Duty Vehicles (Passenger Cars)	2.972	0.247	0.190	0.002	0.007	0.006	340.195	0.023
	Gasoline	LDGT	Light-Duty Trucks (0-8,500 lbs)	4.078	0.305	0.334	0.003	0.009	0.008	438.244	0.024
	Gasoline	HDGV	Heavy-Duty Vehicles (8,501 + lbs)	17.054	0.757	1.074	0.005	0.020	0.018	801.978	0.046
	Diesel	LDDV	Light-Duty Vehicles (Passenger Cars)	2.487	0.103	0.126	0.003	0.004	0.004	330.042	0.008
	Diesel	LDDT	Light-Duty Trucks (0-8,500 lbs)	4.317	0.250	0.366	0.004	0.007	0.006	468.758	0.008
	Diesel	HDDV	Heavy-Duty Vehicles (8,501 + lbs)	1.396	0.277	3.836	0.013	0.176	0.162	1500.101	0.026
	NA	MC	Motorcycles	12.713	2.505	0.713	0.003	0.026	0.023	394.471	0.051

Table 5-23. On-Road Vehicle Emission Factors – 2020 (cont.)

State	Fuel Type	Vehicle Type		Emission Factors (g/mi)							
				Criteria Pollutants and Ozone Precursors							
				CO	VOC	NO_X	SO_2	PM_{10}	$PM_{2.5}$	CO_2e	NH_3
Florida	Gasoline	LDGV	Light-Duty Vehicles (Passenger Cars)	3.544	0.281	0.207	0.002	0.006	0.005	341.308	0.023
	Gasoline	LDGT	Light-Duty Trucks (0-8,500 lbs)	5.134	0.380	0.372	0.003	0.007	0.006	438.887	0.024
	Gasoline	HDGV	Heavy-Duty Vehicles (8,501 + lbs)	16.230	0.810	0.963	0.005	0.016	0.014	810.473	0.046
	Diesel	LDDV	Light-Duty Vehicles (Passenger Cars)	2.820	0.079	0.127	0.003	0.004	0.004	333.904	0.008
	Diesel	LDDT	Light-Duty Trucks (0-8,500 lbs)	4.845	0.219	0.364	0.004	0.007	0.006	472.877	0.008
	Diesel	HDDV	Heavy-Duty Vehicles (8,501 + lbs)	1.653	0.378	4.174	0.013	0.174	0.160	1557.827	0.028
	NA	MC	Motorcycles	12.996	3.023	0.623	0.003	0.026	0.023	391.756	0.052
Georgia	Gasoline	LDGV	Light-Duty Vehicles (Passenger Cars)	3.165	0.269	0.210	0.002	0.007	0.006	320.377	0.023
	Gasoline	LDGT	Light-Duty Trucks (0-8,500 lbs)	4.486	0.343	0.371	0.003	0.009	0.008	413.284	0.024
	Gasoline	HDGV	Heavy-Duty Vehicles (8,501 + lbs)	14.753	0.695	0.986	0.005	0.020	0.017	762.152	0.044
	Diesel	LDDV	Light-Duty Vehicles (Passenger Cars)	2.601	0.098	0.133	0.003	0.004	0.004	311.725	0.008
	Diesel	LDDT	Light-Duty Trucks (0-8,500 lbs)	4.432	0.233	0.378	0.004	0.007	0.006	442.736	0.008
	Diesel	HDDV	Heavy-Duty Vehicles (8,501 + lbs)	1.748	0.450	4.838	0.013	0.165	0.152	1499.483	0.028
	NA	MC	Motorcycles	13.062	2.569	0.719	0.003	0.027	0.024	394.708	0.054
Hawaii	Gasoline	LDGV	Light-Duty Vehicles (Passenger Cars)	3.471	0.273	0.208	0.002	0.005	0.005	331.783	0.023
	Gasoline	LDGT	Light-Duty Trucks (0-8,500 lbs)	4.994	0.364	0.373	0.003	0.007	0.006	426.950	0.024
	Gasoline	HDGV	Heavy-Duty Vehicles (8,501 + lbs)	16.647	0.780	0.970	0.005	0.015	0.013	785.403	0.046
	Diesel	LDDV	Light-Duty Vehicles (Passenger Cars)	2.705	0.073	0.127	0.003	0.004	0.004	324.862	0.008
	Diesel	LDDT	Light-Duty Trucks (0-8,500 lbs)	4.625	0.210	0.362	0.004	0.007	0.006	460.398	0.008
	Diesel	HDDV	Heavy-Duty Vehicles (8,501 + lbs)	1.358	0.257	3.536	0.013	0.163	0.150	1489.145	0.026
	NA	MC	Motorcycles	13.045	2.831	0.673	0.003	0.025	0.022	391.266	0.052
Idaho	Gasoline	LDGV	Light-Duty Vehicles (Passenger Cars)	3.508	0.310	0.241	0.002	0.009	0.008	319.587	0.023
	Gasoline	LDGT	Light-Duty Trucks (0-8,500 lbs)	4.709	0.370	0.413	0.003	0.011	0.010	410.868	0.024
	Gasoline	HDGV	Heavy-Duty Vehicles (8,501 + lbs)	15.452	0.671	1.079	0.005	0.024	0.021	748.861	0.044
	Diesel	LDDV	Light-Duty Vehicles (Passenger Cars)	2.379	0.126	0.136	0.003	0.004	0.004	308.053	0.008
	Diesel	LDDT	Light-Duty Trucks (0-8,500 lbs)	4.042	0.258	0.386	0.004	0.007	0.006	436.925	0.008
	Diesel	HDDV	Heavy-Duty Vehicles (8,501 + lbs)	1.822	0.494	5.426	0.013	0.167	0.154	1480.635	0.029
	NA	MC	Motorcycles	13.626	2.415	0.853	0.003	0.027	0.024	396.902	0.054
Illinois	Gasoline	LDGV	Light-Duty Vehicles (Passenger Cars)	3.299	0.277	0.210	0.002	0.008	0.007	334.135	0.023
	Gasoline	LDGT	Light-Duty Trucks (0-8,500 lbs)	4.608	0.364	0.375	0.003	0.010	0.009	431.125	0.024
	Gasoline	HDGV	Heavy-Duty Vehicles (8,501 + lbs)	16.615	0.737	1.056	0.005	0.024	0.021	788.948	0.046
	Diesel	LDDV	Light-Duty Vehicles (Passenger Cars)	2.463	0.114	0.128	0.003	0.004	0.004	323.055	0.008
	Diesel	LDDT	Light-Duty Trucks (0-8,500 lbs)	4.276	0.261	0.373	0.004	0.007	0.006	459.297	0.008
	Diesel	HDDV	Heavy-Duty Vehicles (8,501 + lbs)	1.427	0.306	4.048	0.013	0.170	0.156	1480.111	0.026
	NA	MC	Motorcycles	12.819	2.449	0.732	0.003	0.026	0.023	396.864	0.052
Indiana	Gasoline	LDGV	Light-Duty Vehicles (Passenger Cars)	3.470	0.295	0.227	0.002	0.008	0.007	326.846	0.023
	Gasoline	LDGT	Light-Duty Trucks (0-8,500 lbs)	4.769	0.371	0.395	0.003	0.010	0.009	419.858	0.024
	Gasoline	HDGV	Heavy-Duty Vehicles (8,501 + lbs)	15.646	0.703	1.033	0.005	0.022	0.020	765.203	0.045
	Diesel	LDDV	Light-Duty Vehicles (Passenger Cars)	2.420	0.116	0.130	0.003	0.004	0.004	315.910	0.008
	Diesel	LDDT	Light-Duty Trucks (0-8,500 lbs)	4.140	0.254	0.372	0.004	0.007	0.006	447.568	0.008
	Diesel	HDDV	Heavy-Duty Vehicles (8,501 + lbs)	1.721	0.441	4.881	0.013	0.170	0.156	1488.585	0.028
	NA	MC	Motorcycles	13.371	2.410	0.758	0.003	0.027	0.024	395.914	0.053
Iowa	Gasoline	LDGV	Light-Duty Vehicles (Passenger Cars)	3.724	0.327	0.244	0.002	0.009	0.008	318.858	0.023
	Gasoline	LDGT	Light-Duty Trucks (0-8,500 lbs)	4.958	0.390	0.416	0.003	0.011	0.010	409.932	0.024
	Gasoline	HDGV	Heavy-Duty Vehicles (8,501 + lbs)	15.245	0.663	1.033	0.005	0.025	0.022	747.500	0.044
	Diesel	LDDV	Light-Duty Vehicles (Passenger Cars)	2.405	0.126	0.134	0.003	0.004	0.004	307.181	0.008
	Diesel	LDDT	Light-Duty Trucks (0-8,500 lbs)	4.077	0.257	0.378	0.004	0.007	0.006	435.770	0.008
	Diesel	HDDV	Heavy-Duty Vehicles (8,501 + lbs)	1.853	0.508	5.321	0.013	0.167	0.154	1484.846	0.029
	NA	MC	Motorcycles	13.518	2.265	0.795	0.003	0.027	0.024	397.032	0.054
Kansas	Gasoline	LDGV	Light-Duty Vehicles (Passenger Cars)	3.613	0.304	0.238	0.002	0.008	0.007	319.800	0.023
	Gasoline	LDGT	Light-Duty Trucks (0-8,500 lbs)	4.963	0.376	0.412	0.003	0.010	0.009	412.097	0.024
	Gasoline	HDGV	Heavy-Duty Vehicles (8,501 + lbs)	15.519	0.681	1.031	0.005	0.022	0.019	755.293	0.044
	Diesel	LDDV	Light-Duty Vehicles (Passenger Cars)	2.512	0.113	0.134	0.003	0.004	0.004	309.646	0.008
	Diesel	LDDT	Light-Duty Trucks (0-8,500 lbs)	4.273	0.247	0.380	0.004	0.007	0.006	439.709	0.008
	Diesel	HDDV	Heavy-Duty Vehicles (8,501 + lbs)	1.685	0.431	4.819	0.013	0.163	0.150	1478.366	0.028
	NA	MC	Motorcycles	13.310	2.453	0.772	0.003	0.027	0.024	395.965	0.054

Table 5-23. On-Road Vehicle Emission Factors – 2020 (cont.)

State	Fuel Type	Vehicle Type		Emission Factors (g/mi)							
				Criteria Pollutants and Ozone Precursors							
				CO	VOC	NO_X	SO_2	PM_{10}	$PM_{2.5}$	CO_2e	NH_3
Kentucky	Gasoline	LDGV	Light-Duty Vehicles (Passenger Cars)	3.519	0.291	0.232	0.002	0.007	0.006	316.754	0.023
	Gasoline	LDGT	Light-Duty Trucks (0-8,500 lbs)	4.902	0.366	0.406	0.003	0.009	0.008	408.952	0.024
	Gasoline	HDGV	Heavy-Duty Vehicles (8,501 + lbs)	14.881	0.660	0.999	0.005	0.022	0.020	755.139	0.044
	Diesel	LDDV	Light-Duty Vehicles (Passenger Cars)	2.532	0.111	0.136	0.003	0.004	0.004	306.924	0.008
	Diesel	LDDT	Light-Duty Trucks (0-8,500 lbs)	4.312	0.245	0.384	0.004	0.007	0.006	436.358	0.008
	Diesel	HDDV	Heavy-Duty Vehicles (8,501 + lbs)	1.965	0.550	5.540	0.013	0.169	0.155	1512.001	0.030
	NA	MC	Motorcycles	13.062	2.383	0.759	0.003	0.027	0.024	396.720	0.055
Louisiana	Gasoline	LDGV	Light-Duty Vehicles (Passenger Cars)	3.442	0.282	0.214	0.002	0.006	0.005	326.217	0.023
	Gasoline	LDGT	Light-Duty Trucks (0-8,500 lbs)	4.923	0.364	0.380	0.003	0.008	0.007	420.393	0.024
	Gasoline	HDGV	Heavy-Duty Vehicles (8,501 + lbs)	15.168	0.733	0.961	0.005	0.018	0.016	777.203	0.045
	Diesel	LDDV	Light-Duty Vehicles (Passenger Cars)	2.739	0.090	0.132	0.003	0.004	0.004	318.373	0.008
	Diesel	LDDT	Light-Duty Trucks (0-8,500 lbs)	4.673	0.226	0.374	0.004	0.007	0.006	451.605	0.008
	Diesel	HDDV	Heavy-Duty Vehicles (8,501 + lbs)	1.756	0.445	4.669	0.013	0.167	0.154	1525.368	0.028
	NA	MC	Motorcycles	13.056	2.768	0.673	0.003	0.027	0.024	393.562	0.054
Maine	Gasoline	LDGV	Light-Duty Vehicles (Passenger Cars)	3.413	0.326	0.239	0.002	0.010	0.009	311.538	0.022
	Gasoline	LDGT	Light-Duty Trucks (0-8,500 lbs)	4.499	0.378	0.403	0.003	0.013	0.011	401.108	0.024
	Gasoline	HDGV	Heavy-Duty Vehicles (8,501 + lbs)	13.956	0.631	1.021	0.005	0.026	0.023	729.841	0.044
	Diesel	LDDV	Light-Duty Vehicles (Passenger Cars)	2.309	0.136	0.136	0.003	0.004	0.004	299.212	0.008
	Diesel	LDDT	Light-Duty Trucks (0-8,500 lbs)	3.890	0.261	0.380	0.004	0.007	0.006	425.441	0.008
	Diesel	HDDV	Heavy-Duty Vehicles (8,501 + lbs)	1.849	0.514	5.448	0.012	0.164	0.151	1461.720	0.029
	NA	MC	Motorcycles	13.418	2.048	0.824	0.003	0.028	0.025	397.681	0.055
Maryland	Gasoline	LDGV	Light-Duty Vehicles (Passenger Cars)	3.056	0.258	0.205	0.002	0.008	0.007	321.881	0.023
	Gasoline	LDGT	Light-Duty Trucks (0-8,500 lbs)	4.227	0.322	0.364	0.003	0.010	0.009	416.166	0.024
	Gasoline	HDGV	Heavy-Duty Vehicles (8,501 + lbs)	15.457	0.684	1.037	0.005	0.023	0.021	766.611	0.045
	Diesel	LDDV	Light-Duty Vehicles (Passenger Cars)	2.538	0.108	0.133	0.003	0.004	0.004	311.994	0.008
	Diesel	LDDT	Light-Duty Trucks (0-8,500 lbs)	4.370	0.250	0.383	0.004	0.007	0.007	443.966	0.008
	Diesel	HDDV	Heavy-Duty Vehicles (8,501 + lbs)	1.537	0.363	4.434	0.012	0.162	0.149	1469.558	0.027
	NA	MC	Motorcycles	12.758	2.335	0.754	0.003	0.027	0.024	397.088	0.054
Massachusetts	Gasoline	LDGV	Light-Duty Vehicles (Passenger Cars)	3.079	0.268	0.207	0.002	0.009	0.008	320.997	0.023
	Gasoline	LDGT	Light-Duty Trucks (0-8,500 lbs)	4.227	0.335	0.366	0.003	0.011	0.010	414.834	0.024
	Gasoline	HDGV	Heavy-Duty Vehicles (8,501 + lbs)	15.728	0.668	1.061	0.005	0.026	0.023	760.899	0.045
	Diesel	LDDV	Light-Duty Vehicles (Passenger Cars)	2.436	0.120	0.133	0.003	0.004	0.004	309.865	0.008
	Diesel	LDDT	Light-Duty Trucks (0-8,500 lbs)	4.198	0.262	0.383	0.004	0.007	0.007	440.954	0.008
	Diesel	HDDV	Heavy-Duty Vehicles (8,501 + lbs)	1.553	0.376	4.563	0.012	0.163	0.150	1458.393	0.027
	NA	MC	Motorcycles	12.888	2.199	0.789	0.003	0.028	0.025	398.452	0.054
Michigan	Gasoline	LDGV	Light-Duty Vehicles (Passenger Cars)	3.620	0.308	0.238	0.002	0.009	0.008	324.415	0.023
	Gasoline	LDGT	Light-Duty Trucks (0-8,500 lbs)	4.978	0.390	0.414	0.003	0.012	0.010	417.717	0.024
	Gasoline	HDGV	Heavy-Duty Vehicles (8,501 + lbs)	15.574	0.693	1.049	0.005	0.026	0.023	762.856	0.045
	Diesel	LDDV	Light-Duty Vehicles (Passenger Cars)	2.412	0.124	0.132	0.003	0.004	0.004	312.741	0.008
	Diesel	LDDT	Light-Duty Trucks (0-8,500 lbs)	4.138	0.263	0.379	0.004	0.007	0.006	443.903	0.008
	Diesel	HDDV	Heavy-Duty Vehicles (8,501 + lbs)	1.725	0.449	4.988	0.013	0.168	0.155	1482.202	0.028
	NA	MC	Motorcycles	13.517	2.297	0.784	0.003	0.029	0.025	397.804	0.053
Minnesota	Gasoline	LDGV	Light-Duty Vehicles (Passenger Cars)	3.718	0.330	0.241	0.002	0.011	0.010	321.052	0.023
	Gasoline	LDGT	Light-Duty Trucks (0-8,500 lbs)	4.963	0.398	0.411	0.003	0.014	0.012	412.976	0.024
	Gasoline	HDGV	Heavy-Duty Vehicles (8,501 + lbs)	15.437	0.701	1.045	0.005	0.029	0.026	749.591	0.045
	Diesel	LDDV	Light-Duty Vehicles (Passenger Cars)	2.368	0.133	0.133	0.003	0.004	0.004	308.435	0.008
	Diesel	LDDT	Light-Duty Trucks (0-8,500 lbs)	4.035	0.268	0.378	0.004	0.007	0.006	437.771	0.008
	Diesel	HDDV	Heavy-Duty Vehicles (8,501 + lbs)	1.558	0.386	4.596	0.012	0.161	0.148	1445.652	0.027
	NA	MC	Motorcycles	13.817	2.253	0.801	0.003	0.029	0.026	398.201	0.054
Mississippi	Gasoline	LDGV	Light-Duty Vehicles (Passenger Cars)	3.371	0.290	0.222	0.002	0.006	0.006	320.052	0.022
	Gasoline	LDGT	Light-Duty Trucks (0-8,500 lbs)	4.755	0.362	0.386	0.003	0.008	0.007	411.943	0.024
	Gasoline	HDGV	Heavy-Duty Vehicles (8,501 + lbs)	14.740	0.703	0.964	0.005	0.017	0.015	755.160	0.044
	Diesel	LDDV	Light-Duty Vehicles (Passenger Cars)	2.590	0.096	0.132	0.003	0.004	0.004	311.761	0.008
	Diesel	LDDT	Light-Duty Trucks (0-8,500 lbs)	4.381	0.225	0.370	0.004	0.007	0.006	442.188	0.008
	Diesel	HDDV	Heavy-Duty Vehicles (8,501 + lbs)	1.645	0.405	4.499	0.013	0.162	0.149	1484.364	0.028
	NA	MC	Motorcycles	13.123	2.647	0.704	0.003	0.026	0.023	392.944	0.054

Table 5-23. On-Road Vehicle Emission Factors – 2020 (cont.)

State	Fuel Type	Vehicle Type		Emission Factors (g/mi)							
				Criteria Pollutants and Ozone Precursors							
				CO	VOC	NO_X	SO_2	PM_{10}	$PM_{2.5}$	CO_2e	NH_3
Missouri	Gasoline	LDGV	Light-Duty Vehicles (Passenger Cars)	3.467	0.287	0.226	0.002	0.007	0.007	313.902	0.023
	Gasoline	LDGT	Light-Duty Trucks (0-8,500 lbs)	4.792	0.356	0.397	0.003	0.010	0.009	406.354	0.024
	Gasoline	HDGV	Heavy-Duty Vehicles (8,501 + lbs)	15.206	0.656	1.012	0.005	0.023	0.020	750.647	0.044
	Diesel	LDDV	Light-Duty Vehicles (Passenger Cars)	2.562	0.112	0.136	0.003	0.004	0.004	304.046	0.008
	Diesel	LDDT	Light-Duty Trucks (0-8,500 lbs)	4.364	0.247	0.387	0.004	0.007	0.006	433.198	0.008
	Diesel	HDDV	Heavy-Duty Vehicles (8,501 + lbs)	1.707	0.444	4.899	0.012	0.161	0.148	1475.813	0.028
	NA	MC	Motorcycles	13.011	2.335	0.768	0.003	0.027	0.024	397.348	0.055
Montana	Gasoline	LDGV	Light-Duty Vehicles (Passenger Cars)	3.757	0.337	0.257	0.002	0.010	0.009	313.427	0.022
	Gasoline	LDGT	Light-Duty Trucks (0-8,500 lbs)	4.961	0.392	0.433	0.003	0.012	0.011	403.476	0.024
	Gasoline	HDGV	Heavy-Duty Vehicles (8,501 + lbs)	14.909	0.636	1.063	0.005	0.026	0.023	736.593	0.044
	Diesel	LDDV	Light-Duty Vehicles (Passenger Cars)	2.351	0.136	0.139	0.003	0.004	0.004	301.076	0.008
	Diesel	LDDT	Light-Duty Trucks (0-8,500 lbs)	3.967	0.263	0.389	0.004	0.007	0.006	427.870	0.008
	Diesel	HDDV	Heavy-Duty Vehicles (8,501 + lbs)	1.983	0.570	5.915	0.013	0.168	0.154	1486.384	0.030
	NA	MC	Motorcycles	13.720	2.247	0.871	0.003	0.028	0.024	398.021	0.055
Nebraska	Gasoline	LDGV	Light-Duty Vehicles (Passenger Cars)	3.742	0.322	0.246	0.002	0.009	0.008	318.342	0.023
	Gasoline	LDGT	Light-Duty Trucks (0-8,500 lbs)	5.056	0.390	0.423	0.003	0.011	0.010	410.297	0.024
	Gasoline	HDGV	Heavy-Duty Vehicles (8,501 + lbs)	15.221	0.662	1.039	0.005	0.026	0.023	753.737	0.044
	Diesel	LDDV	Light-Duty Vehicles (Passenger Cars)	2.477	0.123	0.136	0.003	0.004	0.004	307.080	0.008
	Diesel	LDDT	Light-Duty Trucks (0-8,500 lbs)	4.215	0.257	0.386	0.004	0.007	0.006	436.223	0.008
	Diesel	HDDV	Heavy-Duty Vehicles (8,501 + lbs)	1.971	0.557	5.662	0.013	0.169	0.156	1507.066	0.030
	NA	MC	Motorcycles	13.479	2.373	0.800	0.003	0.027	0.024	397.826	0.055
Nevada	Gasoline	LDGV	Light-Duty Vehicles (Passenger Cars)	3.155	0.277	0.216	0.002	0.007	0.006	332.444	0.023
	Gasoline	LDGT	Light-Duty Trucks (0-8,500 lbs)	4.401	0.345	0.386	0.003	0.009	0.008	428.167	0.024
	Gasoline	HDGV	Heavy-Duty Vehicles (8,501 + lbs)	16.434	0.757	1.123	0.005	0.020	0.018	788.040	0.045
	Diesel	LDDV	Light-Duty Vehicles (Passenger Cars)	2.594	0.099	0.137	0.003	0.004	0.004	323.342	0.008
	Diesel	LDDT	Light-Duty Trucks (0-8,500 lbs)	4.470	0.241	0.396	0.004	0.007	0.006	458.665	0.008
	Diesel	HDDV	Heavy-Duty Vehicles (8,501 + lbs)	1.749	0.438	5.163	0.013	0.174	0.160	1526.724	0.028
	NA	MC	Motorcycles	13.236	3.033	0.823	0.003	0.026	0.023	394.576	0.052
New Hampshire	Gasoline	LDGV	Light-Duty Vehicles (Passenger Cars)	3.083	0.284	0.208	0.002	0.009	0.008	318.576	0.023
	Gasoline	LDGT	Light-Duty Trucks (0-8,500 lbs)	4.110	0.338	0.360	0.003	0.012	0.010	409.911	0.024
	Gasoline	HDGV	Heavy-Duty Vehicles (8,501 + lbs)	15.125	0.652	1.046	0.005	0.025	0.022	744.983	0.045
	Diesel	LDDV	Light-Duty Vehicles (Passenger Cars)	2.352	0.127	0.133	0.003	0.004	0.004	306.763	0.008
	Diesel	LDDT	Light-Duty Trucks (0-8,500 lbs)	3.999	0.261	0.377	0.004	0.007	0.006	435.473	0.008
	Diesel	HDDV	Heavy-Duty Vehicles (8,501 + lbs)	1.602	0.402	4.722	0.012	0.162	0.149	1447.092	0.028
	NA	MC	Motorcycles	13.084	2.125	0.807	0.003	0.027	0.024	397.261	0.054
New Jersey	Gasoline	LDGV	Light-Duty Vehicles (Passenger Cars)	3.069	0.259	0.209	0.002	0.008	0.007	313.199	0.023
	Gasoline	LDGT	Light-Duty Trucks (0-8,500 lbs)	4.099	0.300	0.352	0.003	0.010	0.009	405.175	0.024
	Gasoline	HDGV	Heavy-Duty Vehicles (8,501 + lbs)	14.452	0.609	1.015	0.005	0.024	0.021	752.072	0.044
	Diesel	LDDV	Light-Duty Vehicles (Passenger Cars)	2.510	0.115	0.137	0.003	0.004	0.004	303.079	0.008
	Diesel	LDDT	Light-Duty Trucks (0-8,500 lbs)	4.279	0.247	0.390	0.004	0.007	0.006	431.584	0.008
	Diesel	HDDV	Heavy-Duty Vehicles (8,501 + lbs)	2.135	0.626	6.097	0.013	0.172	0.158	1527.482	0.031
	NA	MC	Motorcycles	12.737	2.125	0.791	0.003	0.027	0.024	397.952	0.055
New Mexico	Gasoline	LDGV	Light-Duty Vehicles (Passenger Cars)	3.425	0.304	0.239	0.002	0.007	0.006	318.380	0.023
	Gasoline	LDGT	Light-Duty Trucks (0-8,500 lbs)	4.703	0.366	0.417	0.003	0.009	0.008	410.282	0.024
	Gasoline	HDGV	Heavy-Duty Vehicles (8,501 + lbs)	15.205	0.676	1.073	0.005	0.021	0.019	754.279	0.044
	Diesel	LDDV	Light-Duty Vehicles (Passenger Cars)	2.490	0.110	0.139	0.003	0.004	0.004	308.586	0.008
	Diesel	LDDT	Light-Duty Trucks (0-8,500 lbs)	4.234	0.243	0.394	0.004	0.007	0.006	438.126	0.008
	Diesel	HDDV	Heavy-Duty Vehicles (8,501 + lbs)	1.917	0.528	5.669	0.013	0.169	0.155	1505.099	0.030
	NA	MC	Motorcycles	13.284	2.749	0.841	0.003	0.026	0.023	395.751	0.054
New York	Gasoline	LDGV	Light-Duty Vehicles (Passenger Cars)	2.955	0.258	0.193	0.002	0.008	0.007	324.339	0.023
	Gasoline	LDGT	Light-Duty Trucks (0-8,500 lbs)	3.906	0.302	0.332	0.003	0.011	0.010	418.180	0.024
	Gasoline	HDGV	Heavy-Duty Vehicles (8,501 + lbs)	15.601	0.692	1.055	0.005	0.025	0.022	764.138	0.045
	Diesel	LDDV	Light-Duty Vehicles (Passenger Cars)	2.417	0.118	0.131	0.003	0.004	0.004	313.294	0.008
	Diesel	LDDT	Light-Duty Trucks (0-8,500 lbs)	4.159	0.259	0.377	0.004	0.007	0.006	445.114	0.008
	Diesel	HDDV	Heavy-Duty Vehicles (8,501 + lbs)	1.518	0.357	4.412	0.012	0.164	0.151	1459.242	0.027
	NA	MC	Motorcycles	13.114	2.273	0.773	0.003	0.028	0.024	397.237	0.053

Table 5-23. On-Road Vehicle Emission Factors – 2020 (cont.)

State	Fuel Type	Vehicle Type		Emission Factors (g/mi)							
				Criteria Pollutants and Ozone Precursors							
				CO	VOC	NO_X	SO_2	PM_{10}	$PM_{2.5}$	CO_2e	NH_3
North Carolina	Gasoline	LDGV	Light-Duty Vehicles (Passenger Cars)	3.291	0.282	0.221	0.002	0.007	0.006	322.708	0.023
	Gasoline	LDGT	Light-Duty Trucks (0-8,500 lbs)	4.649	0.363	0.390	0.003	0.009	0.008	415.581	0.024
	Gasoline	HDGV	Heavy-Duty Vehicles (8,501 + lbs)	15.054	0.711	1.006	0.005	0.019	0.017	761.115	0.045
	Diesel	LDDV	Light-Duty Vehicles (Passenger Cars)	2.520	0.101	0.131	0.003	0.004	0.004	313.549	0.008
	Diesel	LDDT	Light-Duty Trucks (0-8,500 lbs)	4.297	0.237	0.373	0.004	0.007	0.006	444.897	0.008
	Diesel	HDDV	Heavy-Duty Vehicles (8,501 + lbs)	1.538	0.360	4.332	0.012	0.163	0.150	1469.156	0.027
	NA	MC	Motorcycles	13.174	2.581	0.728	0.003	0.027	0.024	394.406	0.054
North Dakota	Gasoline	LDGV	Light-Duty Vehicles (Passenger Cars)	3.929	0.367	0.251	0.002	0.012	0.011	314.937	0.022
	Gasoline	LDGT	Light-Duty Trucks (0-8,500 lbs)	5.109	0.420	0.422	0.003	0.015	0.013	404.828	0.024
	Gasoline	HDGV	Heavy-Duty Vehicles (8,501 + lbs)	14.714	0.663	1.033	0.005	0.031	0.028	734.985	0.044
	Diesel	LDDV	Light-Duty Vehicles (Passenger Cars)	2.335	0.145	0.137	0.003	0.004	0.004	301.338	0.008
	Diesel	LDDT	Light-Duty Trucks (0-8,500 lbs)	3.935	0.271	0.383	0.004	0.007	0.006	428.048	0.008
	Diesel	HDDV	Heavy-Duty Vehicles (8,501 + lbs)	1.873	0.527	5.533	0.012	0.165	0.151	1469.573	0.029
	NA	MC	Motorcycles	13.922	2.142	0.836	0.003	0.029	0.026	398.790	0.055
Ohio	Gasoline	LDGV	Light-Duty Vehicles (Passenger Cars)	3.330	0.284	0.216	0.002	0.008	0.007	326.479	0.023
	Gasoline	LDGT	Light-Duty Trucks (0-8,500 lbs)	4.558	0.352	0.376	0.003	0.011	0.009	419.987	0.024
	Gasoline	HDGV	Heavy-Duty Vehicles (8,501 + lbs)	15.794	0.711	1.042	0.005	0.023	0.021	765.850	0.045
	Diesel	LDDV	Light-Duty Vehicles (Passenger Cars)	2.419	0.116	0.130	0.003	0.004	0.004	315.487	0.008
	Diesel	LDDT	Light-Duty Trucks (0-8,500 lbs)	4.149	0.256	0.373	0.004	0.007	0.006	447.468	0.008
	Diesel	HDDV	Heavy-Duty Vehicles (8,501 + lbs)	1.600	0.390	4.574	0.012	0.167	0.154	1473.301	0.027
	NA	MC	Motorcycles	13.469	2.417	0.762	0.003	0.028	0.025	396.342	0.053
Oklahoma	Gasoline	LDGV	Light-Duty Vehicles (Passenger Cars)	3.576	0.295	0.232	0.002	0.007	0.006	323.803	0.023
	Gasoline	LDGT	Light-Duty Trucks (0-8,500 lbs)	4.991	0.372	0.406	0.003	0.009	0.008	416.885	0.024
	Gasoline	HDGV	Heavy-Duty Vehicles (8,501 + lbs)	15.751	0.706	1.021	0.005	0.019	0.017	765.797	0.045
	Diesel	LDDV	Light-Duty Vehicles (Passenger Cars)	2.586	0.103	0.133	0.003	0.004	0.004	314.620	0.008
	Diesel	LDDT	Light-Duty Trucks (0-8,500 lbs)	4.406	0.238	0.378	0.004	0.007	0.006	446.240	0.008
	Diesel	HDDV	Heavy-Duty Vehicles (8,501 + lbs)	1.719	0.437	4.802	0.013	0.166	0.153	1499.452	0.028
	NA	MC	Motorcycles	13.229	2.656	0.743	0.003	0.026	0.023	394.630	0.054
Oregon	Gasoline	LDGV	Light-Duty Vehicles (Passenger Cars)	3.199	0.277	0.227	0.002	0.008	0.007	316.032	0.023
	Gasoline	LDGT	Light-Duty Trucks (0-8,500 lbs)	4.368	0.337	0.387	0.003	0.010	0.009	407.079	0.024
	Gasoline	HDGV	Heavy-Duty Vehicles (8,501 + lbs)	15.287	0.663	1.055	0.005	0.021	0.019	743.300	0.044
	Diesel	LDDV	Light-Duty Vehicles (Passenger Cars)	2.350	0.117	0.134	0.003	0.004	0.004	305.576	0.008
	Diesel	LDDT	Light-Duty Trucks (0-8,500 lbs)	3.996	0.249	0.379	0.004	0.007	0.006	433.982	0.008
	Diesel	HDDV	Heavy-Duty Vehicles (8,501 + lbs)	1.710	0.444	5.034	0.012	0.164	0.151	1460.193	0.028
	NA	MC	Motorcycles	13.439	2.292	0.830	0.003	0.027	0.024	396.125	0.054
Pacific Islands	Gasoline	LDGV	Light-Duty Vehicles (Passenger Cars)	3.209	0.270	0.214	0.002	0.007	0.006	322.472	0.023
	Gasoline	LDGT	Light-Duty Trucks (0-8,500 lbs)	4.466	0.340	0.376	0.003	0.009	0.008	415.846	0.024
	Gasoline	HDGV	Heavy-Duty Vehicles (8,501 + lbs)	15.499	0.693	1.026	0.005	0.021	0.019	763.978	0.045
	Diesel	LDDV	Light-Duty Vehicles (Passenger Cars)	2.497	0.106	0.132	0.003	0.004	0.004	312.864	0.008
	Diesel	LDDT	Light-Duty Trucks (0-8,500 lbs)	4.280	0.244	0.379	0.004	0.007	0.006	444.356	0.008
	Diesel	HDDV	Heavy-Duty Vehicles (8,501 + lbs)	1.681	0.422	4.788	0.013	0.166	0.153	1485.391	0.028
	NA	MC	Motorcycles	13.014	2.472	0.756	0.003	0.027	0.024	395.769	0.054
Pennsylvania	Gasoline	LDGV	Light-Duty Vehicles (Passenger Cars)	3.120	0.270	0.209	0.002	0.008	0.007	324.256	0.023
	Gasoline	LDGT	Light-Duty Trucks (0-8,500 lbs)	4.294	0.336	0.367	0.003	0.011	0.009	417.667	0.024
	Gasoline	HDGV	Heavy-Duty Vehicles (8,501 + lbs)	15.302	0.689	1.040	0.005	0.024	0.021	764.676	0.045
	Diesel	LDDV	Light-Duty Vehicles (Passenger Cars)	2.440	0.117	0.132	0.003	0.004	0.004	313.378	0.008
	Diesel	LDDT	Light-Duty Trucks (0-8,500 lbs)	4.188	0.256	0.378	0.004	0.007	0.006	444.829	0.008
	Diesel	HDDV	Heavy-Duty Vehicles (8,501 + lbs)	1.753	0.457	5.017	0.013	0.169	0.156	1490.143	0.028
	NA	MC	Motorcycles	13.237	2.340	0.767	0.003	0.028	0.025	397.006	0.053
Puerto Rico	Gasoline	LDGV	Light-Duty Vehicles (Passenger Cars)	3.889	0.280	0.203	0.002	0.005	0.005	343.046	0.023
	Gasoline	LDGT	Light-Duty Trucks (0-8,500 lbs)	5.666	0.385	0.369	0.003	0.007	0.006	442.771	0.024
	Gasoline	HDGV	Heavy-Duty Vehicles (8,501 + lbs)	17.633	0.836	0.943	0.005	0.016	0.014	824.346	0.046
	Diesel	LDDV	Light-Duty Vehicles (Passenger Cars)	3.053	0.071	0.127	0.003	0.004	0.004	336.396	0.008
	Diesel	LDDT	Light-Duty Trucks (0-8,500 lbs)	5.262	0.214	0.366	0.004	0.007	0.006	477.629	0.008
	Diesel	HDDV	Heavy-Duty Vehicles (8,501 + lbs)	1.448	0.285	3.522	0.013	0.168	0.155	1557.490	0.026
	NA	MC	Motorcycles	13.044	3.141	0.603	0.003	0.026	0.023	392.087	0.052

Table 5-23. On-Road Vehicle Emission Factors – 2020 (cont.)

State	Fuel Type	Vehicle Type		Emission Factors (g/mi)							
				Criteria Pollutants and Ozone Precursors							
				CO	VOC	NO_X	SO_2	PM_{10}	$PM_{2.5}$	CO_2e	NH_3
Rhode Island	Gasoline	LDGV	Light-Duty Vehicles (Passenger Cars)	3.057	0.259	0.197	0.002	0.008	0.007	326.212	0.023
	Gasoline	LDGT	Light-Duty Trucks (0-8,500 lbs)	4.140	0.311	0.347	0.003	0.011	0.010	421.576	0.024
	Gasoline	HDGV	Heavy-Duty Vehicles (8,501 + lbs)	16.087	0.691	1.067	0.005	0.025	0.023	773.985	0.045
	Diesel	LDDV	Light-Duty Vehicles (Passenger Cars)	2.446	0.116	0.131	0.003	0.004	0.004	315.248	0.008
	Diesel	LDDT	Light-Duty Trucks (0-8,500 lbs)	4.241	0.261	0.380	0.004	0.007	0.007	448.591	0.008
	Diesel	HDDV	Heavy-Duty Vehicles (8,501 + lbs)	1.575	0.378	4.553	0.013	0.168	0.154	1476.363	0.027
	NA	MC	Motorcycles	12.856	2.282	0.768	0.003	0.028	0.024	398.090	0.053
South Carolina	Gasoline	LDGV	Light-Duty Vehicles (Passenger Cars)	3.420	0.287	0.224	0.002	0.007	0.006	323.003	0.023
	Gasoline	LDGT	Light-Duty Trucks (0-8,500 lbs)	4.866	0.368	0.396	0.003	0.008	0.007	416.252	0.024
	Gasoline	HDGV	Heavy-Duty Vehicles (8,501 + lbs)	14.852	0.709	0.986	0.005	0.019	0.017	768.355	0.044
	Diesel	LDDV	Light-Duty Vehicles (Passenger Cars)	2.618	0.097	0.133	0.003	0.004	0.004	314.381	0.008
	Diesel	LDDT	Light-Duty Trucks (0-8,500 lbs)	4.466	0.233	0.378	0.004	0.007	0.006	446.079	0.008
	Diesel	HDDV	Heavy-Duty Vehicles (8,501 + lbs)	1.878	0.503	5.142	0.013	0.170	0.156	1522.836	0.029
	NA	MC	Motorcycles	13.144	2.670	0.712	0.003	0.027	0.024	394.593	0.054
South Dakota	Gasoline	LDGV	Light-Duty Vehicles (Passenger Cars)	3.759	0.336	0.248	0.002	0.010	0.009	313.383	0.022
	Gasoline	LDGT	Light-Duty Trucks (0-8,500 lbs)	5.061	0.399	0.423	0.003	0.013	0.011	404.195	0.024
	Gasoline	HDGV	Heavy-Duty Vehicles (8,501 + lbs)	14.542	0.652	1.025	0.005	0.029	0.025	741.779	0.044
	Diesel	LDDV	Light-Duty Vehicles (Passenger Cars)	2.426	0.134	0.138	0.003	0.004	0.004	301.218	0.008
	Diesel	LDDT	Light-Duty Trucks (0-8,500 lbs)	4.103	0.263	0.389	0.004	0.007	0.006	428.542	0.008
	Diesel	HDDV	Heavy-Duty Vehicles (8,501 + lbs)	2.025	0.587	5.906	0.013	0.168	0.155	1498.981	0.030
	NA	MC	Motorcycles	13.720	2.267	0.821	0.003	0.029	0.025	398.760	0.055
Tennessee	Gasoline	LDGV	Light-Duty Vehicles (Passenger Cars)	3.294	0.277	0.217	0.002	0.007	0.006	323.453	0.023
	Gasoline	LDGT	Light-Duty Trucks (0-8,500 lbs)	4.630	0.352	0.382	0.003	0.009	0.008	416.963	0.024
	Gasoline	HDGV	Heavy-Duty Vehicles (8,501 + lbs)	15.245	0.706	1.009	0.005	0.021	0.019	767.647	0.045
	Diesel	LDDV	Light-Duty Vehicles (Passenger Cars)	2.559	0.104	0.133	0.003	0.004	0.004	314.046	0.008
	Diesel	LDDT	Light-Duty Trucks (0-8,500 lbs)	4.379	0.242	0.378	0.004	0.007	0.006	445.826	0.008
	Diesel	HDDV	Heavy-Duty Vehicles (8,501 + lbs)	1.786	0.466	4.987	0.013	0.168	0.155	1505.673	0.029
	NA	MC	Motorcycles	13.245	2.599	0.733	0.003	0.027	0.024	395.583	0.054
Texas	Gasoline	LDGV	Light-Duty Vehicles (Passenger Cars)	3.209	0.258	0.199	0.002	0.006	0.005	325.158	0.023
	Gasoline	LDGT	Light-Duty Trucks (0-8,500 lbs)	4.561	0.331	0.356	0.003	0.008	0.007	420.023	0.024
	Gasoline	HDGV	Heavy-Duty Vehicles (8,501 + lbs)	15.468	0.716	0.982	0.005	0.018	0.016	778.735	0.045
	Diesel	LDDV	Light-Duty Vehicles (Passenger Cars)	2.765	0.090	0.134	0.003	0.004	0.004	317.317	0.008
	Diesel	LDDT	Light-Duty Trucks (0-8,500 lbs)	4.734	0.228	0.382	0.004	0.007	0.006	450.890	0.008
	Diesel	HDDV	Heavy-Duty Vehicles (8,501 + lbs)	1.638	0.396	4.473	0.013	0.164	0.151	1511.000	0.028
	NA	MC	Motorcycles	12.562	2.729	0.693	0.003	0.026	0.023	394.358	0.054
Utah	Gasoline	LDGV	Light-Duty Vehicles (Passenger Cars)	3.377	0.289	0.223	0.002	0.009	0.008	327.627	0.023
	Gasoline	LDGT	Light-Duty Trucks (0-8,500 lbs)	4.663	0.359	0.394	0.003	0.011	0.010	422.814	0.024
	Gasoline	HDGV	Heavy-Duty Vehicles (8,501 + lbs)	16.421	0.726	1.116	0.005	0.026	0.023	775.708	0.045
	Diesel	LDDV	Light-Duty Vehicles (Passenger Cars)	2.481	0.117	0.135	0.003	0.004	0.004	316.579	0.008
	Diesel	LDDT	Light-Duty Trucks (0-8,500 lbs)	4.286	0.261	0.392	0.004	0.007	0.006	449.962	0.008
	Diesel	HDDV	Heavy-Duty Vehicles (8,501 + lbs)	1.651	0.411	4.925	0.013	0.169	0.155	1489.652	0.028
	NA	MC	Motorcycles	13.589	2.667	0.834	0.003	0.028	0.025	397.728	0.053
Vermont	Gasoline	LDGV	Light-Duty Vehicles (Passenger Cars)	3.167	0.308	0.216	0.002	0.010	0.009	312.221	0.022
	Gasoline	LDGT	Light-Duty Trucks (0-8,500 lbs)	4.160	0.353	0.367	0.003	0.013	0.011	402.077	0.024
	Gasoline	HDGV	Heavy-Duty Vehicles (8,501 + lbs)	14.077	0.638	1.022	0.005	0.027	0.024	732.670	0.044
	Diesel	LDDV	Light-Duty Vehicles (Passenger Cars)	2.335	0.136	0.136	0.003	0.004	0.004	299.795	0.008
	Diesel	LDDT	Light-Duty Trucks (0-8,500 lbs)	3.936	0.263	0.382	0.004	0.007	0.006	426.289	0.008
	Diesel	HDDV	Heavy-Duty Vehicles (8,501 + lbs)	1.882	0.528	5.529	0.012	0.165	0.151	1469.289	0.029
	NA	MC	Motorcycles	13.542	2.114	0.822	0.003	0.028	0.025	398.001	0.055
Virgin Islands	Gasoline	LDGV	Light-Duty Vehicles (Passenger Cars)	3.673	0.295	0.206	0.002	0.005	0.004	325.555	0.022
	Gasoline	LDGT	Light-Duty Trucks (0-8,500 lbs)	5.195	0.356	0.353	0.003	0.006	0.005	418.710	0.024
	Gasoline	HDGV	Heavy-Duty Vehicles (8,501 + lbs)	16.101	0.748	0.869	0.005	0.010	0.009	764.047	0.045
	Diesel	LDDV	Light-Duty Vehicles (Passenger Cars)	2.873	0.073	0.129	0.003	0.004	0.004	319.813	0.007
	Diesel	LDDT	Light-Duty Trucks (0-8,500 lbs)	4.837	0.196	0.355	0.004	0.006	0.006	453.267	0.008
	Diesel	HDDV	Heavy-Duty Vehicles (8,501 + lbs)	1.213	0.210	3.008	0.012	0.148	0.136	1470.336	0.025
	NA	MC	Motorcycles	13.018	2.622	0.623	0.003	0.023	0.021	388.214	0.054

Table 5-23. On-Road Vehicle Emission Factors – 2020 (cont.)

State	Fuel Type	Vehicle Type		Emission Factors (g/mi)							
				Criteria Pollutants and Ozone Precursors							
				CO	VOC	NO_X	SO_2	PM_{10}	$PM_{2.5}$	CO_2e	NH_3
Virginia	Gasoline	LDGV	Light-Duty Vehicles (Passenger Cars)	3.284	0.276	0.219	0.002	0.007	0.006	322.634	0.023
	Gasoline	LDGT	Light-Duty Trucks (0-8,500 lbs)	4.597	0.350	0.387	0.003	0.009	0.008	416.215	0.024
	Gasoline	HDGV	Heavy-Duty Vehicles (8,501 + lbs)	15.130	0.685	1.019	0.005	0.022	0.019	765.871	0.045
	Diesel	LDDV	Light-Duty Vehicles (Passenger Cars)	2.522	0.107	0.132	0.003	0.004	0.004	312.895	0.008
	Diesel	LDDT	Light-Duty Trucks (0-8,500 lbs)	4.325	0.246	0.379	0.004	0.007	0.006	444.495	0.008
	Diesel	HDDV	Heavy-Duty Vehicles (8,501 + lbs)	1.742	0.449	4.921	0.013	0.168	0.154	1495.166	0.028
	NA	MC	Motorcycles	12.914	2.416	0.742	0.003	0.027	0.024	396.223	0.054
Washington	Gasoline	LDGV	Light-Duty Vehicles (Passenger Cars)	3.276	0.272	0.219	0.002	0.008	0.007	319.597	0.023
	Gasoline	LDGT	Light-Duty Trucks (0-8,500 lbs)	4.543	0.342	0.381	0.003	0.010	0.009	412.972	0.024
	Gasoline	HDGV	Heavy-Duty Vehicles (8,501 + lbs)	15.769	0.685	1.072	0.005	0.025	0.022	759.076	0.045
	Diesel	LDDV	Light-Duty Vehicles (Passenger Cars)	2.394	0.117	0.133	0.003	0.004	0.004	308.914	0.008
	Diesel	LDDT	Light-Duty Trucks (0-8,500 lbs)	4.128	0.258	0.384	0.004	0.007	0.007	439.522	0.008
	Diesel	HDDV	Heavy-Duty Vehicles (8,501 + lbs)	1.743	0.455	5.110	0.013	0.168	0.154	1477.901	0.028
	NA	MC	Motorcycles	13.530	2.335	0.816	0.003	0.028	0.025	398.083	0.054
West Virginia	Gasoline	LDGV	Light-Duty Vehicles (Passenger Cars)	3.469	0.299	0.236	0.002	0.008	0.007	313.953	0.022
	Gasoline	LDGT	Light-Duty Trucks (0-8,500 lbs)	4.792	0.369	0.408	0.003	0.010	0.009	405.175	0.024
	Gasoline	HDGV	Heavy-Duty Vehicles (8,501 + lbs)	14.641	0.658	1.007	0.005	0.023	0.020	744.040	0.044
	Diesel	LDDV	Light-Duty Vehicles (Passenger Cars)	2.445	0.116	0.135	0.003	0.004	0.004	303.595	0.008
	Diesel	LDDT	Light-Duty Trucks (0-8,500 lbs)	4.147	0.248	0.381	0.004	0.007	0.006	431.782	0.008
	Diesel	HDDV	Heavy-Duty Vehicles (8,501 + lbs)	1.829	0.497	5.243	0.013	0.165	0.152	1480.330	0.029
	NA	MC	Motorcycles	13.381	2.360	0.778	0.003	0.028	0.024	396.682	0.055
Wisconsin	Gasoline	LDGV	Light-Duty Vehicles (Passenger Cars)	3.546	0.315	0.232	0.002	0.010	0.009	318.780	0.023
	Gasoline	LDGT	Light-Duty Trucks (0-8,500 lbs)	4.767	0.382	0.399	0.003	0.012	0.011	410.261	0.024
	Gasoline	HDGV	Heavy-Duty Vehicles (8,501 + lbs)	15.100	0.669	1.030	0.005	0.027	0.024	747.123	0.044
	Diesel	LDDV	Light-Duty Vehicles (Passenger Cars)	2.376	0.130	0.134	0.003	0.004	0.004	306.620	0.008
	Diesel	LDDT	Light-Duty Trucks (0-8,500 lbs)	4.041	0.264	0.379	0.004	0.007	0.006	435.335	0.008
	Diesel	HDDV	Heavy-Duty Vehicles (8,501 + lbs)	1.724	0.456	5.040	0.012	0.164	0.151	1464.590	0.028
	NA	MC	Motorcycles	13.409	2.190	0.797	0.003	0.028	0.025	397.987	0.054
Wyoming	Gasoline	LDGV	Light-Duty Vehicles (Passenger Cars)	3.855	0.343	0.259	0.002	0.010	0.009	314.894	0.023
	Gasoline	LDGT	Light-Duty Trucks (0-8,500 lbs)	5.127	0.403	0.441	0.003	0.013	0.011	405.944	0.024
	Gasoline	HDGV	Heavy-Duty Vehicles (8,501 + lbs)	14.966	0.643	1.072	0.005	0.029	0.026	745.693	0.044
	Diesel	LDDV	Light-Duty Vehicles (Passenger Cars)	2.411	0.136	0.140	0.003	0.004	0.004	302.468	0.008
	Diesel	LDDT	Light-Duty Trucks (0-8,500 lbs)	4.089	0.267	0.397	0.004	0.007	0.006	430.027	0.008
	Diesel	HDDV	Heavy-Duty Vehicles (8,501 + lbs)	2.139	0.635	6.367	0.013	0.172	0.158	1514.501	0.031
	NA	MC	Motorcycles	13.761	2.355	0.875	0.003	0.028	0.025	399.344	0.055

Table 5-24. On-Road Vehicle Emission Factors – 2021

State	Fuel Type	Vehicle Type		Emission Factors (g/mi)							
				Criteria Pollutants and Ozone Precursors							
				CO	VOC	NO_X	SO_2	PM_{10}	$PM_{2.5}$	CO_2e	NH_3
Alabama	Gasoline	LDGV	Light-Duty Vehicles (Passenger Cars)	3.172	0.260	0.191	0.002	0.006	0.005	315.048	0.022
	Gasoline	LDGT	Light-Duty Trucks (0-8,500 lbs)	4.424	0.328	0.338	0.003	0.008	0.007	404.854	0.023
	Gasoline	HDGV	Heavy-Duty Vehicles (8,501 + lbs)	14.085	0.660	0.880	0.005	0.017	0.015	763.257	0.045
	Diesel	LDDV	Light-Duty Vehicles (Passenger Cars)	2.547	0.092	0.124	0.003	0.004	0.004	306.609	0.008
	Diesel	LDDT	Light-Duty Trucks (0-8,500 lbs)	4.108	0.202	0.328	0.004	0.006	0.006	428.931	0.008
	Diesel	HDDV	Heavy-Duty Vehicles (8,501 + lbs)	1.563	0.379	4.180	0.013	0.144	0.133	1485.869	0.028
	NA	MC	Motorcycles	12.963	2.670	0.701	0.003	0.026	0.023	393.394	0.054
Alaska	Gasoline	LDGV	Light-Duty Vehicles (Passenger Cars)	3.686	0.332	0.218	0.002	0.011	0.010	312.655	0.022
	Gasoline	LDGT	Light-Duty Trucks (0-8,500 lbs)	4.639	0.377	0.366	0.003	0.015	0.013	401.419	0.023
	Gasoline	HDGV	Heavy-Duty Vehicles (8,501 + lbs)	14.630	0.616	0.977	0.005	0.032	0.028	747.903	0.044
	Diesel	LDDV	Light-Duty Vehicles (Passenger Cars)	2.260	0.151	0.128	0.002	0.004	0.004	298.049	0.008
	Diesel	LDDT	Light-Duty Trucks (0-8,500 lbs)	3.659	0.263	0.340	0.004	0.007	0.006	417.489	0.008
	Diesel	HDDV	Heavy-Duty Vehicles (8,501 + lbs)	1.811	0.509	5.280	0.012	0.148	0.137	1471.175	0.030
	NA	MC	Motorcycles	13.825	1.966	0.861	0.003	0.029	0.026	401.288	0.055
Arizona	Gasoline	LDGV	Light-Duty Vehicles (Passenger Cars)	3.146	0.250	0.183	0.002	0.005	0.005	321.456	0.022
	Gasoline	LDGT	Light-Duty Trucks (0-8,500 lbs)	4.349	0.308	0.330	0.003	0.007	0.006	414.506	0.024
	Gasoline	HDGV	Heavy-Duty Vehicles (8,501 + lbs)	15.819	0.698	0.970	0.005	0.017	0.015	791.510	0.045
	Diesel	LDDV	Light-Duty Vehicles (Passenger Cars)	2.758	0.083	0.133	0.003	0.004	0.004	313.894	0.008
	Diesel	LDDT	Light-Duty Trucks (0-8,500 lbs)	4.501	0.200	0.360	0.004	0.007	0.006	439.942	0.008
	Diesel	HDDV	Heavy-Duty Vehicles (8,501 + lbs)	1.706	0.429	4.860	0.013	0.150	0.138	1540.095	0.029
	NA	MC	Motorcycles	12.569	3.132	0.798	0.002	0.025	0.022	393.941	0.053
Arkansas	Gasoline	LDGV	Light-Duty Vehicles (Passenger Cars)	3.370	0.265	0.201	0.002	0.006	0.005	308.351	0.022
	Gasoline	LDGT	Light-Duty Trucks (0-8,500 lbs)	4.636	0.326	0.354	0.003	0.008	0.007	397.787	0.023
	Gasoline	HDGV	Heavy-Duty Vehicles (8,501 + lbs)	14.408	0.627	0.898	0.005	0.019	0.017	754.987	0.044
	Diesel	LDDV	Light-Duty Vehicles (Passenger Cars)	2.571	0.098	0.128	0.003	0.004	0.004	299.572	0.008
	Diesel	LDDT	Light-Duty Trucks (0-8,500 lbs)	4.146	0.208	0.337	0.004	0.007	0.006	420.423	0.008
	Diesel	HDDV	Heavy-Duty Vehicles (8,501 + lbs)	1.714	0.449	4.657	0.013	0.144	0.133	1492.630	0.029
	NA	MC	Motorcycles	13.061	2.524	0.740	0.003	0.026	0.023	395.263	0.055
Colorado	Gasoline	LDGV	Light-Duty Vehicles (Passenger Cars)	3.170	0.270	0.199	0.002	0.008	0.007	312.944	0.022
	Gasoline	LDGT	Light-Duty Trucks (0-8,500 lbs)	4.250	0.323	0.348	0.003	0.011	0.009	403.575	0.023
	Gasoline	HDGV	Heavy-Duty Vehicles (8,501 + lbs)	14.998	0.642	0.982	0.005	0.025	0.022	760.282	0.045
	Diesel	LDDV	Light-Duty Vehicles (Passenger Cars)	2.405	0.116	0.128	0.003	0.004	0.004	301.897	0.008
	Diesel	LDDT	Light-Duty Trucks (0-8,500 lbs)	3.922	0.232	0.345	0.004	0.007	0.006	423.732	0.008
	Diesel	HDDV	Heavy-Duty Vehicles (8,501 + lbs)	1.583	0.400	4.609	0.012	0.145	0.133	1467.660	0.028
	NA	MC	Motorcycles	13.434	2.616	0.831	0.003	0.028	0.025	398.091	0.054
Connecticut	Gasoline	LDGV	Light-Duty Vehicles (Passenger Cars)	2.867	0.233	0.171	0.002	0.007	0.007	312.657	0.022
	Gasoline	LDGT	Light-Duty Trucks (0-8,500 lbs)	3.892	0.282	0.305	0.003	0.010	0.009	404.849	0.024
	Gasoline	HDGV	Heavy-Duty Vehicles (8,501 + lbs)	15.139	0.630	0.959	0.005	0.025	0.022	766.470	0.045
	Diesel	LDDV	Light-Duty Vehicles (Passenger Cars)	2.450	0.111	0.125	0.003	0.004	0.004	302.109	0.008
	Diesel	LDDT	Light-Duty Trucks (0-8,500 lbs)	4.034	0.232	0.340	0.004	0.007	0.006	425.279	0.008
	Diesel	HDDV	Heavy-Duty Vehicles (8,501 + lbs)	1.296	0.279	3.735	0.012	0.139	0.128	1439.677	0.026
	NA	MC	Motorcycles	12.711	2.261	0.773	0.003	0.028	0.025	398.880	0.054
Delaware	Gasoline	LDGV	Light-Duty Vehicles (Passenger Cars)	2.788	0.236	0.179	0.002	0.007	0.006	316.681	0.022
	Gasoline	LDGT	Light-Duty Trucks (0-8,500 lbs)	3.728	0.283	0.314	0.003	0.008	0.008	406.318	0.023
	Gasoline	HDGV	Heavy-Duty Vehicles (8,501 + lbs)	14.998	0.633	0.931	0.005	0.017	0.015	757.454	0.045
	Diesel	LDDV	Light-Duty Vehicles (Passenger Cars)	2.377	0.104	0.121	0.003	0.004	0.004	306.764	0.008
	Diesel	LDDT	Light-Duty Trucks (0-8,500 lbs)	3.839	0.216	0.323	0.004	0.006	0.006	428.978	0.008
	Diesel	HDDV	Heavy-Duty Vehicles (8,501 + lbs)	1.167	0.219	3.277	0.012	0.139	0.127	1421.934	0.025
	NA	MC	Motorcycles	12.562	2.274	0.746	0.003	0.025	0.022	394.064	0.053
District of Columbia	Gasoline	LDGV	Light-Duty Vehicles (Passenger Cars)	2.794	0.225	0.165	0.002	0.007	0.006	329.823	0.022
	Gasoline	LDGT	Light-Duty Trucks (0-8,500 lbs)	3.786	0.278	0.292	0.003	0.009	0.008	424.691	0.024
	Gasoline	HDGV	Heavy-Duty Vehicles (8,501 + lbs)	16.071	0.694	0.964	0.005	0.019	0.017	799.271	0.046
	Diesel	LDDV	Light-Duty Vehicles (Passenger Cars)	2.452	0.099	0.119	0.003	0.004	0.004	319.855	0.008
	Diesel	LDDT	Light-Duty Trucks (0-8,500 lbs)	4.032	0.221	0.323	0.004	0.007	0.006	448.594	0.008
	Diesel	HDDV	Heavy-Duty Vehicles (8,501 + lbs)	1.274	0.244	3.427	0.013	0.152	0.140	1489.362	0.026
	NA	MC	Motorcycles	12.569	2.496	0.711	0.003	0.026	0.023	394.549	0.051

Table 5-24. On-Road Vehicle Emission Factors – 2021 (cont.)

State	Fuel Type	Vehicle Type		Emission Factors (g/mi)							
				Criteria Pollutants and Ozone Precursors							
				CO	VOC	NO_X	SO_2	PM_{10}	$PM_{2.5}$	CO_2e	NH_3
Florida	Gasoline	LDGV	Light-Duty Vehicles (Passenger Cars)	3.335	0.254	0.177	0.002	0.005	0.005	330.840	0.022
	Gasoline	LDGT	Light-Duty Trucks (0-8,500 lbs)	4.757	0.339	0.323	0.003	0.007	0.006	425.228	0.024
	Gasoline	HDGV	Heavy-Duty Vehicles (8,501 + lbs)	15.246	0.744	0.862	0.005	0.016	0.014	807.709	0.046
	Diesel	LDDV	Light-Duty Vehicles (Passenger Cars)	2.779	0.075	0.120	0.003	0.004	0.004	323.543	0.008
	Diesel	LDDT	Light-Duty Trucks (0-8,500 lbs)	4.530	0.191	0.322	0.004	0.007	0.006	452.469	0.008
	Diesel	HDDV	Heavy-Duty Vehicles (8,501 + lbs)	1.532	0.342	3.789	0.013	0.151	0.139	1546.096	0.028
	NA	MC	Motorcycles	12.855	3.009	0.621	0.003	0.026	0.023	391.843	0.052
Georgia	Gasoline	LDGV	Light-Duty Vehicles (Passenger Cars)	2.978	0.244	0.181	0.002	0.006	0.005	310.621	0.022
	Gasoline	LDGT	Light-Duty Trucks (0-8,500 lbs)	4.156	0.307	0.323	0.003	0.008	0.007	400.492	0.023
	Gasoline	HDGV	Heavy-Duty Vehicles (8,501 + lbs)	13.833	0.638	0.885	0.005	0.019	0.017	759.384	0.044
	Diesel	LDDV	Light-Duty Vehicles (Passenger Cars)	2.565	0.094	0.126	0.003	0.004	0.004	302.090	0.008
	Diesel	LDDT	Light-Duty Trucks (0-8,500 lbs)	4.146	0.205	0.335	0.004	0.007	0.006	423.689	0.008
	Diesel	HDDV	Heavy-Duty Vehicles (8,501 + lbs)	1.635	0.413	4.427	0.013	0.144	0.132	1487.500	0.028
	NA	MC	Motorcycles	12.916	2.560	0.718	0.003	0.027	0.024	394.800	0.055
Hawaii	Gasoline	LDGV	Light-Duty Vehicles (Passenger Cars)	3.271	0.247	0.178	0.002	0.005	0.004	321.608	0.022
	Gasoline	LDGT	Light-Duty Trucks (0-8,500 lbs)	4.632	0.325	0.324	0.003	0.006	0.006	413.657	0.023
	Gasoline	HDGV	Heavy-Duty Vehicles (8,501 + lbs)	15.691	0.717	0.869	0.005	0.014	0.013	782.702	0.045
	Diesel	LDDV	Light-Duty Vehicles (Passenger Cars)	2.666	0.070	0.120	0.003	0.004	0.004	314.777	0.008
	Diesel	LDDT	Light-Duty Trucks (0-8,500 lbs)	4.324	0.183	0.320	0.004	0.007	0.006	440.507	0.008
	Diesel	HDDV	Heavy-Duty Vehicles (8,501 + lbs)	1.243	0.227	3.168	0.012	0.141	0.130	1478.096	0.026
	NA	MC	Motorcycles	12.914	2.819	0.671	0.003	0.025	0.022	391.355	0.053
Idaho	Gasoline	LDGV	Light-Duty Vehicles (Passenger Cars)	3.294	0.282	0.209	0.002	0.008	0.007	309.931	0.022
	Gasoline	LDGT	Light-Duty Trucks (0-8,500 lbs)	4.362	0.333	0.361	0.003	0.010	0.009	398.237	0.023
	Gasoline	HDGV	Heavy-Duty Vehicles (8,501 + lbs)	14.501	0.617	0.969	0.005	0.023	0.020	746.060	0.044
	Diesel	LDDV	Light-Duty Vehicles (Passenger Cars)	2.346	0.121	0.129	0.003	0.004	0.004	298.592	0.008
	Diesel	LDDT	Light-Duty Trucks (0-8,500 lbs)	3.779	0.230	0.342	0.004	0.007	0.006	418.186	0.008
	Diesel	HDDV	Heavy-Duty Vehicles (8,501 + lbs)	1.709	0.456	4.977	0.012	0.146	0.134	1468.654	0.029
	NA	MC	Motorcycles	13.471	2.408	0.851	0.003	0.027	0.024	396.988	0.055
Illinois	Gasoline	LDGV	Light-Duty Vehicles (Passenger Cars)	3.095	0.252	0.182	0.002	0.007	0.006	323.985	0.022
	Gasoline	LDGT	Light-Duty Trucks (0-8,500 lbs)	4.256	0.326	0.326	0.003	0.010	0.009	417.838	0.024
	Gasoline	HDGV	Heavy-Duty Vehicles (8,501 + lbs)	15.634	0.676	0.947	0.005	0.022	0.020	786.219	0.046
	Diesel	LDDV	Light-Duty Vehicles (Passenger Cars)	2.428	0.109	0.121	0.003	0.004	0.004	313.103	0.008
	Diesel	LDDT	Light-Duty Trucks (0-8,500 lbs)	3.996	0.232	0.329	0.004	0.007	0.006	439.596	0.008
	Diesel	HDDV	Heavy-Duty Vehicles (8,501 + lbs)	1.309	0.273	3.635	0.012	0.147	0.135	1469.205	0.026
	NA	MC	Motorcycles	12.669	2.441	0.731	0.003	0.026	0.023	396.943	0.052
Indiana	Gasoline	LDGV	Light-Duty Vehicles (Passenger Cars)	3.257	0.268	0.197	0.002	0.007	0.007	316.934	0.022
	Gasoline	LDGT	Light-Duty Trucks (0-8,500 lbs)	4.415	0.333	0.345	0.003	0.010	0.009	406.919	0.023
	Gasoline	HDGV	Heavy-Duty Vehicles (8,501 + lbs)	14.676	0.645	0.927	0.005	0.021	0.019	762.418	0.045
	Diesel	LDDV	Light-Duty Vehicles (Passenger Cars)	2.386	0.112	0.123	0.003	0.004	0.004	306.188	0.008
	Diesel	LDDT	Light-Duty Trucks (0-8,500 lbs)	3.869	0.225	0.329	0.004	0.007	0.006	428.347	0.008
	Diesel	HDDV	Heavy-Duty Vehicles (8,501 + lbs)	1.606	0.404	4.455	0.012	0.148	0.136	1476.892	0.028
	NA	MC	Motorcycles	13.215	2.401	0.757	0.003	0.027	0.024	395.998	0.053
Iowa	Gasoline	LDGV	Light-Duty Vehicles (Passenger Cars)	3.502	0.298	0.213	0.002	0.008	0.007	309.233	0.022
	Gasoline	LDGT	Light-Duty Trucks (0-8,500 lbs)	4.602	0.351	0.365	0.003	0.011	0.009	397.334	0.023
	Gasoline	HDGV	Heavy-Duty Vehicles (8,501 + lbs)	14.323	0.610	0.928	0.005	0.023	0.020	744.691	0.044
	Diesel	LDDV	Light-Duty Vehicles (Passenger Cars)	2.371	0.122	0.127	0.002	0.004	0.004	297.750	0.008
	Diesel	LDDT	Light-Duty Trucks (0-8,500 lbs)	3.812	0.229	0.334	0.004	0.007	0.006	417.083	0.008
	Diesel	HDDV	Heavy-Duty Vehicles (8,501 + lbs)	1.740	0.469	4.887	0.012	0.145	0.134	1472.750	0.029
	NA	MC	Motorcycles	13.356	2.242	0.793	0.003	0.027	0.024	397.120	0.055
Kansas	Gasoline	LDGV	Light-Duty Vehicles (Passenger Cars)	3.400	0.276	0.206	0.002	0.007	0.006	310.102	0.022
	Gasoline	LDGT	Light-Duty Trucks (0-8,500 lbs)	4.605	0.338	0.361	0.003	0.009	0.008	399.390	0.023
	Gasoline	HDGV	Heavy-Duty Vehicles (8,501 + lbs)	14.591	0.626	0.926	0.005	0.021	0.018	752.523	0.044
	Diesel	LDDV	Light-Duty Vehicles (Passenger Cars)	2.476	0.108	0.127	0.003	0.004	0.004	300.105	0.008
	Diesel	LDDT	Light-Duty Trucks (0-8,500 lbs)	3.996	0.219	0.336	0.004	0.007	0.006	420.823	0.008
	Diesel	HDDV	Heavy-Duty Vehicles (8,501 + lbs)	1.573	0.395	4.400	0.012	0.142	0.131	1466.583	0.028
	NA	MC	Motorcycles	13.157	2.425	0.770	0.003	0.027	0.024	396.055	0.055

Table 5-24. On-Road Vehicle Emission Factors – 2021 (cont.)

State	Fuel Type	Vehicle Type		Emission Factors (g/mi)							
				Criteria Pollutants and Ozone Precursors							
				CO	VOC	NO_X	SO_2	PM_{10}	$PM_{2.5}$	CO_2e	NH_3
Kentucky	Gasoline	LDGV	Light-Duty Vehicles (Passenger Cars)	3.309	0.264	0.202	0.002	0.007	0.006	307.148	0.022
	Gasoline	LDGT	Light-Duty Trucks (0-8,500 lbs)	4.543	0.327	0.355	0.003	0.009	0.008	396.338	0.023
	Gasoline	HDGV	Heavy-Duty Vehicles (8,501 + lbs)	13.945	0.607	0.897	0.005	0.021	0.018	752.329	0.044
	Diesel	LDDV	Light-Duty Vehicles (Passenger Cars)	2.496	0.107	0.128	0.002	0.004	0.004	297.465	0.008
	Diesel	LDDT	Light-Duty Trucks (0-8,500 lbs)	4.034	0.217	0.340	0.004	0.007	0.006	417.637	0.008
	Diesel	HDDV	Heavy-Duty Vehicles (8,501 + lbs)	1.851	0.509	5.105	0.013	0.147	0.136	1499.562	0.030
	NA	MC	Motorcycles	12.913	2.376	0.757	0.003	0.027	0.024	396.811	0.055
Louisiana	Gasoline	LDGV	Light-Duty Vehicles (Passenger Cars)	3.240	0.255	0.184	0.002	0.006	0.005	316.253	0.022
	Gasoline	LDGT	Light-Duty Trucks (0-8,500 lbs)	4.565	0.325	0.331	0.003	0.007	0.007	407.348	0.023
	Gasoline	HDGV	Heavy-Duty Vehicles (8,501 + lbs)	14.230	0.674	0.862	0.005	0.017	0.015	774.424	0.045
	Diesel	LDDV	Light-Duty Vehicles (Passenger Cars)	2.701	0.086	0.125	0.003	0.004	0.004	308.512	0.008
	Diesel	LDDT	Light-Duty Trucks (0-8,500 lbs)	4.372	0.198	0.331	0.004	0.007	0.006	432.148	0.008
	Diesel	HDDV	Heavy-Duty Vehicles (8,501 + lbs)	1.641	0.408	4.270	0.013	0.145	0.134	1513.286	0.028
	NA	MC	Motorcycles	12.912	2.757	0.672	0.003	0.027	0.024	393.654	0.054
Maine	Gasoline	LDGV	Light-Duty Vehicles (Passenger Cars)	3.201	0.298	0.208	0.002	0.009	0.008	302.168	0.022
	Gasoline	LDGT	Light-Duty Trucks (0-8,500 lbs)	4.165	0.341	0.353	0.003	0.012	0.010	388.810	0.023
	Gasoline	HDGV	Heavy-Duty Vehicles (8,501 + lbs)	13.068	0.580	0.917	0.005	0.024	0.022	727.044	0.044
	Diesel	LDDV	Light-Duty Vehicles (Passenger Cars)	2.277	0.131	0.129	0.002	0.004	0.004	290.048	0.008
	Diesel	LDDT	Light-Duty Trucks (0-8,500 lbs)	3.637	0.234	0.336	0.003	0.006	0.006	407.213	0.008
	Diesel	HDDV	Heavy-Duty Vehicles (8,501 + lbs)	1.739	0.476	5.008	0.012	0.143	0.131	1449.648	0.029
	NA	MC	Motorcycles	13.257	2.041	0.823	0.003	0.028	0.025	397.770	0.056
Maryland	Gasoline	LDGV	Light-Duty Vehicles (Passenger Cars)	2.876	0.235	0.178	0.002	0.007	0.006	312.103	0.022
	Gasoline	LDGT	Light-Duty Trucks (0-8,500 lbs)	3.914	0.290	0.317	0.003	0.009	0.008	403.327	0.023
	Gasoline	HDGV	Heavy-Duty Vehicles (8,501 + lbs)	14.524	0.628	0.931	0.005	0.022	0.019	763.872	0.045
	Diesel	LDDV	Light-Duty Vehicles (Passenger Cars)	2.503	0.104	0.126	0.003	0.004	0.004	302.368	0.008
	Diesel	LDDT	Light-Duty Trucks (0-8,500 lbs)	4.089	0.221	0.339	0.004	0.007	0.006	424.924	0.008
	Diesel	HDDV	Heavy-Duty Vehicles (8,501 + lbs)	1.425	0.330	4.021	0.012	0.141	0.130	1458.161	0.027
	NA	MC	Motorcycles	12.613	2.328	0.753	0.003	0.027	0.024	397.176	0.054
Massachusetts	Gasoline	LDGV	Light-Duty Vehicles (Passenger Cars)	2.887	0.244	0.180	0.002	0.008	0.007	311.280	0.022
	Gasoline	LDGT	Light-Duty Trucks (0-8,500 lbs)	3.895	0.301	0.318	0.003	0.010	0.009	402.076	0.023
	Gasoline	HDGV	Heavy-Duty Vehicles (8,501 + lbs)	14.790	0.613	0.954	0.005	0.024	0.022	758.149	0.045
	Diesel	LDDV	Light-Duty Vehicles (Passenger Cars)	2.402	0.115	0.126	0.003	0.004	0.004	300.330	0.008
	Diesel	LDDT	Light-Duty Trucks (0-8,500 lbs)	3.926	0.233	0.339	0.004	0.007	0.006	422.075	0.008
	Diesel	HDDV	Heavy-Duty Vehicles (8,501 + lbs)	1.442	0.342	4.141	0.012	0.141	0.130	1447.037	0.027
	NA	MC	Motorcycles	12.737	2.193	0.787	0.003	0.028	0.024	398.537	0.054
Michigan	Gasoline	LDGV	Light-Duty Vehicles (Passenger Cars)	3.396	0.280	0.206	0.002	0.008	0.007	314.603	0.022
	Gasoline	LDGT	Light-Duty Trucks (0-8,500 lbs)	4.608	0.351	0.362	0.003	0.011	0.010	404.876	0.023
	Gasoline	HDGV	Heavy-Duty Vehicles (8,501 + lbs)	14.596	0.636	0.942	0.005	0.025	0.022	760.066	0.045
	Diesel	LDDV	Light-Duty Vehicles (Passenger Cars)	2.378	0.119	0.125	0.003	0.004	0.004	303.131	0.008
	Diesel	LDDT	Light-Duty Trucks (0-8,500 lbs)	3.869	0.235	0.335	0.004	0.007	0.006	424.886	0.008
	Diesel	HDDV	Heavy-Duty Vehicles (8,501 + lbs)	1.611	0.412	4.556	0.012	0.146	0.135	1470.487	0.028
	NA	MC	Motorcycles	13.356	2.289	0.783	0.003	0.028	0.025	397.887	0.054
Minnesota	Gasoline	LDGV	Light-Duty Vehicles (Passenger Cars)	3.482	0.301	0.210	0.002	0.010	0.009	311.375	0.022
	Gasoline	LDGT	Light-Duty Trucks (0-8,500 lbs)	4.590	0.359	0.361	0.003	0.013	0.011	400.314	0.023
	Gasoline	HDGV	Heavy-Duty Vehicles (8,501 + lbs)	14.433	0.644	0.938	0.005	0.027	0.024	746.816	0.045
	Diesel	LDDV	Light-Duty Vehicles (Passenger Cars)	2.335	0.128	0.126	0.003	0.004	0.004	298.977	0.008
	Diesel	LDDT	Light-Duty Trucks (0-8,500 lbs)	3.772	0.239	0.334	0.004	0.007	0.006	419.025	0.008
	Diesel	HDDV	Heavy-Duty Vehicles (8,501 + lbs)	1.447	0.352	4.175	0.012	0.140	0.129	1434.285	0.027
	NA	MC	Motorcycles	13.646	2.259	0.799	0.003	0.029	0.025	398.284	0.054
Mississippi	Gasoline	LDGV	Light-Duty Vehicles (Passenger Cars)	3.172	0.262	0.191	0.002	0.006	0.005	310.299	0.022
	Gasoline	LDGT	Light-Duty Trucks (0-8,500 lbs)	4.406	0.323	0.336	0.003	0.008	0.007	399.178	0.023
	Gasoline	HDGV	Heavy-Duty Vehicles (8,501 + lbs)	13.830	0.646	0.864	0.005	0.016	0.014	752.406	0.044
	Diesel	LDDV	Light-Duty Vehicles (Passenger Cars)	2.553	0.092	0.125	0.003	0.004	0.004	302.122	0.008
	Diesel	LDDT	Light-Duty Trucks (0-8,500 lbs)	4.096	0.198	0.328	0.004	0.006	0.006	423.116	0.008
	Diesel	HDDV	Heavy-Duty Vehicles (8,501 + lbs)	1.533	0.371	4.103	0.012	0.141	0.129	1472.574	0.028
	NA	MC	Motorcycles	12.977	2.637	0.702	0.003	0.026	0.023	393.036	0.055

Table 5-24. On-Road Vehicle Emission Factors – 2021 (cont.)

State	Fuel Type	Vehicle Type		Emission Factors (g/mi)							
				Criteria Pollutants and Ozone Precursors							
				CO	VOC	NO_X	SO_2	PM_{10}	$PM_{2.5}$	CO_2e	NH_3
Missouri	Gasoline	LDGV	Light-Duty Vehicles (Passenger Cars)	3.263	0.261	0.197	0.002	0.007	0.006	304.389	0.022
	Gasoline	LDGT	Light-Duty Trucks (0-8,500 lbs)	4.443	0.320	0.347	0.003	0.009	0.008	393.830	0.023
	Gasoline	HDGV	Heavy-Duty Vehicles (8,501 + lbs)	14.290	0.603	0.910	0.005	0.022	0.019	747.885	0.044
	Diesel	LDDV	Light-Duty Vehicles (Passenger Cars)	2.526	0.108	0.129	0.002	0.004	0.004	294.672	0.008
	Diesel	LDDT	Light-Duty Trucks (0-8,500 lbs)	4.085	0.219	0.343	0.004	0.007	0.006	414.624	0.008
	Diesel	HDDV	Heavy-Duty Vehicles (8,501 + lbs)	1.597	0.408	4.482	0.012	0.140	0.129	1463.908	0.028
	NA	MC	Motorcycles	12.862	2.314	0.767	0.003	0.027	0.024	397.440	0.056
Montana	Gasoline	LDGV	Light-Duty Vehicles (Passenger Cars)	3.529	0.307	0.224	0.002	0.009	0.008	303.998	0.022
	Gasoline	LDGT	Light-Duty Trucks (0-8,500 lbs)	4.600	0.353	0.380	0.003	0.011	0.010	391.105	0.023
	Gasoline	HDGV	Heavy-Duty Vehicles (8,501 + lbs)	13.976	0.585	0.956	0.005	0.025	0.022	733.766	0.044
	Diesel	LDDV	Light-Duty Vehicles (Passenger Cars)	2.319	0.131	0.131	0.002	0.004	0.004	291.854	0.008
	Diesel	LDDT	Light-Duty Trucks (0-8,500 lbs)	3.710	0.235	0.345	0.003	0.006	0.006	409.549	0.008
	Diesel	HDDV	Heavy-Duty Vehicles (8,501 + lbs)	1.870	0.529	5.456	0.012	0.146	0.135	1473.992	0.030
	NA	MC	Motorcycles	13.561	2.240	0.869	0.003	0.027	0.024	398.110	0.056
Nebraska	Gasoline	LDGV	Light-Duty Vehicles (Passenger Cars)	3.521	0.293	0.214	0.002	0.008	0.007	308.723	0.022
	Gasoline	LDGT	Light-Duty Trucks (0-8,500 lbs)	4.694	0.350	0.371	0.003	0.010	0.009	397.682	0.023
	Gasoline	HDGV	Heavy-Duty Vehicles (8,501 + lbs)	14.291	0.609	0.934	0.005	0.024	0.021	750.909	0.044
	Diesel	LDDV	Light-Duty Vehicles (Passenger Cars)	2.442	0.119	0.129	0.002	0.004	0.004	297.643	0.008
	Diesel	LDDT	Light-Duty Trucks (0-8,500 lbs)	3.943	0.229	0.342	0.004	0.007	0.006	417.537	0.008
	Diesel	HDDV	Heavy-Duty Vehicles (8,501 + lbs)	1.857	0.516	5.217	0.013	0.148	0.136	1494.656	0.030
	NA	MC	Motorcycles	13.320	2.347	0.798	0.003	0.027	0.024	397.915	0.055
Nevada	Gasoline	LDGV	Light-Duty Vehicles (Passenger Cars)	2.972	0.251	0.186	0.002	0.006	0.005	322.303	0.022
	Gasoline	LDGT	Light-Duty Trucks (0-8,500 lbs)	4.078	0.309	0.335	0.003	0.008	0.007	414.908	0.024
	Gasoline	HDGV	Heavy-Duty Vehicles (8,501 + lbs)	15.469	0.695	1.008	0.005	0.019	0.017	785.264	0.045
	Diesel	LDDV	Light-Duty Vehicles (Passenger Cars)	2.558	0.095	0.129	0.003	0.004	0.004	313.348	0.008
	Diesel	LDDT	Light-Duty Trucks (0-8,500 lbs)	4.179	0.212	0.350	0.004	0.007	0.006	438.937	0.008
	Diesel	HDDV	Heavy-Duty Vehicles (8,501 + lbs)	1.631	0.401	4.710	0.013	0.151	0.139	1514.905	0.028
	NA	MC	Motorcycles	13.097	3.024	0.821	0.003	0.026	0.023	394.660	0.053
New Hampshire	Gasoline	LDGV	Light-Duty Vehicles (Passenger Cars)	2.888	0.259	0.181	0.002	0.008	0.007	308.959	0.022
	Gasoline	LDGT	Light-Duty Trucks (0-8,500 lbs)	3.790	0.304	0.313	0.003	0.011	0.010	397.320	0.023
	Gasoline	HDGV	Heavy-Duty Vehicles (8,501 + lbs)	14.211	0.599	0.940	0.005	0.023	0.021	742.217	0.044
	Diesel	LDDV	Light-Duty Vehicles (Passenger Cars)	2.319	0.123	0.126	0.002	0.004	0.004	297.345	0.008
	Diesel	LDDT	Light-Duty Trucks (0-8,500 lbs)	3.739	0.232	0.334	0.004	0.007	0.006	416.802	0.008
	Diesel	HDDV	Heavy-Duty Vehicles (8,501 + lbs)	1.490	0.368	4.298	0.012	0.141	0.129	1435.629	0.027
	NA	MC	Motorcycles	12.928	2.119	0.805	0.003	0.027	0.024	397.347	0.054
New Jersey	Gasoline	LDGV	Light-Duty Vehicles (Passenger Cars)	2.883	0.237	0.181	0.002	0.007	0.006	303.715	0.022
	Gasoline	LDGT	Light-Duty Trucks (0-8,500 lbs)	3.795	0.271	0.308	0.003	0.009	0.008	392.690	0.023
	Gasoline	HDGV	Heavy-Duty Vehicles (8,501 + lbs)	13.554	0.560	0.912	0.005	0.023	0.020	749.233	0.043
	Diesel	LDDV	Light-Duty Vehicles (Passenger Cars)	2.475	0.110	0.130	0.002	0.004	0.004	293.743	0.008
	Diesel	LDDT	Light-Duty Trucks (0-8,500 lbs)	4.005	0.219	0.346	0.003	0.007	0.006	413.095	0.008
	Diesel	HDDV	Heavy-Duty Vehicles (8,501 + lbs)	2.021	0.582	5.644	0.013	0.150	0.138	1514.648	0.031
	NA	MC	Motorcycles	12.591	2.119	0.790	0.003	0.027	0.024	398.045	0.056
New Mexico	Gasoline	LDGV	Light-Duty Vehicles (Passenger Cars)	3.224	0.275	0.207	0.002	0.007	0.006	308.719	0.022
	Gasoline	LDGT	Light-Duty Trucks (0-8,500 lbs)	4.363	0.328	0.364	0.003	0.009	0.008	397.621	0.023
	Gasoline	HDGV	Heavy-Duty Vehicles (8,501 + lbs)	14.284	0.621	0.964	0.005	0.020	0.018	751.478	0.044
	Diesel	LDDV	Light-Duty Vehicles (Passenger Cars)	2.455	0.105	0.131	0.003	0.004	0.004	299.076	0.008
	Diesel	LDDT	Light-Duty Trucks (0-8,500 lbs)	3.960	0.215	0.349	0.004	0.007	0.006	419.306	0.008
	Diesel	HDDV	Heavy-Duty Vehicles (8,501 + lbs)	1.803	0.488	5.215	0.013	0.147	0.135	1492.809	0.029
	NA	MC	Motorcycles	13.132	2.710	0.839	0.003	0.026	0.023	395.841	0.055
New York	Gasoline	LDGV	Light-Duty Vehicles (Passenger Cars)	2.782	0.236	0.169	0.002	0.008	0.007	314.510	0.022
	Gasoline	LDGT	Light-Duty Trucks (0-8,500 lbs)	3.634	0.275	0.291	0.003	0.010	0.009	405.306	0.023
	Gasoline	HDGV	Heavy-Duty Vehicles (8,501 + lbs)	14.658	0.636	0.947	0.005	0.023	0.020	761.393	0.045
	Diesel	LDDV	Light-Duty Vehicles (Passenger Cars)	2.383	0.113	0.124	0.003	0.004	0.004	303.651	0.008
	Diesel	LDDT	Light-Duty Trucks (0-8,500 lbs)	3.888	0.230	0.334	0.004	0.007	0.006	426.028	0.008
	Diesel	HDDV	Heavy-Duty Vehicles (8,501 + lbs)	1.404	0.324	3.994	0.012	0.143	0.131	1448.016	0.027
	NA	MC	Motorcycles	12.960	2.266	0.771	0.003	0.028	0.024	397.321	0.054

Table 5-24. On-Road Vehicle Emission Factors – 2021 (cont.)

State	Fuel Type	Vehicle Type		Emission Factors (g/mi)							
				Criteria Pollutants and Ozone Precursors							
				CO	VOC	NO_X	SO_2	PM_{10}	$PM_{2.5}$	CO_2e	NH_3
North Carolina	Gasoline	LDGV	Light-Duty Vehicles (Passenger Cars)	3.094	0.256	0.191	0.002	0.006	0.006	312.886	0.022
	Gasoline	LDGT	Light-Duty Trucks (0-8,500 lbs)	4.305	0.324	0.339	0.003	0.008	0.007	402.727	0.023
	Gasoline	HDGV	Heavy-Duty Vehicles (8,501 + lbs)	14.127	0.653	0.902	0.005	0.019	0.016	758.377	0.045
	Diesel	LDDV	Light-Duty Vehicles (Passenger Cars)	2.485	0.097	0.124	0.003	0.004	0.004	303.866	0.008
	Diesel	LDDT	Light-Duty Trucks (0-8,500 lbs)	4.018	0.209	0.330	0.004	0.007	0.006	425.750	0.008
	Diesel	HDDV	Heavy-Duty Vehicles (8,501 + lbs)	1.426	0.326	3.928	0.012	0.141	0.130	1457.747	0.027
	NA	MC	Motorcycles	13.026	2.572	0.726	0.003	0.027	0.024	394.494	0.054
North Dakota	Gasoline	LDGV	Light-Duty Vehicles (Passenger Cars)	3.673	0.335	0.219	0.002	0.011	0.010	305.492	0.022
	Gasoline	LDGT	Light-Duty Trucks (0-8,500 lbs)	4.723	0.379	0.370	0.003	0.014	0.012	392.449	0.023
	Gasoline	HDGV	Heavy-Duty Vehicles (8,501 + lbs)	13.738	0.610	0.928	0.005	0.029	0.025	732.159	0.044
	Diesel	LDDV	Light-Duty Vehicles (Passenger Cars)	2.303	0.140	0.129	0.002	0.004	0.004	292.129	0.008
	Diesel	LDDT	Light-Duty Trucks (0-8,500 lbs)	3.679	0.243	0.339	0.003	0.006	0.006	409.737	0.008
	Diesel	HDDV	Heavy-Duty Vehicles (8,501 + lbs)	1.761	0.488	5.089	0.012	0.144	0.132	1457.430	0.029
	NA	MC	Motorcycles	13.746	2.148	0.834	0.003	0.029	0.025	398.877	0.056
Ohio	Gasoline	LDGV	Light-Duty Vehicles (Passenger Cars)	3.127	0.258	0.188	0.002	0.008	0.007	316.580	0.022
	Gasoline	LDGT	Light-Duty Trucks (0-8,500 lbs)	4.222	0.317	0.329	0.003	0.010	0.009	407.049	0.023
	Gasoline	HDGV	Heavy-Duty Vehicles (8,501 + lbs)	14.813	0.652	0.935	0.005	0.022	0.019	763.087	0.045
	Diesel	LDDV	Light-Duty Vehicles (Passenger Cars)	2.385	0.112	0.123	0.003	0.004	0.004	305.777	0.008
	Diesel	LDDT	Light-Duty Trucks (0-8,500 lbs)	3.878	0.227	0.330	0.004	0.007	0.006	428.261	0.008
	Diesel	HDDV	Heavy-Duty Vehicles (8,501 + lbs)	1.485	0.355	4.155	0.012	0.145	0.133	1461.894	0.027
	NA	MC	Motorcycles	13.312	2.409	0.760	0.003	0.028	0.024	396.426	0.053
Oklahoma	Gasoline	LDGV	Light-Duty Vehicles (Passenger Cars)	3.367	0.267	0.201	0.002	0.006	0.006	313.950	0.022
	Gasoline	LDGT	Light-Duty Trucks (0-8,500 lbs)	4.631	0.332	0.354	0.003	0.008	0.007	403.993	0.023
	Gasoline	HDGV	Heavy-Duty Vehicles (8,501 + lbs)	14.813	0.649	0.916	0.005	0.019	0.016	763.022	0.045
	Diesel	LDDV	Light-Duty Vehicles (Passenger Cars)	2.549	0.098	0.126	0.003	0.004	0.004	304.905	0.008
	Diesel	LDDT	Light-Duty Trucks (0-8,500 lbs)	4.120	0.210	0.335	0.004	0.007	0.006	427.041	0.008
	Diesel	HDDV	Heavy-Duty Vehicles (8,501 + lbs)	1.605	0.401	4.386	0.013	0.144	0.133	1487.567	0.028
	NA	MC	Motorcycles	13.080	2.623	0.741	0.003	0.026	0.023	394.720	0.054
Oregon	Gasoline	LDGV	Light-Duty Vehicles (Passenger Cars)	3.007	0.251	0.197	0.002	0.007	0.006	306.459	0.022
	Gasoline	LDGT	Light-Duty Trucks (0-8,500 lbs)	4.043	0.303	0.339	0.003	0.009	0.008	394.537	0.023
	Gasoline	HDGV	Heavy-Duty Vehicles (8,501 + lbs)	14.353	0.609	0.948	0.005	0.020	0.018	740.541	0.044
	Diesel	LDDV	Light-Duty Vehicles (Passenger Cars)	2.317	0.112	0.127	0.002	0.004	0.004	296.173	0.008
	Diesel	LDDT	Light-Duty Trucks (0-8,500 lbs)	3.736	0.222	0.336	0.004	0.007	0.006	415.347	0.008
	Diesel	HDDV	Heavy-Duty Vehicles (8,501 + lbs)	1.598	0.408	4.600	0.012	0.143	0.132	1448.491	0.028
	NA	MC	Motorcycles	13.291	2.286	0.827	0.003	0.027	0.024	396.214	0.055
Pacific Islands	Gasoline	LDGV	Light-Duty Vehicles (Passenger Cars)	3.019	0.245	0.185	0.002	0.006	0.006	312.667	0.022
	Gasoline	LDGT	Light-Duty Trucks (0-8,500 lbs)	4.139	0.305	0.328	0.003	0.009	0.008	403.000	0.023
	Gasoline	HDGV	Heavy-Duty Vehicles (8,501 + lbs)	14.559	0.637	0.921	0.005	0.020	0.018	761.216	0.045
	Diesel	LDDV	Light-Duty Vehicles (Passenger Cars)	2.462	0.101	0.125	0.003	0.004	0.004	303.211	0.008
	Diesel	LDDT	Light-Duty Trucks (0-8,500 lbs)	4.003	0.215	0.335	0.004	0.007	0.006	425.267	0.008
	Diesel	HDDV	Heavy-Duty Vehicles (8,501 + lbs)	1.567	0.386	4.367	0.012	0.145	0.133	1473.699	0.028
	NA	MC	Motorcycles	12.869	2.457	0.755	0.003	0.027	0.024	395.854	0.054
Pennsylvania	Gasoline	LDGV	Light-Duty Vehicles (Passenger Cars)	2.930	0.245	0.181	0.002	0.008	0.007	314.427	0.022
	Gasoline	LDGT	Light-Duty Trucks (0-8,500 lbs)	3.972	0.302	0.319	0.003	0.010	0.009	404.803	0.023
	Gasoline	HDGV	Heavy-Duty Vehicles (8,501 + lbs)	14.355	0.632	0.934	0.005	0.023	0.020	761.890	0.045
	Diesel	LDDV	Light-Duty Vehicles (Passenger Cars)	2.406	0.112	0.125	0.003	0.004	0.004	303.732	0.008
	Diesel	LDDT	Light-Duty Trucks (0-8,500 lbs)	3.916	0.227	0.335	0.004	0.007	0.006	425.752	0.008
	Diesel	HDDV	Heavy-Duty Vehicles (8,501 + lbs)	1.638	0.419	4.587	0.012	0.147	0.135	1478.348	0.028
	NA	MC	Motorcycles	13.084	2.339	0.765	0.003	0.028	0.024	397.091	0.054
Puerto Rico	Gasoline	LDGV	Light-Duty Vehicles (Passenger Cars)	3.667	0.253	0.174	0.002	0.005	0.004	332.506	0.022
	Gasoline	LDGT	Light-Duty Trucks (0-8,500 lbs)	5.262	0.343	0.321	0.003	0.007	0.006	428.971	0.024
	Gasoline	HDGV	Heavy-Duty Vehicles (8,501 + lbs)	16.619	0.769	0.845	0.005	0.016	0.014	821.610	0.046
	Diesel	LDDV	Light-Duty Vehicles (Passenger Cars)	3.009	0.067	0.120	0.003	0.004	0.004	325.935	0.008
	Diesel	LDDT	Light-Duty Trucks (0-8,500 lbs)	4.924	0.186	0.323	0.004	0.007	0.006	457.024	0.008
	Diesel	HDDV	Heavy-Duty Vehicles (8,501 + lbs)	1.329	0.253	3.166	0.013	0.146	0.134	1546.044	0.026
	NA	MC	Motorcycles	12.913	3.126	0.601	0.003	0.026	0.023	392.176	0.052

Table 5-24. On-Road Vehicle Emission Factors – 2021 (cont.)

State	Fuel Type	Vehicle Type		Emission Factors (g/mi)							
				Criteria Pollutants and Ozone Precursors							
				CO	VOC	NO_X	SO_2	PM_{10}	$PM_{2.5}$	CO_2e	NH_3
Rhode Island	Gasoline	LDGV	Light-Duty Vehicles (Passenger Cars)	2.874	0.237	0.172	0.002	0.007	0.007	316.319	0.022
	Gasoline	LDGT	Light-Duty Trucks (0-8,500 lbs)	3.849	0.284	0.305	0.003	0.010	0.009	408.596	0.024
	Gasoline	HDGV	Heavy-Duty Vehicles (8,501 + lbs)	15.132	0.634	0.959	0.005	0.024	0.021	771.235	0.045
	Diesel	LDDV	Light-Duty Vehicles (Passenger Cars)	2.412	0.112	0.124	0.003	0.004	0.004	305.540	0.008
	Diesel	LDDT	Light-Duty Trucks (0-8,500 lbs)	3.966	0.232	0.336	0.004	0.007	0.006	429.377	0.008
	Diesel	HDDV	Heavy-Duty Vehicles (8,501 + lbs)	1.461	0.344	4.130	0.012	0.145	0.134	1465.026	0.027
	NA	MC	Motorcycles	12.706	2.276	0.766	0.003	0.027	0.024	398.172	0.053
South Carolina	Gasoline	LDGV	Light-Duty Vehicles (Passenger Cars)	3.218	0.260	0.193	0.002	0.006	0.005	313.162	0.022
	Gasoline	LDGT	Light-Duty Trucks (0-8,500 lbs)	4.511	0.329	0.345	0.003	0.008	0.007	403.364	0.023
	Gasoline	HDGV	Heavy-Duty Vehicles (8,501 + lbs)	13.922	0.652	0.884	0.005	0.019	0.016	765.560	0.044
	Diesel	LDDV	Light-Duty Vehicles (Passenger Cars)	2.581	0.093	0.126	0.003	0.004	0.004	304.664	0.008
	Diesel	LDDT	Light-Duty Trucks (0-8,500 lbs)	4.178	0.205	0.335	0.004	0.007	0.006	426.887	0.008
	Diesel	HDDV	Heavy-Duty Vehicles (8,501 + lbs)	1.763	0.463	4.722	0.013	0.148	0.136	1510.567	0.029
	NA	MC	Motorcycles	12.998	2.660	0.711	0.003	0.027	0.024	394.683	0.054
South Dakota	Gasoline	LDGV	Light-Duty Vehicles (Passenger Cars)	3.519	0.306	0.216	0.002	0.009	0.008	303.951	0.022
	Gasoline	LDGT	Light-Duty Trucks (0-8,500 lbs)	4.679	0.358	0.371	0.003	0.012	0.011	391.801	0.023
	Gasoline	HDGV	Heavy-Duty Vehicles (8,501 + lbs)	13.567	0.600	0.921	0.005	0.027	0.023	738.941	0.044
	Diesel	LDDV	Light-Duty Vehicles (Passenger Cars)	2.392	0.129	0.131	0.002	0.004	0.004	291.985	0.008
	Diesel	LDDT	Light-Duty Trucks (0-8,500 lbs)	3.839	0.235	0.345	0.003	0.007	0.006	410.209	0.008
	Diesel	HDDV	Heavy-Duty Vehicles (8,501 + lbs)	1.912	0.545	5.455	0.013	0.147	0.135	1486.439	0.030
	NA	MC	Motorcycles	13.552	2.277	0.819	0.003	0.029	0.025	398.850	0.056
Tennessee	Gasoline	LDGV	Light-Duty Vehicles (Passenger Cars)	3.097	0.251	0.187	0.002	0.007	0.006	313.615	0.022
	Gasoline	LDGT	Light-Duty Trucks (0-8,500 lbs)	4.287	0.315	0.333	0.003	0.009	0.008	404.077	0.023
	Gasoline	HDGV	Heavy-Duty Vehicles (8,501 + lbs)	14.292	0.649	0.906	0.005	0.020	0.018	764.864	0.045
	Diesel	LDDV	Light-Duty Vehicles (Passenger Cars)	2.523	0.100	0.125	0.003	0.004	0.004	304.352	0.008
	Diesel	LDDT	Light-Duty Trucks (0-8,500 lbs)	4.096	0.213	0.335	0.004	0.007	0.006	426.670	0.008
	Diesel	HDDV	Heavy-Duty Vehicles (8,501 + lbs)	1.672	0.428	4.565	0.013	0.147	0.135	1493.683	0.029
	NA	MC	Motorcycles	13.096	2.590	0.732	0.003	0.027	0.024	395.671	0.054
Texas	Gasoline	LDGV	Light-Duty Vehicles (Passenger Cars)	3.024	0.234	0.172	0.002	0.005	0.005	315.228	0.022
	Gasoline	LDGT	Light-Duty Trucks (0-8,500 lbs)	4.231	0.296	0.311	0.003	0.007	0.006	406.995	0.023
	Gasoline	HDGV	Heavy-Duty Vehicles (8,501 + lbs)	14.540	0.657	0.881	0.005	0.018	0.016	775.981	0.045
	Diesel	LDDV	Light-Duty Vehicles (Passenger Cars)	2.726	0.086	0.126	0.003	0.004	0.004	307.486	0.008
	Diesel	LDDT	Light-Duty Trucks (0-8,500 lbs)	4.430	0.200	0.338	0.004	0.007	0.006	431.484	0.008
	Diesel	HDDV	Heavy-Duty Vehicles (8,501 + lbs)	1.525	0.361	4.073	0.013	0.143	0.131	1499.179	0.028
	NA	MC	Motorcycles	12.425	2.699	0.691	0.003	0.026	0.023	394.450	0.054
Utah	Gasoline	LDGV	Light-Duty Vehicles (Passenger Cars)	3.175	0.263	0.194	0.002	0.008	0.007	317.692	0.022
	Gasoline	LDGT	Light-Duty Trucks (0-8,500 lbs)	4.324	0.324	0.344	0.003	0.011	0.009	409.796	0.024
	Gasoline	HDGV	Heavy-Duty Vehicles (8,501 + lbs)	15.424	0.667	1.003	0.005	0.024	0.022	772.936	0.045
	Diesel	LDDV	Light-Duty Vehicles (Passenger Cars)	2.446	0.113	0.128	0.003	0.004	0.004	306.832	0.008
	Diesel	LDDT	Light-Duty Trucks (0-8,500 lbs)	4.008	0.232	0.347	0.004	0.007	0.006	430.682	0.008
	Diesel	HDDV	Heavy-Duty Vehicles (8,501 + lbs)	1.535	0.375	4.481	0.012	0.147	0.135	1478.106	0.028
	NA	MC	Motorcycles	13.436	2.659	0.832	0.003	0.028	0.025	397.811	0.053
Vermont	Gasoline	LDGV	Light-Duty Vehicles (Passenger Cars)	2.965	0.280	0.188	0.002	0.009	0.008	302.832	0.022
	Gasoline	LDGT	Light-Duty Trucks (0-8,500 lbs)	3.837	0.318	0.320	0.003	0.012	0.010	389.752	0.023
	Gasoline	HDGV	Heavy-Duty Vehicles (8,501 + lbs)	13.179	0.587	0.918	0.005	0.025	0.022	729.863	0.044
	Diesel	LDDV	Light-Duty Vehicles (Passenger Cars)	2.302	0.131	0.129	0.002	0.004	0.004	290.613	0.008
	Diesel	LDDT	Light-Duty Trucks (0-8,500 lbs)	3.680	0.235	0.338	0.003	0.006	0.006	408.033	0.008
	Diesel	HDDV	Heavy-Duty Vehicles (8,501 + lbs)	1.771	0.489	5.087	0.012	0.144	0.132	1457.127	0.029
	NA	MC	Motorcycles	13.379	2.107	0.820	0.003	0.028	0.025	398.090	0.056
Virgin Islands	Gasoline	LDGV	Light-Duty Vehicles (Passenger Cars)	3.460	0.266	0.177	0.002	0.004	0.004	315.570	0.021
	Gasoline	LDGT	Light-Duty Trucks (0-8,500 lbs)	4.818	0.317	0.306	0.003	0.006	0.005	405.653	0.023
	Gasoline	HDGV	Heavy-Duty Vehicles (8,501 + lbs)	15.187	0.689	0.779	0.005	0.010	0.009	761.325	0.045
	Diesel	LDDV	Light-Duty Vehicles (Passenger Cars)	2.831	0.069	0.122	0.003	0.004	0.004	309.869	0.007
	Diesel	LDDT	Light-Duty Trucks (0-8,500 lbs)	4.521	0.170	0.313	0.004	0.006	0.006	433.572	0.008
	Diesel	HDDV	Heavy-Duty Vehicles (8,501 + lbs)	1.104	0.184	2.685	0.012	0.128	0.118	1459.121	0.025
	NA	MC	Motorcycles	12.885	2.607	0.622	0.003	0.023	0.021	388.311	0.055

Table 5-24. On-Road Vehicle Emission Factors – 2021 (cont.)

State	Fuel Type	Vehicle Type		Emission Factors (g/mi)							
				Criteria Pollutants and Ozone Precursors							
				CO	VOC	NO_X	SO_2	PM_{10}	$PM_{2.5}$	CO_2e	NH_3
Virginia	Gasoline	LDGV	Light-Duty Vehicles (Passenger Cars)	3.090	0.251	0.190	0.002	0.007	0.006	312.830	0.022
	Gasoline	LDGT	Light-Duty Trucks (0-8,500 lbs)	4.263	0.314	0.338	0.003	0.009	0.008	403.364	0.023
	Gasoline	HDGV	Heavy-Duty Vehicles (8,501 + lbs)	14.202	0.629	0.915	0.005	0.021	0.018	763.098	0.045
	Diesel	LDDV	Light-Duty Vehicles (Passenger Cars)	2.487	0.103	0.125	0.003	0.004	0.004	303.243	0.008
	Diesel	LDDT	Light-Duty Trucks (0-8,500 lbs)	4.046	0.217	0.336	0.004	0.007	0.006	425.412	0.008
	Diesel	HDDV	Heavy-Duty Vehicles (8,501 + lbs)	1.628	0.412	4.498	0.013	0.146	0.134	1483.312	0.028
	NA	MC	Motorcycles	12.768	2.408	0.741	0.003	0.027	0.024	396.311	0.054
Washington	Gasoline	LDGV	Light-Duty Vehicles (Passenger Cars)	3.079	0.247	0.191	0.002	0.007	0.006	309.912	0.022
	Gasoline	LDGT	Light-Duty Trucks (0-8,500 lbs)	4.209	0.308	0.335	0.003	0.010	0.009	400.257	0.024
	Gasoline	HDGV	Heavy-Duty Vehicles (8,501 + lbs)	14.800	0.629	0.963	0.005	0.023	0.021	756.309	0.045
	Diesel	LDDV	Light-Duty Vehicles (Passenger Cars)	2.360	0.113	0.126	0.003	0.004	0.004	299.405	0.008
	Diesel	LDDT	Light-Duty Trucks (0-8,500 lbs)	3.861	0.230	0.340	0.004	0.007	0.006	420.698	0.008
	Diesel	HDDV	Heavy-Duty Vehicles (8,501 + lbs)	1.629	0.418	4.672	0.012	0.146	0.134	1466.158	0.028
	NA	MC	Motorcycles	13.380	2.329	0.814	0.003	0.028	0.025	398.169	0.054
West Virginia	Gasoline	LDGV	Light-Duty Vehicles (Passenger Cars)	3.259	0.271	0.205	0.002	0.007	0.006	304.451	0.022
	Gasoline	LDGT	Light-Duty Trucks (0-8,500 lbs)	4.439	0.331	0.357	0.003	0.009	0.008	392.695	0.023
	Gasoline	HDGV	Heavy-Duty Vehicles (8,501 + lbs)	13.712	0.605	0.905	0.005	0.022	0.019	741.258	0.044
	Diesel	LDDV	Light-Duty Vehicles (Passenger Cars)	2.411	0.112	0.128	0.002	0.004	0.004	294.252	0.008
	Diesel	LDDT	Light-Duty Trucks (0-8,500 lbs)	3.880	0.220	0.337	0.003	0.007	0.006	413.255	0.008
	Diesel	HDDV	Heavy-Duty Vehicles (8,501 + lbs)	1.717	0.459	4.814	0.012	0.143	0.132	1468.239	0.029
	NA	MC	Motorcycles	13.227	2.353	0.776	0.003	0.028	0.024	396.774	0.055
Wisconsin	Gasoline	LDGV	Light-Duty Vehicles (Passenger Cars)	3.320	0.286	0.202	0.002	0.009	0.008	309.166	0.022
	Gasoline	LDGT	Light-Duty Trucks (0-8,500 lbs)	4.403	0.343	0.349	0.003	0.011	0.010	397.671	0.023
	Gasoline	HDGV	Heavy-Duty Vehicles (8,501 + lbs)	14.134	0.614	0.925	0.005	0.025	0.022	744.331	0.044
	Diesel	LDDV	Light-Duty Vehicles (Passenger Cars)	2.343	0.126	0.127	0.002	0.004	0.004	297.213	0.008
	Diesel	LDDT	Light-Duty Trucks (0-8,500 lbs)	3.779	0.236	0.336	0.004	0.007	0.006	416.689	0.008
	Diesel	HDDV	Heavy-Duty Vehicles (8,501 + lbs)	1.612	0.419	4.609	0.012	0.143	0.131	1452.825	0.028
	NA	MC	Motorcycles	13.246	2.194	0.795	0.003	0.028	0.024	398.073	0.055
Wyoming	Gasoline	LDGV	Light-Duty Vehicles (Passenger Cars)	3.621	0.313	0.226	0.002	0.009	0.008	305.420	0.022
	Gasoline	LDGT	Light-Duty Trucks (0-8,500 lbs)	4.757	0.363	0.387	0.003	0.012	0.010	393.503	0.023
	Gasoline	HDGV	Heavy-Duty Vehicles (8,501 + lbs)	14.019	0.591	0.964	0.005	0.027	0.024	742.828	0.044
	Diesel	LDDV	Light-Duty Vehicles (Passenger Cars)	2.377	0.131	0.133	0.002	0.004	0.004	293.202	0.008
	Diesel	LDDT	Light-Duty Trucks (0-8,500 lbs)	3.825	0.239	0.352	0.003	0.007	0.006	411.648	0.008
	Diesel	HDDV	Heavy-Duty Vehicles (8,501 + lbs)	2.025	0.591	5.895	0.013	0.150	0.138	1501.737	0.031
	NA	MC	Motorcycles	13.600	2.349	0.873	0.003	0.028	0.025	399.433	0.056

Table 5-25. On-Road Vehicle Emission Factors – 2022

State	Fuel Type	Vehicle Type		Emission Factors (g/mi)							
				Criteria Pollutants and Ozone Precursors							
				CO	VOC	NO_X	SO_2	PM_{10}	$PM_{2.5}$	CO_2e	NH_3
Alabama	Gasoline	LDGV	Light-Duty Vehicles (Passenger Cars)	3.004	0.239	0.166	0.002	0.006	0.005	304.869	0.021
	Gasoline	LDGT	Light-Duty Trucks (0-8,500 lbs)	4.114	0.295	0.296	0.003	0.007	0.007	391.966	0.023
	Gasoline	HDGV	Heavy-Duty Vehicles (8,501 + lbs)	13.290	0.611	0.790	0.005	0.016	0.015	760.930	0.045
	Diesel	LDDV	Light-Duty Vehicles (Passenger Cars)	2.514	0.088	0.117	0.002	0.004	0.004	296.976	0.008
	Diesel	LDDT	Light-Duty Trucks (0-8,500 lbs)	3.868	0.179	0.293	0.003	0.006	0.006	410.578	0.008
	Diesel	HDDV	Heavy-Duty Vehicles (8,501 + lbs)	1.466	0.349	3.829	0.012	0.126	0.116	1475.362	0.028
	NA	MC	Motorcycles	12.835	2.685	0.700	0.003	0.026	0.023	393.466	0.054
Alaska	Gasoline	LDGV	Light-Duty Vehicles (Passenger Cars)	3.478	0.307	0.193	0.002	0.010	0.009	302.730	0.021
	Gasoline	LDGT	Light-Duty Trucks (0-8,500 lbs)	4.320	0.345	0.324	0.003	0.014	0.012	388.848	0.023
	Gasoline	HDGV	Heavy-Duty Vehicles (8,501 + lbs)	13.818	0.570	0.880	0.005	0.030	0.026	745.484	0.044
	Diesel	LDDV	Light-Duty Vehicles (Passenger Cars)	2.231	0.147	0.121	0.002	0.004	0.004	288.812	0.008
	Diesel	LDDT	Light-Duty Trucks (0-8,500 lbs)	3.444	0.239	0.304	0.003	0.007	0.006	399.815	0.008
	Diesel	HDDV	Heavy-Duty Vehicles (8,501 + lbs)	1.713	0.474	4.881	0.012	0.130	0.120	1460.367	0.029
	NA	MC	Motorcycles	13.669	1.954	0.859	0.003	0.029	0.026	401.363	0.055
Arizona	Gasoline	LDGV	Light-Duty Vehicles (Passenger Cars)	2.982	0.228	0.159	0.002	0.005	0.004	311.035	0.022
	Gasoline	LDGT	Light-Duty Trucks (0-8,500 lbs)	4.046	0.277	0.289	0.003	0.007	0.006	401.280	0.023
	Gasoline	HDGV	Heavy-Duty Vehicles (8,501 + lbs)	14.984	0.646	0.871	0.005	0.016	0.015	789.171	0.045
	Diesel	LDDV	Light-Duty Vehicles (Passenger Cars)	2.722	0.080	0.126	0.003	0.004	0.004	304.003	0.008
	Diesel	LDDT	Light-Duty Trucks (0-8,500 lbs)	4.239	0.177	0.321	0.004	0.007	0.006	421.133	0.008
	Diesel	HDDV	Heavy-Duty Vehicles (8,501 + lbs)	1.606	0.397	4.470	0.013	0.131	0.121	1529.226	0.029
	NA	MC	Motorcycles	12.450	3.088	0.796	0.002	0.025	0.022	394.013	0.054
Arkansas	Gasoline	LDGV	Light-Duty Vehicles (Passenger Cars)	3.193	0.243	0.176	0.002	0.006	0.005	298.413	0.021
	Gasoline	LDGT	Light-Duty Trucks (0-8,500 lbs)	4.316	0.294	0.312	0.003	0.008	0.007	385.150	0.023
	Gasoline	HDGV	Heavy-Duty Vehicles (8,501 + lbs)	13.608	0.582	0.808	0.005	0.018	0.016	752.639	0.044
	Diesel	LDDV	Light-Duty Vehicles (Passenger Cars)	2.538	0.095	0.121	0.002	0.004	0.004	290.172	0.008
	Diesel	LDDT	Light-Duty Trucks (0-8,500 lbs)	3.906	0.185	0.302	0.003	0.006	0.006	402.476	0.008
	Diesel	HDDV	Heavy-Duty Vehicles (8,501 + lbs)	1.617	0.417	4.294	0.012	0.126	0.116	1481.749	0.029
	NA	MC	Motorcycles	12.919	2.516	0.739	0.003	0.026	0.023	395.336	0.055
Colorado	Gasoline	LDGV	Light-Duty Vehicles (Passenger Cars)	2.997	0.248	0.176	0.002	0.007	0.007	302.905	0.021
	Gasoline	LDGT	Light-Duty Trucks (0-8,500 lbs)	3.958	0.294	0.307	0.003	0.010	0.009	390.825	0.023
	Gasoline	HDGV	Heavy-Duty Vehicles (8,501 + lbs)	14.152	0.593	0.884	0.005	0.023	0.021	757.940	0.045
	Diesel	LDDV	Light-Duty Vehicles (Passenger Cars)	2.375	0.112	0.121	0.002	0.004	0.004	292.464	0.008
	Diesel	LDDT	Light-Duty Trucks (0-8,500 lbs)	3.693	0.209	0.308	0.003	0.007	0.006	405.713	0.008
	Diesel	HDDV	Heavy-Duty Vehicles (8,501 + lbs)	1.486	0.369	4.226	0.012	0.127	0.117	1457.249	0.028
	NA	MC	Motorcycles	13.285	2.584	0.829	0.003	0.028	0.025	398.165	0.054
Connecticut	Gasoline	LDGV	Light-Duty Vehicles (Passenger Cars)	2.714	0.215	0.151	0.002	0.007	0.006	302.610	0.022
	Gasoline	LDGT	Light-Duty Trucks (0-8,500 lbs)	3.624	0.258	0.269	0.003	0.010	0.008	392.047	0.023
	Gasoline	HDGV	Heavy-Duty Vehicles (8,501 + lbs)	14.324	0.583	0.863	0.005	0.023	0.021	764.186	0.045
	Diesel	LDDV	Light-Duty Vehicles (Passenger Cars)	2.419	0.107	0.119	0.002	0.004	0.004	292.652	0.008
	Diesel	LDDT	Light-Duty Trucks (0-8,500 lbs)	3.800	0.208	0.304	0.003	0.007	0.006	407.204	0.008
	Diesel	HDDV	Heavy-Duty Vehicles (8,501 + lbs)	1.201	0.253	3.378	0.012	0.122	0.112	1429.840	0.026
	NA	MC	Motorcycles	12.579	2.262	0.771	0.003	0.028	0.025	398.953	0.054
Delaware	Gasoline	LDGV	Light-Duty Vehicles (Passenger Cars)	2.636	0.217	0.156	0.002	0.006	0.005	306.480	0.021
	Gasoline	LDGT	Light-Duty Trucks (0-8,500 lbs)	3.457	0.257	0.274	0.003	0.008	0.007	393.425	0.023
	Gasoline	HDGV	Heavy-Duty Vehicles (8,501 + lbs)	14.204	0.585	0.837	0.005	0.017	0.015	755.171	0.045
	Diesel	LDDV	Light-Duty Vehicles (Passenger Cars)	2.346	0.100	0.115	0.002	0.004	0.004	297.154	0.008
	Diesel	LDDT	Light-Duty Trucks (0-8,500 lbs)	3.612	0.193	0.288	0.003	0.006	0.006	410.639	0.008
	Diesel	HDDV	Heavy-Duty Vehicles (8,501 + lbs)	1.071	0.195	2.935	0.012	0.121	0.111	1412.415	0.025
	NA	MC	Motorcycles	12.434	2.274	0.745	0.003	0.025	0.022	394.136	0.053
District of Columbia	Gasoline	LDGV	Light-Duty Vehicles (Passenger Cars)	2.637	0.207	0.144	0.002	0.006	0.005	319.170	0.022
	Gasoline	LDGT	Light-Duty Trucks (0-8,500 lbs)	3.517	0.254	0.256	0.003	0.008	0.007	411.199	0.023
	Gasoline	HDGV	Heavy-Duty Vehicles (8,501 + lbs)	15.226	0.641	0.865	0.005	0.018	0.016	797.008	0.046
	Diesel	LDDV	Light-Duty Vehicles (Passenger Cars)	2.421	0.095	0.112	0.003	0.004	0.004	309.820	0.008
	Diesel	LDDT	Light-Duty Trucks (0-8,500 lbs)	3.792	0.197	0.288	0.004	0.007	0.006	429.432	0.008
	Diesel	HDDV	Heavy-Duty Vehicles (8,501 + lbs)	1.170	0.217	3.071	0.012	0.132	0.122	1479.817	0.026
	NA	MC	Motorcycles	12.441	2.497	0.710	0.003	0.026	0.023	394.619	0.051

Table 5-25. On-Road Vehicle Emission Factors – 2022 (cont.)

State	Fuel Type	Vehicle Type		Emission Factors (g/mi)							
				Criteria Pollutants and Ozone Precursors							
				CO	VOC	NO_X	SO_2	PM_{10}	$PM_{2.5}$	CO_2e	NH_3
Florida	Gasoline	LDGV	Light-Duty Vehicles (Passenger Cars)	3.162	0.232	0.153	0.002	0.005	0.004	320.089	0.022
	Gasoline	LDGT	Light-Duty Trucks (0-8,500 lbs)	4.425	0.304	0.282	0.003	0.007	0.006	411.631	0.023
	Gasoline	HDGV	Heavy-Duty Vehicles (8,501 + lbs)	14.397	0.689	0.772	0.005	0.015	0.014	805.400	0.046
	Diesel	LDDV	Light-Duty Vehicles (Passenger Cars)	2.743	0.071	0.113	0.003	0.004	0.004	313.336	0.008
	Diesel	LDDT	Light-Duty Trucks (0-8,500 lbs)	4.264	0.168	0.287	0.004	0.007	0.006	433.077	0.008
	Diesel	HDDV	Heavy-Duty Vehicles (8,501 + lbs)	1.429	0.312	3.453	0.013	0.132	0.122	1535.655	0.028
	NA	MC	Motorcycles	12.732	3.025	0.620	0.003	0.026	0.023	391.913	0.052
Georgia	Gasoline	LDGV	Light-Duty Vehicles (Passenger Cars)	2.820	0.223	0.158	0.002	0.006	0.005	300.596	0.021
	Gasoline	LDGT	Light-Duty Trucks (0-8,500 lbs)	3.865	0.278	0.284	0.003	0.008	0.007	387.757	0.023
	Gasoline	HDGV	Heavy-Duty Vehicles (8,501 + lbs)	13.045	0.591	0.795	0.005	0.018	0.016	757.052	0.044
	Diesel	LDDV	Light-Duty Vehicles (Passenger Cars)	2.532	0.090	0.119	0.002	0.004	0.004	292.603	0.008
	Diesel	LDDT	Light-Duty Trucks (0-8,500 lbs)	3.905	0.183	0.299	0.003	0.006	0.006	405.591	0.008
	Diesel	HDDV	Heavy-Duty Vehicles (8,501 + lbs)	1.539	0.382	4.069	0.012	0.126	0.116	1476.813	0.028
	NA	MC	Motorcycles	12.788	2.569	0.716	0.003	0.027	0.024	394.873	0.055
Hawaii	Gasoline	LDGV	Light-Duty Vehicles (Passenger Cars)	3.103	0.225	0.154	0.002	0.005	0.004	311.157	0.021
	Gasoline	LDGT	Light-Duty Trucks (0-8,500 lbs)	4.310	0.291	0.283	0.003	0.006	0.005	400.426	0.023
	Gasoline	HDGV	Heavy-Duty Vehicles (8,501 + lbs)	14.861	0.664	0.780	0.005	0.014	0.012	780.442	0.045
	Diesel	LDDV	Light-Duty Vehicles (Passenger Cars)	2.631	0.066	0.113	0.003	0.004	0.004	304.845	0.008
	Diesel	LDDT	Light-Duty Trucks (0-8,500 lbs)	4.071	0.160	0.285	0.004	0.006	0.006	421.609	0.008
	Diesel	HDDV	Heavy-Duty Vehicles (8,501 + lbs)	1.144	0.202	2.849	0.012	0.123	0.113	1468.252	0.026
	NA	MC	Motorcycles	12.793	2.783	0.669	0.003	0.025	0.022	391.427	0.053
Idaho	Gasoline	LDGV	Light-Duty Vehicles (Passenger Cars)	3.111	0.259	0.184	0.002	0.007	0.007	300.007	0.021
	Gasoline	LDGT	Light-Duty Trucks (0-8,500 lbs)	4.052	0.301	0.317	0.003	0.010	0.009	385.660	0.023
	Gasoline	HDGV	Heavy-Duty Vehicles (8,501 + lbs)	13.677	0.570	0.873	0.005	0.021	0.019	743.692	0.044
	Diesel	LDDV	Light-Duty Vehicles (Passenger Cars)	2.316	0.117	0.122	0.002	0.004	0.004	289.277	0.008
	Diesel	LDDT	Light-Duty Trucks (0-8,500 lbs)	3.557	0.207	0.306	0.003	0.006	0.006	400.380	0.008
	Diesel	HDDV	Heavy-Duty Vehicles (8,501 + lbs)	1.612	0.423	4.586	0.012	0.128	0.118	1457.970	0.029
	NA	MC	Motorcycles	13.320	2.380	0.850	0.003	0.027	0.024	397.062	0.055
Illinois	Gasoline	LDGV	Light-Duty Vehicles (Passenger Cars)	2.922	0.230	0.159	0.002	0.007	0.006	313.559	0.022
	Gasoline	LDGT	Light-Duty Trucks (0-8,500 lbs)	3.947	0.295	0.285	0.003	0.009	0.008	404.611	0.023
	Gasoline	HDGV	Heavy-Duty Vehicles (8,501 + lbs)	14.791	0.624	0.851	0.005	0.021	0.019	783.932	0.046
	Diesel	LDDV	Light-Duty Vehicles (Passenger Cars)	2.397	0.106	0.115	0.003	0.004	0.004	303.302	0.008
	Diesel	LDDT	Light-Duty Trucks (0-8,500 lbs)	3.761	0.208	0.294	0.004	0.007	0.006	420.870	0.008
	Diesel	HDDV	Heavy-Duty Vehicles (8,501 + lbs)	1.209	0.246	3.276	0.012	0.128	0.118	1459.498	0.026
	NA	MC	Motorcycles	12.536	2.422	0.729	0.003	0.026	0.023	397.014	0.052
Indiana	Gasoline	LDGV	Light-Duty Vehicles (Passenger Cars)	3.077	0.245	0.173	0.002	0.007	0.006	306.751	0.021
	Gasoline	LDGT	Light-Duty Trucks (0-8,500 lbs)	4.103	0.301	0.303	0.003	0.009	0.008	394.038	0.023
	Gasoline	HDGV	Heavy-Duty Vehicles (8,501 + lbs)	13.844	0.597	0.834	0.005	0.020	0.018	760.072	0.045
	Diesel	LDDV	Light-Duty Vehicles (Passenger Cars)	2.356	0.108	0.117	0.002	0.004	0.004	296.614	0.008
	Diesel	LDDT	Light-Duty Trucks (0-8,500 lbs)	3.641	0.202	0.294	0.003	0.006	0.006	410.082	0.008
	Diesel	HDDV	Heavy-Duty Vehicles (8,501 + lbs)	1.507	0.373	4.084	0.012	0.129	0.119	1466.474	0.028
	NA	MC	Motorcycles	13.077	2.377	0.755	0.003	0.027	0.024	396.071	0.054
Iowa	Gasoline	LDGV	Light-Duty Vehicles (Passenger Cars)	3.311	0.274	0.188	0.002	0.008	0.007	299.339	0.021
	Gasoline	LDGT	Light-Duty Trucks (0-8,500 lbs)	4.284	0.318	0.322	0.003	0.010	0.009	384.792	0.023
	Gasoline	HDGV	Heavy-Duty Vehicles (8,501 + lbs)	13.525	0.564	0.836	0.005	0.022	0.019	742.313	0.044
	Diesel	LDDV	Light-Duty Vehicles (Passenger Cars)	2.341	0.118	0.120	0.002	0.004	0.004	288.465	0.008
	Diesel	LDDT	Light-Duty Trucks (0-8,500 lbs)	3.589	0.207	0.299	0.003	0.006	0.006	399.327	0.008
	Diesel	HDDV	Heavy-Duty Vehicles (8,501 + lbs)	1.643	0.436	4.510	0.012	0.128	0.117	1461.963	0.029
	NA	MC	Motorcycles	13.203	2.235	0.792	0.003	0.027	0.024	397.193	0.055
Kansas	Gasoline	LDGV	Light-Duty Vehicles (Passenger Cars)	3.219	0.254	0.181	0.002	0.007	0.006	300.136	0.021
	Gasoline	LDGT	Light-Duty Trucks (0-8,500 lbs)	4.287	0.306	0.318	0.003	0.009	0.008	386.737	0.023
	Gasoline	HDGV	Heavy-Duty Vehicles (8,501 + lbs)	13.786	0.580	0.834	0.005	0.020	0.017	750.185	0.044
	Diesel	LDDV	Light-Duty Vehicles (Passenger Cars)	2.445	0.105	0.120	0.002	0.004	0.004	290.710	0.008
	Diesel	LDDT	Light-Duty Trucks (0-8,500 lbs)	3.763	0.196	0.301	0.003	0.006	0.006	402.879	0.008
	Diesel	HDDV	Heavy-Duty Vehicles (8,501 + lbs)	1.477	0.365	4.036	0.012	0.124	0.115	1456.074	0.028
	NA	MC	Motorcycles	13.010	2.417	0.769	0.003	0.027	0.024	396.128	0.055

Table 5-25. On-Road Vehicle Emission Factors – 2022 (cont.)

State	Fuel Type	Vehicle Type		Emission Factors (g/mi)							
				Criteria Pollutants and Ozone Precursors							
				CO	VOC	NO_X	SO_2	PM_{10}	$PM_{2.5}$	CO_2e	NH_3
Kentucky	Gasoline	LDGV	Light-Duty Vehicles (Passenger Cars)	3.132	0.242	0.177	0.002	0.006	0.005	297.276	0.021
	Gasoline	LDGT	Light-Duty Trucks (0-8,500 lbs)	4.227	0.295	0.312	0.003	0.008	0.007	383.778	0.023
	Gasoline	HDGV	Heavy-Duty Vehicles (8,501 + lbs)	13.146	0.562	0.807	0.005	0.020	0.018	749.956	0.044
	Diesel	LDDV	Light-Duty Vehicles (Passenger Cars)	2.464	0.103	0.122	0.002	0.004	0.004	288.152	0.008
	Diesel	LDDT	Light-Duty Trucks (0-8,500 lbs)	3.800	0.195	0.305	0.003	0.007	0.006	399.847	0.008
	Diesel	HDDV	Heavy-Duty Vehicles (8,501 + lbs)	1.754	0.475	4.727	0.013	0.129	0.119	1488.469	0.030
	NA	MC	Motorcycles	12.781	2.353	0.755	0.003	0.027	0.024	396.886	0.056
Louisiana	Gasoline	LDGV	Light-Duty Vehicles (Passenger Cars)	3.072	0.234	0.160	0.002	0.005	0.005	306.016	0.021
	Gasoline	LDGT	Light-Duty Trucks (0-8,500 lbs)	4.248	0.293	0.289	0.003	0.007	0.006	394.362	0.023
	Gasoline	HDGV	Heavy-Duty Vehicles (8,501 + lbs)	13.424	0.625	0.774	0.005	0.017	0.015	772.088	0.044
	Diesel	LDDV	Light-Duty Vehicles (Passenger Cars)	2.665	0.082	0.118	0.002	0.004	0.004	298.801	0.008
	Diesel	LDDT	Light-Duty Trucks (0-8,500 lbs)	4.118	0.175	0.296	0.003	0.006	0.006	413.662	0.008
	Diesel	HDDV	Heavy-Duty Vehicles (8,501 + lbs)	1.543	0.377	3.923	0.013	0.127	0.117	1502.514	0.028
	NA	MC	Motorcycles	12.787	2.771	0.670	0.003	0.027	0.024	393.726	0.055
Maine	Gasoline	LDGV	Light-Duty Vehicles (Passenger Cars)	3.021	0.274	0.183	0.002	0.008	0.007	292.535	0.021
	Gasoline	LDGT	Light-Duty Trucks (0-8,500 lbs)	3.871	0.309	0.310	0.003	0.011	0.010	376.564	0.023
	Gasoline	HDGV	Heavy-Duty Vehicles (8,501 + lbs)	12.310	0.536	0.825	0.005	0.023	0.020	724.672	0.044
	Diesel	LDDV	Light-Duty Vehicles (Passenger Cars)	2.249	0.127	0.122	0.002	0.004	0.004	281.026	0.008
	Diesel	LDDT	Light-Duty Trucks (0-8,500 lbs)	3.424	0.211	0.301	0.003	0.006	0.006	389.896	0.008
	Diesel	HDDV	Heavy-Duty Vehicles (8,501 + lbs)	1.644	0.443	4.626	0.012	0.125	0.115	1438.878	0.029
	NA	MC	Motorcycles	13.114	2.043	0.821	0.003	0.028	0.025	397.844	0.056
Maryland	Gasoline	LDGV	Light-Duty Vehicles (Passenger Cars)	2.720	0.216	0.155	0.002	0.006	0.006	302.056	0.021
	Gasoline	LDGT	Light-Duty Trucks (0-8,500 lbs)	3.635	0.263	0.277	0.003	0.009	0.008	390.543	0.023
	Gasoline	HDGV	Heavy-Duty Vehicles (8,501 + lbs)	13.727	0.580	0.837	0.005	0.021	0.019	761.570	0.045
	Diesel	LDDV	Light-Duty Vehicles (Passenger Cars)	2.471	0.100	0.119	0.002	0.004	0.004	292.891	0.008
	Diesel	LDDT	Light-Duty Trucks (0-8,500 lbs)	3.851	0.198	0.303	0.003	0.007	0.006	406.828	0.008
	Diesel	HDDV	Heavy-Duty Vehicles (8,501 + lbs)	1.329	0.302	3.663	0.012	0.123	0.113	1447.997	0.027
	NA	MC	Motorcycles	12.485	2.331	0.751	0.003	0.027	0.024	397.249	0.054
Massachusetts	Gasoline	LDGV	Light-Duty Vehicles (Passenger Cars)	2.722	0.223	0.157	0.002	0.007	0.006	301.293	0.021
	Gasoline	LDGT	Light-Duty Trucks (0-8,500 lbs)	3.601	0.273	0.278	0.003	0.010	0.009	389.374	0.023
	Gasoline	HDGV	Heavy-Duty Vehicles (8,501 + lbs)	13.989	0.567	0.858	0.005	0.023	0.020	755.834	0.045
	Diesel	LDDV	Light-Duty Vehicles (Passenger Cars)	2.371	0.112	0.119	0.002	0.004	0.004	290.943	0.008
	Diesel	LDDT	Light-Duty Trucks (0-8,500 lbs)	3.697	0.210	0.303	0.003	0.007	0.006	404.133	0.008
	Diesel	HDDV	Heavy-Duty Vehicles (8,501 + lbs)	1.346	0.314	3.775	0.012	0.124	0.114	1436.911	0.027
	NA	MC	Motorcycles	12.603	2.194	0.786	0.003	0.027	0.024	398.610	0.054
Michigan	Gasoline	LDGV	Light-Duty Vehicles (Passenger Cars)	3.207	0.257	0.181	0.002	0.008	0.007	304.519	0.021
	Gasoline	LDGT	Light-Duty Trucks (0-8,500 lbs)	4.284	0.317	0.319	0.003	0.010	0.009	392.092	0.023
	Gasoline	HDGV	Heavy-Duty Vehicles (8,501 + lbs)	13.759	0.588	0.848	0.005	0.023	0.021	757.714	0.045
	Diesel	LDDV	Light-Duty Vehicles (Passenger Cars)	2.348	0.115	0.118	0.002	0.004	0.004	293.667	0.008
	Diesel	LDDT	Light-Duty Trucks (0-8,500 lbs)	3.642	0.211	0.299	0.003	0.007	0.006	406.812	0.008
	Diesel	HDDV	Heavy-Duty Vehicles (8,501 + lbs)	1.513	0.381	4.180	0.012	0.128	0.118	1460.046	0.028
	NA	MC	Motorcycles	13.213	2.271	0.781	0.003	0.028	0.025	397.961	0.054
Minnesota	Gasoline	LDGV	Light-Duty Vehicles (Passenger Cars)	3.282	0.277	0.185	0.002	0.009	0.008	301.430	0.021
	Gasoline	LDGT	Light-Duty Trucks (0-8,500 lbs)	4.262	0.326	0.318	0.003	0.012	0.011	387.708	0.023
	Gasoline	HDGV	Heavy-Duty Vehicles (8,501 + lbs)	13.574	0.595	0.844	0.005	0.025	0.022	744.472	0.045
	Diesel	LDDV	Light-Duty Vehicles (Passenger Cars)	2.306	0.124	0.119	0.002	0.004	0.004	289.664	0.008
	Diesel	LDDT	Light-Duty Trucks (0-8,500 lbs)	3.550	0.216	0.299	0.003	0.006	0.006	401.213	0.008
	Diesel	HDDV	Heavy-Duty Vehicles (8,501 + lbs)	1.352	0.324	3.809	0.012	0.123	0.113	1424.147	0.027
	NA	MC	Motorcycles	13.492	2.252	0.797	0.003	0.029	0.025	398.358	0.055
Mississippi	Gasoline	LDGV	Light-Duty Vehicles (Passenger Cars)	3.005	0.240	0.166	0.002	0.006	0.005	300.278	0.021
	Gasoline	LDGT	Light-Duty Trucks (0-8,500 lbs)	4.099	0.291	0.294	0.003	0.007	0.006	386.469	0.023
	Gasoline	HDGV	Heavy-Duty Vehicles (8,501 + lbs)	13.048	0.599	0.776	0.005	0.016	0.014	750.084	0.044
	Diesel	LDDV	Light-Duty Vehicles (Passenger Cars)	2.520	0.088	0.118	0.002	0.004	0.004	292.629	0.008
	Diesel	LDDT	Light-Duty Trucks (0-8,500 lbs)	3.857	0.176	0.293	0.003	0.006	0.006	405.000	0.008
	Diesel	HDDV	Heavy-Duty Vehicles (8,501 + lbs)	1.437	0.341	3.758	0.012	0.123	0.113	1462.057	0.028
	NA	MC	Motorcycles	12.849	2.652	0.701	0.003	0.026	0.023	393.110	0.055

Table 5-25. On-Road Vehicle Emission Factors – 2022 (cont.)

State	Fuel Type	Vehicle Type		Emission Factors (g/mi)							
				Criteria Pollutants and Ozone Precursors							
				CO	VOC	NO_X	SO_2	PM_{10}	$PM_{2.5}$	CO_2e	NH_3
Missouri	Gasoline	LDGV	Light-Duty Vehicles (Passenger Cars)	3.089	0.239	0.173	0.002	0.006	0.006	294.612	0.021
	Gasoline	LDGT	Light-Duty Trucks (0-8,500 lbs)	4.132	0.289	0.305	0.003	0.008	0.008	381.359	0.023
	Gasoline	HDGV	Heavy-Duty Vehicles (8,501 + lbs)	13.500	0.558	0.819	0.005	0.021	0.018	745.555	0.044
	Diesel	LDDV	Light-Duty Vehicles (Passenger Cars)	2.493	0.104	0.122	0.002	0.004	0.004	285.445	0.008
	Diesel	LDDT	Light-Duty Trucks (0-8,500 lbs)	3.849	0.196	0.307	0.003	0.007	0.006	396.974	0.008
	Diesel	HDDV	Heavy-Duty Vehicles (8,501 + lbs)	1.503	0.378	4.119	0.012	0.123	0.113	1453.285	0.028
	NA	MC	Motorcycles	12.722	2.307	0.765	0.003	0.027	0.024	397.515	0.056
Montana	Gasoline	LDGV	Light-Duty Vehicles (Passenger Cars)	3.332	0.282	0.198	0.002	0.008	0.007	294.305	0.021
	Gasoline	LDGT	Light-Duty Trucks (0-8,500 lbs)	4.278	0.320	0.336	0.003	0.011	0.009	378.787	0.023
	Gasoline	HDGV	Heavy-Duty Vehicles (8,501 + lbs)	13.169	0.542	0.861	0.005	0.023	0.020	731.370	0.044
	Diesel	LDDV	Light-Duty Vehicles (Passenger Cars)	2.289	0.127	0.124	0.002	0.004	0.004	282.775	0.008
	Diesel	LDDT	Light-Duty Trucks (0-8,500 lbs)	3.493	0.213	0.308	0.003	0.006	0.006	392.141	0.008
	Diesel	HDDV	Heavy-Duty Vehicles (8,501 + lbs)	1.774	0.494	5.057	0.012	0.128	0.118	1462.938	0.030
	NA	MC	Motorcycles	13.407	2.216	0.867	0.003	0.027	0.024	398.185	0.056
Nebraska	Gasoline	LDGV	Light-Duty Vehicles (Passenger Cars)	3.331	0.270	0.188	0.002	0.007	0.006	298.836	0.021
	Gasoline	LDGT	Light-Duty Trucks (0-8,500 lbs)	4.371	0.318	0.327	0.003	0.010	0.009	385.122	0.023
	Gasoline	HDGV	Heavy-Duty Vehicles (8,501 + lbs)	13.488	0.564	0.841	0.005	0.023	0.020	748.517	0.044
	Diesel	LDDV	Light-Duty Vehicles (Passenger Cars)	2.411	0.115	0.122	0.002	0.004	0.004	288.352	0.008
	Diesel	LDDT	Light-Duty Trucks (0-8,500 lbs)	3.713	0.206	0.306	0.003	0.007	0.006	399.780	0.008
	Diesel	HDDV	Heavy-Duty Vehicles (8,501 + lbs)	1.760	0.482	4.831	0.013	0.130	0.119	1483.590	0.030
	NA	MC	Motorcycles	13.168	2.340	0.797	0.003	0.027	0.024	397.989	0.055
Nevada	Gasoline	LDGV	Light-Duty Vehicles (Passenger Cars)	2.814	0.229	0.162	0.002	0.006	0.005	311.886	0.022
	Gasoline	LDGT	Light-Duty Trucks (0-8,500 lbs)	3.789	0.279	0.292	0.003	0.008	0.007	401.710	0.023
	Gasoline	HDGV	Heavy-Duty Vehicles (8,501 + lbs)	14.635	0.643	0.905	0.005	0.018	0.016	782.936	0.045
	Diesel	LDDV	Light-Duty Vehicles (Passenger Cars)	2.525	0.091	0.122	0.003	0.004	0.004	303.505	0.008
	Diesel	LDDT	Light-Duty Trucks (0-8,500 lbs)	3.934	0.189	0.313	0.004	0.007	0.006	420.188	0.008
	Diesel	HDDV	Heavy-Duty Vehicles (8,501 + lbs)	1.530	0.369	4.317	0.013	0.132	0.121	1504.381	0.028
	NA	MC	Motorcycles	12.969	2.980	0.819	0.003	0.026	0.023	394.733	0.053
New Hampshire	Gasoline	LDGV	Light-Duty Vehicles (Passenger Cars)	2.722	0.238	0.159	0.002	0.008	0.007	299.073	0.021
	Gasoline	LDGT	Light-Duty Trucks (0-8,500 lbs)	3.507	0.276	0.274	0.003	0.010	0.009	384.784	0.023
	Gasoline	HDGV	Heavy-Duty Vehicles (8,501 + lbs)	13.430	0.554	0.846	0.005	0.022	0.019	739.879	0.044
	Diesel	LDDV	Light-Duty Vehicles (Passenger Cars)	2.290	0.119	0.119	0.002	0.004	0.004	288.072	0.008
	Diesel	LDDT	Light-Duty Trucks (0-8,500 lbs)	3.519	0.209	0.299	0.003	0.006	0.006	399.062	0.008
	Diesel	HDDV	Heavy-Duty Vehicles (8,501 + lbs)	1.395	0.339	3.930	0.012	0.123	0.113	1425.404	0.027
	NA	MC	Motorcycles	12.790	2.121	0.803	0.003	0.027	0.024	397.420	0.055
New Jersey	Gasoline	LDGV	Light-Duty Vehicles (Passenger Cars)	2.727	0.218	0.159	0.002	0.006	0.006	293.966	0.021
	Gasoline	LDGT	Light-Duty Trucks (0-8,500 lbs)	3.523	0.247	0.271	0.003	0.009	0.008	380.258	0.023
	Gasoline	HDGV	Heavy-Duty Vehicles (8,501 + lbs)	12.790	0.518	0.821	0.005	0.021	0.019	746.833	0.043
	Diesel	LDDV	Light-Duty Vehicles (Passenger Cars)	2.443	0.107	0.124	0.002	0.004	0.004	284.552	0.008
	Diesel	LDDT	Light-Duty Trucks (0-8,500 lbs)	3.774	0.197	0.310	0.003	0.007	0.006	395.524	0.008
	Diesel	HDDV	Heavy-Duty Vehicles (8,501 + lbs)	1.923	0.546	5.250	0.013	0.132	0.121	1503.201	0.031
	NA	MC	Motorcycles	12.461	2.120	0.788	0.003	0.027	0.024	398.119	0.056
New Mexico	Gasoline	LDGV	Light-Duty Vehicles (Passenger Cars)	3.052	0.252	0.181	0.002	0.006	0.005	298.790	0.021
	Gasoline	LDGT	Light-Duty Trucks (0-8,500 lbs)	4.058	0.297	0.320	0.003	0.008	0.007	385.014	0.023
	Gasoline	HDGV	Heavy-Duty Vehicles (8,501 + lbs)	13.487	0.575	0.868	0.005	0.019	0.017	749.111	0.044
	Diesel	LDDV	Light-Duty Vehicles (Passenger Cars)	2.424	0.102	0.124	0.002	0.004	0.004	289.712	0.008
	Diesel	LDDT	Light-Duty Trucks (0-8,500 lbs)	3.729	0.192	0.312	0.003	0.006	0.006	401.424	0.008
	Diesel	HDDV	Heavy-Duty Vehicles (8,501 + lbs)	1.705	0.455	4.820	0.013	0.129	0.119	1481.849	0.029
	NA	MC	Motorcycles	12.987	2.701	0.838	0.003	0.026	0.023	395.915	0.055
New York	Gasoline	LDGV	Light-Duty Vehicles (Passenger Cars)	2.633	0.218	0.149	0.002	0.007	0.006	304.409	0.021
	Gasoline	LDGT	Light-Duty Trucks (0-8,500 lbs)	3.390	0.252	0.256	0.003	0.010	0.008	392.488	0.023
	Gasoline	HDGV	Heavy-Duty Vehicles (8,501 + lbs)	13.851	0.587	0.852	0.005	0.022	0.019	759.081	0.045
	Diesel	LDDV	Light-Duty Vehicles (Passenger Cars)	2.353	0.109	0.117	0.002	0.004	0.004	294.157	0.008
	Diesel	LDDT	Light-Duty Trucks (0-8,500 lbs)	3.660	0.207	0.298	0.003	0.007	0.006	407.890	0.008
	Diesel	HDDV	Heavy-Duty Vehicles (8,501 + lbs)	1.308	0.296	3.632	0.012	0.125	0.115	1438.010	0.027
	NA	MC	Motorcycles	12.825	2.269	0.769	0.003	0.027	0.024	397.393	0.054

Table 5-25. On-Road Vehicle Emission Factors – 2022 (cont.)

State	Fuel Type	Vehicle Type		Emission Factors (g/mi)							
				Criteria Pollutants and Ozone Precursors							
				CO	VOC	NO_X	SO_2	PM_{10}	$PM_{2.5}$	CO_2e	NH_3
North Carolina	Gasoline	LDGV	Light-Duty Vehicles (Passenger Cars)	2.929	0.234	0.166	0.002	0.006	0.005	302.793	0.021
	Gasoline	LDGT	Light-Duty Trucks (0-8,500 lbs)	4.002	0.292	0.297	0.003	0.008	0.007	389.931	0.023
	Gasoline	HDGV	Heavy-Duty Vehicles (8,501 + lbs)	13.331	0.604	0.810	0.005	0.018	0.016	756.072	0.045
	Diesel	LDDV	Light-Duty Vehicles (Passenger Cars)	2.453	0.093	0.117	0.002	0.004	0.004	294.331	0.008
	Diesel	LDDT	Light-Duty Trucks (0-8,500 lbs)	3.783	0.186	0.295	0.003	0.006	0.006	407.558	0.008
	Diesel	HDDV	Heavy-Duty Vehicles (8,501 + lbs)	1.329	0.298	3.578	0.012	0.123	0.113	1447.574	0.027
	NA	MC	Motorcycles	12.896	2.585	0.725	0.003	0.027	0.024	394.567	0.054
North Dakota	Gasoline	LDGV	Light-Duty Vehicles (Passenger Cars)	3.456	0.308	0.194	0.002	0.010	0.009	295.783	0.021
	Gasoline	LDGT	Light-Duty Trucks (0-8,500 lbs)	4.385	0.344	0.326	0.003	0.013	0.011	380.123	0.023
	Gasoline	HDGV	Heavy-Duty Vehicles (8,501 + lbs)	12.904	0.564	0.835	0.005	0.027	0.024	729.762	0.044
	Diesel	LDDV	Light-Duty Vehicles (Passenger Cars)	2.274	0.136	0.123	0.002	0.004	0.004	283.062	0.008
	Diesel	LDDT	Light-Duty Trucks (0-8,500 lbs)	3.464	0.220	0.303	0.003	0.006	0.006	392.341	0.008
	Diesel	HDDV	Heavy-Duty Vehicles (8,501 + lbs)	1.666	0.455	4.703	0.012	0.126	0.116	1446.596	0.029
	NA	MC	Motorcycles	13.587	2.141	0.832	0.003	0.028	0.025	398.951	0.056
Ohio	Gasoline	LDGV	Light-Duty Vehicles (Passenger Cars)	2.954	0.236	0.165	0.002	0.007	0.006	306.408	0.021
	Gasoline	LDGT	Light-Duty Trucks (0-8,500 lbs)	3.924	0.287	0.289	0.003	0.009	0.008	394.168	0.023
	Gasoline	HDGV	Heavy-Duty Vehicles (8,501 + lbs)	13.974	0.603	0.841	0.005	0.021	0.019	760.760	0.045
	Diesel	LDDV	Light-Duty Vehicles (Passenger Cars)	2.355	0.108	0.116	0.002	0.004	0.004	296.215	0.008
	Diesel	LDDT	Light-Duty Trucks (0-8,500 lbs)	3.650	0.204	0.295	0.003	0.006	0.006	410.009	0.008
	Diesel	HDDV	Heavy-Duty Vehicles (8,501 + lbs)	1.387	0.326	3.790	0.012	0.127	0.117	1451.731	0.027
	NA	MC	Motorcycles	13.173	2.385	0.758	0.003	0.028	0.024	396.498	0.054
Oklahoma	Gasoline	LDGV	Light-Duty Vehicles (Passenger Cars)	3.189	0.245	0.176	0.002	0.006	0.005	303.826	0.021
	Gasoline	LDGT	Light-Duty Trucks (0-8,500 lbs)	4.309	0.300	0.311	0.003	0.008	0.007	391.157	0.023
	Gasoline	HDGV	Heavy-Duty Vehicles (8,501 + lbs)	13.999	0.601	0.824	0.005	0.018	0.016	760.685	0.045
	Diesel	LDDV	Light-Duty Vehicles (Passenger Cars)	2.516	0.095	0.119	0.002	0.004	0.004	295.337	0.008
	Diesel	LDDT	Light-Duty Trucks (0-8,500 lbs)	3.879	0.187	0.299	0.003	0.006	0.006	408.800	0.008
	Diesel	HDDV	Heavy-Duty Vehicles (8,501 + lbs)	1.508	0.370	4.026	0.012	0.126	0.116	1476.970	0.028
	NA	MC	Motorcycles	12.938	2.613	0.740	0.003	0.026	0.023	394.793	0.055
Oregon	Gasoline	LDGV	Light-Duty Vehicles (Passenger Cars)	2.842	0.231	0.173	0.002	0.006	0.006	296.621	0.021
	Gasoline	LDGT	Light-Duty Trucks (0-8,500 lbs)	3.752	0.274	0.298	0.003	0.009	0.008	382.048	0.023
	Gasoline	HDGV	Heavy-Duty Vehicles (8,501 + lbs)	13.542	0.563	0.853	0.005	0.019	0.017	738.211	0.044
	Diesel	LDDV	Light-Duty Vehicles (Passenger Cars)	2.288	0.108	0.120	0.002	0.004	0.004	286.916	0.008
	Diesel	LDDT	Light-Duty Trucks (0-8,500 lbs)	3.517	0.199	0.300	0.003	0.006	0.006	397.642	0.008
	Diesel	HDDV	Heavy-Duty Vehicles (8,501 + lbs)	1.502	0.377	4.224	0.012	0.125	0.115	1438.054	0.028
	NA	MC	Motorcycles	13.148	2.265	0.826	0.003	0.027	0.024	396.288	0.055
Pacific Islands	Gasoline	LDGV	Light-Duty Vehicles (Passenger Cars)	2.858	0.225	0.162	0.002	0.006	0.005	302.589	0.021
	Gasoline	LDGT	Light-Duty Trucks (0-8,500 lbs)	3.849	0.276	0.288	0.003	0.008	0.007	390.206	0.023
	Gasoline	HDGV	Heavy-Duty Vehicles (8,501 + lbs)	13.751	0.589	0.827	0.005	0.019	0.017	758.883	0.045
	Diesel	LDDV	Light-Duty Vehicles (Passenger Cars)	2.431	0.098	0.119	0.002	0.004	0.004	293.705	0.008
	Diesel	LDDT	Light-Duty Trucks (0-8,500 lbs)	3.769	0.193	0.300	0.003	0.007	0.006	407.128	0.008
	Diesel	HDDV	Heavy-Duty Vehicles (8,501 + lbs)	1.470	0.356	4.001	0.012	0.127	0.117	1463.277	0.028
	NA	MC	Motorcycles	12.737	2.450	0.753	0.003	0.027	0.024	395.920	0.054
Pennsylvania	Gasoline	LDGV	Light-Duty Vehicles (Passenger Cars)	2.768	0.225	0.159	0.002	0.007	0.006	304.327	0.021
	Gasoline	LDGT	Light-Duty Trucks (0-8,500 lbs)	3.687	0.274	0.280	0.003	0.009	0.008	391.995	0.023
	Gasoline	HDGV	Heavy-Duty Vehicles (8,501 + lbs)	13.544	0.584	0.839	0.005	0.022	0.019	759.542	0.045
	Diesel	LDDV	Light-Duty Vehicles (Passenger Cars)	2.376	0.109	0.118	0.002	0.004	0.004	294.235	0.008
	Diesel	LDDT	Light-Duty Trucks (0-8,500 lbs)	3.686	0.204	0.299	0.003	0.007	0.006	407.623	0.008
	Diesel	HDDV	Heavy-Duty Vehicles (8,501 + lbs)	1.540	0.388	4.212	0.012	0.129	0.118	1467.837	0.028
	NA	MC	Motorcycles	12.947	2.338	0.764	0.003	0.028	0.024	397.164	0.054
Puerto Rico	Gasoline	LDGV	Light-Duty Vehicles (Passenger Cars)	3.481	0.230	0.150	0.002	0.005	0.004	321.682	0.022
	Gasoline	LDGT	Light-Duty Trucks (0-8,500 lbs)	4.901	0.307	0.280	0.003	0.006	0.006	415.235	0.023
	Gasoline	HDGV	Heavy-Duty Vehicles (8,501 + lbs)	15.737	0.713	0.758	0.005	0.016	0.014	819.336	0.046
	Diesel	LDDV	Light-Duty Vehicles (Passenger Cars)	2.970	0.064	0.113	0.003	0.004	0.004	315.628	0.008
	Diesel	LDDT	Light-Duty Trucks (0-8,500 lbs)	4.639	0.163	0.289	0.004	0.007	0.006	437.444	0.008
	Diesel	HDDV	Heavy-Duty Vehicles (8,501 + lbs)	1.228	0.227	2.858	0.013	0.127	0.117	1535.851	0.026
	NA	MC	Motorcycles	12.793	3.082	0.600	0.003	0.026	0.023	392.247	0.053

Table 5-25. On-Road Vehicle Emission Factors – 2022 (cont.)

State	Fuel Type	Vehicle Type		Emission Factors (g/mi)							
				Criteria Pollutants and Ozone Precursors							
				CO	VOC	NO_X	SO_2	PM_{10}	$PM_{2.5}$	CO_2e	NH_3
Rhode Island	Gasoline	LDGV	Light-Duty Vehicles (Passenger Cars)	2.721	0.219	0.152	0.002	0.007	0.006	306.152	0.022
	Gasoline	LDGT	Light-Duty Trucks (0-8,500 lbs)	3.588	0.260	0.269	0.003	0.009	0.008	395.672	0.023
	Gasoline	HDGV	Heavy-Duty Vehicles (8,501 + lbs)	14.316	0.586	0.862	0.005	0.023	0.020	768.924	0.045
	Diesel	LDDV	Light-Duty Vehicles (Passenger Cars)	2.381	0.108	0.117	0.002	0.004	0.004	295.981	0.008
	Diesel	LDDT	Light-Duty Trucks (0-8,500 lbs)	3.734	0.209	0.300	0.003	0.007	0.006	411.114	0.008
	Diesel	HDDV	Heavy-Duty Vehicles (8,501 + lbs)	1.363	0.315	3.762	0.012	0.127	0.117	1454.926	0.027
	NA	MC	Motorcycles	12.574	2.277	0.764	0.003	0.027	0.024	398.244	0.054
South Carolina	Gasoline	LDGV	Light-Duty Vehicles (Passenger Cars)	3.049	0.238	0.168	0.002	0.006	0.005	303.050	0.021
	Gasoline	LDGT	Light-Duty Trucks (0-8,500 lbs)	4.198	0.297	0.302	0.003	0.008	0.007	390.531	0.023
	Gasoline	HDGV	Heavy-Duty Vehicles (8,501 + lbs)	13.125	0.604	0.794	0.005	0.018	0.016	763.206	0.044
	Diesel	LDDV	Light-Duty Vehicles (Passenger Cars)	2.548	0.089	0.119	0.002	0.004	0.004	295.095	0.008
	Diesel	LDDT	Light-Duty Trucks (0-8,500 lbs)	3.935	0.182	0.299	0.003	0.006	0.006	408.652	0.008
	Diesel	HDDV	Heavy-Duty Vehicles (8,501 + lbs)	1.665	0.430	4.358	0.013	0.130	0.119	1499.630	0.029
	NA	MC	Motorcycles	12.870	2.675	0.709	0.003	0.027	0.024	394.757	0.055
South Dakota	Gasoline	LDGV	Light-Duty Vehicles (Passenger Cars)	3.316	0.280	0.190	0.002	0.008	0.007	294.256	0.021
	Gasoline	LDGT	Light-Duty Trucks (0-8,500 lbs)	4.344	0.324	0.327	0.003	0.011	0.010	379.460	0.023
	Gasoline	HDGV	Heavy-Duty Vehicles (8,501 + lbs)	12.737	0.555	0.829	0.005	0.025	0.022	736.537	0.043
	Diesel	LDDV	Light-Duty Vehicles (Passenger Cars)	2.361	0.125	0.124	0.002	0.004	0.004	282.896	0.008
	Diesel	LDDT	Light-Duty Trucks (0-8,500 lbs)	3.616	0.212	0.309	0.003	0.006	0.006	392.789	0.008
	Diesel	HDDV	Heavy-Duty Vehicles (8,501 + lbs)	1.816	0.510	5.062	0.012	0.129	0.119	1475.252	0.030
	NA	MC	Motorcycles	13.402	2.270	0.817	0.003	0.028	0.025	398.925	0.056
Tennessee	Gasoline	LDGV	Light-Duty Vehicles (Passenger Cars)	2.930	0.229	0.163	0.002	0.006	0.005	303.506	0.021
	Gasoline	LDGT	Light-Duty Trucks (0-8,500 lbs)	3.983	0.284	0.292	0.003	0.008	0.007	391.247	0.023
	Gasoline	HDGV	Heavy-Duty Vehicles (8,501 + lbs)	13.475	0.600	0.814	0.005	0.019	0.017	762.521	0.045
	Diesel	LDDV	Light-Duty Vehicles (Passenger Cars)	2.490	0.096	0.119	0.002	0.004	0.004	294.806	0.008
	Diesel	LDDT	Light-Duty Trucks (0-8,500 lbs)	3.857	0.191	0.300	0.003	0.007	0.006	408.467	0.008
	Diesel	HDDV	Heavy-Duty Vehicles (8,501 + lbs)	1.574	0.396	4.199	0.013	0.128	0.118	1482.996	0.028
	NA	MC	Motorcycles	12.964	2.560	0.730	0.003	0.027	0.024	395.744	0.054
Texas	Gasoline	LDGV	Light-Duty Vehicles (Passenger Cars)	2.867	0.214	0.150	0.002	0.005	0.005	305.024	0.021
	Gasoline	LDGT	Light-Duty Trucks (0-8,500 lbs)	3.934	0.267	0.272	0.003	0.007	0.006	394.023	0.023
	Gasoline	HDGV	Heavy-Duty Vehicles (8,501 + lbs)	13.739	0.609	0.792	0.005	0.017	0.015	773.668	0.045
	Diesel	LDDV	Light-Duty Vehicles (Passenger Cars)	2.691	0.082	0.120	0.002	0.004	0.004	297.804	0.008
	Diesel	LDDT	Light-Duty Trucks (0-8,500 lbs)	4.174	0.178	0.303	0.003	0.007	0.006	413.044	0.008
	Diesel	HDDV	Heavy-Duty Vehicles (8,501 + lbs)	1.428	0.332	3.726	0.013	0.125	0.115	1488.638	0.027
	NA	MC	Motorcycles	12.299	2.709	0.690	0.003	0.026	0.023	394.523	0.055
Utah	Gasoline	LDGV	Light-Duty Vehicles (Passenger Cars)	3.000	0.241	0.170	0.002	0.007	0.006	307.484	0.022
	Gasoline	LDGT	Light-Duty Trucks (0-8,500 lbs)	4.018	0.294	0.303	0.003	0.010	0.009	396.836	0.023
	Gasoline	HDGV	Heavy-Duty Vehicles (8,501 + lbs)	14.559	0.616	0.902	0.005	0.023	0.020	770.605	0.045
	Diesel	LDDV	Light-Duty Vehicles (Passenger Cars)	2.415	0.109	0.121	0.002	0.004	0.004	297.234	0.008
	Diesel	LDDT	Light-Duty Trucks (0-8,500 lbs)	3.774	0.209	0.310	0.003	0.007	0.006	412.358	0.008
	Diesel	HDDV	Heavy-Duty Vehicles (8,501 + lbs)	1.437	0.345	4.095	0.012	0.128	0.118	1467.820	0.028
	NA	MC	Motorcycles	13.288	2.626	0.831	0.003	0.028	0.025	397.883	0.054
Vermont	Gasoline	LDGV	Light-Duty Vehicles (Passenger Cars)	2.792	0.257	0.165	0.002	0.008	0.008	293.179	0.021
	Gasoline	LDGT	Light-Duty Trucks (0-8,500 lbs)	3.553	0.288	0.280	0.003	0.011	0.010	377.480	0.023
	Gasoline	HDGV	Heavy-Duty Vehicles (8,501 + lbs)	12.413	0.543	0.826	0.005	0.024	0.021	727.483	0.044
	Diesel	LDDV	Light-Duty Vehicles (Passenger Cars)	2.273	0.127	0.122	0.002	0.004	0.004	281.574	0.008
	Diesel	LDDT	Light-Duty Trucks (0-8,500 lbs)	3.465	0.212	0.302	0.003	0.006	0.006	390.689	0.008
	Diesel	HDDV	Heavy-Duty Vehicles (8,501 + lbs)	1.676	0.456	4.703	0.012	0.126	0.116	1446.276	0.029
	NA	MC	Motorcycles	13.234	2.112	0.819	0.003	0.028	0.025	398.165	0.056
Virgin Islands	Gasoline	LDGV	Light-Duty Vehicles (Passenger Cars)	3.280	0.242	0.153	0.002	0.004	0.004	305.314	0.021
	Gasoline	LDGT	Light-Duty Trucks (0-8,500 lbs)	4.483	0.284	0.268	0.003	0.005	0.005	392.657	0.022
	Gasoline	HDGV	Heavy-Duty Vehicles (8,501 + lbs)	14.386	0.640	0.699	0.005	0.010	0.009	759.037	0.044
	Diesel	LDDV	Light-Duty Vehicles (Passenger Cars)	2.794	0.066	0.115	0.003	0.004	0.004	300.073	0.007
	Diesel	LDDT	Light-Duty Trucks (0-8,500 lbs)	4.256	0.149	0.280	0.003	0.006	0.005	414.878	0.008
	Diesel	HDDV	Heavy-Duty Vehicles (8,501 + lbs)	1.011	0.161	2.404	0.012	0.112	0.103	1449.103	0.025
	NA	MC	Motorcycles	12.763	2.572	0.620	0.003	0.023	0.021	388.385	0.055

Table 5-25. On-Road Vehicle Emission Factors – 2022 (cont.)

State	Fuel Type	Vehicle Type		Emission Factors (g/mi)							
				Criteria Pollutants and Ozone Precursors							
				CO	VOC	NO_X	SO_2	PM_{10}	$PM_{2.5}$	CO_2e	NH_3
Virginia	Gasoline	LDGV	Light-Duty Vehicles (Passenger Cars)	2.927	0.230	0.166	0.002	0.006	0.006	302.755	0.021
	Gasoline	LDGT	Light-Duty Trucks (0-8,500 lbs)	3.967	0.285	0.297	0.003	0.008	0.007	390.569	0.023
	Gasoline	HDGV	Heavy-Duty Vehicles (8,501 + lbs)	13.408	0.582	0.822	0.005	0.020	0.018	760.763	0.045
	Diesel	LDDV	Light-Duty Vehicles (Passenger Cars)	2.455	0.099	0.119	0.002	0.004	0.004	293.739	0.008
	Diesel	LDDT	Light-Duty Trucks (0-8,500 lbs)	3.810	0.194	0.300	0.003	0.007	0.006	407.277	0.008
	Diesel	HDDV	Heavy-Duty Vehicles (8,501 + lbs)	1.531	0.381	4.131	0.012	0.128	0.117	1472.745	0.028
	NA	MC	Motorcycles	12.639	2.415	0.739	0.003	0.027	0.024	396.384	0.054
Washington	Gasoline	LDGV	Light-Duty Vehicles (Passenger Cars)	2.911	0.227	0.168	0.002	0.007	0.006	299.959	0.021
	Gasoline	LDGT	Light-Duty Trucks (0-8,500 lbs)	3.909	0.279	0.295	0.003	0.009	0.008	387.597	0.023
	Gasoline	HDGV	Heavy-Duty Vehicles (8,501 + lbs)	13.962	0.582	0.867	0.005	0.022	0.020	753.978	0.045
	Diesel	LDDV	Light-Duty Vehicles (Passenger Cars)	2.330	0.109	0.119	0.002	0.004	0.004	290.042	0.008
	Diesel	LDDT	Light-Duty Trucks (0-8,500 lbs)	3.635	0.206	0.304	0.003	0.007	0.006	402.806	0.008
	Diesel	HDDV	Heavy-Duty Vehicles (8,501 + lbs)	1.532	0.387	4.291	0.012	0.128	0.118	1455.691	0.028
	NA	MC	Motorcycles	13.235	2.308	0.813	0.003	0.028	0.025	398.243	0.054
West Virginia	Gasoline	LDGV	Light-Duty Vehicles (Passenger Cars)	3.083	0.248	0.180	0.002	0.007	0.006	294.684	0.021
	Gasoline	LDGT	Light-Duty Trucks (0-8,500 lbs)	4.128	0.298	0.314	0.003	0.009	0.008	380.268	0.023
	Gasoline	HDGV	Heavy-Duty Vehicles (8,501 + lbs)	12.919	0.560	0.814	0.005	0.021	0.018	738.906	0.044
	Diesel	LDDV	Light-Duty Vehicles (Passenger Cars)	2.380	0.108	0.121	0.002	0.004	0.004	285.054	0.008
	Diesel	LDDT	Light-Duty Trucks (0-8,500 lbs)	3.654	0.198	0.302	0.003	0.006	0.006	395.652	0.008
	Diesel	HDDV	Heavy-Duty Vehicles (8,501 + lbs)	1.622	0.426	4.441	0.012	0.126	0.116	1457.453	0.029
	NA	MC	Motorcycles	13.090	2.328	0.774	0.003	0.027	0.024	396.847	0.056
Wisconsin	Gasoline	LDGV	Light-Duty Vehicles (Passenger Cars)	3.128	0.263	0.177	0.002	0.008	0.007	299.286	0.021
	Gasoline	LDGT	Light-Duty Trucks (0-8,500 lbs)	4.083	0.311	0.306	0.003	0.011	0.009	385.136	0.023
	Gasoline	HDGV	Heavy-Duty Vehicles (8,501 + lbs)	13.308	0.568	0.832	0.005	0.023	0.021	741.972	0.044
	Diesel	LDDV	Light-Duty Vehicles (Passenger Cars)	2.313	0.122	0.120	0.002	0.004	0.004	287.951	0.008
	Diesel	LDDT	Light-Duty Trucks (0-8,500 lbs)	3.557	0.213	0.300	0.003	0.006	0.006	398.971	0.008
	Diesel	HDDV	Heavy-Duty Vehicles (8,501 + lbs)	1.516	0.388	4.235	0.012	0.125	0.115	1442.332	0.028
	NA	MC	Motorcycles	13.100	2.187	0.793	0.003	0.027	0.024	398.147	0.055
Wyoming	Gasoline	LDGV	Light-Duty Vehicles (Passenger Cars)	3.420	0.287	0.200	0.002	0.008	0.007	295.681	0.021
	Gasoline	LDGT	Light-Duty Trucks (0-8,500 lbs)	4.426	0.329	0.342	0.003	0.011	0.010	381.115	0.023
	Gasoline	HDGV	Heavy-Duty Vehicles (8,501 + lbs)	13.201	0.547	0.868	0.005	0.025	0.022	740.402	0.043
	Diesel	LDDV	Light-Duty Vehicles (Passenger Cars)	2.347	0.127	0.126	0.002	0.004	0.004	284.079	0.008
	Diesel	LDDT	Light-Duty Trucks (0-8,500 lbs)	3.603	0.216	0.315	0.003	0.006	0.006	394.182	0.008
	Diesel	HDDV	Heavy-Duty Vehicles (8,501 + lbs)	1.928	0.554	5.484	0.013	0.132	0.122	1490.354	0.031
	NA	MC	Motorcycles	13.445	2.321	0.871	0.003	0.028	0.025	399.508	0.056

Table 5-26. 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_2e	NH_3
ALAMEDA	All Vehicles	0.242	0.004	2.987	0.434	0.058	0.025	429.843	0.027
ALPINE	All Vehicles	0.349	0.004	3.948	0.532	0.059	0.025	404.768	0.027
AMADOR	All Vehicles	0.381	0.004	4.047	0.622	0.056	0.024	367.770	0.027
BUTTE	All Vehicles	0.348	0.004	3.776	0.581	0.055	0.024	408.073	0.027
CALAVERAS	All Vehicles	0.397	0.004	4.394	0.694	0.057	0.025	407.605	0.027
COLUSA	All Vehicles	0.275	0.004	3.085	0.465	0.057	0.024	411.373	0.027
CONTRA COSTA	All Vehicles	0.233	0.004	2.930	0.431	0.058	0.025	424.080	0.027
DEL NORTE	All Vehicles	0.461	0.004	4.540	0.684	0.056	0.026	418.905	0.027
EL DORADO	All Vehicles	0.253	0.004	3.292	0.537	0.057	0.024	419.308	0.025
FRESNO	All Vehicles	0.233	0.004	2.925	0.451	0.056	0.024	404.378	0.027
GLENN	All Vehicles	0.299	0.004	3.397	0.537	0.057	0.025	425.515	0.027
HUMBOLDT	All Vehicles	0.433	0.004	4.355	0.636	0.055	0.024	389.135	0.027
IMPERIAL	All Vehicles	0.450	0.004	4.582	0.624	0.058	0.025	413.524	0.027
INYO	All Vehicles	0.332	0.004	3.738	0.604	0.059	0.025	441.304	0.027
KERN	All Vehicles	0.232	0.004	2.939	0.440	0.057	0.024	439.915	0.027
KINGS	All Vehicles	0.265	0.004	3.017	0.446	0.056	0.024	400.102	0.027
LAKE	All Vehicles	0.414	0.004	4.458	0.729	0.055	0.024	403.226	0.027
LASSEN	All Vehicles	0.383	0.004	4.347	0.653	0.057	0.025	439.414	0.027
LOS ANGELES	All Vehicles	0.242	0.005	3.060	0.464	0.060	0.026	468.387	0.027
MADERA	All Vehicles	0.249	0.004	3.144	0.463	0.056	0.024	432.198	0.027
MARIN	All Vehicles	0.240	0.004	2.994	0.459	0.059	0.025	437.550	0.027
MARIPOSA	All Vehicles	0.451	0.004	4.910	0.747	0.057	0.025	422.178	0.027
MENDOCINO	All Vehicles	0.418	0.004	4.262	0.628	0.056	0.025	392.956	0.027
MERCED	All Vehicles	0.253	0.004	3.080	0.430	0.055	0.024	415.373	0.027
MODOC	All Vehicles	0.426	0.005	4.901	0.713	0.058	0.026	492.705	0.027
MONO	All Vehicles	0.360	0.004	4.132	0.571	0.058	0.025	427.910	0.027
MONTEREY	All Vehicles	0.330	0.004	3.513	0.475	0.057	0.025	440.280	0.027
NAPA	All Vehicles	0.249	0.004	3.063	0.440	0.057	0.024	406.955	0.027
NEVADA	All Vehicles	0.339	0.004	3.714	0.568	0.055	0.024	390.859	0.027
ORANGE	All Vehicles	0.210	0.004	2.701	0.430	0.060	0.026	447.654	0.027
PLACER	All Vehicles	0.230	0.004	2.963	0.444	0.057	0.024	411.465	0.027
PLUMAS	All Vehicles	0.433	0.005	4.908	0.732	0.058	0.026	464.221	0.027
RIVERSIDE	All Vehicles	0.218	0.004	2.756	0.431	0.057	0.024	412.981	0.027
SACRAMENTO	All Vehicles	0.242	0.004	2.991	0.457	0.056	0.024	417.343	0.027
SAN BENITO	All Vehicles	0.278	0.004	3.122	0.441	0.057	0.024	404.492	0.027
SAN BERNARDINO	All Vehicles	0.248	0.004	3.095	0.438	0.055	0.024	410.616	0.027
SAN DIEGO	All Vehicles	0.250	0.005	3.004	0.444	0.059	0.025	451.911	0.027
SAN FRANCISCO	All Vehicles	0.230	0.005	3.011	0.489	0.061	0.028	483.342	0.027
SAN JOAQUIN	All Vehicles	0.243	0.004	2.979	0.439	0.055	0.024	413.406	0.027
SAN LUIS OBISPO	All Vehicles	0.304	0.004	3.317	0.522	0.056	0.024	400.518	0.027
SAN MATEO	All Vehicles	0.218	0.004	2.698	0.393	0.064	0.027	448.566	0.027
SANTA BARBARA	All Vehicles	0.313	0.004	3.233	0.472	0.057	0.024	390.918	0.027
SANTA CLARA	All Vehicles	0.233	0.004	2.848	0.427	0.058	0.025	420.836	0.027
SANTA CRUZ	All Vehicles	0.364	0.004	3.838	0.580	0.057	0.025	425.321	0.027
SHASTA	All Vehicles	0.310	0.004	3.548	0.568	0.056	0.025	429.877	0.027
SIERRA	All Vehicles	0.399	0.005	4.530	0.648	0.059	0.026	489.115	0.027
SISKIYOU	All Vehicles	0.397	0.005	4.455	0.659	0.058	0.026	465.081	0.027
SOLANO	All Vehicles	0.242	0.004	3.044	0.438	0.058	0.025	444.242	0.027
SONOMA	All Vehicles	0.313	0.004	3.233	0.472	0.057	0.024	390.918	0.027
STANISLAUS	All Vehicles	0.249	0.004	3.157	0.490	0.055	0.024	423.529	0.027
SUTTER	All Vehicles	0.280	0.004	3.126	0.533	0.055	0.024	385.871	0.027
TEHAMA	All Vehicles	0.327	0.004	3.617	0.546	0.057	0.025	427.358	0.027
TRINITY	All Vehicles	0.518	0.005	5.634	0.813	0.059	0.028	497.066	0.027
TULARE	All Vehicles	0.249	0.004	2.999	0.477	0.054	0.023	393.092	0.027
TUOLUMNE	All Vehicles	0.452	0.004	4.890	0.724	0.056	0.025	422.728	0.027
VENTURA	All Vehicles	0.235	0.004	2.988	0.505	0.059	0.025	429.049	0.027
YOLO	All Vehicles	0.232	0.004	2.928	0.439	0.056	0.024	413.947	0.027
YUBA	All Vehicles	0.320	0.004	3.457	0.515	0.055	0.024	401.378	0.027

Table 5-27. 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_2e	NH_3
ALAMEDA	All Vehicles	0.202	0.004	2.522	0.375	0.052	0.022	374.173	0.025
ALPINE	All Vehicles	0.287	0.004	3.318	0.461	0.052	0.022	350.906	0.025
AMADOR	All Vehicles	0.324	0.003	3.501	0.556	0.051	0.022	329.652	0.025
BUTTE	All Vehicles	0.293	0.004	3.251	0.514	0.051	0.022	368.545	0.025
CALAVERAS	All Vehicles	0.337	0.004	3.791	0.620	0.052	0.023	364.925	0.025
COLUSA	All Vehicles	0.230	0.004	2.624	0.406	0.051	0.022	362.308	0.025
CONTRA COSTA	All Vehicles	0.194	0.004	2.475	0.372	0.052	0.022	369.496	0.025
DEL NORTE	All Vehicles	0.395	0.004	3.947	0.615	0.052	0.023	380.931	0.025
EL DORADO	All Vehicles	0.216	0.004	2.843	0.480	0.051	0.022	367.157	0.023
FRESNO	All Vehicles	0.197	0.004	2.518	0.398	0.050	0.021	359.648	0.025
GLENN	All Vehicles	0.248	0.004	2.879	0.469	0.051	0.022	375.493	0.025
HUMBOLDT	All Vehicles	0.373	0.004	3.807	0.575	0.051	0.022	356.033	0.025
IMPERIAL	All Vehicles	0.380	0.004	3.920	0.542	0.051	0.022	360.330	0.025
INYO	All Vehicles	0.275	0.004	3.163	0.529	0.052	0.022	385.057	0.025
KERN	All Vehicles	0.196	0.004	2.520	0.386	0.051	0.022	388.144	0.025
KINGS	All Vehicles	0.223	0.004	2.579	0.391	0.051	0.022	355.197	0.025
LAKE	All Vehicles	0.352	0.004	3.868	0.655	0.051	0.022	366.567	0.025
LASSEN	All Vehicles	0.323	0.004	3.732	0.579	0.052	0.022	392.315	0.025
LOS ANGELES	All Vehicles	0.201	0.004	2.579	0.402	0.053	0.023	404.117	0.025
MADERA	All Vehicles	0.210	0.004	2.701	0.406	0.051	0.022	385.317	0.025
MARIN	All Vehicles	0.199	0.004	2.518	0.396	0.052	0.022	377.347	0.025
MARIPOSA	All Vehicles	0.383	0.004	4.241	0.666	0.052	0.023	379.581	0.025
MENDOCINO	All Vehicles	0.358	0.004	3.709	0.565	0.052	0.023	356.155	0.025
MERCED	All Vehicles	0.214	0.004	2.652	0.377	0.051	0.022	372.346	0.025
MODOC	All Vehicles	0.355	0.004	4.167	0.626	0.053	0.024	437.404	0.025
MONO	All Vehicles	0.299	0.004	3.511	0.500	0.052	0.022	373.635	0.025
MONTEREY	All Vehicles	0.278	0.004	2.997	0.414	0.052	0.023	392.835	0.025
NAPA	All Vehicles	0.208	0.004	2.582	0.380	0.051	0.022	356.380	0.025
NEVADA	All Vehicles	0.289	0.004	3.239	0.513	0.051	0.022	351.372	0.025

County	Vehicle Type	Emission Factors (g/mi)							
		Criteria Pollutants and Ozone Precursors							
		NO_X	SO_2	CO	ROG	PM_{10}	$PM_{2.5}$	CO_2e	NH_3
ORANGE	All Vehicles	0.174	0.004	2.284	0.374	0.052	0.022	384.166	0.025
PLACER	All Vehicles	0.195	0.004	2.551	0.394	0.051	0.022	360.649	0.025
PLUMAS	All Vehicles	0.365	0.004	4.215	0.650	0.052	0.023	413.552	0.025
RIVERSIDE	All Vehicles	0.183	0.004	2.350	0.378	0.051	0.022	361.627	0.025
SACRAMENTO	All Vehicles	0.205	0.004	2.574	0.404	0.051	0.022	367.852	0.025
SAN BENITO	All Vehicles	0.231	0.004	2.646	0.384	0.051	0.022	353.505	0.025
SAN BERNARDINO	All Vehicles	0.206	0.004	2.609	0.379	0.049	0.021	356.299	0.025
SAN DIEGO	All Vehicles	0.208	0.004	2.542	0.386	0.052	0.022	389.955	0.025
SAN FRANCISCO	All Vehicles	0.190	0.004	2.521	0.422	0.053	0.024	411.093	0.025
SAN JOAQUIN	All Vehicles	0.205	0.004	2.564	0.387	0.050	0.022	368.029	0.025
SAN LUIS OBISPO	All Vehicles	0.256	0.004	2.832	0.461	0.051	0.022	354.657	0.025
SAN MATEO	All Vehicles	0.178	0.004	2.242	0.335	0.054	0.023	372.100	0.025
SANTA BARBARA	All Vehicles	0.262	0.003	2.750	0.413	0.051	0.022	345.567	0.025
SANTA CLARA	All Vehicles	0.194	0.004	2.401	0.369	0.051	0.022	365.542	0.025
SANTA CRUZ	All Vehicles	0.306	0.004	3.275	0.510	0.052	0.023	380.487	0.025
SHASTA	All Vehicles	0.258	0.004	3.029	0.502	0.051	0.022	380.417	0.025
SIERRA	All Vehicles	0.331	0.004	3.834	0.567	0.053	0.023	427.528	0.025
SISKIYOU	All Vehicles	0.331	0.004	3.796	0.580	0.052	0.023	411.078	0.025
SOLANO	All Vehicles	0.201	0.004	2.576	0.379	0.052	0.022	386.096	0.025
SONOMA	All Vehicles	0.262	0.003	2.750	0.413	0.051	0.022	345.567	0.025
STANISLAUS	All Vehicles	0.212	0.004	2.727	0.435	0.050	0.022	379.630	0.025
SUTTER	All Vehicles	0.235	0.003	2.682	0.472	0.050	0.021	343.681	0.025
TEHAMA	All Vehicles	0.271	0.004	3.072	0.478	0.051	0.022	377.475	0.025
TRINITY	All Vehicles	0.441	0.005	4.868	0.724	0.054	0.025	448.904	0.025
TULARE	All Vehicles	0.210	0.004	2.583	0.421	0.050	0.021	353.319	0.025
TUOLUMNE	All Vehicles	0.386	0.004	4.239	0.648	0.051	0.023	380.982	0.025
VENTURA	All Vehicles	0.195	0.004	2.529	0.441	0.052	0.022	371.971	0.025
YOLO	All Vehicles	0.196	0.004	2.519	0.387	0.051	0.022	365.291	0.025
YUBA	All Vehicles	0.265	0.004	2.933	0.451	0.050	0.022	354.205	0.025

Table 5-28. 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_2e	NH_3
ALAMEDA	All Vehicles	0.171	0.003	2.168	0.330	0.046	0.020	328.018	0.025
ALPINE	All Vehicles	0.242	0.003	2.848	0.408	0.046	0.020	306.644	0.025
AMADOR	All Vehicles	0.281	0.003	3.073	0.503	0.046	0.020	297.270	0.025
BUTTE	All Vehicles	0.252	0.003	2.842	0.462	0.047	0.020	334.722	0.025
CALAVERAS	All Vehicles	0.291	0.003	3.327	0.563	0.047	0.021	328.667	0.025
COLUSA	All Vehicles	0.196	0.003	2.278	0.362	0.046	0.020	321.612	0.025
CONTRA COSTA	All Vehicles	0.165	0.003	2.131	0.328	0.046	0.020	324.386	0.025
DEL NORTE	All Vehicles	0.343	0.004	3.487	0.561	0.048	0.022	348.549	0.025
EL DORADO	All Vehicles	0.187	0.003	2.511	0.439	0.046	0.020	327.209	0.023
FRESNO	All Vehicles	0.170	0.003	2.205	0.358	0.046	0.019	322.228	0.025
GLENN	All Vehicles	0.210	0.003	2.487	0.417	0.047	0.020	333.926	0.025
HUMBOLDT	All Vehicles	0.326	0.003	3.372	0.527	0.047	0.021	327.573	0.025
IMPERIAL	All Vehicles	0.330	0.003	3.432	0.484	0.046	0.020	316.786	0.025
INYO	All Vehicles	0.233	0.003	2.730	0.473	0.047	0.020	338.798	0.025
KERN	All Vehicles	0.169	0.004	2.203	0.347	0.046	0.020	345.695	0.025
KINGS	All Vehicles	0.191	0.003	2.247	0.350	0.046	0.020	317.967	0.025
LAKE	All Vehicles	0.304	0.003	3.407	0.597	0.047	0.021	335.187	0.025
LASSEN	All Vehicles	0.277	0.004	3.262	0.523	0.047	0.020	352.750	0.025
LOS ANGELES	All Vehicles	0.171	0.004	2.223	0.356	0.047	0.020	352.525	0.025
MADERA	All Vehicles	0.181	0.004	2.358	0.362	0.047	0.020	345.945	0.025
MARIN	All Vehicles	0.169	0.003	2.160	0.349	0.046	0.020	328.126	0.025
MARIPOSA	All Vehicles	0.331	0.004	3.720	0.603	0.048	0.021	343.086	0.025
MENDOCINO	All Vehicles	0.312	0.003	3.276	0.516	0.048	0.021	324.689	0.025
MERCED	All Vehicles	0.184	0.003	2.320	0.337	0.046	0.020	335.974	0.025
MODOC	All Vehicles	0.303	0.004	3.608	0.558	0.048	0.021	391.085	0.025
MONO	All Vehicles	0.254	0.003	3.045	0.447	0.047	0.020	328.982	0.025
MONTEREY	All Vehicles	0.238	0.004	2.601	0.368	0.047	0.021	352.785	0.025
NAPA	All Vehicles	0.176	0.003	2.217	0.334	0.046	0.020	314.279	0.025
NEVADA	All Vehicles	0.251	0.003	2.867	0.470	0.047	0.020	318.056	0.025
ORANGE	All Vehicles	0.148	0.003	1.968	0.332	0.046	0.020	331.298	0.025
PLACER	All Vehicles	0.168	0.003	2.234	0.355	0.046	0.020	318.841	0.025
PLUMAS	All Vehicles	0.314	0.004	3.680	0.587	0.047	0.021	370.969	0.025
RIVERSIDE	All Vehicles	0.157	0.003	2.043	0.338	0.046	0.019	319.472	0.025
SACRAMENTO	All Vehicles	0.177	0.003	2.258	0.364	0.046	0.020	328.269	0.025
SAN BENITO	All Vehicles	0.196	0.003	2.285	0.340	0.046	0.020	311.580	0.025
SAN BERNARDINO	All Vehicles	0.175	0.003	2.253	0.337	0.044	0.019	313.822	0.025
SAN DIEGO	All Vehicles	0.178	0.003	2.194	0.342	0.046	0.020	339.369	0.025
SAN FRANCISCO	All Vehicles	0.160	0.004	2.155	0.372	0.046	0.021	353.456	0.025
SAN JOAQUIN	All Vehicles	0.177	0.003	2.244	0.347	0.046	0.020	330.011	0.025
SAN LUIS OBISPO	All Vehicles	0.219	0.003	2.459	0.414	0.046	0.020	316.485	0.025
SAN MATEO	All Vehicles	0.149	0.003	1.907	0.292	0.046	0.020	312.737	0.025
SANTA BARBARA	All Vehicles	0.223	0.003	2.381	0.368	0.046	0.020	307.770	0.025
SANTA CLARA	All Vehicles	0.164	0.003	2.064	0.326	0.046	0.020	320.160	0.025
SANTA CRUZ	All Vehicles	0.261	0.003	2.842	0.456	0.047	0.021	342.538	0.025
SHASTA	All Vehicles	0.220	0.003	2.632	0.451	0.046	0.020	339.156	0.025
SIERRA	All Vehicles	0.280	0.004	3.301	0.504	0.047	0.021	376.515	0.025
SISKIYOU	All Vehicles	0.282	0.004	3.292	0.519	0.047	0.021	365.977	0.025
SOLANO	All Vehicles	0.171	0.003	2.217	0.335	0.046	0.020	338.304	0.025
SONOMA	All Vehicles	0.223	0.003	2.381	0.368	0.046	0.020	307.770	0.025
STANISLAUS	All Vehicles	0.183	0.003	2.394	0.392	0.046	0.020	342.494	0.025
SUTTER	All Vehicles	0.201	0.003	2.349	0.426	0.046	0.020	308.901	0.025
TEHAMA	All Vehicles	0.230	0.003	2.657	0.426	0.047	0.020	336.112	0.025
TRINITY	All Vehicles	0.382	0.004	4.259	0.654	0.049	0.023	407.745	0.025
TULARE	All Vehicles	0.181	0.003	2.262	0.378	0.046	0.020	319.747	0.025
TUOLUMNE	All Vehicles	0.334	0.003	3.725	0.587	0.047	0.021	345.209	0.025
VENTURA	All Vehicles	0.166	0.003	2.181	0.392	0.046	0.020	324.164	0.025
YOLO	All Vehicles	0.169	0.003	2.209	0.349	0.046	0.020	326.223	0.025
YUBA	All Vehicles	0.225	0.003	2.543	0.404	0.046	0.020	318.027	0.025

Table 5-29. EMFAC County-Specific On-Road Vehicle Composite EFs – 2021 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_2e	NH_3
ALAMEDA	All Vehicles	0.148	0.003	1.892	0.296	0.041	0.018	288.638	0.024
ALPINE	All Vehicles	0.208	0.003	2.485	0.368	0.041	0.018	269.194	0.024
AMADOR	All Vehicles	0.246	0.003	2.726	0.462	0.043	0.018	268.849	0.024
BUTTE	All Vehicles	0.220	0.003	2.523	0.424	0.044	0.019	305.290	0.024
CALAVERAS	All Vehicles	0.255	0.003	2.949	0.518	0.043	0.019	297.072	0.024
COLUSA	All Vehicles	0.170	0.003	2.010	0.328	0.042	0.018	286.733	0.024
CONTRA COSTA	All Vehicles	0.143	0.003	1.863	0.295	0.041	0.018	285.912	0.024
DEL NORTE	All Vehicles	0.303	0.003	3.117	0.520	0.045	0.020	319.989	0.024
EL DORADO	All Vehicles	0.166	0.003	2.252	0.407	0.042	0.018	292.975	0.022
FRESNO	All Vehicles	0.149	0.003	1.960	0.327	0.042	0.018	289.797	0.024
GLENN	All Vehicles	0.182	0.003	2.186	0.379	0.042	0.018	298.182	0.024
HUMBOLDT	All Vehicles	0.288	0.003	3.019	0.489	0.044	0.019	302.287	0.024
IMPERIAL	All Vehicles	0.292	0.003	3.065	0.440	0.041	0.017	279.985	0.024
INYO	All Vehicles	0.201	0.003	2.394	0.430	0.042	0.018	299.547	0.024
KERN	All Vehicles	0.148	0.003	1.960	0.317	0.042	0.018	309.532	0.024
KINGS	All Vehicles	0.167	0.003	1.995	0.320	0.042	0.018	287.155	0.024
LAKE	All Vehicles	0.267	0.003	3.035	0.551	0.044	0.019	307.410	0.024
LASSEN	All Vehicles	0.242	0.003	2.889	0.480	0.043	0.019	318.477	0.024
LOS ANGELES	All Vehicles	0.148	0.003	1.949	0.321	0.042	0.018	309.698	0.024
MADERA	All Vehicles	0.158	0.003	2.073	0.327	0.043	0.018	307.810	0.024
MARIN	All Vehicles	0.145	0.003	1.882	0.313	0.041	0.018	286.696	0.024
MARIPOSA	All Vehicles	0.289	0.003	3.277	0.552	0.044	0.019	311.029	0.024
MENDOCINO	All Vehicles	0.275	0.003	2.922	0.477	0.044	0.019	297.008	0.024
MERCED	All Vehicles	0.162	0.003	2.068	0.308	0.043	0.018	305.675	0.024
MODOC	All Vehicles	0.263	0.004	3.160	0.506	0.044	0.019	351.094	0.024
MONO	All Vehicles	0.220	0.003	2.679	0.405	0.042	0.018	291.097	0.024
MONTEREY	All Vehicles	0.207	0.003	2.295	0.332	0.043	0.019	317.940	0.024
NAPA	All Vehicles	0.152	0.003	1.935	0.299	0.042	0.018	278.215	0.024
NEVADA	All Vehicles	0.222	0.003	2.575	0.436	0.043	0.018	288.928	0.024
ORANGE	All Vehicles	0.128	0.003	1.724	0.300	0.040	0.017	287.574	0.024
PLACER	All Vehicles	0.147	0.003	1.988	0.326	0.041	0.018	283.276	0.024
PLUMAS	All Vehicles	0.275	0.003	3.249	0.536	0.043	0.019	334.101	0.024
RIVERSIDE	All Vehicles	0.137	0.003	1.806	0.308	0.041	0.018	284.085	0.024
SACRAMENTO	All Vehicles	0.155	0.003	2.011	0.334	0.042	0.018	294.081	0.024
SAN BENITO	All Vehicles	0.170	0.003	2.016	0.310	0.041	0.018	277.673	0.024
SAN BERNARDINO	All Vehicles	0.152	0.003	1.981	0.305	0.040	0.017	278.754	0.024
SAN DIEGO	All Vehicles	0.155	0.003	1.929	0.309	0.041	0.018	297.220	0.024
SAN FRANCISCO	All Vehicles	0.137	0.003	1.872	0.334	0.041	0.018	305.664	0.024
SAN JOAQUIN	All Vehicles	0.155	0.003	1.990	0.317	0.042	0.018	295.955	0.024
SAN LUIS OBISPO	All Vehicles	0.190	0.003	2.168	0.378	0.042	0.018	283.626	0.024
SAN MATEO	All Vehicles	0.127	0.003	1.652	0.261	0.039	0.017	265.026	0.024
SANTA BARBARA	All Vehicles	0.194	0.003	2.094	0.334	0.042	0.018	275.285	0.024
SANTA CLARA	All Vehicles	0.142	0.003	1.804	0.293	0.041	0.017	281.733	0.024
SANTA CRUZ	All Vehicles	0.227	0.003	2.510	0.415	0.043	0.019	311.263	0.024
SHASTA	All Vehicles	0.190	0.003	2.324	0.412	0.042	0.018	303.509	0.024
SIERRA	All Vehicles	0.242	0.003	2.888	0.456	0.042	0.019	332.987	0.024
SISKIYOU	All Vehicles	0.245	0.003	2.898	0.472	0.043	0.019	327.131	0.024
SOLANO	All Vehicles	0.147	0.003	1.919	0.299	0.041	0.018	297.734	0.024
SONOMA	All Vehicles	0.194	0.003	2.094	0.334	0.042	0.018	275.285	0.024
STANISLAUS	All Vehicles	0.160	0.003	2.133	0.360	0.042	0.018	310.700	0.024
SUTTER	All Vehicles	0.176	0.003	2.094	0.392	0.042	0.018	278.891	0.024
TEHAMA	All Vehicles	0.199	0.003	2.340	0.387	0.042	0.018	300.525	0.024
TRINITY	All Vehicles	0.335	0.004	3.762	0.599	0.045	0.021	371.689	0.024
TULARE	All Vehicles	0.160	0.003	2.019	0.347	0.042	0.018	291.200	0.024
TUOLUMNE	All Vehicles	0.293	0.003	3.298	0.538	0.043	0.019	313.637	0.024
VENTURA	All Vehicles	0.143	0.003	1.917	0.356	0.041	0.018	285.340	0.024
YOLO	All Vehicles	0.149	0.003	1.966	0.319	0.042	0.018	292.553	0.024
YUBA	All Vehicles	0.196	0.003	2.246	0.368	0.042	0.018	286.729	0.024

Table 5-30. EMFAC County-Specific On-Road Vehicle Composite EFs – 2022 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_2e	NH_3
ALAMEDA	All Vehicles	0.129	0.003	1.667	0.269	0.037	0.016	254.140	0.023
ALPINE	All Vehicles	0.181	0.002	2.194	0.337	0.037	0.016	236.721	0.023
AMADOR	All Vehicles	0.219	0.002	2.437	0.429	0.039	0.017	243.153	0.023
BUTTE	All Vehicles	0.195	0.003	2.261	0.393	0.040	0.017	277.976	0.023
CALAVERAS	All Vehicles	0.227	0.003	2.632	0.481	0.040	0.017	268.813	0.023
COLUSA	All Vehicles	0.150	0.003	1.793	0.302	0.038	0.016	256.054	0.023
CONTRA COSTA	All Vehicles	0.125	0.003	1.646	0.269	0.037	0.016	252.156	0.023
DEL NORTE	All Vehicles	0.270	0.003	2.799	0.484	0.041	0.018	293.915	0.023
EL DORADO	All Vehicles	0.148	0.003	2.040	0.382	0.038	0.016	262.639	0.021
FRESNO	All Vehicles	0.132	0.003	1.759	0.304	0.038	0.016	260.734	0.023
GLENN	All Vehicles	0.159	0.003	1.943	0.348	0.038	0.016	266.600	0.023
HUMBOLDT	All Vehicles	0.257	0.003	2.719	0.457	0.041	0.018	279.000	0.023
IMPERIAL	All Vehicles	0.265	0.003	2.781	0.410	0.037	0.016	248.079	0.023
INYO	All Vehicles	0.177	0.003	2.122	0.398	0.037	0.016	265.384	0.023
KERN	All Vehicles	0.132	0.003	1.761	0.294	0.038	0.016	277.581	0.023
KINGS	All Vehicles	0.149	0.003	1.790	0.297	0.038	0.016	258.676	0.023
LAKE	All Vehicles	0.237	0.003	2.719	0.513	0.041	0.018	282.046	0.023
LASSEN	All Vehicles	0.214	0.003	2.569	0.443	0.039	0.017	287.902	0.023
LOS ANGELES	All Vehicles	0.130	0.003	1.725	0.294	0.037	0.016	272.308	0.023
MADERA	All Vehicles	0.140	0.003	1.859	0.302	0.039	0.017	277.581	0.023
MARIN	All Vehicles	0.127	0.003	1.657	0.285	0.036	0.016	250.850	0.023
MARIPOSA	All Vehicles	0.256	0.003	2.909	0.510	0.040	0.018	282.042	0.023
MENDOCINO	All Vehicles	0.245	0.003	2.624	0.444	0.040	0.018	271.875	0.023
MERCED	All Vehicles	0.143	0.003	1.856	0.283	0.039	0.017	276.890	0.023
MODOC	All Vehicles	0.231	0.003	2.787	0.463	0.040	0.017	315.589	0.023
MONO	All Vehicles	0.193	0.003	2.383	0.373	0.037	0.016	258.116	0.023
MONTEREY	All Vehicles	0.183	0.003	2.044	0.303	0.039	0.017	286.829	0.023
NAPA	All Vehicles	0.133	0.003	1.705	0.272	0.037	0.016	246.442	0.023
NEVADA	All Vehicles	0.198	0.003	2.334	0.408	0.039	0.017	262.647	0.023
ORANGE	All Vehicles	0.112	0.002	1.526	0.275	0.035	0.015	249.876	0.023
PLACER	All Vehicles	0.131	0.003	1.788	0.303	0.037	0.016	252.027	0.023
PLUMAS	All Vehicles	0.243	0.003	2.886	0.495	0.039	0.017	301.147	0.023
RIVERSIDE	All Vehicles	0.121	0.003	1.614	0.286	0.037	0.016	252.746	0.023
SACRAMENTO	All Vehicles	0.138	0.003	1.810	0.310	0.038	0.016	263.559	0.023
SAN BENITO	All Vehicles	0.149	0.002	1.790	0.283	0.037	0.016	246.168	0.023
SAN BERNARDINO	All Vehicles	0.134	0.002	1.760	0.280	0.036	0.015	247.593	0.023
SAN DIEGO	All Vehicles	0.136	0.003	1.712	0.283	0.036	0.016	260.312	0.023
SAN FRANCISCO	All Vehicles	0.120	0.003	1.645	0.303	0.036	0.016	264.801	0.023
SAN JOAQUIN	All Vehicles	0.138	0.003	1.786	0.293	0.038	0.016	266.769	0.023
SAN LUIS OBISPO	All Vehicles	0.168	0.003	1.933	0.349	0.038	0.016	254.513	0.023
SAN MATEO	All Vehicles	0.111	0.002	1.448	0.237	0.033	0.014	225.658	0.023
SANTA BARBARA	All Vehicles	0.171	0.002	1.861	0.307	0.038	0.016	246.638	0.023
SANTA CLARA	All Vehicles	0.124	0.002	1.592	0.267	0.036	0.016	248.212	0.023
SANTA CRUZ	All Vehicles	0.200	0.003	2.231	0.381	0.039	0.017	281.341	0.023
SHASTA	All Vehicles	0.167	0.003	2.075	0.381	0.038	0.017	271.819	0.023
SIERRA	All Vehicles	0.212	0.003	2.548	0.418	0.038	0.017	294.921	0.023
SISKIYOU	All Vehicles	0.215	0.003	2.568	0.434	0.038	0.017	292.760	0.023
SOLANO	All Vehicles	0.129	0.003	1.693	0.273	0.037	0.016	262.378	0.023
SONOMA	All Vehicles	0.171	0.002	1.861	0.307	0.038	0.016	246.638	0.023
STANISLAUS	All Vehicles	0.143	0.003	1.917	0.334	0.039	0.017	281.318	0.023
SUTTER	All Vehicles	0.156	0.003	1.889	0.366	0.039	0.016	251.994	0.023
TEHAMA	All Vehicles	0.175	0.003	2.083	0.357	0.038	0.017	268.981	0.023
TRINITY	All Vehicles	0.297	0.003	3.345	0.552	0.042	0.019	339.141	0.023
TULARE	All Vehicles	0.142	0.003	1.816	0.323	0.039	0.017	264.769	0.023
TUOLUMNE	All Vehicles	0.260	0.003	2.938	0.498	0.040	0.018	284.920	0.023
VENTURA	All Vehicles	0.126	0.003	1.698	0.327	0.036	0.016	250.259	0.023
YOLO	All Vehicles	0.132	0.003	1.769	0.296	0.038	0.016	262.489	0.023
YUBA	All Vehicles	0.172	0.003	2.003	0.340	0.039	0.017	258.738	0.023

Table 5-31. 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	1.331	0.007	1.491	0.213	0.092	0.047	707.599	0.024
ALPINE	All Vehicles	1.447	0.007	2.296	0.312	0.086	0.042	696.654	0.024
AMADOR	All Vehicles	1.713	0.006	2.793	0.451	0.094	0.052	565.081	0.024
BUTTE	All Vehicles	1.617	0.007	2.506	0.355	0.096	0.054	693.005	0.024
CALAVERAS	All Vehicles	1.770	0.006	3.125	0.493	0.099	0.056	623.174	0.024
COLUSA	All Vehicles	1.414	0.007	1.736	0.259	0.088	0.046	690.572	0.024
CONTRA COSTA	All Vehicles	1.308	0.007	1.429	0.206	0.095	0.047	684.130	0.024
DEL NORTE	All Vehicles	2.059	0.006	3.316	0.492	0.120	0.076	607.700	0.024
EL DORADO	All Vehicles	1.427	0.006	1.843	0.282	0.092	0.049	603.106	0.024
FRESNO	All Vehicles	1.273	0.007	1.521	0.246	0.082	0.041	698.538	0.024
GLENN	All Vehicles	1.506	0.007	2.068	0.310	0.092	0.049	703.275	0.024
HUMBOLDT	All Vehicles	1.900	0.006	2.934	0.432	0.102	0.060	636.280	0.024
IMPERIAL	All Vehicles	1.195	0.007	2.209	0.364	0.081	0.039	686.651	0.024
INYO	All Vehicles	1.503	0.007	2.315	0.381	0.093	0.047	706.285	0.024
KERN	All Vehicles	1.260	0.007	1.461	0.232	0.081	0.040	734.773	0.024
KINGS	All Vehicles	1.354	0.007	1.748	0.260	0.080	0.039	706.212	0.024
LAKE	All Vehicles	1.854	0.006	2.987	0.491	0.103	0.061	611.600	0.024
LASSEN	All Vehicles	1.812	0.006	2.879	0.440	0.100	0.055	621.383	0.024
LOS ANGELES	All Vehicles	1.134	0.007	1.685	0.210	0.089	0.044	698.060	0.024
MADERA	All Vehicles	1.357	0.007	1.843	0.277	0.084	0.043	722.728	0.024
MARIN	All Vehicles	1.462	0.007	1.517	0.232	0.111	0.058	689.097	0.024
MARIPOSA	All Vehicles	1.997	0.006	3.789	0.566	0.107	0.063	597.659	0.024
MENDOCINO	All Vehicles	1.846	0.006	3.000	0.444	0.107	0.065	659.744	0.024
MERCED	All Vehicles	1.361	0.007	1.757	0.258	0.083	0.041	723.160	0.024
MODOC	All Vehicles	1.900	0.007	3.408	0.477	0.101	0.057	689.358	0.024
MONO	All Vehicles	1.556	0.007	2.415	0.342	0.088	0.045	710.080	0.024
MONTEREY	All Vehicles	1.548	0.007	2.146	0.302	0.106	0.061	699.307	0.024
NAPA	All Vehicles	1.387	0.007	1.669	0.241	0.088	0.045	677.914	0.024
NEVADA	All Vehicles	1.593	0.006	2.183	0.312	0.087	0.047	655.636	0.024
ORANGE	All Vehicles	0.953	0.006	1.353	0.178	0.088	0.043	658.346	0.024
PLACER	All Vehicles	1.193	0.006	1.437	0.209	0.086	0.043	660.203	0.024
PLUMAS	All Vehicles	1.848	0.007	3.505	0.486	0.095	0.053	667.462	0.024
RIVERSIDE	All Vehicles	1.061	0.006	1.357	0.193	0.081	0.039	666.963	0.024
SACRAMENTO	All Vehicles	1.388	0.006	1.690	0.239	0.093	0.049	665.762	0.024
SAN BENITO	All Vehicles	1.387	0.007	1.641	0.249	0.081	0.040	717.321	0.024
SAN BERNARDINO	All Vehicles	1.101	0.006	1.517	0.207	0.081	0.039	665.460	0.024
SAN DIEGO	All Vehicles	1.243	0.007	1.551	0.224	0.093	0.047	709.234	0.024
SAN FRANCISCO	All Vehicles	1.427	0.007	1.518	0.218	0.115	0.060	742.303	0.024
SAN JOAQUIN	All Vehicles	1.301	0.007	1.531	0.232	0.084	0.043	685.561	0.024
SAN LUIS OBISPO	All Vehicles	1.614	0.006	1.935	0.285	0.098	0.054	639.373	0.024
SAN MATEO	All Vehicles	1.010	0.006	1.191	0.175	0.099	0.049	641.500	0.024
SANTA BARBARA	All Vehicles	1.531	0.006	1.931	0.288	0.102	0.055	648.395	0.024
SANTA CLARA	All Vehicles	1.253	0.007	1.472	0.214	0.091	0.046	679.255	0.024
SANTA CRUZ	All Vehicles	1.820	0.007	2.403	0.348	0.117	0.068	673.098	0.024
SHASTA	All Vehicles	1.562	0.007	2.077	0.317	0.091	0.048	714.653	0.024
SIERRA	All Vehicles	1.819	0.007	3.039	0.418	0.100	0.056	672.062	0.024
SISKIYOU	All Vehicles	1.633	0.007	2.862	0.418	0.093	0.051	758.836	0.024
SOLANO	All Vehicles	1.311	0.007	1.491	0.226	0.088	0.044	721.121	0.024
SONOMA	All Vehicles	1.531	0.006	1.931	0.288	0.102	0.055	648.395	0.024
STANISLAUS	All Vehicles	1.297	0.007	1.689	0.254	0.083	0.042	695.683	0.024
SUTTER	All Vehicles	1.319	0.007	1.816	0.278	0.083	0.042	669.801	0.024
TEHAMA	All Vehicles	1.563	0.007	2.208	0.323	0.092	0.050	723.467	0.024
TRINITY	All Vehicles	1.945	0.008	4.264	0.571	0.116	0.074	775.021	0.024
TULARE	All Vehicles	1.339	0.007	1.723	0.270	0.085	0.044	673.569	0.024
TUOLUMNE	All Vehicles	1.866	0.006	3.501	0.500	0.099	0.056	610.490	0.024
VENTURA	All Vehicles	1.133	0.006	1.511	0.211	0.088	0.044	646.237	0.024
YOLO	All Vehicles	1.064	0.006	1.408	0.210	0.086	0.043	652.504	0.024
YUBA	All Vehicles	1.721	0.006	2.295	0.335	0.101	0.055	627.920	0.024

Table 5-32. 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	1.245	0.181	0.084	0.042	649.647	0.023
ALPINE	All Vehicles	1.262	0.006	1.899	0.267	0.077	0.037	637.212	0.023
AMADOR	All Vehicles	1.536	0.005	2.369	0.395	0.086	0.046	528.364	0.023
BUTTE	All Vehicles	1.428	0.006	2.103	0.303	0.087	0.047	644.870	0.023
CALAVERAS	All Vehicles	1.581	0.006	2.647	0.430	0.089	0.050	579.804	0.023
COLUSA	All Vehicles	1.248	0.006	1.440	0.219	0.080	0.040	635.988	0.023
CONTRA COSTA	All Vehicles	1.167	0.006	1.191	0.176	0.086	0.042	624.008	0.023
DEL NORTE	All Vehicles	1.817	0.006	2.849	0.435	0.107	0.066	560.009	0.023
EL DORADO	All Vehicles	1.270	0.005	1.559	0.245	0.084	0.044	553.686	0.023
FRESNO	All Vehicles	1.160	0.006	1.283	0.212	0.076	0.037	655.589	0.023
GLENN	All Vehicles	1.324	0.006	1.701	0.261	0.082	0.043	644.717	0.023
HUMBOLDT	All Vehicles	1.699	0.006	2.538	0.384	0.093	0.053	598.392	0.023
IMPERIAL	All Vehicles	1.044	0.006	1.837	0.311	0.074	0.035	632.234	0.023
INYO	All Vehicles	1.314	0.006	1.921	0.327	0.083	0.042	645.622	0.023
KERN	All Vehicles	1.141	0.007	1.232	0.200	0.075	0.036	684.610	0.023
KINGS	All Vehicles	1.226	0.006	1.467	0.224	0.074	0.036	661.221	0.023
LAKE	All Vehicles	1.666	0.006	2.541	0.431	0.094	0.054	576.217	0.023
LASSEN	All Vehicles	1.595	0.006	2.435	0.384	0.090	0.049	568.469	0.023
LOS ANGELES	All Vehicles	1.001	0.006	1.408	0.178	0.082	0.040	639.058	0.023
MADERA	All Vehicles	1.226	0.007	1.545	0.237	0.078	0.039	673.456	0.023
MARIN	All Vehicles	1.269	0.006	1.259	0.196	0.099	0.051	619.255	0.023
MARIPOSA	All Vehicles	1.763	0.005	3.215	0.494	0.096	0.055	548.726	0.023
MENDOCINO	All Vehicles	1.646	0.006	2.586	0.393	0.096	0.057	620.866	0.023
MERCED	All Vehicles	1.236	0.007	1.481	0.221	0.076	0.038	677.910	0.023
MODOC	All Vehicles	1.667	0.006	2.854	0.411	0.091	0.050	628.519	0.023
MONO	All Vehicles	1.358	0.006	2.012	0.295	0.079	0.039	649.215	0.023
MONTEREY	All Vehicles	1.363	0.006	1.819	0.260	0.096	0.054	648.505	0.023
NAPA	All Vehicles	1.244	0.006	1.383	0.204	0.080	0.040	619.726	0.023
NEVADA	All Vehicles	1.423	0.006	1.882	0.276	0.080	0.042	617.555	0.023
ORANGE	All Vehicles	0.849	0.006	1.132	0.153	0.080	0.039	599.191	0.023
PLACER	All Vehicles	1.064	0.006	1.217	0.180	0.078	0.039	612.585	0.023
PLUMAS	All Vehicles	1.652	0.006	2.987	0.427	0.086	0.047	623.087	0.023
RIVERSIDE	All Vehicles	0.936	0.006	1.139	0.165	0.074	0.035	615.223	0.023
SACRAMENTO	All Vehicles	1.232	0.006	1.433	0.206	0.085	0.044	615.576	0.023
SAN BENITO	All Vehicles	1.225	0.006	1.365	0.211	0.073	0.035	660.571	0.023
SAN BERNARDINO	All Vehicles	0.964	0.006	1.249	0.174	0.074	0.035	611.222	0.023
SAN DIEGO	All Vehicles	1.100	0.006	1.294	0.191	0.084	0.042	643.639	0.023
SAN FRANCISCO	All Vehicles	1.253	0.006	1.266	0.184	0.102	0.053	666.980	0.023
SAN JOAQUIN	All Vehicles	1.174	0.006	1.294	0.201	0.078	0.039	640.909	0.023
SAN LUIS OBISPO	All Vehicles	1.419	0.006	1.634	0.246	0.088	0.048	587.506	0.023
SAN MATEO	All Vehicles	0.882	0.006	0.995	0.148	0.089	0.044	578.456	0.023
SANTA BARBARA	All Vehicles	1.346	0.006	1.635	0.248	0.093	0.049	600.167	0.023
SANTA CLARA	All Vehicles	1.113	0.006	1.229	0.183	0.082	0.041	620.503	0.023
SANTA CRUZ	All Vehicles	1.584	0.006	2.025	0.298	0.104	0.059	619.228	0.023
SHASTA	All Vehicles	1.375	0.006	1.716	0.268	0.081	0.042	657.223	0.023
SIERRA	All Vehicles	1.577	0.006	2.547	0.361	0.089	0.049	608.370	0.023
SISKIYOU	All Vehicles	1.429	0.007	2.397	0.361	0.083	0.044	699.498	0.023
SOLANO	All Vehicles	1.168	0.006	1.239	0.192	0.080	0.039	658.439	0.023
SONOMA	All Vehicles	1.346	0.006	1.635	0.248	0.093	0.049	600.167	0.023
STANISLAUS	All Vehicles	1.177	0.006	1.430	0.219	0.077	0.038	653.438	0.023
SUTTER	All Vehicles	1.181	0.006	1.503	0.236	0.076	0.038	624.575	0.023
TEHAMA	All Vehicles	1.374	0.006	1.821	0.272	0.082	0.044	665.855	0.023
TRINITY	All Vehicles	1.721	0.007	3.645	0.499	0.103	0.064	722.084	0.023
TULARE	All Vehicles	1.208	0.006	1.448	0.231	0.079	0.040	632.029	0.023
TUOLUMNE	All Vehicles	1.662	0.006	2.989	0.438	0.090	0.050	567.882	0.023
VENTURA	All Vehicles	0.999	0.006	1.252	0.179	0.080	0.040	586.987	0.023
YOLO	All Vehicles	0.960	0.006	1.182	0.181	0.079	0.039	608.501	0.023
YUBA	All Vehicles	1.506	0.006	1.898	0.283	0.090	0.048	571.991	0.023

Table 5-33. 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	1.075	0.006	1.060	0.157	0.076	0.037	602.331	0.023
ALPINE	All Vehicles	1.115	0.006	1.609	0.234	0.070	0.033	586.257	0.023
AMADOR	All Vehicles	1.353	0.005	2.032	0.348	0.078	0.040	495.678	0.023
BUTTE	All Vehicles	1.256	0.006	1.789	0.262	0.079	0.042	602.203	0.023
CALAVERAS	All Vehicles	1.392	0.005	2.271	0.380	0.080	0.043	541.118	0.023
COLUSA	All Vehicles	1.100	0.006	1.221	0.189	0.072	0.035	589.074	0.023
CONTRA COSTA	All Vehicles	1.039	0.006	1.011	0.152	0.078	0.037	574.469	0.023
DEL NORTE	All Vehicles	1.582	0.005	2.474	0.387	0.096	0.058	516.910	0.023
EL DORADO	All Vehicles	1.124	0.005	1.343	0.216	0.076	0.039	515.501	0.023
FRESNO	All Vehicles	1.051	0.006	1.102	0.186	0.070	0.033	619.654	0.023
GLENN	All Vehicles	1.162	0.006	1.427	0.224	0.074	0.037	594.486	0.023
HUMBOLDT	All Vehicles	1.498	0.006	2.214	0.344	0.083	0.046	564.190	0.023
IMPERIAL	All Vehicles	0.913	0.006	1.562	0.272	0.068	0.032	586.207	0.023
INYO	All Vehicles	1.156	0.006	1.628	0.287	0.075	0.037	593.501	0.023
KERN	All Vehicles	1.031	0.006	1.061	0.176	0.069	0.033	642.421	0.023
KINGS	All Vehicles	1.111	0.006	1.257	0.196	0.069	0.033	622.970	0.023
LAKE	All Vehicles	1.456	0.005	2.179	0.380	0.083	0.046	545.303	0.023
LASSEN	All Vehicles	1.394	0.005	2.089	0.340	0.081	0.043	522.237	0.023
LOS ANGELES	All Vehicles	0.883	0.006	1.206	0.155	0.075	0.036	593.511	0.023
MADERA	All Vehicles	1.105	0.006	1.317	0.205	0.071	0.035	631.445	0.023
MARIN	All Vehicles	1.110	0.005	1.067	0.169	0.088	0.045	562.634	0.023
MARIPOSA	All Vehicles	1.540	0.005	2.759	0.435	0.085	0.047	505.944	0.023
MENDOCINO	All Vehicles	1.451	0.006	2.253	0.351	0.086	0.049	585.468	0.023
MERCED	All Vehicles	1.119	0.006	1.270	0.193	0.071	0.034	638.832	0.023
MODOC	All Vehicles	1.451	0.006	2.424	0.360	0.081	0.044	574.375	0.023
MONO	All Vehicles	1.195	0.006	1.713	0.260	0.071	0.035	596.814	0.023
MONTEREY	All Vehicles	1.184	0.006	1.562	0.224	0.086	0.046	603.680	0.023
NAPA	All Vehicles	1.108	0.006	1.165	0.175	0.072	0.035	571.361	0.023
NEVADA	All Vehicles	1.265	0.006	1.639	0.246	0.073	0.037	583.769	0.023
ORANGE	All Vehicles	0.746	0.005	0.963	0.132	0.073	0.034	550.865	0.023
PLACER	All Vehicles	0.945	0.006	1.044	0.157	0.072	0.035	572.412	0.023
PLUMAS	All Vehicles	1.467	0.006	2.578	0.378	0.078	0.041	584.458	0.023
RIVERSIDE	All Vehicles	0.821	0.005	0.975	0.145	0.068	0.031	572.270	0.023
SACRAMENTO	All Vehicles	1.092	0.005	1.235	0.179	0.077	0.039	576.946	0.023
SAN BENITO	All Vehicles	1.080	0.006	1.161	0.183	0.066	0.031	611.837	0.023
SAN BERNARDINO	All Vehicles	0.848	0.005	1.062	0.151	0.068	0.032	569.445	0.023
SAN DIEGO	All Vehicles	0.972	0.006	1.103	0.165	0.076	0.037	590.696	0.023
SAN FRANCISCO	All Vehicles	1.089	0.006	1.070	0.157	0.091	0.046	607.902	0.023
SAN JOAQUIN	All Vehicles	1.053	0.006	1.111	0.175	0.072	0.035	603.616	0.023
SAN LUIS OBISPO	All Vehicles	1.224	0.005	1.395	0.213	0.078	0.041	542.045	0.023
SAN MATEO	All Vehicles	0.771	0.005	0.853	0.128	0.080	0.039	529.810	0.023
SANTA BARBARA	All Vehicles	1.163	0.005	1.401	0.214	0.083	0.042	558.432	0.023
SANTA CLARA	All Vehicles	0.983	0.006	1.045	0.158	0.075	0.036	572.902	0.023
SANTA CRUZ	All Vehicles	1.349	0.006	1.726	0.255	0.091	0.050	572.278	0.023
SHASTA	All Vehicles	1.208	0.006	1.443	0.230	0.073	0.037	607.939	0.023
SIERRA	All Vehicles	1.348	0.005	2.160	0.314	0.079	0.042	551.135	0.023
SISKIYOU	All Vehicles	1.256	0.006	2.040	0.317	0.075	0.039	647.732	0.023
SOLANO	All Vehicles	1.041	0.006	1.050	0.166	0.072	0.035	606.513	0.023
SONOMA	All Vehicles	1.163	0.005	1.401	0.214	0.083	0.042	558.432	0.023
STANISLAUS	All Vehicles	1.062	0.006	1.228	0.191	0.071	0.035	618.272	0.023
SUTTER	All Vehicles	1.056	0.006	1.277	0.205	0.070	0.034	587.411	0.023
TEHAMA	All Vehicles	1.210	0.006	1.531	0.234	0.074	0.038	616.548	0.023
TRINITY	All Vehicles	1.522	0.007	3.143	0.441	0.093	0.056	674.697	0.023
TULARE	All Vehicles	1.084	0.006	1.236	0.200	0.072	0.036	597.343	0.023
TUOLUMNE	All Vehicles	1.464	0.005	2.573	0.387	0.081	0.043	529.955	0.023
VENTURA	All Vehicles	0.870	0.005	1.057	0.153	0.072	0.035	538.499	0.023
YOLO	All Vehicles	0.866	0.006	1.013	0.158	0.073	0.036	574.670	0.023
YUBA	All Vehicles	1.296	0.005	1.588	0.241	0.080	0.041	526.314	0.023

Table 5-34. EMFAC County-Specific On-Road Vehicle Composite EFs – 2021 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	0.981	0.006	0.923	0.139	0.070	0.033	567.985	0.022
ALPINE	All Vehicles	0.985	0.005	1.388	0.210	0.064	0.030	540.557	0.022
AMADOR	All Vehicles	1.198	0.005	1.760	0.312	0.070	0.035	464.224	0.022
BUTTE	All Vehicles	1.106	0.005	1.553	0.232	0.071	0.037	562.358	0.022
CALAVERAS	All Vehicles	1.227	0.005	1.966	0.341	0.072	0.037	502.905	0.022
COLUSA	All Vehicles	0.972	0.005	1.061	0.168	0.065	0.032	546.050	0.022
CONTRA COSTA	All Vehicles	0.940	0.005	0.880	0.135	0.072	0.034	536.012	0.022
DEL NORTE	All Vehicles	1.395	0.005	2.175	0.352	0.086	0.051	477.592	0.022
EL DORADO	All Vehicles	1.001	0.005	1.179	0.195	0.068	0.034	481.258	0.022
FRESNO	All Vehicles	0.949	0.006	0.966	0.167	0.065	0.030	588.936	0.022
GLENN	All Vehicles	1.020	0.005	1.227	0.198	0.066	0.033	548.598	0.022
HUMBOLDT	All Vehicles	1.339	0.005	1.954	0.315	0.076	0.041	531.570	0.022
IMPERIAL	All Vehicles	0.801	0.005	1.355	0.244	0.062	0.028	545.954	0.022
INYO	All Vehicles	1.019	0.005	1.403	0.258	0.068	0.033	546.811	0.022
KERN	All Vehicles	0.925	0.006	0.936	0.158	0.064	0.030	605.860	0.022
KINGS	All Vehicles	1.000	0.006	1.105	0.177	0.064	0.030	589.411	0.022
LAKE	All Vehicles	1.298	0.005	1.898	0.343	0.076	0.041	514.845	0.022
LASSEN	All Vehicles	1.230	0.005	1.816	0.307	0.073	0.038	479.595	0.022
LOS ANGELES	All Vehicles	0.785	0.005	1.058	0.138	0.068	0.032	558.466	0.022
MADERA	All Vehicles	0.993	0.006	1.142	0.183	0.066	0.032	590.314	0.022
MARIN	All Vehicles	0.992	0.005	0.927	0.150	0.080	0.040	518.744	0.022
MARIPOSA	All Vehicles	1.359	0.005	2.367	0.389	0.077	0.042	465.516	0.022
MENDOCINO	All Vehicles	1.291	0.005	1.981	0.319	0.078	0.044	551.623	0.022
MERCED	All Vehicles	1.008	0.006	1.119	0.173	0.066	0.031	604.750	0.022
MODOC	All Vehicles	1.273	0.005	2.075	0.321	0.073	0.039	524.913	0.022
MONO	All Vehicles	1.051	0.005	1.481	0.234	0.065	0.031	549.738	0.022
MONTEREY	All Vehicles	1.044	0.005	1.373	0.199	0.078	0.041	566.482	0.022
NAPA	All Vehicles	1.000	0.005	1.006	0.154	0.066	0.031	534.626	0.022
NEVADA	All Vehicles	1.120	0.005	1.451	0.224	0.067	0.033	548.252	0.022
ORANGE	All Vehicles	0.657	0.005	0.838	0.116	0.066	0.030	518.127	0.022
PLACER	All Vehicles	0.834	0.005	0.914	0.140	0.065	0.031	535.694	0.022
PLUMAS	All Vehicles	1.314	0.005	2.238	0.341	0.071	0.037	548.448	0.022
RIVERSIDE	All Vehicles	0.720	0.005	0.853	0.130	0.062	0.028	535.785	0.022
SACRAMENTO	All Vehicles	0.980	0.005	1.086	0.160	0.071	0.035	545.346	0.022
SAN BENITO	All Vehicles	0.968	0.006	1.021	0.164	0.061	0.028	574.720	0.022
SAN BERNARDINO	All Vehicles	0.752	0.005	0.930	0.135	0.062	0.028	536.927	0.022
SAN DIEGO	All Vehicles	0.870	0.005	0.968	0.147	0.069	0.033	549.893	0.022
SAN FRANCISCO	All Vehicles	0.981	0.005	0.936	0.138	0.082	0.040	567.864	0.022
SAN JOAQUIN	All Vehicles	0.946	0.005	0.977	0.157	0.066	0.032	570.067	0.022
SAN LUIS OBISPO	All Vehicles	1.065	0.005	1.215	0.189	0.070	0.035	501.939	0.022
SAN MATEO	All Vehicles	0.687	0.005	0.750	0.113	0.073	0.034	497.227	0.022
SANTA BARBARA	All Vehicles	1.020	0.005	1.227	0.190	0.074	0.037	522.103	0.022
SANTA CLARA	All Vehicles	0.887	0.005	0.911	0.140	0.068	0.032	537.193	0.022
SANTA CRUZ	All Vehicles	1.162	0.005	1.500	0.223	0.080	0.042	533.896	0.022
SHASTA	All Vehicles	1.064	0.005	1.242	0.204	0.066	0.033	562.693	0.022
SIERRA	All Vehicles	1.171	0.005	1.863	0.281	0.071	0.037	499.340	0.022
SISKIYOU	All Vehicles	1.105	0.006	1.767	0.285	0.068	0.035	599.569	0.022
SOLANO	All Vehicles	0.934	0.005	0.912	0.147	0.066	0.031	563.680	0.022
SONOMA	All Vehicles	1.020	0.005	1.227	0.190	0.074	0.037	522.103	0.022
STANISLAUS	All Vehicles	0.959	0.006	1.081	0.171	0.066	0.031	588.096	0.022
SUTTER	All Vehicles	0.948	0.005	1.111	0.182	0.065	0.031	556.193	0.022
TEHAMA	All Vehicles	1.067	0.006	1.320	0.208	0.067	0.034	571.403	0.022
TRINITY	All Vehicles	1.348	0.006	2.723	0.397	0.084	0.050	629.438	0.022
TULARE	All Vehicles	0.975	0.005	1.079	0.179	0.067	0.032	567.307	0.022
TUOLUMNE	All Vehicles	1.295	0.005	2.227	0.346	0.073	0.038	493.720	0.022
VENTURA	All Vehicles	0.772	0.005	0.917	0.136	0.065	0.031	503.638	0.022
YOLO	All Vehicles	0.788	0.005	0.886	0.141	0.068	0.032	549.873	0.022
YUBA	All Vehicles	1.136	0.005	1.365	0.212	0.072	0.036	484.708	0.022

Table 5-35. EMFAC County-Specific On-Road Vehicle Composite EFs – 2022 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	0.904	0.005	0.817	0.127	0.065	0.031	529.907	0.022
ALPINE	All Vehicles	0.871	0.005	1.212	0.192	0.058	0.027	496.449	0.022
AMADOR	All Vehicles	1.095	0.004	1.538	0.287	0.065	0.032	434.134	0.022
BUTTE	All Vehicles	0.985	0.005	1.359	0.210	0.066	0.033	522.333	0.022
CALAVERAS	All Vehicles	1.106	0.005	1.715	0.312	0.066	0.034	466.486	0.022
COLUSA	All Vehicles	0.864	0.005	0.934	0.153	0.060	0.029	504.273	0.022
CONTRA COSTA	All Vehicles	0.857	0.005	0.778	0.123	0.066	0.031	495.901	0.022
DEL NORTE	All Vehicles	1.246	0.004	1.921	0.324	0.079	0.046	441.308	0.022
EL DORADO	All Vehicles	0.911	0.004	1.053	0.180	0.063	0.031	446.738	0.022
FRESNO	All Vehicles	0.860	0.005	0.860	0.153	0.061	0.028	554.817	0.022
GLENN	All Vehicles	0.904	0.005	1.069	0.179	0.060	0.030	504.397	0.022
HUMBOLDT	All Vehicles	1.208	0.005	1.737	0.292	0.071	0.038	498.757	0.022
IMPERIAL	All Vehicles	0.705	0.005	1.190	0.223	0.057	0.026	506.386	0.022
INYO	All Vehicles	0.905	0.005	1.224	0.236	0.062	0.030	501.891	0.022
KERN	All Vehicles	0.832	0.006	0.839	0.146	0.060	0.027	568.038	0.022
KINGS	All Vehicles	0.904	0.005	0.987	0.163	0.060	0.028	555.215	0.022
LAKE	All Vehicles	1.185	0.005	1.669	0.316	0.070	0.037	486.445	0.022
LASSEN	All Vehicles	1.099	0.004	1.582	0.281	0.067	0.035	439.849	0.022
LOS ANGELES	All Vehicles	0.711	0.005	0.942	0.126	0.063	0.029	518.943	0.022
MADERA	All Vehicles	0.897	0.005	1.013	0.167	0.061	0.029	553.228	0.022
MARIN	All Vehicles	0.895	0.005	0.818	0.136	0.073	0.036	473.809	0.022
MARIPOSA	All Vehicles	1.218	0.004	2.044	0.355	0.070	0.038	427.951	0.022
MENDOCINO	All Vehicles	1.163	0.005	1.756	0.296	0.073	0.040	517.993	0.022
MERCED	All Vehicles	0.912	0.006	0.995	0.158	0.062	0.029	569.057	0.022
MODOC	All Vehicles	1.129	0.005	1.785	0.291	0.067	0.035	478.904	0.022
MONO	All Vehicles	0.928	0.005	1.296	0.214	0.059	0.028	504.349	0.022
MONTEREY	All Vehicles	0.943	0.005	1.223	0.181	0.071	0.037	530.245	0.022
NAPA	All Vehicles	0.907	0.005	0.881	0.139	0.060	0.028	493.861	0.022
NEVADA	All Vehicles	1.003	0.005	1.293	0.207	0.062	0.030	512.732	0.022
ORANGE	All Vehicles	0.597	0.004	0.744	0.107	0.061	0.027	477.269	0.022
PLACER	All Vehicles	0.753	0.005	0.814	0.129	0.060	0.028	498.651	0.022
PLUMAS	All Vehicles	1.201	0.005	1.949	0.313	0.065	0.034	514.686	0.022
RIVERSIDE	All Vehicles	0.636	0.005	0.759	0.120	0.057	0.026	498.379	0.022
SACRAMENTO	All Vehicles	0.893	0.005	0.969	0.147	0.066	0.032	509.732	0.022
SAN BENITO	All Vehicles	0.870	0.005	0.906	0.151	0.056	0.026	536.176	0.022
SAN BERNARDINO	All Vehicles	0.668	0.005	0.824	0.124	0.058	0.026	500.441	0.022
SAN DIEGO	All Vehicles	0.790	0.005	0.859	0.134	0.063	0.030	506.659	0.022
SAN FRANCISCO	All Vehicles	0.905	0.005	0.836	0.127	0.076	0.037	523.223	0.022
SAN JOAQUIN	All Vehicles	0.858	0.005	0.872	0.144	0.062	0.029	535.556	0.022
SAN LUIS OBISPO	All Vehicles	0.953	0.004	1.078	0.173	0.064	0.032	463.954	0.022
SAN MATEO	All Vehicles	0.632	0.004	0.674	0.105	0.067	0.031	458.468	0.022
SANTA BARBARA	All Vehicles	0.925	0.005	1.092	0.175	0.069	0.034	487.498	0.022
SANTA CLARA	All Vehicles	0.810	0.005	0.808	0.128	0.063	0.030	498.588	0.022
SANTA CRUZ	All Vehicles	1.052	0.005	1.326	0.203	0.074	0.038	496.398	0.022
SHASTA	All Vehicles	0.944	0.005	1.083	0.185	0.060	0.030	518.860	0.022
SIERRA	All Vehicles	1.034	0.004	1.621	0.255	0.064	0.033	452.478	0.022
SISKIYOU	All Vehicles	0.974	0.005	1.536	0.260	0.062	0.031	552.268	0.022
SOLANO	All Vehicles	0.843	0.005	0.805	0.134	0.060	0.028	521.251	0.022
SONOMA	All Vehicles	0.925	0.005	1.092	0.175	0.069	0.034	487.498	0.022
STANISLAUS	All Vehicles	0.874	0.005	0.962	0.156	0.061	0.029	553.849	0.022
SUTTER	All Vehicles	0.856	0.005	0.983	0.167	0.060	0.028	521.727	0.022
TEHAMA	All Vehicles	0.944	0.005	1.152	0.188	0.062	0.031	527.433	0.022
TRINITY	All Vehicles	1.199	0.006	2.375	0.362	0.077	0.045	584.847	0.022
TULARE	All Vehicles	0.883	0.005	0.956	0.163	0.063	0.030	533.940	0.022
TUOLUMNE	All Vehicles	1.177	0.004	1.939	0.317	0.068	0.035	459.602	0.022
VENTURA	All Vehicles	0.695	0.004	0.806	0.123	0.060	0.028	462.720	0.022
YOLO	All Vehicles	0.729	0.005	0.790	0.130	0.064	0.030	518.621	0.022
YUBA	All Vehicles	1.012	0.004	1.185	0.192	0.066	0.033	446.123	0.022

Table 5-36. EMFAC County-Specific On-Road Vehicle EFs – 2018

County	Fuel Type	Vehicle Type		Emission Factors (g/mi)							
				Criteria Pollutants and Ozone Precursors							
				NO_X	SOx	CO	ROG	PM_{10}	$PM_{2.5}$	CO_2e	NH_3
Alameda	Gasoline	LDGV	Light-Duty Vehicles (Passenger Cars)	0.135	0.004	1.518	0.175	0.059	0.025	393.313	0.025
	Gasoline	LDGT	Light-Duty Trucks (0-8,500 lbs)	0.216	0.005	1.997	0.267	0.060	0.025	512.797	0.026
	Gasoline	HDGV	Heavy-Duty Vehicles (8,501 + lbs)	0.550	0.007	3.567	0.439	0.067	0.029	743.242	0.045
	Diesel	LDDV	Light-Duty Vehicles (Passenger Cars)	0.275	0.003	0.401	0.041	0.081	0.046	356.961	0.008
	Diesel	LDDT	Light-Duty Trucks (0-8,500 lbs)	0.235	0.004	0.316	0.047	0.084	0.050	441.872	0.008
	Diesel	HDDV	Heavy-Duty Vehicles (8,501 + lbs)	5.367	0.014	0.970	0.208	0.191	0.106	1496.905	0.027
	NA	MC	Motorcycles	1.573	0.003	31.105	5.272	0.023	0.011	227.368	0.053
Alpine	Gasoline	LDGV	Light-Duty Vehicles (Passenger Cars)	0.186	0.004	1.928	0.189	0.060	0.025	369.137	0.025
	Gasoline	LDGT	Light-Duty Trucks (0-8,500 lbs)	0.411	0.005	3.425	0.442	0.060	0.025	483.108	0.026
	Gasoline	HDGV	Heavy-Duty Vehicles (8,501 + lbs)	1.059	0.008	6.189	0.844	0.070	0.030	742.888	0.045
	Diesel	LDDV	Light-Duty Vehicles (Passenger Cars)	0.261	0.003	0.385	0.036	0.076	0.042	337.064	0.008
	Diesel	LDDT	Light-Duty Trucks (0-8,500 lbs)	0.243	0.004	0.315	0.046	0.081	0.047	408.430	0.008
	Diesel	HDDV	Heavy-Duty Vehicles (8,501 + lbs)	5.347	0.015	0.892	0.197	0.164	0.086	1547.520	0.027
	NA	MC	Motorcycles	1.732	0.003	35.902	5.870	0.023	0.011	216.948	0.053
Amador	Gasoline	LDGV	Light-Duty Vehicles (Passenger Cars)	0.194	0.003	1.966	0.227	0.056	0.023	331.072	0.025
	Gasoline	LDGT	Light-Duty Trucks (0-8,500 lbs)	0.507	0.005	4.304	0.671	0.057	0.025	449.854	0.026
	Gasoline	HDGV	Heavy-Duty Vehicles (8,501 + lbs)	1.134	0.007	6.703	1.065	0.068	0.029	701.695	0.045
	Diesel	LDDV	Light-Duty Vehicles (Passenger Cars)	0.365	0.003	0.335	0.034	0.074	0.042	298.546	0.008
	Diesel	LDDT	Light-Duty Trucks (0-8,500 lbs)	0.253	0.003	0.340	0.051	0.083	0.051	351.697	0.008
	Diesel	HDDV	Heavy-Duty Vehicles (8,501 + lbs)	6.351	0.010	1.160	0.279	0.208	0.130	1077.568	0.027
	NA	MC	Motorcycles	1.530	0.002	30.727	5.577	0.022	0.010	186.133	0.053
Butte	Gasoline	LDGV	Light-Duty Vehicles (Passenger Cars)	0.159	0.004	1.699	0.185	0.054	0.023	359.938	0.025
	Gasoline	LDGT	Light-Duty Trucks (0-8,500 lbs)	0.468	0.005	3.813	0.510	0.058	0.025	508.689	0.026
	Gasoline	HDGV	Heavy-Duty Vehicles (8,501 + lbs)	0.851	0.008	5.642	0.718	0.069	0.030	765.331	0.045
	Diesel	LDDV	Light-Duty Vehicles (Passenger Cars)	0.314	0.003	0.390	0.044	0.078	0.047	321.142	0.008
	Diesel	LDDT	Light-Duty Trucks (0-8,500 lbs)	0.617	0.004	0.596	0.102	0.130	0.096	427.112	0.008
	Diesel	HDDV	Heavy-Duty Vehicles (8,501 + lbs)	5.773	0.014	1.021	0.232	0.179	0.102	1459.477	0.027
	NA	MC	Motorcycles	1.524	0.003	31.987	6.480	0.023	0.011	210.131	0.053
Calaveras	Gasoline	LDGV	Light-Duty Vehicles (Passenger Cars)	0.197	0.004	2.088	0.225	0.056	0.024	367.301	0.025
	Gasoline	LDGT	Light-Duty Trucks (0-8,500 lbs)	0.540	0.005	4.855	0.738	0.058	0.025	497.352	0.026
	Gasoline	HDGV	Heavy-Duty Vehicles (8,501 + lbs)	1.237	0.008	7.401	1.179	0.069	0.030	757.071	0.045
	Diesel	LDDV	Light-Duty Vehicles (Passenger Cars)	0.411	0.003	0.499	0.057	0.088	0.055	334.747	0.008
	Diesel	LDDT	Light-Duty Trucks (0-8,500 lbs)	0.392	0.004	0.554	0.094	0.114	0.080	411.570	0.008
	Diesel	HDDV	Heavy-Duty Vehicles (8,501 + lbs)	6.408	0.011	1.137	0.270	0.199	0.122	1169.279	0.027
	NA	MC	Motorcycles	1.537	0.003	32.466	6.661	0.023	0.011	209.556	0.053
Colusa	Gasoline	LDGV	Light-Duty Vehicles (Passenger Cars)	0.139	0.004	1.437	0.165	0.057	0.024	373.810	0.025
	Gasoline	LDGT	Light-Duty Trucks (0-8,500 lbs)	0.303	0.005	2.466	0.350	0.058	0.025	494.609	0.026
	Gasoline	HDGV	Heavy-Duty Vehicles (8,501 + lbs)	0.657	0.008	4.078	0.533	0.067	0.028	752.723	0.045
	Diesel	LDDV	Light-Duty Vehicles (Passenger Cars)	0.254	0.003	0.363	0.038	0.077	0.044	332.108	0.008
	Diesel	LDDT	Light-Duty Trucks (0-8,500 lbs)	0.322	0.004	0.419	0.059	0.093	0.060	415.858	0.008
	Diesel	HDDV	Heavy-Duty Vehicles (8,501 + lbs)	5.473	0.014	0.937	0.218	0.169	0.095	1484.352	0.027
	NA	MC	Motorcycles	1.556	0.003	30.609	5.446	0.023	0.011	216.237	0.053
Contra Costa	Gasoline	LDGV	Light-Duty Vehicles (Passenger Cars)	0.125	0.004	1.409	0.163	0.058	0.025	383.904	0.025
	Gasoline	LDGT	Light-Duty Trucks (0-8,500 lbs)	0.209	0.005	1.958	0.264	0.060	0.025	512.798	0.026
	Gasoline	HDGV	Heavy-Duty Vehicles (8,501 + lbs)	0.515	0.007	3.392	0.422	0.066	0.028	742.709	0.045
	Diesel	LDDV	Light-Duty Vehicles (Passenger Cars)	0.213	0.003	0.343	0.036	0.077	0.043	345.514	0.008
	Diesel	LDDT	Light-Duty Trucks (0-8,500 lbs)	0.182	0.004	0.259	0.035	0.075	0.041	439.308	0.008
	Diesel	HDDV	Heavy-Duty Vehicles (8,501 + lbs)	5.333	0.013	0.898	0.201	0.210	0.112	1393.881	0.027
	NA	MC	Motorcycles	1.586	0.003	31.581	5.382	0.023	0.011	227.235	0.053
Del Norte	Gasoline	LDGV	Light-Duty Vehicles (Passenger Cars)	0.206	0.004	1.995	0.217	0.055	0.023	375.580	0.025
	Gasoline	LDGT	Light-Duty Trucks (0-8,500 lbs)	0.682	0.005	4.976	0.697	0.057	0.025	513.108	0.026
	Gasoline	HDGV	Heavy-Duty Vehicles (8,501 + lbs)	1.116	0.008	6.458	0.941	0.065	0.028	759.398	0.045
	Diesel	LDDV	Light-Duty Vehicles (Passenger Cars)	0.358	0.003	0.520	0.055	0.085	0.053	351.999	0.008
	Diesel	LDDT	Light-Duty Trucks (0-8,500 lbs)	0.983	0.004	1.330	0.220	0.217	0.179	464.708	0.008
	Diesel	HDDV	Heavy-Duty Vehicles (8,501 + lbs)	7.000	0.010	1.392	0.310	0.221	0.137	1015.974	0.027
	NA	MC	Motorcycles	1.619	0.003	35.916	6.859	0.024	0.012	225.280	0.053

Table 5-36. 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	SOx	CO	ROG	PM_{10}	$PM_{2.5}$	CO_2e	NH_3
El Dorado	Gasoline	LDGV	Light-Duty Vehicles (Passenger Cars)	0.117	0.004	1.378	0.146	0.058	0.024	380.958	0.025
	Gasoline	LDGT	Light-Duty Trucks (0-8,500 lbs)	0.270	0.005	2.629	0.381	0.058	0.025	507.205	0.026
	Gasoline	HDGV	Heavy-Duty Vehicles (8,501 + lbs)	0.642	0.008	4.392	0.630	0.065	0.028	745.027	0.045
	Diesel	LDDV	Light-Duty Vehicles (Passenger Cars)	0.240	0.003	0.362	0.032	0.072	0.039	343.664	0.008
	Diesel	LDDT	Light-Duty Trucks (0-8,500 lbs)	0.289	0.004	0.349	0.049	0.083	0.050	428.346	0.008
	Diesel	HDDV	Heavy-Duty Vehicles (8,501 + lbs)	5.642	0.010	1.093	0.249	0.195	0.116	1037.750	0.027
	NA	MC	Motorcycles	1.608	0.003	34.666	7.031	0.023	0.011	221.891	0.053
Fresno	Gasoline	LDGV	Light-Duty Vehicles (Passenger Cars)	0.112	0.004	1.258	0.157	0.057	0.024	369.222	0.025
	Gasoline	LDGT	Light-Duty Trucks (0-8,500 lbs)	0.238	0.005	2.180	0.344	0.056	0.024	483.968	0.026
	Gasoline	HDGV	Heavy-Duty Vehicles (8,501 + lbs)	0.555	0.007	3.747	0.500	0.065	0.027	735.459	0.045
	Diesel	LDDV	Light-Duty Vehicles (Passenger Cars)	0.141	0.003	0.236	0.021	0.065	0.033	311.658	0.008
	Diesel	LDDT	Light-Duty Trucks (0-8,500 lbs)	0.225	0.004	0.292	0.039	0.077	0.046	397.909	0.008
	Diesel	HDDV	Heavy-Duty Vehicles (8,501 + lbs)	5.068	0.015	0.800	0.186	0.156	0.083	1565.250	0.027
	NA	MC	Motorcycles	1.531	0.003	31.621	5.247	0.022	0.010	207.984	0.053
Glenn	Gasoline	LDGV	Light-Duty Vehicles (Passenger Cars)	0.143	0.004	1.526	0.169	0.057	0.024	380.222	0.025
	Gasoline	LDGT	Light-Duty Trucks (0-8,500 lbs)	0.360	0.005	3.014	0.436	0.059	0.025	522.671	0.026
	Gasoline	HDGV	Heavy-Duty Vehicles (8,501 + lbs)	0.748	0.008	4.950	0.651	0.069	0.030	792.318	0.045
	Diesel	LDDV	Light-Duty Vehicles (Passenger Cars)	0.221	0.003	0.385	0.037	0.073	0.041	335.227	0.008
	Diesel	LDDT	Light-Duty Trucks (0-8,500 lbs)	0.367	0.004	0.527	0.075	0.106	0.072	430.183	0.008
	Diesel	HDDV	Heavy-Duty Vehicles (8,501 + lbs)	5.723	0.014	0.983	0.229	0.174	0.099	1459.840	0.027
	NA	MC	Motorcycles	1.565	0.003	32.024	6.301	0.023	0.011	223.751	0.053
Humboldt	Gasoline	LDGV	Light-Duty Vehicles (Passenger Cars)	0.215	0.004	2.057	0.222	0.054	0.023	349.845	0.025
	Gasoline	LDGT	Light-Duty Trucks (0-8,500 lbs)	0.591	0.005	4.499	0.617	0.056	0.024	472.973	0.026
	Gasoline	HDGV	Heavy-Duty Vehicles (8,501 + lbs)	1.107	0.007	6.138	0.929	0.064	0.028	704.237	0.045
	Diesel	LDDV	Light-Duty Vehicles (Passenger Cars)	0.673	0.003	0.625	0.070	0.098	0.065	343.195	0.008
	Diesel	LDDT	Light-Duty Trucks (0-8,500 lbs)	0.600	0.004	0.695	0.118	0.140	0.106	410.378	0.008
	Diesel	HDDV	Heavy-Duty Vehicles (8,501 + lbs)	6.753	0.012	1.195	0.284	0.204	0.125	1302.840	0.027
	NA	MC	Motorcycles	1.618	0.003	34.876	6.378	0.023	0.011	209.626	0.053
Imperial	Gasoline	LDGV	Light-Duty Vehicles (Passenger Cars)	0.419	0.004	3.805	0.326	0.058	0.024	375.799	0.025
	Gasoline	LDGT	Light-Duty Trucks (0-8,500 lbs)	0.366	0.005	3.225	0.591	0.059	0.025	500.133	0.026
	Gasoline	HDGV	Heavy-Duty Vehicles (8,501 + lbs)	0.795	0.007	4.938	0.711	0.066	0.028	718.099	0.045
	Diesel	LDDV	Light-Duty Vehicles (Passenger Cars)	0.183	0.003	0.257	0.028	0.073	0.039	313.379	0.008
	Diesel	LDDT	Light-Duty Trucks (0-8,500 lbs)	0.319	0.004	0.306	0.042	0.083	0.049	406.402	0.008
	Diesel	HDDV	Heavy-Duty Vehicles (8,501 + lbs)	4.184	0.014	0.459	0.095	0.142	0.071	1469.211	0.027
	NA	MC	Motorcycles	1.477	0.003	27.933	5.046	0.022	0.010	207.224	0.053
Inyo	Gasoline	LDGV	Light-Duty Vehicles (Passenger Cars)	0.169	0.004	1.726	0.210	0.059	0.025	402.491	0.025
	Gasoline	LDGT	Light-Duty Trucks (0-8,500 lbs)	0.405	0.005	3.438	0.559	0.059	0.025	530.310	0.026
	Gasoline	HDGV	Heavy-Duty Vehicles (8,501 + lbs)	1.018	0.008	6.013	0.963	0.070	0.030	795.856	0.045
	Diesel	LDDV	Light-Duty Vehicles (Passenger Cars)	0.254	0.003	0.417	0.039	0.077	0.043	355.083	0.008
	Diesel	LDDT	Light-Duty Trucks (0-8,500 lbs)	0.279	0.004	0.400	0.057	0.089	0.055	434.606	0.008
	Diesel	HDDV	Heavy-Duty Vehicles (8,501 + lbs)	5.609	0.014	1.004	0.221	0.188	0.103	1443.243	0.027
	NA	MC	Motorcycles	1.608	0.003	33.689	6.284	0.023	0.011	226.939	0.053
Kern	Gasoline	LDGV	Light-Duty Vehicles (Passenger Cars)	0.112	0.004	1.236	0.152	0.058	0.025	406.105	0.025
	Gasoline	LDGT	Light-Duty Trucks (0-8,500 lbs)	0.232	0.005	2.073	0.321	0.057	0.024	519.361	0.026
	Gasoline	HDGV	Heavy-Duty Vehicles (8,501 + lbs)	0.556	0.008	3.665	0.495	0.067	0.028	796.034	0.045
	Diesel	LDDV	Light-Duty Vehicles (Passenger Cars)	0.148	0.003	0.302	0.025	0.068	0.035	356.702	0.008
	Diesel	LDDT	Light-Duty Trucks (0-8,500 lbs)	0.225	0.004	0.318	0.045	0.080	0.048	439.356	0.008
	Diesel	HDDV	Heavy-Duty Vehicles (8,501 + lbs)	5.024	0.015	0.789	0.179	0.150	0.078	1594.313	0.027
	NA	MC	Motorcycles	1.558	0.003	33.217	5.293	0.022	0.010	225.821	0.053
Kings	Gasoline	LDGV	Light-Duty Vehicles (Passenger Cars)	0.123	0.004	1.302	0.148	0.057	0.024	366.203	0.025
	Gasoline	LDGT	Light-Duty Trucks (0-8,500 lbs)	0.311	0.005	2.624	0.378	0.057	0.024	476.470	0.026
	Gasoline	HDGV	Heavy-Duty Vehicles (8,501 + lbs)	0.617	0.008	3.895	0.520	0.067	0.028	746.174	0.045
	Diesel	LDDV	Light-Duty Vehicles (Passenger Cars)	0.149	0.003	0.289	0.026	0.067	0.035	310.342	0.008
	Diesel	LDDT	Light-Duty Trucks (0-8,500 lbs)	0.279	0.004	0.360	0.047	0.082	0.050	386.580	0.008
	Diesel	HDDV	Heavy-Duty Vehicles (8,501 + lbs)	5.228	0.015	0.796	0.182	0.144	0.074	1625.211	0.027
	NA	MC	Motorcycles	1.522	0.003	29.633	5.011	0.022	0.010	207.817	0.053

Table 5-36. 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	SOx	CO	ROG	PM_{10}	$PM_{2.5}$	CO_2e	NH_3
Lake	Gasoline	LDGV	Light-Duty Vehicles (Passenger Cars)	0.227	0.004	2.304	0.276	0.055	0.023	365.031	0.025
	Gasoline	LDGT	Light-Duty Trucks (0-8,500 lbs)	0.525	0.005	4.392	0.696	0.056	0.025	489.188	0.026
	Gasoline	HDGV	Heavy-Duty Vehicles (8,501 + lbs)	1.292	0.008	7.778	1.254	0.067	0.029	739.336	0.045
	Diesel	LDDV	Light-Duty Vehicles (Passenger Cars)	0.401	0.003	0.477	0.050	0.082	0.050	325.804	0.008
	Diesel	LDDT	Light-Duty Trucks (0-8,500 lbs)	0.641	0.004	0.625	0.093	0.119	0.086	410.985	0.008
	Diesel	HDDV	Heavy-Duty Vehicles (8,501 + lbs)	6.611	0.011	1.265	0.315	0.222	0.144	1138.591	0.027
	NA	MC	Motorcycles	1.565	0.003	34.682	7.096	0.023	0.012	210.153	0.053
Lassen	Gasoline	LDGV	Light-Duty Vehicles (Passenger Cars)	0.198	0.004	2.036	0.217	0.057	0.024	396.769	0.025
	Gasoline	LDGT	Light-Duty Trucks (0-8,500 lbs)	0.487	0.005	4.230	0.618	0.058	0.025	536.127	0.026
	Gasoline	HDGV	Heavy-Duty Vehicles (8,501 + lbs)	1.253	0.008	7.519	1.177	0.068	0.030	798.777	0.045
	Diesel	LDDV	Light-Duty Vehicles (Passenger Cars)	0.279	0.003	0.477	0.042	0.074	0.041	350.987	0.008
	Diesel	LDDT	Light-Duty Trucks (0-8,500 lbs)	0.302	0.004	0.474	0.069	0.092	0.059	441.412	0.008
	Diesel	HDDV	Heavy-Duty Vehicles (8,501 + lbs)	6.790	0.010	1.402	0.308	0.225	0.138	1031.195	0.027
	NA	MC	Motorcycles	1.649	0.003	36.923	6.776	0.023	0.011	231.997	0.053
Los Angeles	Gasoline	LDGV	Light-Duty Vehicles (Passenger Cars)	0.133	0.004	1.636	0.183	0.062	0.026	439.801	0.025
	Gasoline	LDGT	Light-Duty Trucks (0-8,500 lbs)	0.233	0.005	2.314	0.279	0.059	0.025	543.330	0.026
	Gasoline	HDGV	Heavy-Duty Vehicles (8,501 + lbs)	0.524	0.008	3.773	0.427	0.068	0.029	780.189	0.045
	Diesel	LDDV	Light-Duty Vehicles (Passenger Cars)	0.216	0.004	0.476	0.053	0.089	0.053	382.374	0.008
	Diesel	LDDT	Light-Duty Trucks (0-8,500 lbs)	0.218	0.004	0.347	0.051	0.080	0.047	453.755	0.008
	Diesel	HDDV	Heavy-Duty Vehicles (8,501 + lbs)	4.436	0.012	1.072	0.164	0.178	0.094	1348.677	0.027
	NA	MC	Motorcycles	1.530	0.003	28.737	5.758	0.024	0.011	249.409	0.053
Madera	Gasoline	LDGV	Light-Duty Vehicles (Passenger Cars)	0.115	0.004	1.389	0.149	0.056	0.024	389.314	0.025
	Gasoline	LDGT	Light-Duty Trucks (0-8,500 lbs)	0.278	0.005	2.697	0.396	0.058	0.025	527.100	0.026
	Gasoline	HDGV	Heavy-Duty Vehicles (8,501 + lbs)	0.628	0.008	4.469	0.570	0.068	0.029	799.627	0.045
	Diesel	LDDV	Light-Duty Vehicles (Passenger Cars)	0.199	0.003	0.402	0.037	0.071	0.039	332.696	0.008
	Diesel	LDDT	Light-Duty Trucks (0-8,500 lbs)	0.317	0.004	0.410	0.061	0.089	0.057	424.183	0.008
	Diesel	HDDV	Heavy-Duty Vehicles (8,501 + lbs)	5.285	0.015	0.873	0.196	0.155	0.082	1540.461	0.027
	NA	MC	Motorcycles	1.494	0.003	30.680	5.227	0.022	0.010	218.907	0.053
Marin	Gasoline	LDGV	Light-Duty Vehicles (Passenger Cars)	0.129	0.004	1.409	0.178	0.060	0.025	397.755	0.025
	Gasoline	LDGT	Light-Duty Trucks (0-8,500 lbs)	0.210	0.005	1.914	0.279	0.061	0.025	525.752	0.026
	Gasoline	HDGV	Heavy-Duty Vehicles (8,501 + lbs)	0.521	0.008	3.337	0.450	0.069	0.029	761.767	0.045
	Diesel	LDDV	Light-Duty Vehicles (Passenger Cars)	0.290	0.004	0.423	0.042	0.082	0.047	378.697	0.008
	Diesel	LDDT	Light-Duty Trucks (0-8,500 lbs)	0.189	0.005	0.290	0.038	0.078	0.043	475.697	0.008
	Diesel	HDDV	Heavy-Duty Vehicles (8,501 + lbs)	6.039	0.013	1.385	0.272	0.282	0.162	1348.873	0.027
	NA	MC	Motorcycles	1.639	0.003	33.291	5.695	0.024	0.012	234.750	0.053
Mariposa	Gasoline	LDGV	Light-Duty Vehicles (Passenger Cars)	0.193	0.004	2.037	0.234	0.056	0.024	376.313	0.025
	Gasoline	LDGT	Light-Duty Trucks (0-8,500 lbs)	0.691	0.005	6.068	0.857	0.059	0.026	523.678	0.026
	Gasoline	HDGV	Heavy-Duty Vehicles (8,501 + lbs)	1.267	0.008	7.788	1.218	0.069	0.030	779.446	0.045
	Diesel	LDDV	Light-Duty Vehicles (Passenger Cars)	0.411	0.003	0.537	0.048	0.077	0.045	349.185	0.008
	Diesel	LDDT	Light-Duty Trucks (0-8,500 lbs)	0.489	0.004	0.825	0.135	0.135	0.101	413.131	0.008
	Diesel	HDDV	Heavy-Duty Vehicles (8,501 + lbs)	7.060	0.009	1.330	0.311	0.220	0.136	983.051	0.027
	NA	MC	Motorcycles	1.576	0.003	35.105	6.788	0.023	0.011	217.800	0.053
Mendocino	Gasoline	LDGV	Light-Duty Vehicles (Passenger Cars)	0.192	0.004	1.888	0.206	0.056	0.024	357.087	0.025
	Gasoline	LDGT	Light-Duty Trucks (0-8,500 lbs)	0.582	0.005	4.637	0.636	0.056	0.024	470.955	0.026
	Gasoline	HDGV	Heavy-Duty Vehicles (8,501 + lbs)	1.130	0.007	6.398	0.958	0.065	0.028	712.018	0.045
	Diesel	LDDV	Light-Duty Vehicles (Passenger Cars)	0.718	0.003	0.630	0.065	0.096	0.062	353.999	0.008
	Diesel	LDDT	Light-Duty Trucks (0-8,500 lbs)	0.918	0.004	0.872	0.167	0.183	0.147	418.686	0.008
	Diesel	HDDV	Heavy-Duty Vehicles (8,501 + lbs)	6.266	0.013	1.070	0.261	0.188	0.114	1404.869	0.027
	NA	MC	Motorcycles	1.585	0.003	33.806	6.238	0.023	0.011	207.730	0.053
Merced	Gasoline	LDGV	Light-Duty Vehicles (Passenger Cars)	0.122	0.004	1.403	0.155	0.055	0.023	375.525	0.025
	Gasoline	LDGT	Light-Duty Trucks (0-8,500 lbs)	0.278	0.005	2.552	0.363	0.057	0.024	503.351	0.026
	Gasoline	HDGV	Heavy-Duty Vehicles (8,501 + lbs)	0.626	0.008	4.339	0.527	0.067	0.028	764.876	0.045
	Diesel	LDDV	Light-Duty Vehicles (Passenger Cars)	0.227	0.003	0.361	0.034	0.070	0.039	321.537	0.008
	Diesel	LDDT	Light-Duty Trucks (0-8,500 lbs)	0.308	0.004	0.401	0.057	0.086	0.054	414.504	0.008
	Diesel	HDDV	Heavy-Duty Vehicles (8,501 + lbs)	5.305	0.015	0.817	0.188	0.151	0.079	1615.365	0.027
	NA	MC	Motorcycles	1.482	0.003	30.237	4.685	0.022	0.010	209.933	0.053

Table 5-36. 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	SOx	CO	ROG	PM_{10}	$PM_{2.5}$	CO_2e	NH_3
Modoc	Gasoline	LDGV	Light-Duty Vehicles (Passenger Cars)	0.221	0.004	2.301	0.233	0.058	0.025	446.749	0.025
	Gasoline	LDGT	Light-Duty Trucks (0-8,500 lbs)	0.555	0.006	5.110	0.668	0.060	0.026	597.392	0.026
	Gasoline	HDGV	Heavy-Duty Vehicles (8,501 + lbs)	1.449	0.009	9.224	1.384	0.070	0.031	871.061	0.045
	Diesel	LDDV	Light-Duty Vehicles (Passenger Cars)	0.323	0.004	0.691	0.068	0.089	0.056	399.382	0.008
	Diesel	LDDT	Light-Duty Trucks (0-8,500 lbs)	0.546	0.005	0.683	0.096	0.107	0.073	539.843	0.008
	Diesel	HDDV	Heavy-Duty Vehicles (8,501 + lbs)	6.801	0.010	1.302	0.297	0.214	0.130	1098.436	0.027
	NA	MC	Motorcycles	1.685	0.003	38.765	7.495	0.024	0.012	260.536	0.053
Mono	Gasoline	LDGV	Light-Duty Vehicles (Passenger Cars)	0.179	0.004	1.788	0.182	0.059	0.025	386.801	0.025
	Gasoline	LDGT	Light-Duty Trucks (0-8,500 lbs)	0.438	0.005	3.571	0.487	0.059	0.025	516.937	0.026
	Gasoline	HDGV	Heavy-Duty Vehicles (8,501 + lbs)	1.100	0.008	6.532	0.922	0.070	0.030	773.279	0.045
	Diesel	LDDV	Light-Duty Vehicles (Passenger Cars)	0.306	0.003	0.466	0.042	0.079	0.045	361.275	0.008
	Diesel	LDDT	Light-Duty Trucks (0-8,500 lbs)	0.564	0.004	0.534	0.061	0.089	0.055	455.116	0.008
	Diesel	HDDV	Heavy-Duty Vehicles (8,501 + lbs)	5.533	0.014	0.932	0.211	0.168	0.091	1484.726	0.027
	NA	MC	Motorcycles	1.767	0.003	40.520	6.452	0.023	0.011	228.149	0.053
Monterey	Gasoline	LDGV	Light-Duty Vehicles (Passenger Cars)	0.173	0.004	1.794	0.192	0.058	0.025	402.206	0.025
	Gasoline	LDGT	Light-Duty Trucks (0-8,500 lbs)	0.400	0.005	3.063	0.393	0.057	0.025	526.940	0.026
	Gasoline	HDGV	Heavy-Duty Vehicles (8,501 + lbs)	0.771	0.008	4.595	0.557	0.067	0.029	793.285	0.045
	Diesel	LDDV	Light-Duty Vehicles (Passenger Cars)	0.299	0.003	0.533	0.056	0.085	0.052	360.538	0.008
	Diesel	LDDT	Light-Duty Trucks (0-8,500 lbs)	0.476	0.004	0.621	0.134	0.142	0.107	456.312	0.008
	Diesel	HDDV	Heavy-Duty Vehicles (8,501 + lbs)	5.726	0.013	1.132	0.248	0.217	0.126	1401.090	0.027
	NA	MC	Motorcycles	1.541	0.003	30.832	4.959	0.023	0.011	230.404	0.053
Napa	Gasoline	LDGV	Light-Duty Vehicles (Passenger Cars)	0.123	0.004	1.394	0.151	0.057	0.024	364.363	0.025
	Gasoline	LDGT	Light-Duty Trucks (0-8,500 lbs)	0.254	0.005	2.377	0.324	0.060	0.025	506.491	0.026
	Gasoline	HDGV	Heavy-Duty Vehicles (8,501 + lbs)	0.658	0.008	4.275	0.548	0.070	0.030	760.947	0.045
	Diesel	LDDV	Light-Duty Vehicles (Passenger Cars)	0.243	0.003	0.354	0.037	0.077	0.044	333.883	0.008
	Diesel	LDDT	Light-Duty Trucks (0-8,500 lbs)	0.182	0.004	0.256	0.033	0.075	0.042	436.685	0.008
	Diesel	HDDV	Heavy-Duty Vehicles (8,501 + lbs)	5.572	0.013	0.952	0.217	0.179	0.101	1398.865	0.027
	NA	MC	Motorcycles	1.592	0.003	31.514	5.296	0.023	0.011	219.383	0.053
Nevada	Gasoline	LDGV	Light-Duty Vehicles (Passenger Cars)	0.164	0.004	1.685	0.184	0.056	0.024	356.376	0.025
	Gasoline	LDGT	Light-Duty Trucks (0-8,500 lbs)	0.416	0.005	3.190	0.438	0.055	0.023	476.552	0.026
	Gasoline	HDGV	Heavy-Duty Vehicles (8,501 + lbs)	0.858	0.007	5.476	0.692	0.063	0.027	690.623	0.045
	Diesel	LDDV	Light-Duty Vehicles (Passenger Cars)	0.418	0.003	0.470	0.053	0.087	0.054	338.305	0.008
	Diesel	LDDT	Light-Duty Trucks (0-8,500 lbs)	0.626	0.004	0.542	0.070	0.099	0.066	417.219	0.008
	Diesel	HDDV	Heavy-Duty Vehicles (8,501 + lbs)	5.763	0.013	0.979	0.229	0.167	0.096	1393.896	0.027
	NA	MC	Motorcycles	1.632	0.003	35.818	6.819	0.023	0.012	206.310	0.053
Orange	Gasoline	LDGV	Light-Duty Vehicles (Passenger Cars)	0.110	0.004	1.347	0.158	0.062	0.026	409.253	0.025
	Gasoline	LDGT	Light-Duty Trucks (0-8,500 lbs)	0.181	0.005	1.841	0.239	0.061	0.026	530.348	0.026
	Gasoline	HDGV	Heavy-Duty Vehicles (8,501 + lbs)	0.486	0.008	3.322	0.408	0.069	0.029	763.234	0.045
	Diesel	LDDV	Light-Duty Vehicles (Passenger Cars)	0.150	0.003	0.347	0.033	0.076	0.041	358.331	0.008
	Diesel	LDDT	Light-Duty Trucks (0-8,500 lbs)	0.134	0.004	0.246	0.033	0.072	0.038	451.639	0.008
	Diesel	HDDV	Heavy-Duty Vehicles (8,501 + lbs)	3.783	0.011	0.872	0.131	0.178	0.095	1200.048	0.027
	NA	MC	Motorcycles	1.531	0.003	28.317	5.621	0.024	0.011	237.262	0.053
Placer	Gasoline	LDGV	Light-Duty Vehicles (Passenger Cars)	0.118	0.004	1.372	0.153	0.059	0.025	375.933	0.025
	Gasoline	LDGT	Light-Duty Trucks (0-8,500 lbs)	0.206	0.005	1.983	0.266	0.058	0.024	486.277	0.026
	Gasoline	HDGV	Heavy-Duty Vehicles (8,501 + lbs)	0.535	0.007	3.626	0.463	0.066	0.028	734.630	0.045
	Diesel	LDDV	Light-Duty Vehicles (Passenger Cars)	0.244	0.003	0.340	0.034	0.076	0.042	335.555	0.008
	Diesel	LDDT	Light-Duty Trucks (0-8,500 lbs)	0.256	0.004	0.297	0.044	0.080	0.047	411.235	0.008
	Diesel	HDDV	Heavy-Duty Vehicles (8,501 + lbs)	4.732	0.013	0.842	0.195	0.169	0.093	1358.054	0.027
	NA	MC	Motorcycles	1.591	0.003	32.687	5.780	0.023	0.011	212.983	0.053
Plumas	Gasoline	LDGV	Light-Duty Vehicles (Passenger Cars)	0.205	0.004	2.203	0.238	0.059	0.025	417.453	0.025
	Gasoline	LDGT	Light-Duty Trucks (0-8,500 lbs)	0.604	0.006	5.442	0.709	0.058	0.026	562.093	0.026
	Gasoline	HDGV	Heavy-Duty Vehicles (8,501 + lbs)	1.464	0.008	9.386	1.312	0.068	0.030	804.227	0.045
	Diesel	LDDV	Light-Duty Vehicles (Passenger Cars)	0.349	0.004	0.632	0.056	0.082	0.048	387.085	0.008
	Diesel	LDDT	Light-Duty Trucks (0-8,500 lbs)	0.312	0.005	0.519	0.075	0.091	0.059	475.774	0.008
	Diesel	HDDV	Heavy-Duty Vehicles (8,501 + lbs)	6.634	0.011	1.224	0.282	0.202	0.127	1140.951	0.027
	NA	MC	Motorcycles	1.637	0.003	37.885	7.542	0.024	0.012	240.175	0.053

Table 5-36. 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	SOx	CO	ROG	PM_{10}	$PM_{2.5}$	CO_2e	NH_3
Riverside	Gasoline	LDGV	Light-Duty Vehicles (Passenger Cars)	0.109	0.004	1.278	0.152	0.058	0.024	376.818	0.025
	Gasoline	LDGT	Light-Duty Trucks (0-8,500 lbs)	0.204	0.005	1.973	0.281	0.058	0.025	489.003	0.026
	Gasoline	HDGV	Heavy-Duty Vehicles (8,501 + lbs)	0.515	0.007	3.470	0.445	0.066	0.028	711.047	0.045
	Diesel	LDDV	Light-Duty Vehicles (Passenger Cars)	0.161	0.003	0.267	0.025	0.069	0.036	325.007	0.008
	Diesel	LDDT	Light-Duty Trucks (0-8,500 lbs)	0.159	0.004	0.231	0.033	0.072	0.040	404.344	0.008
	Diesel	HDDV	Heavy-Duty Vehicles (8,501 + lbs)	4.213	0.013	0.617	0.105	0.151	0.077	1394.415	0.027
	NA	MC	Motorcycles	1.523	0.003	29.414	5.403	0.023	0.010	219.243	0.053
Sacramento	Gasoline	LDGV	Light-Duty Vehicles (Passenger Cars)	0.125	0.004	1.494	0.170	0.057	0.024	381.122	0.025
	Gasoline	LDGT	Light-Duty Trucks (0-8,500 lbs)	0.226	0.005	2.207	0.302	0.057	0.024	493.800	0.026
	Gasoline	HDGV	Heavy-Duty Vehicles (8,501 + lbs)	0.593	0.008	4.000	0.506	0.068	0.029	759.507	0.045
	Diesel	LDDV	Light-Duty Vehicles (Passenger Cars)	0.212	0.003	0.345	0.035	0.074	0.042	324.862	0.008
	Diesel	LDDT	Light-Duty Trucks (0-8,500 lbs)	0.554	0.004	0.549	0.074	0.099	0.065	429.755	0.008
	Diesel	HDDV	Heavy-Duty Vehicles (8,501 + lbs)	5.343	0.012	1.204	0.217	0.190	0.106	1345.286	0.027
	NA	MC	Motorcycles	1.504	0.003	29.932	5.567	0.022	0.010	213.696	0.053
San Benito	Gasoline	LDGV	Light-Duty Vehicles (Passenger Cars)	0.142	0.004	1.455	0.149	0.059	0.025	367.911	0.025
	Gasoline	LDGT	Light-Duty Trucks (0-8,500 lbs)	0.297	0.005	2.367	0.344	0.058	0.025	477.485	0.026
	Gasoline	HDGV	Heavy-Duty Vehicles (8,501 + lbs)	0.704	0.007	4.236	0.562	0.067	0.028	737.921	0.045
	Diesel	LDDV	Light-Duty Vehicles (Passenger Cars)	0.330	0.003	0.400	0.036	0.076	0.042	345.254	0.008
	Diesel	LDDT	Light-Duty Trucks (0-8,500 lbs)	0.103	0.004	0.211	0.029	0.068	0.035	421.066	0.008
	Diesel	HDDV	Heavy-Duty Vehicles (8,501 + lbs)	5.512	0.016	0.862	0.205	0.156	0.085	1637.965	0.027
	NA	MC	Motorcycles	1.602	0.003	32.143	5.151	0.023	0.011	211.187	0.053
San Bernardino	Gasoline	LDGV	Light-Duty Vehicles (Passenger Cars)	0.120	0.004	1.345	0.150	0.057	0.024	374.116	0.025
	Gasoline	LDGT	Light-Duty Trucks (0-8,500 lbs)	0.245	0.005	2.227	0.302	0.057	0.024	484.357	0.026
	Gasoline	HDGV	Heavy-Duty Vehicles (8,501 + lbs)	0.554	0.007	3.663	0.447	0.064	0.027	700.835	0.045
	Diesel	LDDV	Light-Duty Vehicles (Passenger Cars)	0.158	0.003	0.287	0.027	0.070	0.037	323.918	0.008
	Diesel	LDDT	Light-Duty Trucks (0-8,500 lbs)	0.207	0.004	0.278	0.040	0.076	0.044	399.673	0.008
	Diesel	HDDV	Heavy-Duty Vehicles (8,501 + lbs)	4.257	0.013	0.704	0.118	0.153	0.078	1404.706	0.027
	NA	MC	Motorcycles	1.711	0.003	34.113	5.425	0.025	0.011	239.678	0.053
San Diego	Gasoline	LDGV	Light-Duty Vehicles (Passenger Cars)	0.144	0.004	1.492	0.166	0.060	0.025	405.256	0.025
	Gasoline	LDGT	Light-Duty Trucks (0-8,500 lbs)	0.219	0.005	2.045	0.293	0.061	0.026	545.980	0.026
	Gasoline	HDGV	Heavy-Duty Vehicles (8,501 + lbs)	0.503	0.008	3.342	0.425	0.070	0.030	795.253	0.045
	Diesel	LDDV	Light-Duty Vehicles (Passenger Cars)	0.186	0.004	0.359	0.034	0.076	0.042	370.475	0.008
	Diesel	LDDT	Light-Duty Trucks (0-8,500 lbs)	0.270	0.005	0.383	0.053	0.089	0.054	475.183	0.008
	Diesel	HDDV	Heavy-Duty Vehicles (8,501 + lbs)	4.926	0.013	1.184	0.208	0.188	0.102	1378.826	0.027
	NA	MC	Motorcycles	1.587	0.003	31.613	5.424	0.023	0.011	241.459	0.053
San Francisco	Gasoline	LDGV	Light-Duty Vehicles (Passenger Cars)	0.125	0.004	1.487	0.178	0.062	0.027	443.031	0.025
	Gasoline	LDGT	Light-Duty Trucks (0-8,500 lbs)	0.182	0.006	1.822	0.244	0.062	0.026	568.073	0.026
	Gasoline	HDGV	Heavy-Duty Vehicles (8,501 + lbs)	0.529	0.008	3.418	0.440	0.075	0.032	828.492	0.045
	Diesel	LDDV	Light-Duty Vehicles (Passenger Cars)	0.182	0.004	0.500	0.040	0.077	0.041	407.537	0.008
	Diesel	LDDT	Light-Duty Trucks (0-8,500 lbs)	0.201	0.005	0.378	0.047	0.077	0.041	509.817	0.008
	Diesel	HDDV	Heavy-Duty Vehicles (8,501 + lbs)	5.921	0.013	1.501	0.277	0.294	0.170	1432.410	0.027
	NA	MC	Motorcycles	1.654	0.003	33.515	6.637	0.025	0.012	260.387	0.053
San Joaquin	Gasoline	LDGV	Light-Duty Vehicles (Passenger Cars)	0.121	0.004	1.331	0.157	0.057	0.024	376.785	0.025
	Gasoline	LDGT	Light-Duty Trucks (0-8,500 lbs)	0.240	0.005	2.133	0.307	0.056	0.024	489.646	0.026
	Gasoline	HDGV	Heavy-Duty Vehicles (8,501 + lbs)	0.572	0.007	3.779	0.492	0.065	0.027	740.149	0.045
	Diesel	LDDV	Light-Duty Vehicles (Passenger Cars)	0.210	0.003	0.296	0.030	0.072	0.040	328.053	0.008
	Diesel	LDDT	Light-Duty Trucks (0-8,500 lbs)	0.282	0.004	0.325	0.044	0.081	0.049	406.322	0.008
	Diesel	HDDV	Heavy-Duty Vehicles (8,501 + lbs)	5.134	0.014	0.914	0.202	0.167	0.091	1471.549	0.027
	NA	MC	Motorcycles	1.549	0.003	32.376	5.260	0.022	0.010	215.304	0.053
San Luis Obispo	Gasoline	LDGV	Light-Duty Vehicles (Passenger Cars)	0.139	0.004	1.419	0.160	0.057	0.024	359.038	0.025
	Gasoline	LDGT	Light-Duty Trucks (0-8,500 lbs)	0.358	0.005	2.755	0.375	0.057	0.024	482.443	0.026
	Gasoline	HDGV	Heavy-Duty Vehicles (8,501 + lbs)	0.732	0.007	4.410	0.578	0.068	0.029	729.346	0.045
	Diesel	LDDV	Light-Duty Vehicles (Passenger Cars)	0.270	0.003	0.366	0.036	0.076	0.043	341.026	0.008
	Diesel	LDDT	Light-Duty Trucks (0-8,500 lbs)	0.360	0.004	0.437	0.064	0.097	0.064	415.762	0.008
	Diesel	HDDV	Heavy-Duty Vehicles (8,501 + lbs)	6.230	0.012	1.187	0.273	0.213	0.130	1274.002	0.027
	NA	MC	Motorcycles	1.661	0.003	33.856	6.573	0.024	0.012	219.705	0.053

Table 5-36. 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	SOx	CO	ROG	PM_{10}	$PM_{2.5}$	CO_2e	NH_3
San Mateo	Gasoline	LDGV	Light-Duty Vehicles (Passenger Cars)	0.137	0.004	1.574	0.202	0.069	0.029	438.136	0.025
	Gasoline	LDGT	Light-Duty Trucks (0-8,500 lbs)	0.155	0.005	1.482	0.202	0.060	0.025	486.083	0.026
	Gasoline	HDGV	Heavy-Duty Vehicles (8,501 + lbs)	0.416	0.007	2.717	0.357	0.068	0.029	715.255	0.045
	Diesel	LDDV	Light-Duty Vehicles (Passenger Cars)	0.224	0.004	0.367	0.037	0.089	0.049	406.171	0.008
	Diesel	LDDT	Light-Duty Trucks (0-8,500 lbs)	0.117	0.004	0.191	0.026	0.069	0.035	434.115	0.008
	Diesel	HDDV	Heavy-Duty Vehicles (8,501 + lbs)	4.122	0.011	0.986	0.195	0.229	0.127	1228.046	0.027
	NA	MC	Motorcycles	1.560	0.003	28.238	4.548	0.023	0.011	228.373	0.053
Santa Barbara	Gasoline	LDGV	Light-Duty Vehicles (Passenger Cars)	0.155	0.004	1.556	0.182	0.058	0.024	354.493	0.025
	Gasoline	LDGT	Light-Duty Trucks (0-8,500 lbs)	0.370	0.005	2.749	0.393	0.057	0.024	464.342	0.026
	Gasoline	HDGV	Heavy-Duty Vehicles (8,501 + lbs)	0.742	0.007	4.444	0.573	0.074	0.031	715.534	0.045
	Diesel	LDDV	Light-Duty Vehicles (Passenger Cars)	0.243	0.003	0.320	0.031	0.073	0.040	332.102	0.008
	Diesel	LDDT	Light-Duty Trucks (0-8,500 lbs)	0.306	0.004	0.343	0.052	0.088	0.056	396.107	0.008
	Diesel	HDDV	Heavy-Duty Vehicles (8,501 + lbs)	5.851	0.013	1.199	0.250	0.241	0.143	1376.321	0.027
	NA	MC	Motorcycles	1.595	0.003	30.326	5.032	0.023	0.011	208.089	0.053
Santa Clara	Gasoline	LDGV	Light-Duty Vehicles (Passenger Cars)	0.120	0.004	1.383	0.161	0.059	0.025	381.163	0.025
	Gasoline	LDGT	Light-Duty Trucks (0-8,500 lbs)	0.217	0.005	2.043	0.276	0.059	0.025	502.244	0.026
	Gasoline	HDGV	Heavy-Duty Vehicles (8,501 + lbs)	0.530	0.007	3.535	0.448	0.067	0.028	721.775	0.045
	Diesel	LDDV	Light-Duty Vehicles (Passenger Cars)	0.171	0.003	0.297	0.027	0.071	0.038	339.037	0.008
	Diesel	LDDT	Light-Duty Trucks (0-8,500 lbs)	0.176	0.004	0.254	0.037	0.076	0.043	428.615	0.008
	Diesel	HDDV	Heavy-Duty Vehicles (8,501 + lbs)	5.056	0.013	0.928	0.205	0.192	0.107	1398.904	0.027
	NA	MC	Motorcycles	1.573	0.003	29.553	5.226	0.023	0.011	225.463	0.053
Santa Cruz	Gasoline	LDGV	Light-Duty Vehicles (Passenger Cars)	0.182	0.004	1.894	0.197	0.056	0.024	379.326	0.025
	Gasoline	LDGT	Light-Duty Trucks (0-8,500 lbs)	0.449	0.005	3.477	0.466	0.058	0.025	516.618	0.026
	Gasoline	HDGV	Heavy-Duty Vehicles (8,501 + lbs)	0.820	0.008	5.019	0.612	0.068	0.029	761.082	0.045
	Diesel	LDDV	Light-Duty Vehicles (Passenger Cars)	0.468	0.003	0.591	0.065	0.093	0.060	362.293	0.008
	Diesel	LDDT	Light-Duty Trucks (0-8,500 lbs)	0.482	0.004	0.528	0.094	0.119	0.085	434.132	0.008
	Diesel	HDDV	Heavy-Duty Vehicles (8,501 + lbs)	6.852	0.012	1.420	0.321	0.282	0.178	1326.024	0.027
	NA	MC	Motorcycles	1.627	0.003	33.732	6.651	0.024	0.012	229.826	0.053
Shasta	Gasoline	LDGV	Light-Duty Vehicles (Passenger Cars)	0.149	0.004	1.593	0.179	0.056	0.024	380.801	0.025
	Gasoline	LDGT	Light-Duty Trucks (0-8,500 lbs)	0.365	0.005	3.010	0.438	0.059	0.025	526.921	0.026
	Gasoline	HDGV	Heavy-Duty Vehicles (8,501 + lbs)	0.831	0.008	5.396	0.750	0.071	0.030	800.125	0.045
	Diesel	LDDV	Light-Duty Vehicles (Passenger Cars)	0.293	0.003	0.425	0.043	0.078	0.045	334.634	0.008
	Diesel	LDDT	Light-Duty Trucks (0-8,500 lbs)	0.404	0.004	0.491	0.074	0.102	0.068	438.112	0.008
	Diesel	HDDV	Heavy-Duty Vehicles (8,501 + lbs)	5.910	0.014	0.971	0.229	0.173	0.099	1485.684	0.027
	NA	MC	Motorcycles	1.606	0.003	34.697	6.843	0.023	0.011	223.590	0.053
Sierra	Gasoline	LDGV	Light-Duty Vehicles (Passenger Cars)	0.202	0.004	2.112	0.216	0.061	0.026	446.067	0.025
	Gasoline	LDGT	Light-Duty Trucks (0-8,500 lbs)	0.514	0.006	4.505	0.573	0.060	0.026	583.356	0.026
	Gasoline	HDGV	Heavy-Duty Vehicles (8,501 + lbs)	1.243	0.009	7.788	1.080	0.069	0.031	841.926	0.045
	Diesel	LDDV	Light-Duty Vehicles (Passenger Cars)	0.197	0.004	0.597	0.051	0.079	0.044	394.196	0.008
	Diesel	LDDT	Light-Duty Trucks (0-8,500 lbs)	0.308	0.005	0.622	0.095	0.103	0.069	476.891	0.008
	Diesel	HDDV	Heavy-Duty Vehicles (8,501 + lbs)	6.751	0.010	1.387	0.301	0.211	0.127	1094.375	0.027
	NA	MC	Motorcycles	1.687	0.003	38.067	7.049	0.024	0.012	255.784	0.053
Siskiyou	Gasoline	LDGV	Light-Duty Vehicles (Passenger Cars)	0.199	0.004	2.024	0.211	0.058	0.025	419.574	0.025
	Gasoline	LDGT	Light-Duty Trucks (0-8,500 lbs)	0.511	0.006	4.342	0.604	0.059	0.026	557.780	0.026
	Gasoline	HDGV	Heavy-Duty Vehicles (8,501 + lbs)	1.198	0.008	7.454	1.095	0.070	0.030	814.372	0.045
	Diesel	LDDV	Light-Duty Vehicles (Passenger Cars)	0.339	0.004	0.589	0.054	0.083	0.049	381.747	0.008
	Diesel	LDDT	Light-Duty Trucks (0-8,500 lbs)	0.506	0.005	0.696	0.108	0.123	0.088	478.735	0.008
	Diesel	HDDV	Heavy-Duty Vehicles (8,501 + lbs)	5.739	0.015	0.962	0.222	0.166	0.093	1570.867	0.027
	NA	MC	Motorcycles	1.690	0.003	38.811	7.095	0.024	0.012	243.401	0.053
Solano	Gasoline	LDGV	Light-Duty Vehicles (Passenger Cars)	0.123	0.004	1.327	0.160	0.059	0.025	400.555	0.025
	Gasoline	LDGT	Light-Duty Trucks (0-8,500 lbs)	0.225	0.005	2.022	0.294	0.060	0.025	532.932	0.026
	Gasoline	HDGV	Heavy-Duty Vehicles (8,501 + lbs)	0.570	0.008	3.650	0.489	0.069	0.029	792.306	0.045
	Diesel	LDDV	Light-Duty Vehicles (Passenger Cars)	0.202	0.003	0.344	0.033	0.074	0.041	359.914	0.008
	Diesel	LDDT	Light-Duty Trucks (0-8,500 lbs)	0.269	0.004	0.343	0.044	0.082	0.048	456.191	0.008
	Diesel	HDDV	Heavy-Duty Vehicles (8,501 + lbs)	5.225	0.014	0.982	0.206	0.173	0.093	1480.725	0.027
	NA	MC	Motorcycles	1.623	0.003	34.736	5.345	0.023	0.011	234.333	0.053

Table 5-36. 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	SOx	CO	ROG	PM_{10}	$PM_{2.5}$	CO_2e	NH_3
Sonoma	Gasoline	LDGV	Light-Duty Vehicles (Passenger Cars)	0.155	0.004	1.556	0.182	0.058	0.024	354.493	0.025
	Gasoline	LDGT	Light-Duty Trucks (0-8,500 lbs)	0.370	0.005	2.749	0.393	0.057	0.024	464.342	0.026
	Gasoline	HDGV	Heavy-Duty Vehicles (8,501 + lbs)	0.742	0.007	4.444	0.573	0.074	0.031	715.534	0.045
	Diesel	LDDV	Light-Duty Vehicles (Passenger Cars)	0.243	0.003	0.320	0.031	0.073	0.040	332.102	0.008
	Diesel	LDDT	Light-Duty Trucks (0-8,500 lbs)	0.306	0.004	0.343	0.052	0.088	0.056	396.107	0.008
	Diesel	HDDV	Heavy-Duty Vehicles (8,501 + lbs)	5.851	0.013	1.199	0.250	0.241	0.143	1376.321	0.027
	NA	MC	Motorcycles	1.595	0.003	30.326	5.032	0.023	0.011	208.089	0.053
Stanislaus	Gasoline	LDGV	Light-Duty Vehicles (Passenger Cars)	0.123	0.004	1.430	0.162	0.056	0.023	382.571	0.025
	Gasoline	LDGT	Light-Duty Trucks (0-8,500 lbs)	0.258	0.005	2.438	0.350	0.057	0.024	508.111	0.026
	Gasoline	HDGV	Heavy-Duty Vehicles (8,501 + lbs)	0.612	0.008	4.207	0.545	0.066	0.028	767.218	0.045
	Diesel	LDDV	Light-Duty Vehicles (Passenger Cars)	0.205	0.003	0.371	0.034	0.070	0.038	322.300	0.008
	Diesel	LDDT	Light-Duty Trucks (0-8,500 lbs)	0.236	0.004	0.348	0.051	0.080	0.048	411.470	0.008
	Diesel	HDDV	Heavy-Duty Vehicles (8,501 + lbs)	5.101	0.014	0.840	0.195	0.159	0.087	1466.261	0.027
	NA	MC	Motorcycles	1.534	0.003	32.662	6.035	0.022	0.011	219.250	0.053
Sutter	Gasoline	LDGV	Light-Duty Vehicles (Passenger Cars)	0.128	0.003	1.379	0.151	0.055	0.023	343.855	0.025
	Gasoline	LDGT	Light-Duty Trucks (0-8,500 lbs)	0.335	0.005	2.724	0.401	0.057	0.024	468.451	0.026
	Gasoline	HDGV	Heavy-Duty Vehicles (8,501 + lbs)	0.709	0.007	4.510	0.603	0.065	0.028	722.414	0.045
	Diesel	LDDV	Light-Duty Vehicles (Passenger Cars)	0.166	0.003	0.250	0.021	0.062	0.031	294.806	0.008
	Diesel	LDDT	Light-Duty Trucks (0-8,500 lbs)	0.278	0.004	0.311	0.052	0.088	0.055	373.672	0.008
	Diesel	HDDV	Heavy-Duty Vehicles (8,501 + lbs)	4.984	0.014	0.798	0.190	0.153	0.083	1489.429	0.027
	NA	MC	Motorcycles	1.553	0.003	30.405	6.733	0.023	0.011	206.826	0.053
Tehama	Gasoline	LDGV	Light-Duty Vehicles (Passenger Cars)	0.149	0.004	1.532	0.164	0.057	0.024	379.359	0.025
	Gasoline	LDGT	Light-Duty Trucks (0-8,500 lbs)	0.406	0.005	3.278	0.457	0.059	0.025	521.555	0.026
	Gasoline	HDGV	Heavy-Duty Vehicles (8,501 + lbs)	0.814	0.008	5.294	0.701	0.069	0.029	786.707	0.045
	Diesel	LDDV	Light-Duty Vehicles (Passenger Cars)	0.277	0.003	0.415	0.039	0.075	0.043	337.323	0.008
	Diesel	LDDT	Light-Duty Trucks (0-8,500 lbs)	0.537	0.004	0.640	0.094	0.122	0.087	443.706	0.008
	Diesel	HDDV	Heavy-Duty Vehicles (8,501 + lbs)	5.721	0.015	0.929	0.217	0.162	0.090	1537.447	0.027
	NA	MC	Motorcycles	1.632	0.003	34.917	6.386	0.023	0.011	225.300	0.053
Trinity	Gasoline	LDGV	Light-Duty Vehicles (Passenger Cars)	0.226	0.004	2.369	0.245	0.057	0.025	444.112	0.025
	Gasoline	LDGT	Light-Duty Trucks (0-8,500 lbs)	0.798	0.006	6.871	0.838	0.060	0.027	605.049	0.026
	Gasoline	HDGV	Heavy-Duty Vehicles (8,501 + lbs)	1.442	0.009	9.131	1.314	0.069	0.031	863.084	0.045
	Diesel	LDDV	Light-Duty Vehicles (Passenger Cars)	0.523	0.004	0.837	0.100	0.114	0.080	400.475	0.008
	Diesel	LDDT	Light-Duty Trucks (0-8,500 lbs)	0.824	0.005	1.299	0.261	0.244	0.205	513.450	0.008
	Diesel	HDDV	Heavy-Duty Vehicles (8,501 + lbs)	6.245	0.014	1.045	0.245	0.172	0.100	1494.079	0.027
	NA	MC	Motorcycles	1.640	0.003	40.763	8.209	0.025	0.013	257.805	0.053
Tulare	Gasoline	LDGV	Light-Duty Vehicles (Passenger Cars)	0.111	0.004	1.267	0.148	0.055	0.023	354.134	0.025
	Gasoline	LDGT	Light-Duty Trucks (0-8,500 lbs)	0.274	0.005	2.507	0.384	0.056	0.024	471.911	0.026
	Gasoline	HDGV	Heavy-Duty Vehicles (8,501 + lbs)	0.597	0.007	4.155	0.525	0.063	0.027	720.410	0.045
	Diesel	LDDV	Light-Duty Vehicles (Passenger Cars)	0.158	0.003	0.244	0.025	0.066	0.035	295.962	0.008
	Diesel	LDDT	Light-Duty Trucks (0-8,500 lbs)	0.372	0.004	0.422	0.064	0.094	0.062	381.156	0.008
	Diesel	HDDV	Heavy-Duty Vehicles (8,501 + lbs)	5.164	0.014	0.867	0.198	0.163	0.088	1489.428	0.027
	NA	MC	Motorcycles	1.528	0.003	30.689	5.654	0.022	0.010	206.559	0.053
Tuolumne	Gasoline	LDGV	Light-Duty Vehicles (Passenger Cars)	0.223	0.004	2.291	0.249	0.056	0.024	378.392	0.025
	Gasoline	LDGT	Light-Duty Trucks (0-8,500 lbs)	0.639	0.005	5.605	0.754	0.058	0.026	515.499	0.026
	Gasoline	HDGV	Heavy-Duty Vehicles (8,501 + lbs)	1.249	0.008	7.425	1.112	0.067	0.029	764.726	0.045
	Diesel	LDDV	Light-Duty Vehicles (Passenger Cars)	0.350	0.003	0.491	0.050	0.081	0.049	337.242	0.008
	Diesel	LDDT	Light-Duty Trucks (0-8,500 lbs)	0.461	0.004	0.559	0.077	0.097	0.065	412.547	0.008
	Diesel	HDDV	Heavy-Duty Vehicles (8,501 + lbs)	6.559	0.010	1.233	0.289	0.218	0.134	1054.179	0.027
	NA	MC	Motorcycles	1.571	0.003	35.426	6.927	0.023	0.012	215.356	0.053
Ventura	Gasoline	LDGV	Light-Duty Vehicles (Passenger Cars)	0.119	0.004	1.389	0.159	0.059	0.025	384.821	0.025
	Gasoline	LDGT	Light-Duty Trucks (0-8,500 lbs)	0.217	0.005	2.113	0.292	0.061	0.026	518.167	0.026
	Gasoline	HDGV	Heavy-Duty Vehicles (8,501 + lbs)	0.563	0.008	3.755	0.481	0.070	0.029	756.613	0.045
	Diesel	LDDV	Light-Duty Vehicles (Passenger Cars)	0.202	0.003	0.368	0.037	0.077	0.043	346.828	0.008
	Diesel	LDDT	Light-Duty Trucks (0-8,500 lbs)	0.232	0.004	0.321	0.046	0.082	0.047	446.142	0.008
	Diesel	HDDV	Heavy-Duty Vehicles (8,501 + lbs)	4.442	0.011	0.848	0.142	0.170	0.094	1186.828	0.027
	NA	MC	Motorcycles	1.622	0.003	32.011	6.864	0.024	0.012	237.718	0.053

Table 5-36. 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	SOx	CO	ROG	PM_{10}	$PM_{2.5}$	CO_2e	NH_3
Yolo	Gasoline	LDGV	Light-Duty Vehicles (Passenger Cars)	0.125	0.004	1.397	0.164	0.057	0.024	376.805	0.025
	Gasoline	LDGT	Light-Duty Trucks (0-8,500 lbs)	0.206	0.005	1.910	0.277	0.057	0.024	491.636	0.026
	Gasoline	HDGV	Heavy-Duty Vehicles (8,501 + lbs)	0.552	0.008	3.614	0.474	0.067	0.028	746.201	0.045
	Diesel	LDDV	Light-Duty Vehicles (Passenger Cars)	0.314	0.003	0.385	0.041	0.079	0.047	337.611	0.008
	Diesel	LDDT	Light-Duty Trucks (0-8,500 lbs)	0.311	0.004	0.345	0.046	0.084	0.051	424.531	0.008
	Diesel	HDDV	Heavy-Duty Vehicles (8,501 + lbs)	4.079	0.012	0.816	0.171	0.168	0.091	1296.856	0.027
	NA	MC	Motorcycles	1.545	0.003	32.147	5.447	0.022	0.011	213.436	0.053
Yuba	Gasoline	LDGV	Light-Duty Vehicles (Passenger Cars)	0.132	0.004	1.403	0.148	0.055	0.023	353.580	0.025
	Gasoline	LDGT	Light-Duty Trucks (0-8,500 lbs)	0.425	0.005	3.413	0.469	0.058	0.025	496.905	0.026
	Gasoline	HDGV	Heavy-Duty Vehicles (8,501 + lbs)	0.863	0.008	5.649	0.717	0.068	0.029	746.851	0.045
	Diesel	LDDV	Light-Duty Vehicles (Passenger Cars)	0.200	0.003	0.303	0.028	0.067	0.036	310.513	0.008
	Diesel	LDDT	Light-Duty Trucks (0-8,500 lbs)	0.335	0.004	0.348	0.055	0.091	0.058	389.397	0.008
	Diesel	HDDV	Heavy-Duty Vehicles (8,501 + lbs)	6.577	0.012	1.248	0.285	0.230	0.138	1209.849	0.027
	NA	MC	Motorcycles	1.562	0.003	31.953	5.833	0.023	0.011	209.550	0.053

Table 5-37. EMFAC County-Specific On-Road Vehicle EFs – 2019

County	Fuel Type	Vehicle Type		Emission Factors (g/mi)							
				Criteria Pollutants and Ozone Precursors							
				NO_X	SOx	CO	ROG	PM_{10}	$PM_{2.5}$	CO_2e	NH_3
Alameda	Gasoline	LDGV	Light-Duty Vehicles (Passenger Cars)	0.109	0.003	1.239	0.145	0.053	0.022	341.832	0.024
	Gasoline	LDGT	Light-Duty Trucks (0-8,500 lbs)	0.171	0.004	1.616	0.221	0.053	0.022	444.696	0.025
	Gasoline	HDGV	Heavy-Duty Vehicles (8,501 + lbs)	0.465	0.007	3.045	0.387	0.061	0.026	662.446	0.045
	Diesel	LDDV	Light-Duty Vehicles (Passenger Cars)	0.215	0.003	0.346	0.034	0.071	0.040	316.513	0.008
	Diesel	LDDT	Light-Duty Trucks (0-8,500 lbs)	0.186	0.004	0.268	0.039	0.073	0.042	396.059	0.008
	Diesel	HDDV	Heavy-Duty Vehicles (8,501 + lbs)	4.905	0.014	0.912	0.191	0.179	0.097	1451.184	0.027
	NA	MC	Motorcycles	1.408	0.003	27.336	4.713	0.021	0.010	204.850	0.053
Alpine	Gasoline	LDGV	Light-Duty Vehicles (Passenger Cars)	0.149	0.003	1.566	0.156	0.053	0.022	318.033	0.024
	Gasoline	LDGT	Light-Duty Trucks (0-8,500 lbs)	0.327	0.004	2.780	0.373	0.053	0.022	419.626	0.025
	Gasoline	HDGV	Heavy-Duty Vehicles (8,501 + lbs)	0.904	0.007	5.304	0.758	0.063	0.027	656.770	0.045
	Diesel	LDDV	Light-Duty Vehicles (Passenger Cars)	0.201	0.003	0.333	0.030	0.067	0.036	294.608	0.008
	Diesel	LDDT	Light-Duty Trucks (0-8,500 lbs)	0.193	0.004	0.272	0.039	0.071	0.040	366.826	0.008
	Diesel	HDDV	Heavy-Duty Vehicles (8,501 + lbs)	4.758	0.014	0.810	0.174	0.151	0.077	1482.589	0.027
	NA	MC	Motorcycles	1.547	0.003	31.593	5.258	0.021	0.010	195.223	0.053
Amador	Gasoline	LDGV	Light-Duty Vehicles (Passenger Cars)	0.161	0.003	1.650	0.193	0.051	0.021	296.315	0.024
	Gasoline	LDGT	Light-Duty Trucks (0-8,500 lbs)	0.422	0.004	3.607	0.584	0.052	0.022	401.875	0.025
	Gasoline	HDGV	Heavy-Duty Vehicles (8,501 + lbs)	1.002	0.006	5.912	0.987	0.063	0.027	638.684	0.045
	Diesel	LDDV	Light-Duty Vehicles (Passenger Cars)	0.288	0.003	0.287	0.029	0.067	0.037	271.498	0.008
	Diesel	LDDT	Light-Duty Trucks (0-8,500 lbs)	0.195	0.003	0.275	0.039	0.072	0.042	327.509	0.008
	Diesel	HDDV	Heavy-Duty Vehicles (8,501 + lbs)	5.802	0.010	1.046	0.247	0.192	0.116	1058.722	0.027
	NA	MC	Motorcycles	1.416	0.002	28.116	5.228	0.020	0.010	173.595	0.053
Butte	Gasoline	LDGV	Light-Duty Vehicles (Passenger Cars)	0.131	0.003	1.416	0.154	0.050	0.021	327.867	0.024
	Gasoline	LDGT	Light-Duty Trucks (0-8,500 lbs)	0.382	0.005	3.155	0.431	0.052	0.023	453.138	0.025
	Gasoline	HDGV	Heavy-Duty Vehicles (8,501 + lbs)	0.729	0.007	4.860	0.639	0.062	0.027	685.016	0.045
	Diesel	LDDV	Light-Duty Vehicles (Passenger Cars)	0.254	0.003	0.349	0.038	0.071	0.042	299.946	0.008
	Diesel	LDDT	Light-Duty Trucks (0-8,500 lbs)	0.510	0.004	0.509	0.086	0.113	0.082	393.860	0.008
	Diesel	HDDV	Heavy-Duty Vehicles (8,501 + lbs)	5.202	0.013	0.923	0.204	0.163	0.090	1413.640	0.027
	NA	MC	Motorcycles	1.406	0.003	29.113	6.022	0.021	0.010	195.108	0.053
Calaveras	Gasoline	LDGV	Light-Duty Vehicles (Passenger Cars)	0.163	0.003	1.747	0.191	0.052	0.022	328.105	0.024
	Gasoline	LDGT	Light-Duty Trucks (0-8,500 lbs)	0.447	0.005	4.057	0.639	0.053	0.023	444.344	0.025
	Gasoline	HDGV	Heavy-Duty Vehicles (8,501 + lbs)	1.090	0.007	6.529	1.090	0.063	0.027	687.151	0.045
	Diesel	LDDV	Light-Duty Vehicles (Passenger Cars)	0.331	0.003	0.442	0.048	0.078	0.048	303.075	0.008
	Diesel	LDDT	Light-Duty Trucks (0-8,500 lbs)	0.322	0.004	0.476	0.079	0.099	0.068	379.360	0.008
	Diesel	HDDV	Heavy-Duty Vehicles (8,501 + lbs)	5.831	0.011	1.028	0.240	0.184	0.109	1140.248	0.027
	NA	MC	Motorcycles	1.424	0.003	29.725	6.242	0.021	0.010	195.289	0.053
Colusa	Gasoline	LDGV	Light-Duty Vehicles (Passenger Cars)	0.113	0.003	1.185	0.137	0.052	0.022	328.842	0.024
	Gasoline	LDGT	Light-Duty Trucks (0-8,500 lbs)	0.241	0.004	2.003	0.291	0.052	0.022	434.095	0.025
	Gasoline	HDGV	Heavy-Duty Vehicles (8,501 + lbs)	0.555	0.007	3.464	0.471	0.060	0.025	667.447	0.045
	Diesel	LDDV	Light-Duty Vehicles (Passenger Cars)	0.200	0.003	0.315	0.032	0.068	0.038	297.556	0.008
	Diesel	LDDT	Light-Duty Trucks (0-8,500 lbs)	0.256	0.004	0.349	0.049	0.081	0.050	377.156	0.008
	Diesel	HDDV	Heavy-Duty Vehicles (8,501 + lbs)	4.920	0.014	0.853	0.192	0.155	0.084	1430.375	0.027
	NA	MC	Motorcycles	1.408	0.003	27.236	4.947	0.021	0.010	197.058	0.053
Contra Costa	Gasoline	LDGV	Light-Duty Vehicles (Passenger Cars)	0.101	0.003	1.157	0.135	0.052	0.022	335.014	0.024
	Gasoline	LDGT	Light-Duty Trucks (0-8,500 lbs)	0.165	0.004	1.582	0.218	0.053	0.022	443.669	0.025
	Gasoline	HDGV	Heavy-Duty Vehicles (8,501 + lbs)	0.435	0.007	2.895	0.374	0.060	0.025	658.824	0.045
	Diesel	LDDV	Light-Duty Vehicles (Passenger Cars)	0.169	0.003	0.298	0.030	0.068	0.038	308.202	0.008
	Diesel	LDDT	Light-Duty Trucks (0-8,500 lbs)	0.143	0.004	0.220	0.029	0.066	0.035	393.086	0.008
	Diesel	HDDV	Heavy-Duty Vehicles (8,501 + lbs)	4.832	0.013	0.843	0.184	0.197	0.103	1340.121	0.027
	NA	MC	Motorcycles	1.414	0.003	27.650	4.803	0.021	0.010	204.051	0.053
Del Norte	Gasoline	LDGV	Light-Duty Vehicles (Passenger Cars)	0.171	0.003	1.672	0.184	0.051	0.022	340.730	0.024
	Gasoline	LDGT	Light-Duty Trucks (0-8,500 lbs)	0.577	0.005	4.237	0.615	0.052	0.023	466.911	0.025
	Gasoline	HDGV	Heavy-Duty Vehicles (8,501 + lbs)	0.999	0.007	5.801	0.884	0.060	0.026	699.283	0.045
	Diesel	LDDV	Light-Duty Vehicles (Passenger Cars)	0.296	0.003	0.470	0.048	0.077	0.047	325.179	0.008
	Diesel	LDDT	Light-Duty Trucks (0-8,500 lbs)	0.813	0.004	1.114	0.183	0.184	0.150	422.669	0.008
	Diesel	HDDV	Heavy-Duty Vehicles (8,501 + lbs)	6.278	0.009	1.262	0.278	0.201	0.123	955.842	0.027
	NA	MC	Motorcycles	1.492	0.003	32.682	6.403	0.022	0.011	208.886	0.053

Table 5-37. 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	SOx	CO	ROG	PM_{10}	$PM_{2.5}$	CO_2e	NH_3
El Dorado	Gasoline	LDGV	Light-Duty Vehicles (Passenger Cars)	0.095	0.003	1.137	0.121	0.052	0.022	330.873	0.024
	Gasoline	LDGT	Light-Duty Trucks (0-8,500 lbs)	0.221	0.004	2.192	0.329	0.052	0.022	446.080	0.025
	Gasoline	HDGV	Heavy-Duty Vehicles (8,501 + lbs)	0.557	0.007	3.822	0.576	0.059	0.025	664.940	0.045
	Diesel	LDDV	Light-Duty Vehicles (Passenger Cars)	0.182	0.003	0.302	0.026	0.064	0.033	303.487	0.008
	Diesel	LDDT	Light-Duty Trucks (0-8,500 lbs)	0.231	0.004	0.291	0.040	0.073	0.043	388.075	0.008
	Diesel	HDDV	Heavy-Duty Vehicles (8,501 + lbs)	5.091	0.010	0.987	0.221	0.181	0.105	1011.546	0.027
	NA	MC	Motorcycles	1.476	0.003	31.224	6.491	0.021	0.010	203.524	0.053
Fresno	Gasoline	LDGV	Light-Duty Vehicles (Passenger Cars)	0.091	0.003	1.043	0.130	0.051	0.021	326.324	0.024
	Gasoline	LDGT	Light-Duty Trucks (0-8,500 lbs)	0.192	0.004	1.796	0.291	0.051	0.022	431.389	0.025
	Gasoline	HDGV	Heavy-Duty Vehicles (8,501 + lbs)	0.473	0.007	3.224	0.448	0.059	0.025	659.872	0.045
	Diesel	LDDV	Light-Duty Vehicles (Passenger Cars)	0.109	0.003	0.208	0.018	0.059	0.029	284.034	0.008
	Diesel	LDDT	Light-Duty Trucks (0-8,500 lbs)	0.182	0.004	0.249	0.033	0.070	0.040	369.319	0.008
	Diesel	HDDV	Heavy-Duty Vehicles (8,501 + lbs)	4.702	0.015	0.761	0.173	0.149	0.078	1537.031	0.027
	NA	MC	Motorcycles	1.396	0.002	28.359	4.827	0.020	0.009	191.198	0.053
Glenn	Gasoline	LDGV	Light-Duty Vehicles (Passenger Cars)	0.117	0.003	1.261	0.140	0.052	0.022	337.701	0.024
	Gasoline	LDGT	Light-Duty Trucks (0-8,500 lbs)	0.284	0.005	2.428	0.362	0.053	0.023	455.634	0.025
	Gasoline	HDGV	Heavy-Duty Vehicles (8,501 + lbs)	0.630	0.007	4.185	0.575	0.062	0.026	698.003	0.045
	Diesel	LDDV	Light-Duty Vehicles (Passenger Cars)	0.176	0.003	0.345	0.031	0.066	0.036	304.343	0.008
	Diesel	LDDT	Light-Duty Trucks (0-8,500 lbs)	0.291	0.004	0.438	0.061	0.091	0.059	388.305	0.008
	Diesel	HDDV	Heavy-Duty Vehicles (8,501 + lbs)	5.138	0.013	0.887	0.201	0.158	0.087	1404.886	0.027
	NA	MC	Motorcycles	1.416	0.003	28.529	5.745	0.021	0.010	203.781	0.053
Humboldt	Gasoline	LDGV	Light-Duty Vehicles (Passenger Cars)	0.179	0.003	1.728	0.189	0.050	0.021	319.030	0.024
	Gasoline	LDGT	Light-Duty Trucks (0-8,500 lbs)	0.505	0.004	3.866	0.549	0.052	0.022	433.288	0.025
	Gasoline	HDGV	Heavy-Duty Vehicles (8,501 + lbs)	0.993	0.007	5.514	0.873	0.060	0.026	651.008	0.045
	Diesel	LDDV	Light-Duty Vehicles (Passenger Cars)	0.548	0.003	0.541	0.060	0.087	0.057	313.836	0.008
	Diesel	LDDT	Light-Duty Trucks (0-8,500 lbs)	0.501	0.004	0.596	0.100	0.123	0.091	384.476	0.008
	Diesel	HDDV	Heavy-Duty Vehicles (8,501 + lbs)	6.124	0.012	1.070	0.250	0.185	0.110	1258.241	0.027
	NA	MC	Motorcycles	1.495	0.003	31.872	5.980	0.021	0.010	194.904	0.053
Imperial	Gasoline	LDGV	Light-Duty Vehicles (Passenger Cars)	0.360	0.003	3.289	0.279	0.052	0.022	326.740	0.024
	Gasoline	LDGT	Light-Duty Trucks (0-8,500 lbs)	0.290	0.004	2.618	0.497	0.053	0.022	434.511	0.025
	Gasoline	HDGV	Heavy-Duty Vehicles (8,501 + lbs)	0.685	0.006	4.298	0.648	0.060	0.025	643.216	0.045
	Diesel	LDDV	Light-Duty Vehicles (Passenger Cars)	0.140	0.003	0.219	0.023	0.064	0.034	277.541	0.008
	Diesel	LDDT	Light-Duty Trucks (0-8,500 lbs)	0.248	0.003	0.250	0.034	0.072	0.041	363.420	0.008
	Diesel	HDDV	Heavy-Duty Vehicles (8,501 + lbs)	3.747	0.014	0.429	0.088	0.136	0.067	1429.886	0.027
	NA	MC	Motorcycles	1.323	0.002	24.553	4.563	0.020	0.009	187.010	0.053
Inyo	Gasoline	LDGV	Light-Duty Vehicles (Passenger Cars)	0.136	0.004	1.408	0.174	0.053	0.022	349.196	0.024
	Gasoline	LDGT	Light-Duty Trucks (0-8,500 lbs)	0.324	0.005	2.801	0.475	0.053	0.023	463.422	0.025
	Gasoline	HDGV	Heavy-Duty Vehicles (8,501 + lbs)	0.877	0.007	5.186	0.874	0.064	0.027	709.714	0.045
	Diesel	LDDV	Light-Duty Vehicles (Passenger Cars)	0.194	0.003	0.359	0.032	0.067	0.037	312.342	0.008
	Diesel	LDDT	Light-Duty Trucks (0-8,500 lbs)	0.220	0.004	0.337	0.047	0.077	0.046	392.132	0.008
	Diesel	HDDV	Heavy-Duty Vehicles (8,501 + lbs)	4.998	0.013	0.908	0.194	0.171	0.091	1381.596	0.027
	NA	MC	Motorcycles	1.454	0.003	29.983	5.744	0.021	0.010	206.586	0.053
Kern	Gasoline	LDGV	Light-Duty Vehicles (Passenger Cars)	0.091	0.004	1.022	0.126	0.052	0.022	354.484	0.024
	Gasoline	LDGT	Light-Duty Trucks (0-8,500 lbs)	0.186	0.005	1.703	0.270	0.052	0.022	462.023	0.025
	Gasoline	HDGV	Heavy-Duty Vehicles (8,501 + lbs)	0.473	0.007	3.151	0.443	0.060	0.025	712.005	0.045
	Diesel	LDDV	Light-Duty Vehicles (Passenger Cars)	0.115	0.003	0.265	0.021	0.061	0.030	316.874	0.008
	Diesel	LDDT	Light-Duty Trucks (0-8,500 lbs)	0.182	0.004	0.274	0.038	0.071	0.041	404.389	0.008
	Diesel	HDDV	Heavy-Duty Vehicles (8,501 + lbs)	4.629	0.015	0.749	0.166	0.143	0.072	1553.718	0.027
	NA	MC	Motorcycles	1.411	0.003	29.519	4.823	0.020	0.010	206.217	0.053
Kings	Gasoline	LDGV	Light-Duty Vehicles (Passenger Cars)	0.100	0.003	1.079	0.124	0.052	0.022	322.527	0.024
	Gasoline	LDGT	Light-Duty Trucks (0-8,500 lbs)	0.250	0.004	2.152	0.317	0.052	0.022	425.079	0.025
	Gasoline	HDGV	Heavy-Duty Vehicles (8,501 + lbs)	0.525	0.007	3.338	0.465	0.060	0.025	664.169	0.045
	Diesel	LDDV	Light-Duty Vehicles (Passenger Cars)	0.116	0.003	0.258	0.022	0.061	0.031	280.414	0.008
	Diesel	LDDT	Light-Duty Trucks (0-8,500 lbs)	0.223	0.003	0.307	0.039	0.073	0.043	357.655	0.008
	Diesel	HDDV	Heavy-Duty Vehicles (8,501 + lbs)	4.839	0.015	0.761	0.171	0.138	0.070	1587.002	0.027
	NA	MC	Motorcycles	1.379	0.002	26.463	4.587	0.020	0.009	189.766	0.053

Table 5-37. 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	SOx	CO	ROG	PM_{10}	$PM_{2.5}$	CO_2e	NH_3
Lake	Gasoline	LDGV	Light-Duty Vehicles (Passenger Cars)	0.189	0.003	1.938	0.235	0.051	0.022	331.926	0.024
	Gasoline	LDGT	Light-Duty Trucks (0-8,500 lbs)	0.436	0.004	3.676	0.606	0.052	0.022	442.823	0.025
	Gasoline	HDGV	Heavy-Duty Vehicles (8,501 + lbs)	1.158	0.007	6.968	1.172	0.062	0.027	683.411	0.045
	Diesel	LDDV	Light-Duty Vehicles (Passenger Cars)	0.325	0.003	0.422	0.043	0.074	0.044	301.264	0.008
	Diesel	LDDT	Light-Duty Trucks (0-8,500 lbs)	0.501	0.004	0.510	0.074	0.100	0.070	378.169	0.008
	Diesel	HDDV	Heavy-Duty Vehicles (8,501 + lbs)	6.083	0.011	1.155	0.282	0.205	0.130	1127.074	0.027
	NA	MC	Motorcycles	1.455	0.003	31.885	6.688	0.022	0.011	196.573	0.053
Lassen	Gasoline	LDGV	Light-Duty Vehicles (Passenger Cars)	0.162	0.004	1.684	0.181	0.052	0.022	352.946	0.024
	Gasoline	LDGT	Light-Duty Trucks (0-8,500 lbs)	0.400	0.005	3.514	0.534	0.053	0.023	478.957	0.025
	Gasoline	HDGV	Heavy-Duty Vehicles (8,501 + lbs)	1.109	0.007	6.647	1.092	0.063	0.027	726.045	0.045
	Diesel	LDDV	Light-Duty Vehicles (Passenger Cars)	0.219	0.003	0.428	0.036	0.066	0.036	317.337	0.008
	Diesel	LDDT	Light-Duty Trucks (0-8,500 lbs)	0.243	0.004	0.411	0.058	0.080	0.050	406.305	0.008
	Diesel	HDDV	Heavy-Duty Vehicles (8,501 + lbs)	6.063	0.009	1.262	0.273	0.204	0.123	971.581	0.027
	NA	MC	Motorcycles	1.511	0.003	33.376	6.269	0.021	0.010	213.648	0.053
Los Angeles	Gasoline	LDGV	Light-Duty Vehicles (Passenger Cars)	0.107	0.004	1.327	0.150	0.054	0.023	374.373	0.024
	Gasoline	LDGT	Light-Duty Trucks (0-8,500 lbs)	0.185	0.005	1.888	0.233	0.053	0.023	474.321	0.025
	Gasoline	HDGV	Heavy-Duty Vehicles (8,501 + lbs)	0.438	0.007	3.190	0.372	0.061	0.026	691.072	0.045
	Diesel	LDDV	Light-Duty Vehicles (Passenger Cars)	0.170	0.003	0.410	0.043	0.076	0.044	329.089	0.008
	Diesel	LDDT	Light-Duty Trucks (0-8,500 lbs)	0.179	0.004	0.307	0.043	0.071	0.041	411.108	0.008
	Diesel	HDDV	Heavy-Duty Vehicles (8,501 + lbs)	3.980	0.012	0.985	0.146	0.169	0.087	1305.486	0.027
	NA	MC	Motorcycles	1.370	0.003	25.343	5.142	0.021	0.010	223.564	0.053
Madera	Gasoline	LDGV	Light-Duty Vehicles (Passenger Cars)	0.095	0.003	1.163	0.125	0.051	0.022	347.501	0.024
	Gasoline	LDGT	Light-Duty Trucks (0-8,500 lbs)	0.222	0.005	2.206	0.331	0.052	0.022	467.078	0.025
	Gasoline	HDGV	Heavy-Duty Vehicles (8,501 + lbs)	0.532	0.007	3.811	0.506	0.061	0.026	713.664	0.045
	Diesel	LDDV	Light-Duty Vehicles (Passenger Cars)	0.156	0.003	0.366	0.031	0.064	0.034	303.507	0.008
	Diesel	LDDT	Light-Duty Trucks (0-8,500 lbs)	0.252	0.004	0.355	0.051	0.078	0.048	389.912	0.008
	Diesel	HDDV	Heavy-Duty Vehicles (8,501 + lbs)	4.873	0.014	0.828	0.182	0.148	0.077	1505.327	0.027
	NA	MC	Motorcycles	1.365	0.003	27.587	4.793	0.020	0.010	201.359	0.053
Marin	Gasoline	LDGV	Light-Duty Vehicles (Passenger Cars)	0.104	0.003	1.148	0.147	0.053	0.022	342.798	0.024
	Gasoline	LDGT	Light-Duty Trucks (0-8,500 lbs)	0.165	0.005	1.544	0.232	0.053	0.022	451.498	0.025
	Gasoline	HDGV	Heavy-Duty Vehicles (8,501 + lbs)	0.434	0.007	2.804	0.394	0.062	0.026	668.684	0.045
	Diesel	LDDV	Light-Duty Vehicles (Passenger Cars)	0.228	0.003	0.360	0.035	0.072	0.041	331.656	0.008
	Diesel	LDDT	Light-Duty Trucks (0-8,500 lbs)	0.154	0.004	0.251	0.032	0.068	0.037	422.323	0.008
	Diesel	HDDV	Heavy-Duty Vehicles (8,501 + lbs)	5.292	0.012	1.237	0.239	0.253	0.143	1271.466	0.027
	NA	MC	Motorcycles	1.453	0.003	28.977	5.069	0.021	0.010	209.610	0.053
Mariposa	Gasoline	LDGV	Light-Duty Vehicles (Passenger Cars)	0.159	0.003	1.701	0.198	0.051	0.022	338.459	0.024
	Gasoline	LDGT	Light-Duty Trucks (0-8,500 lbs)	0.577	0.005	5.100	0.744	0.054	0.024	468.944	0.025
	Gasoline	HDGV	Heavy-Duty Vehicles (8,501 + lbs)	1.118	0.007	6.880	1.124	0.063	0.028	709.013	0.045
	Diesel	LDDV	Light-Duty Vehicles (Passenger Cars)	0.323	0.003	0.471	0.040	0.068	0.038	314.971	0.008
	Diesel	LDDT	Light-Duty Trucks (0-8,500 lbs)	0.393	0.004	0.686	0.111	0.115	0.083	381.923	0.008
	Diesel	HDDV	Heavy-Duty Vehicles (8,501 + lbs)	6.338	0.009	1.196	0.275	0.200	0.121	930.630	0.027
	NA	MC	Motorcycles	1.461	0.003	32.137	6.354	0.021	0.010	203.078	0.053
Mendocino	Gasoline	LDGV	Light-Duty Vehicles (Passenger Cars)	0.157	0.003	1.565	0.173	0.051	0.022	319.946	0.024
	Gasoline	LDGT	Light-Duty Trucks (0-8,500 lbs)	0.496	0.004	3.971	0.563	0.052	0.022	431.423	0.025
	Gasoline	HDGV	Heavy-Duty Vehicles (8,501 + lbs)	1.015	0.007	5.748	0.898	0.060	0.026	658.350	0.045
	Diesel	LDDV	Light-Duty Vehicles (Passenger Cars)	0.575	0.003	0.535	0.054	0.083	0.053	316.992	0.008
	Diesel	LDDT	Light-Duty Trucks (0-8,500 lbs)	0.757	0.004	0.734	0.139	0.157	0.123	386.047	0.008
	Diesel	HDDV	Heavy-Duty Vehicles (8,501 + lbs)	5.692	0.013	0.968	0.231	0.172	0.101	1363.677	0.027
	NA	MC	Motorcycles	1.464	0.003	30.890	5.840	0.021	0.010	193.208	0.053
Merced	Gasoline	LDGV	Light-Duty Vehicles (Passenger Cars)	0.100	0.003	1.170	0.129	0.051	0.021	336.874	0.024
	Gasoline	LDGT	Light-Duty Trucks (0-8,500 lbs)	0.224	0.005	2.096	0.304	0.052	0.022	448.545	0.025
	Gasoline	HDGV	Heavy-Duty Vehicles (8,501 + lbs)	0.538	0.007	3.760	0.471	0.061	0.026	691.440	0.045
	Diesel	LDDV	Light-Duty Vehicles (Passenger Cars)	0.178	0.003	0.323	0.029	0.064	0.034	295.747	0.008
	Diesel	LDDT	Light-Duty Trucks (0-8,500 lbs)	0.250	0.004	0.348	0.048	0.077	0.047	384.768	0.008
	Diesel	HDDV	Heavy-Duty Vehicles (8,501 + lbs)	4.913	0.015	0.781	0.176	0.145	0.074	1579.854	0.027
	NA	MC	Motorcycles	1.360	0.002	27.284	4.308	0.020	0.009	194.002	0.053

Table 5-37. 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	SOx	CO	ROG	PM_{10}	$PM_{2.5}$	CO_2e	NH_3
Modoc	Gasoline	LDGV	Light-Duty Vehicles (Passenger Cars)	0.179	0.004	1.891	0.193	0.053	0.023	394.989	0.024
	Gasoline	LDGT	Light-Duty Trucks (0-8,500 lbs)	0.452	0.005	4.200	0.569	0.054	0.024	531.003	0.025
	Gasoline	HDGV	Heavy-Duty Vehicles (8,501 + lbs)	1.272	0.008	8.111	1.270	0.064	0.028	788.999	0.045
	Diesel	LDDV	Light-Duty Vehicles (Passenger Cars)	0.258	0.003	0.624	0.058	0.079	0.048	358.711	0.008
	Diesel	LDDT	Light-Duty Trucks (0-8,500 lbs)	0.436	0.005	0.590	0.079	0.091	0.060	485.606	0.008
	Diesel	HDDV	Heavy-Duty Vehicles (8,501 + lbs)	6.087	0.010	1.172	0.261	0.194	0.116	1042.734	0.027
	NA	MC	Motorcycles	1.541	0.003	34.848	6.852	0.022	0.011	239.116	0.053
Mono	Gasoline	LDGV	Light-Duty Vehicles (Passenger Cars)	0.144	0.003	1.458	0.150	0.053	0.022	335.990	0.024
	Gasoline	LDGT	Light-Duty Trucks (0-8,500 lbs)	0.352	0.005	2.927	0.416	0.053	0.023	451.835	0.025
	Gasoline	HDGV	Heavy-Duty Vehicles (8,501 + lbs)	0.951	0.007	5.656	0.838	0.063	0.027	690.274	0.045
	Diesel	LDDV	Light-Duty Vehicles (Passenger Cars)	0.234	0.003	0.398	0.035	0.069	0.038	316.998	0.008
	Diesel	LDDT	Light-Duty Trucks (0-8,500 lbs)	0.437	0.004	0.439	0.050	0.077	0.046	404.889	0.008
	Diesel	HDDV	Heavy-Duty Vehicles (8,501 + lbs)	4.946	0.014	0.848	0.187	0.154	0.081	1422.821	0.027
	NA	MC	Motorcycles	1.597	0.003	36.044	5.851	0.021	0.010	207.740	0.053
Monterey	Gasoline	LDGV	Light-Duty Vehicles (Passenger Cars)	0.140	0.004	1.473	0.159	0.052	0.022	356.041	0.024
	Gasoline	LDGT	Light-Duty Trucks (0-8,500 lbs)	0.330	0.005	2.559	0.336	0.052	0.022	472.970	0.025
	Gasoline	HDGV	Heavy-Duty Vehicles (8,501 + lbs)	0.669	0.007	4.007	0.503	0.062	0.026	716.403	0.045
	Diesel	LDDV	Light-Duty Vehicles (Passenger Cars)	0.239	0.003	0.476	0.048	0.076	0.045	325.332	0.008
	Diesel	LDDT	Light-Duty Trucks (0-8,500 lbs)	0.400	0.004	0.547	0.115	0.124	0.092	423.349	0.008
	Diesel	HDDV	Heavy-Duty Vehicles (8,501 + lbs)	5.113	0.013	1.017	0.214	0.197	0.111	1344.632	0.027
	NA	MC	Motorcycles	1.394	0.003	27.413	4.485	0.021	0.010	209.729	0.053
Napa	Gasoline	LDGV	Light-Duty Vehicles (Passenger Cars)	0.100	0.003	1.152	0.126	0.052	0.022	322.040	0.024
	Gasoline	LDGT	Light-Duty Trucks (0-8,500 lbs)	0.199	0.004	1.905	0.267	0.053	0.022	436.664	0.025
	Gasoline	HDGV	Heavy-Duty Vehicles (8,501 + lbs)	0.558	0.007	3.650	0.486	0.063	0.027	673.729	0.045
	Diesel	LDDV	Light-Duty Vehicles (Passenger Cars)	0.193	0.003	0.310	0.032	0.069	0.039	301.049	0.008
	Diesel	LDDT	Light-Duty Trucks (0-8,500 lbs)	0.147	0.004	0.223	0.028	0.067	0.036	391.640	0.008
	Diesel	HDDV	Heavy-Duty Vehicles (8,501 + lbs)	5.082	0.013	0.895	0.198	0.167	0.092	1350.937	0.027
	NA	MC	Motorcycles	1.419	0.003	27.605	4.729	0.021	0.010	197.014	0.053
Nevada	Gasoline	LDGV	Light-Duty Vehicles (Passenger Cars)	0.134	0.003	1.385	0.152	0.051	0.022	316.400	0.024
	Gasoline	LDGT	Light-Duty Trucks (0-8,500 lbs)	0.351	0.004	2.721	0.387	0.051	0.022	432.738	0.025
	Gasoline	HDGV	Heavy-Duty Vehicles (8,501 + lbs)	0.771	0.006	4.940	0.646	0.059	0.025	640.796	0.045
	Diesel	LDDV	Light-Duty Vehicles (Passenger Cars)	0.332	0.003	0.406	0.044	0.077	0.047	304.472	0.008
	Diesel	LDDT	Light-Duty Trucks (0-8,500 lbs)	0.511	0.004	0.457	0.058	0.087	0.056	383.302	0.008
	Diesel	HDDV	Heavy-Duty Vehicles (8,501 + lbs)	5.236	0.013	0.894	0.203	0.155	0.086	1365.418	0.027
	NA	MC	Motorcycles	1.508	0.003	32.743	6.395	0.021	0.011	191.956	0.053
Orange	Gasoline	LDGV	Light-Duty Vehicles (Passenger Cars)	0.088	0.004	1.102	0.131	0.054	0.023	349.319	0.024
	Gasoline	LDGT	Light-Duty Trucks (0-8,500 lbs)	0.142	0.005	1.494	0.200	0.053	0.023	455.434	0.025
	Gasoline	HDGV	Heavy-Duty Vehicles (8,501 + lbs)	0.406	0.007	2.806	0.358	0.062	0.026	671.984	0.045
	Diesel	LDDV	Light-Duty Vehicles (Passenger Cars)	0.118	0.003	0.312	0.028	0.066	0.035	310.525	0.008
	Diesel	LDDT	Light-Duty Trucks (0-8,500 lbs)	0.108	0.004	0.222	0.029	0.064	0.033	399.372	0.008
	Diesel	HDDV	Heavy-Duty Vehicles (8,501 + lbs)	3.431	0.011	0.819	0.121	0.169	0.089	1176.180	0.027
	NA	MC	Motorcycles	1.363	0.003	24.886	5.045	0.021	0.010	212.953	0.053
Placer	Gasoline	LDGV	Light-Duty Vehicles (Passenger Cars)	0.096	0.003	1.137	0.128	0.052	0.022	326.621	0.024
	Gasoline	LDGT	Light-Duty Trucks (0-8,500 lbs)	0.167	0.004	1.651	0.226	0.052	0.022	428.420	0.025
	Gasoline	HDGV	Heavy-Duty Vehicles (8,501 + lbs)	0.453	0.007	3.103	0.412	0.060	0.025	651.751	0.045
	Diesel	LDDV	Light-Duty Vehicles (Passenger Cars)	0.187	0.003	0.293	0.028	0.067	0.036	296.907	0.008
	Diesel	LDDT	Light-Duty Trucks (0-8,500 lbs)	0.200	0.004	0.251	0.037	0.071	0.040	373.394	0.008
	Diesel	HDDV	Heavy-Duty Vehicles (8,501 + lbs)	4.292	0.013	0.775	0.175	0.160	0.085	1332.742	0.027
	NA	MC	Motorcycles	1.443	0.003	29.141	5.311	0.021	0.010	195.344	0.053
Plumas	Gasoline	LDGV	Light-Duty Vehicles (Passenger Cars)	0.165	0.004	1.799	0.196	0.053	0.023	367.433	0.024
	Gasoline	LDGT	Light-Duty Trucks (0-8,500 lbs)	0.504	0.005	4.573	0.618	0.053	0.024	505.544	0.025
	Gasoline	HDGV	Heavy-Duty Vehicles (8,501 + lbs)	1.309	0.008	8.412	1.220	0.063	0.028	739.136	0.045
	Diesel	LDDV	Light-Duty Vehicles (Passenger Cars)	0.272	0.003	0.559	0.047	0.071	0.041	342.822	0.008
	Diesel	LDDT	Light-Duty Trucks (0-8,500 lbs)	0.267	0.004	0.477	0.067	0.082	0.052	442.545	0.008
	Diesel	HDDV	Heavy-Duty Vehicles (8,501 + lbs)	6.027	0.011	1.095	0.245	0.183	0.111	1120.701	0.027
	NA	MC	Motorcycles	1.508	0.003	34.425	6.986	0.022	0.011	222.171	0.053

Table 5-37. 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	SOx	CO	ROG	PM_{10}	$PM_{2.5}$	CO_2e	NH_3
Riverside	Gasoline	LDGV	Light-Duty Vehicles (Passenger Cars)	0.089	0.003	1.064	0.128	0.052	0.022	328.702	0.024
	Gasoline	LDGT	Light-Duty Trucks (0-8,500 lbs)	0.163	0.004	1.619	0.236	0.052	0.022	428.065	0.025
	Gasoline	HDGV	Heavy-Duty Vehicles (8,501 + lbs)	0.439	0.006	2.982	0.398	0.060	0.025	634.115	0.045
	Diesel	LDDV	Light-Duty Vehicles (Passenger Cars)	0.126	0.003	0.234	0.021	0.062	0.032	288.693	0.008
	Diesel	LDDT	Light-Duty Trucks (0-8,500 lbs)	0.127	0.003	0.199	0.027	0.065	0.034	366.327	0.008
	Diesel	HDDV	Heavy-Duty Vehicles (8,501 + lbs)	3.767	0.013	0.577	0.096	0.143	0.072	1354.760	0.027
	NA	MC	Motorcycles	1.362	0.002	25.873	4.877	0.020	0.009	197.580	0.053
Sacramento	Gasoline	LDGV	Light-Duty Vehicles (Passenger Cars)	0.102	0.003	1.238	0.142	0.052	0.022	333.812	0.024
	Gasoline	LDGT	Light-Duty Trucks (0-8,500 lbs)	0.184	0.004	1.840	0.257	0.052	0.022	436.498	0.025
	Gasoline	HDGV	Heavy-Duty Vehicles (8,501 + lbs)	0.503	0.007	3.425	0.450	0.061	0.026	675.569	0.045
	Diesel	LDDV	Light-Duty Vehicles (Passenger Cars)	0.166	0.003	0.300	0.030	0.066	0.036	292.553	0.008
	Diesel	LDDT	Light-Duty Trucks (0-8,500 lbs)	0.436	0.004	0.449	0.060	0.086	0.055	386.311	0.008
	Diesel	HDDV	Heavy-Duty Vehicles (8,501 + lbs)	4.834	0.012	1.106	0.196	0.178	0.097	1310.485	0.027
	NA	MC	Motorcycles	1.374	0.002	26.802	5.106	0.020	0.010	196.044	0.053
San Benito	Gasoline	LDGV	Light-Duty Vehicles (Passenger Cars)	0.115	0.003	1.188	0.123	0.052	0.022	319.076	0.024
	Gasoline	LDGT	Light-Duty Trucks (0-8,500 lbs)	0.237	0.004	1.926	0.288	0.052	0.022	419.144	0.025
	Gasoline	HDGV	Heavy-Duty Vehicles (8,501 + lbs)	0.601	0.007	3.628	0.505	0.060	0.025	653.942	0.045
	Diesel	LDDV	Light-Duty Vehicles (Passenger Cars)	0.251	0.003	0.340	0.029	0.067	0.036	302.437	0.008
	Diesel	LDDT	Light-Duty Trucks (0-8,500 lbs)	0.083	0.004	0.188	0.025	0.061	0.031	380.207	0.008
	Diesel	HDDV	Heavy-Duty Vehicles (8,501 + lbs)	4.939	0.015	0.784	0.179	0.142	0.074	1573.699	0.027
	NA	MC	Motorcycles	1.436	0.002	28.421	4.661	0.021	0.010	190.867	0.053
San Bernardino	Gasoline	LDGV	Light-Duty Vehicles (Passenger Cars)	0.096	0.003	1.095	0.124	0.050	0.021	323.014	0.024
	Gasoline	LDGT	Light-Duty Trucks (0-8,500 lbs)	0.194	0.004	1.795	0.251	0.050	0.021	420.486	0.025
	Gasoline	HDGV	Heavy-Duty Vehicles (8,501 + lbs)	0.467	0.006	3.103	0.395	0.057	0.024	619.787	0.045
	Diesel	LDDV	Light-Duty Vehicles (Passenger Cars)	0.122	0.003	0.245	0.022	0.061	0.032	285.128	0.008
	Diesel	LDDT	Light-Duty Trucks (0-8,500 lbs)	0.165	0.003	0.234	0.033	0.067	0.038	360.132	0.008
	Diesel	HDDV	Heavy-Duty Vehicles (8,501 + lbs)	3.793	0.013	0.647	0.105	0.146	0.072	1363.268	0.027
	NA	MC	Motorcycles	1.527	0.003	29.873	4.859	0.022	0.010	214.779	0.053
San Diego	Gasoline	LDGV	Light-Duty Vehicles (Passenger Cars)	0.120	0.004	1.244	0.139	0.053	0.022	349.843	0.024
	Gasoline	LDGT	Light-Duty Trucks (0-8,500 lbs)	0.173	0.005	1.652	0.245	0.053	0.023	468.424	0.025
	Gasoline	HDGV	Heavy-Duty Vehicles (8,501 + lbs)	0.416	0.007	2.795	0.369	0.062	0.026	694.732	0.045
	Diesel	LDDV	Light-Duty Vehicles (Passenger Cars)	0.145	0.003	0.311	0.028	0.067	0.036	325.948	0.008
	Diesel	LDDT	Light-Duty Trucks (0-8,500 lbs)	0.217	0.004	0.325	0.044	0.077	0.046	422.082	0.008
	Diesel	HDDV	Heavy-Duty Vehicles (8,501 + lbs)	4.432	0.012	1.103	0.187	0.176	0.094	1331.327	0.027
	NA	MC	Motorcycles	1.407	0.003	27.589	4.845	0.021	0.010	215.431	0.053
San Francisco	Gasoline	LDGV	Light-Duty Vehicles (Passenger Cars)	0.099	0.004	1.198	0.146	0.054	0.023	374.623	0.024
	Gasoline	LDGT	Light-Duty Trucks (0-8,500 lbs)	0.143	0.005	1.469	0.202	0.054	0.023	483.951	0.025
	Gasoline	HDGV	Heavy-Duty Vehicles (8,501 + lbs)	0.442	0.007	2.875	0.384	0.067	0.028	725.481	0.045
	Diesel	LDDV	Light-Duty Vehicles (Passenger Cars)	0.140	0.003	0.435	0.034	0.066	0.034	349.718	0.008
	Diesel	LDDT	Light-Duty Trucks (0-8,500 lbs)	0.157	0.004	0.327	0.040	0.066	0.035	444.804	0.008
	Diesel	HDDV	Heavy-Duty Vehicles (8,501 + lbs)	5.260	0.013	1.359	0.243	0.267	0.151	1369.934	0.027
	NA	MC	Motorcycles	1.456	0.003	29.064	5.895	0.022	0.011	230.105	0.053
San Joaquin	Gasoline	LDGV	Light-Duty Vehicles (Passenger Cars)	0.099	0.003	1.103	0.131	0.051	0.022	333.442	0.024
	Gasoline	LDGT	Light-Duty Trucks (0-8,500 lbs)	0.194	0.004	1.761	0.259	0.051	0.022	436.954	0.025
	Gasoline	HDGV	Heavy-Duty Vehicles (8,501 + lbs)	0.487	0.007	3.248	0.439	0.059	0.025	664.121	0.045
	Diesel	LDDV	Light-Duty Vehicles (Passenger Cars)	0.164	0.003	0.256	0.025	0.065	0.035	297.709	0.008
	Diesel	LDDT	Light-Duty Trucks (0-8,500 lbs)	0.226	0.004	0.274	0.036	0.072	0.042	376.658	0.008
	Diesel	HDDV	Heavy-Duty Vehicles (8,501 + lbs)	4.715	0.014	0.859	0.186	0.158	0.085	1437.950	0.027
	NA	MC	Motorcycles	1.411	0.003	28.989	4.819	0.020	0.009	197.693	0.053
San Luis Obispo	Gasoline	LDGV	Light-Duty Vehicles (Passenger Cars)	0.113	0.003	1.171	0.133	0.052	0.022	316.091	0.024
	Gasoline	LDGT	Light-Duty Trucks (0-8,500 lbs)	0.294	0.004	2.291	0.321	0.052	0.022	428.658	0.025
	Gasoline	HDGV	Heavy-Duty Vehicles (8,501 + lbs)	0.630	0.007	3.815	0.521	0.061	0.026	652.824	0.045
	Diesel	LDDV	Light-Duty Vehicles (Passenger Cars)	0.213	0.003	0.318	0.030	0.068	0.037	304.762	0.008
	Diesel	LDDT	Light-Duty Trucks (0-8,500 lbs)	0.297	0.004	0.376	0.055	0.086	0.055	382.203	0.008
	Diesel	HDDV	Heavy-Duty Vehicles (8,501 + lbs)	5.546	0.011	1.066	0.237	0.192	0.114	1212.356	0.027
	NA	MC	Motorcycles	1.486	0.003	29.884	5.975	0.022	0.011	198.149	0.053

Table 5-37. 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	SOx	CO	ROG	PM_{10}	$PM_{2.5}$	CO_2e	NH_3
San Mateo	Gasoline	LDGV	Light-Duty Vehicles (Passenger Cars)	0.105	0.004	1.221	0.161	0.057	0.024	350.929	0.024
	Gasoline	LDGT	Light-Duty Trucks (0-8,500 lbs)	0.123	0.004	1.213	0.168	0.053	0.022	420.139	0.025
	Gasoline	HDGV	Heavy-Duty Vehicles (8,501 + lbs)	0.344	0.006	2.281	0.310	0.061	0.026	630.045	0.045
	Diesel	LDDV	Light-Duty Vehicles (Passenger Cars)	0.165	0.003	0.293	0.029	0.072	0.039	326.018	0.008
	Diesel	LDDT	Light-Duty Trucks (0-8,500 lbs)	0.092	0.004	0.165	0.022	0.061	0.030	383.606	0.008
	Diesel	HDDV	Heavy-Duty Vehicles (8,501 + lbs)	3.646	0.011	0.904	0.173	0.211	0.115	1176.729	0.027
	NA	MC	Motorcycles	1.384	0.003	24.699	4.032	0.021	0.010	203.698	0.053
Santa Barbara	Gasoline	LDGV	Light-Duty Vehicles (Passenger Cars)	0.125	0.003	1.270	0.151	0.052	0.022	310.232	0.024
	Gasoline	LDGT	Light-Duty Trucks (0-8,500 lbs)	0.304	0.004	2.288	0.337	0.052	0.022	413.809	0.025
	Gasoline	HDGV	Heavy-Duty Vehicles (8,501 + lbs)	0.639	0.006	3.854	0.516	0.067	0.029	643.201	0.045
	Diesel	LDDV	Light-Duty Vehicles (Passenger Cars)	0.192	0.003	0.277	0.026	0.065	0.035	296.048	0.008
	Diesel	LDDT	Light-Duty Trucks (0-8,500 lbs)	0.248	0.003	0.293	0.044	0.078	0.048	365.142	0.008
	Diesel	HDDV	Heavy-Duty Vehicles (8,501 + lbs)	5.216	0.012	1.095	0.216	0.219	0.125	1322.159	0.027
	NA	MC	Motorcycles	1.431	0.002	26.841	4.564	0.021	0.010	188.033	0.053
Santa Clara	Gasoline	LDGV	Light-Duty Vehicles (Passenger Cars)	0.097	0.003	1.130	0.133	0.053	0.022	329.913	0.024
	Gasoline	LDGT	Light-Duty Trucks (0-8,500 lbs)	0.172	0.004	1.657	0.231	0.053	0.022	435.855	0.025
	Gasoline	HDGV	Heavy-Duty Vehicles (8,501 + lbs)	0.447	0.006	3.011	0.395	0.061	0.026	642.157	0.045
	Diesel	LDDV	Light-Duty Vehicles (Passenger Cars)	0.133	0.003	0.258	0.023	0.063	0.033	299.391	0.008
	Diesel	LDDT	Light-Duty Trucks (0-8,500 lbs)	0.142	0.004	0.220	0.031	0.068	0.037	385.436	0.008
	Diesel	HDDV	Heavy-Duty Vehicles (8,501 + lbs)	4.558	0.013	0.867	0.186	0.179	0.097	1344.554	0.027
	NA	MC	Motorcycles	1.398	0.003	25.868	4.656	0.021	0.010	201.684	0.053
Santa Cruz	Gasoline	LDGV	Light-Duty Vehicles (Passenger Cars)	0.149	0.003	1.567	0.165	0.051	0.022	339.761	0.024
	Gasoline	LDGT	Light-Duty Trucks (0-8,500 lbs)	0.369	0.005	2.892	0.398	0.052	0.023	460.144	0.025
	Gasoline	HDGV	Heavy-Duty Vehicles (8,501 + lbs)	0.710	0.007	4.370	0.550	0.063	0.027	687.181	0.045
	Diesel	LDDV	Light-Duty Vehicles (Passenger Cars)	0.381	0.003	0.525	0.056	0.083	0.052	328.988	0.008
	Diesel	LDDT	Light-Duty Trucks (0-8,500 lbs)	0.392	0.004	0.455	0.079	0.103	0.072	397.853	0.008
	Diesel	HDDV	Heavy-Duty Vehicles (8,501 + lbs)	6.037	0.012	1.249	0.271	0.251	0.153	1260.888	0.027
	NA	MC	Motorcycles	1.465	0.003	29.964	6.047	0.022	0.011	208.214	0.053
Shasta	Gasoline	LDGV	Light-Duty Vehicles (Passenger Cars)	0.122	0.003	1.317	0.149	0.051	0.022	339.245	0.024
	Gasoline	LDGT	Light-Duty Trucks (0-8,500 lbs)	0.290	0.005	2.437	0.365	0.053	0.023	460.510	0.025
	Gasoline	HDGV	Heavy-Duty Vehicles (8,501 + lbs)	0.700	0.007	4.579	0.662	0.063	0.027	706.310	0.045
	Diesel	LDDV	Light-Duty Vehicles (Passenger Cars)	0.228	0.003	0.374	0.036	0.069	0.039	303.894	0.008
	Diesel	LDDT	Light-Duty Trucks (0-8,500 lbs)	0.316	0.004	0.408	0.060	0.087	0.056	394.665	0.008
	Diesel	HDDV	Heavy-Duty Vehicles (8,501 + lbs)	5.316	0.014	0.877	0.202	0.158	0.087	1436.455	0.027
	NA	MC	Motorcycles	1.462	0.003	31.194	6.330	0.021	0.010	204.857	0.053
Sierra	Gasoline	LDGV	Light-Duty Vehicles (Passenger Cars)	0.161	0.004	1.711	0.177	0.054	0.023	385.747	0.024
	Gasoline	LDGT	Light-Duty Trucks (0-8,500 lbs)	0.418	0.005	3.716	0.491	0.054	0.024	514.325	0.025
	Gasoline	HDGV	Heavy-Duty Vehicles (8,501 + lbs)	1.081	0.008	6.791	0.980	0.063	0.028	757.289	0.045
	Diesel	LDDV	Light-Duty Vehicles (Passenger Cars)	0.155	0.003	0.536	0.044	0.069	0.038	346.948	0.008
	Diesel	LDDT	Light-Duty Trucks (0-8,500 lbs)	0.246	0.004	0.536	0.079	0.089	0.058	432.080	0.008
	Diesel	HDDV	Heavy-Duty Vehicles (8,501 + lbs)	5.933	0.010	1.242	0.264	0.190	0.112	1029.317	0.027
	NA	MC	Motorcycles	1.526	0.003	33.868	6.393	0.022	0.011	232.472	0.053
Siskiyou	Gasoline	LDGV	Light-Duty Vehicles (Passenger Cars)	0.160	0.004	1.657	0.175	0.053	0.022	368.534	0.024
	Gasoline	LDGT	Light-Duty Trucks (0-8,500 lbs)	0.416	0.005	3.583	0.518	0.053	0.023	494.511	0.025
	Gasoline	HDGV	Heavy-Duty Vehicles (8,501 + lbs)	1.044	0.007	6.514	0.999	0.063	0.028	735.045	0.045
	Diesel	LDDV	Light-Duty Vehicles (Passenger Cars)	0.265	0.003	0.519	0.046	0.073	0.042	339.700	0.008
	Diesel	LDDT	Light-Duty Trucks (0-8,500 lbs)	0.406	0.004	0.587	0.089	0.105	0.073	431.711	0.008
	Diesel	HDDV	Heavy-Duty Vehicles (8,501 + lbs)	5.127	0.014	0.870	0.195	0.152	0.081	1510.039	0.027
	NA	MC	Motorcycles	1.540	0.003	34.808	6.495	0.022	0.011	223.033	0.053
Solano	Gasoline	LDGV	Light-Duty Vehicles (Passenger Cars)	0.099	0.003	1.088	0.132	0.053	0.022	348.094	0.024
	Gasoline	LDGT	Light-Duty Trucks (0-8,500 lbs)	0.177	0.005	1.630	0.243	0.053	0.022	460.804	0.025
	Gasoline	HDGV	Heavy-Duty Vehicles (8,501 + lbs)	0.479	0.007	3.091	0.431	0.062	0.026	697.970	0.045
	Diesel	LDDV	Light-Duty Vehicles (Passenger Cars)	0.156	0.003	0.295	0.027	0.066	0.035	318.856	0.008
	Diesel	LDDT	Light-Duty Trucks (0-8,500 lbs)	0.209	0.004	0.284	0.036	0.071	0.040	407.272	0.008
	Diesel	HDDV	Heavy-Duty Vehicles (8,501 + lbs)	4.740	0.013	0.916	0.188	0.162	0.085	1428.939	0.027
	NA	MC	Motorcycles	1.448	0.003	30.474	4.795	0.021	0.010	210.663	0.053

Table 5-37. 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	SOx	CO	ROG	PM_{10}	$PM_{2.5}$	CO_2e	NH_3
Sonoma	Gasoline	LDGV	Light-Duty Vehicles (Passenger Cars)	0.125	0.003	1.270	0.151	0.052	0.022	310.232	0.024
	Gasoline	LDGT	Light-Duty Trucks (0-8,500 lbs)	0.304	0.004	2.288	0.337	0.052	0.022	413.809	0.025
	Gasoline	HDGV	Heavy-Duty Vehicles (8,501 + lbs)	0.639	0.006	3.854	0.516	0.067	0.029	643.201	0.045
	Diesel	LDDV	Light-Duty Vehicles (Passenger Cars)	0.192	0.003	0.277	0.026	0.065	0.035	296.048	0.008
	Diesel	LDDT	Light-Duty Trucks (0-8,500 lbs)	0.248	0.003	0.293	0.044	0.078	0.048	365.142	0.008
	Diesel	HDDV	Heavy-Duty Vehicles (8,501 + lbs)	5.216	0.012	1.095	0.216	0.219	0.125	1322.159	0.027
	NA	MC	Motorcycles	1.431	0.002	26.841	4.564	0.021	0.010	188.033	0.053
Stanislaus	Gasoline	LDGV	Light-Duty Vehicles (Passenger Cars)	0.101	0.003	1.188	0.135	0.051	0.022	342.122	0.024
	Gasoline	LDGT	Light-Duty Trucks (0-8,500 lbs)	0.209	0.005	2.014	0.296	0.052	0.022	454.454	0.025
	Gasoline	HDGV	Heavy-Duty Vehicles (8,501 + lbs)	0.525	0.007	3.642	0.490	0.060	0.025	690.994	0.045
	Diesel	LDDV	Light-Duty Vehicles (Passenger Cars)	0.162	0.003	0.337	0.030	0.064	0.034	297.534	0.008
	Diesel	LDDT	Light-Duty Trucks (0-8,500 lbs)	0.193	0.004	0.308	0.043	0.072	0.042	384.545	0.008
	Diesel	HDDV	Heavy-Duty Vehicles (8,501 + lbs)	4.714	0.014	0.796	0.181	0.152	0.081	1442.387	0.027
	NA	MC	Motorcycles	1.408	0.003	29.516	5.583	0.021	0.010	202.556	0.053
Sutter	Gasoline	LDGV	Light-Duty Vehicles (Passenger Cars)	0.105	0.003	1.138	0.125	0.051	0.021	307.456	0.024
	Gasoline	LDGT	Light-Duty Trucks (0-8,500 lbs)	0.266	0.004	2.199	0.333	0.052	0.022	413.039	0.025
	Gasoline	HDGV	Heavy-Duty Vehicles (8,501 + lbs)	0.607	0.006	3.855	0.539	0.059	0.025	642.121	0.045
	Diesel	LDDV	Light-Duty Vehicles (Passenger Cars)	0.128	0.003	0.219	0.017	0.057	0.028	271.126	0.008
	Diesel	LDDT	Light-Duty Trucks (0-8,500 lbs)	0.217	0.003	0.258	0.042	0.077	0.046	344.477	0.008
	Diesel	HDDV	Heavy-Duty Vehicles (8,501 + lbs)	4.571	0.014	0.753	0.176	0.145	0.077	1456.387	0.027
	NA	MC	Motorcycles	1.427	0.002	27.718	6.226	0.021	0.010	190.871	0.053
Tehama	Gasoline	LDGV	Light-Duty Vehicles (Passenger Cars)	0.121	0.003	1.262	0.136	0.052	0.022	336.551	0.024
	Gasoline	LDGT	Light-Duty Trucks (0-8,500 lbs)	0.323	0.005	2.651	0.380	0.053	0.023	456.185	0.025
	Gasoline	HDGV	Heavy-Duty Vehicles (8,501 + lbs)	0.685	0.007	4.489	0.618	0.061	0.026	693.989	0.045
	Diesel	LDDV	Light-Duty Vehicles (Passenger Cars)	0.215	0.003	0.365	0.033	0.067	0.037	305.043	0.008
	Diesel	LDDT	Light-Duty Trucks (0-8,500 lbs)	0.431	0.004	0.534	0.077	0.104	0.072	400.098	0.008
	Diesel	HDDV	Heavy-Duty Vehicles (8,501 + lbs)	5.148	0.014	0.844	0.192	0.149	0.079	1485.594	0.027
	NA	MC	Motorcycles	1.479	0.003	31.169	5.839	0.021	0.010	205.541	0.053
Trinity	Gasoline	LDGV	Light-Duty Vehicles (Passenger Cars)	0.186	0.004	1.970	0.205	0.052	0.023	399.185	0.024
	Gasoline	LDGT	Light-Duty Trucks (0-8,500 lbs)	0.673	0.006	5.820	0.729	0.055	0.025	547.788	0.025
	Gasoline	HDGV	Heavy-Duty Vehicles (8,501 + lbs)	1.282	0.008	8.137	1.215	0.063	0.028	792.457	0.045
	Diesel	LDDV	Light-Duty Vehicles (Passenger Cars)	0.425	0.003	0.750	0.085	0.100	0.068	363.960	0.008
	Diesel	LDDT	Light-Duty Trucks (0-8,500 lbs)	0.685	0.004	1.111	0.219	0.208	0.172	468.496	0.008
	Diesel	HDDV	Heavy-Duty Vehicles (8,501 + lbs)	5.638	0.014	0.954	0.218	0.158	0.089	1443.669	0.027
	NA	MC	Motorcycles	1.514	0.003	37.055	7.621	0.023	0.012	238.755	0.053
Tulare	Gasoline	LDGV	Light-Duty Vehicles (Passenger Cars)	0.092	0.003	1.060	0.124	0.051	0.021	318.219	0.024
	Gasoline	LDGT	Light-Duty Trucks (0-8,500 lbs)	0.220	0.004	2.054	0.321	0.051	0.022	422.339	0.025
	Gasoline	HDGV	Heavy-Duty Vehicles (8,501 + lbs)	0.513	0.007	3.611	0.473	0.058	0.024	650.355	0.045
	Diesel	LDDV	Light-Duty Vehicles (Passenger Cars)	0.124	0.003	0.218	0.021	0.061	0.031	274.290	0.008
	Diesel	LDDT	Light-Duty Trucks (0-8,500 lbs)	0.297	0.003	0.349	0.052	0.083	0.052	354.936	0.008
	Diesel	HDDV	Heavy-Duty Vehicles (8,501 + lbs)	4.760	0.014	0.818	0.183	0.154	0.082	1455.996	0.027
	NA	MC	Motorcycles	1.397	0.002	27.622	5.213	0.020	0.010	190.385	0.053
Tuolumne	Gasoline	LDGV	Light-Duty Vehicles (Passenger Cars)	0.183	0.003	1.903	0.208	0.052	0.022	339.970	0.024
	Gasoline	LDGT	Light-Duty Trucks (0-8,500 lbs)	0.538	0.005	4.740	0.656	0.053	0.024	464.245	0.025
	Gasoline	HDGV	Heavy-Duty Vehicles (8,501 + lbs)	1.109	0.007	6.596	1.031	0.062	0.027	699.256	0.045
	Diesel	LDDV	Light-Duty Vehicles (Passenger Cars)	0.280	0.003	0.442	0.043	0.073	0.043	308.681	0.008
	Diesel	LDDT	Light-Duty Trucks (0-8,500 lbs)	0.370	0.004	0.476	0.065	0.085	0.055	383.530	0.008
	Diesel	HDDV	Heavy-Duty Vehicles (8,501 + lbs)	5.954	0.010	1.115	0.256	0.200	0.120	1021.910	0.027
	NA	MC	Motorcycles	1.465	0.003	32.633	6.513	0.022	0.011	201.916	0.053
Ventura	Gasoline	LDGV	Light-Duty Vehicles (Passenger Cars)	0.097	0.003	1.148	0.133	0.053	0.022	334.953	0.024
	Gasoline	LDGT	Light-Duty Trucks (0-8,500 lbs)	0.170	0.004	1.701	0.242	0.054	0.023	444.756	0.025
	Gasoline	HDGV	Heavy-Duty Vehicles (8,501 + lbs)	0.470	0.007	3.159	0.421	0.062	0.026	662.693	0.045
	Diesel	LDDV	Light-Duty Vehicles (Passenger Cars)	0.160	0.003	0.328	0.032	0.068	0.037	306.893	0.008
	Diesel	LDDT	Light-Duty Trucks (0-8,500 lbs)	0.186	0.004	0.279	0.039	0.072	0.041	396.227	0.008
	Diesel	HDDV	Heavy-Duty Vehicles (8,501 + lbs)	3.986	0.011	0.791	0.129	0.161	0.087	1153.352	0.027
	NA	MC	Motorcycles	1.444	0.003	28.117	6.175	0.022	0.011	213.399	0.053

Table 5-37. 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	SOx	CO	ROG	PM_{10}	$PM_{2.5}$	CO_2e	NH_3
Yolo	Gasoline	LDGV	Light-Duty Vehicles (Passenger Cars)	0.102	0.003	1.157	0.137	0.051	0.022	332.411	0.024
	Gasoline	LDGT	Light-Duty Trucks (0-8,500 lbs)	0.166	0.004	1.570	0.234	0.052	0.022	431.687	0.025
	Gasoline	HDGV	Heavy-Duty Vehicles (8,501 + lbs)	0.468	0.007	3.083	0.421	0.061	0.026	662.709	0.045
	Diesel	LDDV	Light-Duty Vehicles (Passenger Cars)	0.247	0.003	0.327	0.034	0.071	0.041	303.884	0.008
	Diesel	LDDT	Light-Duty Trucks (0-8,500 lbs)	0.245	0.004	0.284	0.037	0.074	0.043	383.695	0.008
	Diesel	HDDV	Heavy-Duty Vehicles (8,501 + lbs)	3.766	0.012	0.758	0.157	0.162	0.086	1293.174	0.027
	NA	MC	Motorcycles	1.409	0.003	28.784	4.984	0.020	0.010	195.426	0.053
Yuba	Gasoline	LDGV	Light-Duty Vehicles (Passenger Cars)	0.108	0.003	1.166	0.123	0.051	0.021	314.436	0.024
	Gasoline	LDGT	Light-Duty Trucks (0-8,500 lbs)	0.338	0.004	2.770	0.390	0.052	0.022	432.681	0.025
	Gasoline	HDGV	Heavy-Duty Vehicles (8,501 + lbs)	0.732	0.007	4.834	0.635	0.061	0.026	658.523	0.045
	Diesel	LDDV	Light-Duty Vehicles (Passenger Cars)	0.154	0.003	0.259	0.023	0.061	0.032	282.884	0.008
	Diesel	LDDT	Light-Duty Trucks (0-8,500 lbs)	0.262	0.003	0.283	0.044	0.079	0.049	355.844	0.008
	Diesel	HDDV	Heavy-Duty Vehicles (8,501 + lbs)	5.863	0.011	1.110	0.248	0.207	0.121	1152.567	0.027
	NA	MC	Motorcycles	1.419	0.002	28.387	5.343	0.021	0.010	190.484	0.053

Table 5-38. EMFAC County-Specific On-Road Vehicle EFs – 2020

County	Fuel Type	Vehicle Type		Emission Factors (g/mi)							
				Criteria Pollutants and Ozone Precursors							
				NO_X	SOx	CO	ROG	PM_{10}	$PM_{2.5}$	CO_2e	NH_3
Alameda	Gasoline	LDGV	Light-Duty Vehicles (Passenger Cars)	0.090	0.003	1.038	0.123	0.047	0.020	299.284	0.023
	Gasoline	LDGT	Light-Duty Trucks (0-8,500 lbs)	0.139	0.004	1.339	0.188	0.047	0.020	388.287	0.024
	Gasoline	HDGV	Heavy-Duty Vehicles (8,501 + lbs)	0.399	0.006	2.639	0.347	0.055	0.023	592.756	0.045
	Diesel	LDDV	Light-Duty Vehicles (Passenger Cars)	0.173	0.003	0.305	0.029	0.063	0.035	282.286	0.008
	Diesel	LDDT	Light-Duty Trucks (0-8,500 lbs)	0.152	0.003	0.234	0.033	0.065	0.037	355.609	0.008
	Diesel	HDDV	Heavy-Duty Vehicles (8,501 + lbs)	4.460	0.013	0.848	0.170	0.167	0.088	1419.126	0.027
	NA	MC	Motorcycles	1.264	0.002	24.228	4.252	0.019	0.009	184.846	0.053
Alpine	Gasoline	LDGV	Light-Duty Vehicles (Passenger Cars)	0.123	0.003	1.312	0.133	0.047	0.020	276.403	0.023
	Gasoline	LDGT	Light-Duty Trucks (0-8,500 lbs)	0.267	0.004	2.315	0.324	0.047	0.020	367.205	0.024
	Gasoline	HDGV	Heavy-Duty Vehicles (8,501 + lbs)	0.781	0.006	4.609	0.690	0.056	0.024	582.859	0.045
	Diesel	LDDV	Light-Duty Vehicles (Passenger Cars)	0.159	0.002	0.295	0.025	0.059	0.031	259.379	0.008
	Diesel	LDDT	Light-Duty Trucks (0-8,500 lbs)	0.159	0.003	0.240	0.033	0.063	0.035	330.338	0.008
	Diesel	HDDV	Heavy-Duty Vehicles (8,501 + lbs)	4.267	0.014	0.745	0.156	0.140	0.069	1422.365	0.027
	NA	MC	Motorcycles	1.388	0.002	28.069	4.763	0.019	0.009	176.010	0.053
Amador	Gasoline	LDGV	Light-Duty Vehicles (Passenger Cars)	0.137	0.003	1.420	0.169	0.047	0.020	267.208	0.023
	Gasoline	LDGT	Light-Duty Trucks (0-8,500 lbs)	0.357	0.004	3.070	0.517	0.047	0.020	360.739	0.024
	Gasoline	HDGV	Heavy-Duty Vehicles (8,501 + lbs)	0.893	0.006	5.257	0.923	0.057	0.025	581.860	0.045
	Diesel	LDDV	Light-Duty Vehicles (Passenger Cars)	0.232	0.002	0.252	0.025	0.061	0.033	248.235	0.008
	Diesel	LDDT	Light-Duty Trucks (0-8,500 lbs)	0.160	0.003	0.236	0.033	0.065	0.037	305.444	0.008
	Diesel	HDDV	Heavy-Duty Vehicles (8,501 + lbs)	5.150	0.010	0.905	0.205	0.171	0.099	1038.359	0.027
	NA	MC	Motorcycles	1.310	0.002	25.790	4.903	0.019	0.009	161.583	0.053
Butte	Gasoline	LDGV	Light-Duty Vehicles (Passenger Cars)	0.111	0.003	1.218	0.133	0.047	0.020	300.671	0.023
	Gasoline	LDGT	Light-Duty Trucks (0-8,500 lbs)	0.318	0.004	2.649	0.372	0.048	0.020	405.575	0.024
	Gasoline	HDGV	Heavy-Duty Vehicles (8,501 + lbs)	0.628	0.006	4.214	0.573	0.056	0.024	613.046	0.045
	Diesel	LDDV	Light-Duty Vehicles (Passenger Cars)	0.210	0.003	0.319	0.033	0.066	0.038	280.641	0.008
	Diesel	LDDT	Light-Duty Trucks (0-8,500 lbs)	0.430	0.003	0.444	0.074	0.101	0.071	363.243	0.008
	Diesel	HDDV	Heavy-Duty Vehicles (8,501 + lbs)	4.634	0.013	0.825	0.174	0.148	0.077	1369.982	0.027
	NA	MC	Motorcycles	1.296	0.002	26.546	5.614	0.020	0.010	180.700	0.053
Calaveras	Gasoline	LDGV	Light-Duty Vehicles (Passenger Cars)	0.138	0.003	1.502	0.166	0.047	0.020	295.123	0.023
	Gasoline	LDGT	Light-Duty Trucks (0-8,500 lbs)	0.378	0.004	3.448	0.564	0.048	0.021	399.148	0.024
	Gasoline	HDGV	Heavy-Duty Vehicles (8,501 + lbs)	0.970	0.006	5.813	1.018	0.058	0.025	624.695	0.045
	Diesel	LDDV	Light-Duty Vehicles (Passenger Cars)	0.272	0.003	0.399	0.042	0.070	0.042	275.544	0.008
	Diesel	LDDT	Light-Duty Trucks (0-8,500 lbs)	0.268	0.003	0.416	0.067	0.088	0.059	349.350	0.008
	Diesel	HDDV	Heavy-Duty Vehicles (8,501 + lbs)	5.179	0.011	0.897	0.200	0.164	0.093	1110.046	0.027
	NA	MC	Motorcycles	1.320	0.002	27.314	5.876	0.020	0.010	181.788	0.053
Colusa	Gasoline	LDGV	Light-Duty Vehicles (Passenger Cars)	0.095	0.003	1.008	0.118	0.047	0.020	291.664	0.023
	Gasoline	LDGT	Light-Duty Trucks (0-8,500 lbs)	0.197	0.004	1.670	0.250	0.047	0.020	384.037	0.024
	Gasoline	HDGV	Heavy-Duty Vehicles (8,501 + lbs)	0.476	0.006	2.983	0.423	0.054	0.023	593.747	0.045
	Diesel	LDDV	Light-Duty Vehicles (Passenger Cars)	0.164	0.003	0.282	0.027	0.062	0.034	268.529	0.008
	Diesel	LDDT	Light-Duty Trucks (0-8,500 lbs)	0.207	0.003	0.298	0.040	0.071	0.043	343.173	0.008
	Diesel	HDDV	Heavy-Duty Vehicles (8,501 + lbs)	4.390	0.013	0.771	0.167	0.141	0.073	1379.809	0.027
	NA	MC	Motorcycles	1.278	0.002	24.430	4.535	0.019	0.009	179.768	0.053
Contra Costa	Gasoline	LDGV	Light-Duty Vehicles (Passenger Cars)	0.084	0.003	0.979	0.116	0.047	0.020	294.787	0.023
	Gasoline	LDGT	Light-Duty Trucks (0-8,500 lbs)	0.133	0.004	1.308	0.186	0.047	0.020	386.535	0.024
	Gasoline	HDGV	Heavy-Duty Vehicles (8,501 + lbs)	0.373	0.006	2.506	0.337	0.054	0.023	586.553	0.045
	Diesel	LDDV	Light-Duty Vehicles (Passenger Cars)	0.138	0.003	0.266	0.026	0.061	0.033	276.521	0.008
	Diesel	LDDT	Light-Duty Trucks (0-8,500 lbs)	0.117	0.003	0.193	0.025	0.059	0.031	352.384	0.008
	Diesel	HDDV	Heavy-Duty Vehicles (8,501 + lbs)	4.342	0.012	0.777	0.162	0.182	0.092	1299.013	0.027
	NA	MC	Motorcycles	1.266	0.002	24.428	4.328	0.019	0.009	183.612	0.053
Del Norte	Gasoline	LDGV	Light-Duty Vehicles (Passenger Cars)	0.146	0.003	1.450	0.162	0.047	0.020	311.444	0.023
	Gasoline	LDGT	Light-Duty Trucks (0-8,500 lbs)	0.495	0.004	3.657	0.551	0.048	0.021	427.051	0.024
	Gasoline	HDGV	Heavy-Duty Vehicles (8,501 + lbs)	0.902	0.007	5.232	0.835	0.056	0.024	644.634	0.045
	Diesel	LDDV	Light-Duty Vehicles (Passenger Cars)	0.249	0.003	0.433	0.043	0.071	0.042	301.587	0.008
	Diesel	LDDT	Light-Duty Trucks (0-8,500 lbs)	0.689	0.004	0.958	0.156	0.160	0.128	388.990	0.008
	Diesel	HDDV	Heavy-Duty Vehicles (8,501 + lbs)	5.492	0.009	1.109	0.234	0.177	0.105	893.100	0.027
	NA	MC	Motorcycles	1.377	0.003	29.876	5.989	0.020	0.010	193.698	0.053

Table 5-38. 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	SOx	CO	ROG	PM_{10}	$PM_{2.5}$	CO_2e	NH_3
El Dorado	Gasoline	LDGV	Light-Duty Vehicles (Passenger Cars)	0.080	0.003	0.973	0.105	0.047	0.020	293.088	0.023
	Gasoline	LDGT	Light-Duty Trucks (0-8,500 lbs)	0.186	0.004	1.866	0.292	0.047	0.020	398.548	0.024
	Gasoline	HDGV	Heavy-Duty Vehicles (8,501 + lbs)	0.491	0.006	3.373	0.534	0.054	0.023	599.806	0.045
	Diesel	LDDV	Light-Duty Vehicles (Passenger Cars)	0.143	0.003	0.270	0.022	0.057	0.030	272.452	0.008
	Diesel	LDDT	Light-Duty Trucks (0-8,500 lbs)	0.190	0.003	0.256	0.034	0.065	0.037	355.104	0.008
	Diesel	HDDV	Heavy-Duty Vehicles (8,501 + lbs)	4.542	0.009	0.874	0.188	0.165	0.092	993.796	0.027
	NA	MC	Motorcycles	1.361	0.002	28.509	6.077	0.020	0.010	188.450	0.053
Fresno	Gasoline	LDGV	Light-Duty Vehicles (Passenger Cars)	0.077	0.003	0.891	0.112	0.047	0.020	290.832	0.023
	Gasoline	LDGT	Light-Duty Trucks (0-8,500 lbs)	0.159	0.004	1.514	0.252	0.047	0.020	387.074	0.024
	Gasoline	HDGV	Heavy-Duty Vehicles (8,501 + lbs)	0.407	0.006	2.790	0.405	0.053	0.022	592.758	0.045
	Diesel	LDDV	Light-Duty Vehicles (Passenger Cars)	0.087	0.002	0.189	0.015	0.054	0.027	260.215	0.008
	Diesel	LDDT	Light-Duty Trucks (0-8,500 lbs)	0.151	0.003	0.218	0.028	0.063	0.035	343.041	0.008
	Diesel	HDDV	Heavy-Duty Vehicles (8,501 + lbs)	4.314	0.014	0.708	0.154	0.141	0.070	1516.734	0.027
	NA	MC	Motorcycles	1.274	0.002	25.570	4.469	0.018	0.009	175.682	0.053
Glenn	Gasoline	LDGV	Light-Duty Vehicles (Passenger Cars)	0.098	0.003	1.074	0.120	0.047	0.020	302.332	0.023
	Gasoline	LDGT	Light-Duty Trucks (0-8,500 lbs)	0.231	0.004	2.002	0.308	0.047	0.020	400.356	0.024
	Gasoline	HDGV	Heavy-Duty Vehicles (8,501 + lbs)	0.537	0.006	3.577	0.515	0.055	0.024	616.396	0.045
	Diesel	LDDV	Light-Duty Vehicles (Passenger Cars)	0.144	0.003	0.316	0.028	0.060	0.032	277.941	0.008
	Diesel	LDDT	Light-Duty Trucks (0-8,500 lbs)	0.237	0.003	0.375	0.051	0.079	0.051	351.628	0.008
	Diesel	HDDV	Heavy-Duty Vehicles (8,501 + lbs)	4.567	0.013	0.792	0.173	0.142	0.075	1353.240	0.027
	NA	MC	Motorcycles	1.284	0.002	25.576	5.274	0.019	0.009	185.643	0.053
Humboldt	Gasoline	LDGV	Light-Duty Vehicles (Passenger Cars)	0.153	0.003	1.493	0.166	0.047	0.020	293.027	0.023
	Gasoline	LDGT	Light-Duty Trucks (0-8,500 lbs)	0.436	0.004	3.357	0.496	0.048	0.021	398.597	0.024
	Gasoline	HDGV	Heavy-Duty Vehicles (8,501 + lbs)	0.898	0.006	4.989	0.827	0.056	0.024	602.427	0.045
	Diesel	LDDV	Light-Duty Vehicles (Passenger Cars)	0.452	0.003	0.475	0.052	0.078	0.050	288.509	0.008
	Diesel	LDDT	Light-Duty Trucks (0-8,500 lbs)	0.429	0.003	0.524	0.087	0.110	0.080	362.432	0.008
	Diesel	HDDV	Heavy-Duty Vehicles (8,501 + lbs)	5.427	0.012	0.927	0.206	0.162	0.091	1213.796	0.027
	NA	MC	Motorcycles	1.382	0.002	29.223	5.623	0.020	0.010	181.040	0.053
Imperial	Gasoline	LDGV	Light-Duty Vehicles (Passenger Cars)	0.318	0.003	2.920	0.248	0.047	0.020	286.706	0.023
	Gasoline	LDGT	Light-Duty Trucks (0-8,500 lbs)	0.237	0.004	2.179	0.431	0.047	0.020	380.910	0.024
	Gasoline	HDGV	Heavy-Duty Vehicles (8,501 + lbs)	0.597	0.006	3.779	0.597	0.054	0.023	578.142	0.045
	Diesel	LDDV	Light-Duty Vehicles (Passenger Cars)	0.112	0.002	0.193	0.019	0.058	0.030	248.061	0.008
	Diesel	LDDT	Light-Duty Trucks (0-8,500 lbs)	0.200	0.003	0.213	0.028	0.064	0.036	326.506	0.008
	Diesel	HDDV	Heavy-Duty Vehicles (8,501 + lbs)	3.328	0.013	0.391	0.078	0.128	0.061	1392.720	0.027
	NA	MC	Motorcycles	1.191	0.002	21.855	4.170	0.018	0.008	169.166	0.053
Inyo	Gasoline	LDGV	Light-Duty Vehicles (Passenger Cars)	0.113	0.003	1.186	0.149	0.047	0.020	305.764	0.023
	Gasoline	LDGT	Light-Duty Trucks (0-8,500 lbs)	0.267	0.004	2.333	0.414	0.047	0.020	408.139	0.024
	Gasoline	HDGV	Heavy-Duty Vehicles (8,501 + lbs)	0.765	0.006	4.528	0.804	0.057	0.025	635.385	0.045
	Diesel	LDDV	Light-Duty Vehicles (Passenger Cars)	0.153	0.003	0.317	0.027	0.059	0.032	276.942	0.008
	Diesel	LDDT	Light-Duty Trucks (0-8,500 lbs)	0.178	0.003	0.292	0.040	0.068	0.040	355.066	0.008
	Diesel	HDDV	Heavy-Duty Vehicles (8,501 + lbs)	4.455	0.013	0.821	0.170	0.156	0.080	1323.423	0.027
	NA	MC	Motorcycles	1.318	0.002	26.892	5.290	0.019	0.009	188.249	0.053
Kern	Gasoline	LDGV	Light-Duty Vehicles (Passenger Cars)	0.077	0.003	0.873	0.109	0.047	0.020	312.565	0.023
	Gasoline	LDGT	Light-Duty Trucks (0-8,500 lbs)	0.154	0.004	1.439	0.235	0.047	0.020	414.702	0.024
	Gasoline	HDGV	Heavy-Duty Vehicles (8,501 + lbs)	0.408	0.006	2.732	0.402	0.055	0.023	639.025	0.045
	Diesel	LDDV	Light-Duty Vehicles (Passenger Cars)	0.093	0.003	0.239	0.018	0.055	0.027	283.762	0.008
	Diesel	LDDT	Light-Duty Trucks (0-8,500 lbs)	0.152	0.004	0.244	0.033	0.065	0.037	373.262	0.008
	Diesel	HDDV	Heavy-Duty Vehicles (8,501 + lbs)	4.228	0.014	0.700	0.150	0.134	0.066	1518.891	0.027
	NA	MC	Motorcycles	1.282	0.002	26.453	4.433	0.019	0.009	188.580	0.053
Kings	Gasoline	LDGV	Light-Duty Vehicles (Passenger Cars)	0.085	0.003	0.924	0.107	0.047	0.020	286.604	0.023
	Gasoline	LDGT	Light-Duty Trucks (0-8,500 lbs)	0.207	0.004	1.809	0.274	0.047	0.020	382.324	0.024
	Gasoline	HDGV	Heavy-Duty Vehicles (8,501 + lbs)	0.451	0.006	2.884	0.420	0.054	0.023	592.364	0.045
	Diesel	LDDV	Light-Duty Vehicles (Passenger Cars)	0.095	0.002	0.237	0.019	0.055	0.028	255.054	0.008
	Diesel	LDDT	Light-Duty Trucks (0-8,500 lbs)	0.185	0.003	0.271	0.034	0.066	0.038	332.156	0.008
	Diesel	HDDV	Heavy-Duty Vehicles (8,501 + lbs)	4.449	0.015	0.717	0.155	0.131	0.064	1553.185	0.027
	NA	MC	Motorcycles	1.253	0.002	23.773	4.229	0.018	0.008	173.349	0.053

Table 5-38. 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	SOx	CO	ROG	PM_{10}	$PM_{2.5}$	CO_2e	NH_3
Lake	Gasoline	LDGV	Light-Duty Vehicles (Passenger Cars)	0.161	0.003	1.674	0.207	0.047	0.020	303.749	0.023
	Gasoline	LDGT	Light-Duty Trucks (0-8,500 lbs)	0.368	0.004	3.121	0.536	0.048	0.021	403.095	0.024
	Gasoline	HDGV	Heavy-Duty Vehicles (8,501 + lbs)	1.046	0.006	6.281	1.104	0.058	0.025	632.309	0.045
	Diesel	LDDV	Light-Duty Vehicles (Passenger Cars)	0.270	0.003	0.383	0.037	0.068	0.039	280.231	0.008
	Diesel	LDDT	Light-Duty Trucks (0-8,500 lbs)	0.404	0.003	0.431	0.062	0.088	0.059	351.072	0.008
	Diesel	HDDV	Heavy-Duty Vehicles (8,501 + lbs)	5.367	0.011	0.989	0.230	0.180	0.107	1114.238	0.027
	NA	MC	Motorcycles	1.353	0.002	29.386	6.327	0.020	0.010	183.578	0.053
Lassen	Gasoline	LDGV	Light-Duty Vehicles (Passenger Cars)	0.136	0.003	1.438	0.157	0.048	0.020	316.645	0.023
	Gasoline	LDGT	Light-Duty Trucks (0-8,500 lbs)	0.336	0.004	2.974	0.472	0.048	0.021	430.420	0.024
	Gasoline	HDGV	Heavy-Duty Vehicles (8,501 + lbs)	0.990	0.007	5.931	1.023	0.057	0.025	661.117	0.045
	Diesel	LDDV	Light-Duty Vehicles (Passenger Cars)	0.176	0.003	0.391	0.031	0.060	0.032	288.840	0.008
	Diesel	LDDT	Light-Duty Trucks (0-8,500 lbs)	0.200	0.004	0.366	0.050	0.072	0.043	375.258	0.008
	Diesel	HDDV	Heavy-Duty Vehicles (8,501 + lbs)	5.334	0.009	1.111	0.231	0.180	0.105	916.202	0.027
	NA	MC	Motorcycles	1.387	0.003	30.337	5.830	0.020	0.010	196.793	0.053
Los Angeles	Gasoline	LDGV	Light-Duty Vehicles (Passenger Cars)	0.088	0.003	1.108	0.128	0.047	0.020	322.038	0.023
	Gasoline	LDGT	Light-Duty Trucks (0-8,500 lbs)	0.152	0.004	1.588	0.202	0.048	0.020	418.817	0.024
	Gasoline	HDGV	Heavy-Duty Vehicles (8,501 + lbs)	0.373	0.006	2.746	0.329	0.056	0.024	617.118	0.045
	Diesel	LDDV	Light-Duty Vehicles (Passenger Cars)	0.139	0.003	0.364	0.037	0.066	0.038	286.736	0.008
	Diesel	LDDT	Light-Duty Trucks (0-8,500 lbs)	0.151	0.004	0.280	0.038	0.064	0.036	374.419	0.008
	Diesel	HDDV	Heavy-Duty Vehicles (8,501 + lbs)	3.545	0.012	0.902	0.127	0.158	0.078	1281.936	0.027
	NA	MC	Motorcycles	1.233	0.002	22.591	4.658	0.019	0.009	201.482	0.053
Madera	Gasoline	LDGV	Light-Duty Vehicles (Passenger Cars)	0.081	0.003	1.004	0.108	0.047	0.020	312.543	0.023
	Gasoline	LDGT	Light-Duty Trucks (0-8,500 lbs)	0.183	0.004	1.842	0.283	0.048	0.020	416.742	0.024
	Gasoline	HDGV	Heavy-Duty Vehicles (8,501 + lbs)	0.454	0.006	3.245	0.451	0.056	0.024	638.120	0.045
	Diesel	LDDV	Light-Duty Vehicles (Passenger Cars)	0.127	0.003	0.340	0.028	0.059	0.031	278.513	0.008
	Diesel	LDDT	Light-Duty Trucks (0-8,500 lbs)	0.207	0.003	0.317	0.044	0.070	0.042	359.592	0.008
	Diesel	HDDV	Heavy-Duty Vehicles (8,501 + lbs)	4.454	0.014	0.773	0.163	0.139	0.069	1474.654	0.027
	NA	MC	Motorcycles	1.249	0.002	24.900	4.412	0.019	0.009	184.986	0.053
Marin	Gasoline	LDGV	Light-Duty Vehicles (Passenger Cars)	0.086	0.003	0.966	0.126	0.047	0.020	298.099	0.023
	Gasoline	LDGT	Light-Duty Trucks (0-8,500 lbs)	0.134	0.004	1.276	0.199	0.047	0.020	390.748	0.024
	Gasoline	HDGV	Heavy-Duty Vehicles (8,501 + lbs)	0.368	0.006	2.401	0.352	0.055	0.023	590.370	0.045
	Diesel	LDDV	Light-Duty Vehicles (Passenger Cars)	0.183	0.003	0.313	0.029	0.063	0.035	291.885	0.008
	Diesel	LDDT	Light-Duty Trucks (0-8,500 lbs)	0.127	0.004	0.219	0.027	0.060	0.032	374.059	0.008
	Diesel	HDDV	Heavy-Duty Vehicles (8,501 + lbs)	4.665	0.011	1.113	0.206	0.228	0.125	1214.656	0.027
	NA	MC	Motorcycles	1.295	0.002	25.468	4.551	0.019	0.009	187.682	0.053
Mariposa	Gasoline	LDGV	Light-Duty Vehicles (Passenger Cars)	0.134	0.003	1.459	0.171	0.048	0.020	306.301	0.023
	Gasoline	LDGT	Light-Duty Trucks (0-8,500 lbs)	0.490	0.004	4.348	0.657	0.049	0.022	421.828	0.024
	Gasoline	HDGV	Heavy-Duty Vehicles (8,501 + lbs)	0.994	0.007	6.101	1.046	0.058	0.025	645.357	0.045
	Diesel	LDDV	Light-Duty Vehicles (Passenger Cars)	0.259	0.003	0.424	0.034	0.061	0.034	286.442	0.008
	Diesel	LDDT	Light-Duty Trucks (0-8,500 lbs)	0.323	0.003	0.587	0.093	0.100	0.071	353.902	0.008
	Diesel	HDDV	Heavy-Duty Vehicles (8,501 + lbs)	5.581	0.008	1.043	0.230	0.176	0.102	883.836	0.027
	NA	MC	Motorcycles	1.357	0.002	29.571	5.978	0.020	0.010	189.369	0.053
Mendocino	Gasoline	LDGV	Light-Duty Vehicles (Passenger Cars)	0.132	0.003	1.338	0.150	0.047	0.020	288.767	0.023
	Gasoline	LDGT	Light-Duty Trucks (0-8,500 lbs)	0.428	0.004	3.444	0.507	0.048	0.021	396.898	0.024
	Gasoline	HDGV	Heavy-Duty Vehicles (8,501 + lbs)	0.919	0.006	5.199	0.849	0.056	0.024	609.510	0.045
	Diesel	LDDV	Light-Duty Vehicles (Passenger Cars)	0.465	0.003	0.460	0.046	0.074	0.045	285.015	0.008
	Diesel	LDDT	Light-Duty Trucks (0-8,500 lbs)	0.642	0.003	0.635	0.119	0.137	0.106	359.554	0.008
	Diesel	HDDV	Heavy-Duty Vehicles (8,501 + lbs)	5.056	0.013	0.848	0.193	0.152	0.084	1319.258	0.027
	NA	MC	Motorcycles	1.354	0.002	28.339	5.491	0.019	0.009	179.608	0.053
Merced	Gasoline	LDGV	Light-Duty Vehicles (Passenger Cars)	0.085	0.003	1.003	0.111	0.047	0.020	304.343	0.023
	Gasoline	LDGT	Light-Duty Trucks (0-8,500 lbs)	0.185	0.004	1.758	0.261	0.047	0.020	402.337	0.024
	Gasoline	HDGV	Heavy-Duty Vehicles (8,501 + lbs)	0.465	0.006	3.278	0.424	0.056	0.024	624.800	0.045
	Diesel	LDDV	Light-Duty Vehicles (Passenger Cars)	0.144	0.003	0.297	0.025	0.059	0.031	273.578	0.008
	Diesel	LDDT	Light-Duty Trucks (0-8,500 lbs)	0.209	0.003	0.310	0.042	0.070	0.042	357.516	0.008
	Diesel	HDDV	Heavy-Duty Vehicles (8,501 + lbs)	4.512	0.015	0.734	0.159	0.137	0.067	1548.396	0.027
	NA	MC	Motorcycles	1.248	0.002	24.717	3.982	0.018	0.008	179.010	0.053

Table 5-38. 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	SOx	CO	ROG	PM_{10}	$PM_{2.5}$	CO_2e	NH_3
Modoc	Gasoline	LDGV	Light-Duty Vehicles (Passenger Cars)	0.150	0.004	1.606	0.166	0.048	0.021	352.120	0.023
	Gasoline	LDGT	Light-Duty Trucks (0-8,500 lbs)	0.376	0.005	3.512	0.494	0.049	0.022	475.042	0.024
	Gasoline	HDGV	Heavy-Duty Vehicles (8,501 + lbs)	1.126	0.007	7.173	1.175	0.058	0.026	715.523	0.045
	Diesel	LDDV	Light-Duty Vehicles (Passenger Cars)	0.212	0.003	0.574	0.051	0.070	0.042	324.046	0.008
	Diesel	LDDT	Light-Duty Trucks (0-8,500 lbs)	0.358	0.004	0.524	0.068	0.080	0.051	438.747	0.008
	Diesel	HDDV	Heavy-Duty Vehicles (8,501 + lbs)	5.352	0.009	1.034	0.223	0.173	0.099	984.018	0.027
	NA	MC	Motorcycles	1.411	0.003	31.510	6.291	0.020	0.010	219.435	0.053
Mono	Gasoline	LDGV	Light-Duty Vehicles (Passenger Cars)	0.120	0.003	1.230	0.129	0.047	0.020	294.611	0.023
	Gasoline	LDGT	Light-Duty Trucks (0-8,500 lbs)	0.291	0.004	2.456	0.364	0.047	0.020	397.939	0.024
	Gasoline	HDGV	Heavy-Duty Vehicles (8,501 + lbs)	0.832	0.006	4.951	0.770	0.057	0.025	618.236	0.045
	Diesel	LDDV	Light-Duty Vehicles (Passenger Cars)	0.183	0.003	0.348	0.029	0.060	0.033	280.314	0.008
	Diesel	LDDT	Light-Duty Trucks (0-8,500 lbs)	0.348	0.003	0.372	0.042	0.068	0.039	362.381	0.008
	Diesel	HDDV	Heavy-Duty Vehicles (8,501 + lbs)	4.427	0.013	0.775	0.165	0.142	0.073	1363.395	0.027
	NA	MC	Motorcycles	1.449	0.003	32.330	5.351	0.019	0.009	189.355	0.053
Monterey	Gasoline	LDGV	Light-Duty Vehicles (Passenger Cars)	0.117	0.003	1.246	0.136	0.047	0.020	317.454	0.023
	Gasoline	LDGT	Light-Duty Trucks (0-8,500 lbs)	0.277	0.004	2.178	0.293	0.048	0.021	427.128	0.024
	Gasoline	HDGV	Heavy-Duty Vehicles (8,501 + lbs)	0.585	0.007	3.518	0.458	0.056	0.024	648.119	0.045
	Diesel	LDDV	Light-Duty Vehicles (Passenger Cars)	0.197	0.003	0.434	0.042	0.068	0.040	295.311	0.008
	Diesel	LDDT	Light-Duty Trucks (0-8,500 lbs)	0.338	0.004	0.487	0.098	0.109	0.079	392.650	0.008
	Diesel	HDDV	Heavy-Duty Vehicles (8,501 + lbs)	4.469	0.012	0.892	0.174	0.174	0.093	1291.459	0.027
	NA	MC	Motorcycles	1.265	0.002	24.530	4.082	0.019	0.009	191.004	0.053
Napa	Gasoline	LDGV	Light-Duty Vehicles (Passenger Cars)	0.084	0.003	0.981	0.108	0.047	0.020	286.735	0.023
	Gasoline	LDGT	Light-Duty Trucks (0-8,500 lbs)	0.161	0.004	1.561	0.225	0.047	0.020	378.978	0.024
	Gasoline	HDGV	Heavy-Duty Vehicles (8,501 + lbs)	0.480	0.006	3.149	0.436	0.056	0.024	597.950	0.045
	Diesel	LDDV	Light-Duty Vehicles (Passenger Cars)	0.158	0.003	0.277	0.027	0.062	0.034	272.607	0.008
	Diesel	LDDT	Light-Duty Trucks (0-8,500 lbs)	0.121	0.003	0.197	0.024	0.060	0.032	350.538	0.008
	Diesel	HDDV	Heavy-Duty Vehicles (8,501 + lbs)	4.576	0.012	0.822	0.172	0.153	0.081	1314.105	0.027
	NA	MC	Motorcycles	1.269	0.002	24.371	4.254	0.019	0.009	177.218	0.053
Nevada	Gasoline	LDGV	Light-Duty Vehicles (Passenger Cars)	0.112	0.003	1.179	0.131	0.047	0.020	283.544	0.023
	Gasoline	LDGT	Light-Duty Trucks (0-8,500 lbs)	0.300	0.004	2.345	0.346	0.047	0.020	394.636	0.024
	Gasoline	HDGV	Heavy-Duty Vehicles (8,501 + lbs)	0.698	0.006	4.480	0.608	0.055	0.024	595.389	0.045
	Diesel	LDDV	Light-Duty Vehicles (Passenger Cars)	0.269	0.003	0.358	0.038	0.069	0.041	275.205	0.008
	Diesel	LDDT	Light-Duty Trucks (0-8,500 lbs)	0.427	0.003	0.396	0.050	0.077	0.049	354.340	0.008
	Diesel	HDDV	Heavy-Duty Vehicles (8,501 + lbs)	4.702	0.013	0.804	0.175	0.141	0.075	1336.842	0.027
	NA	MC	Motorcycles	1.395	0.002	30.049	6.020	0.020	0.010	178.535	0.053
Orange	Gasoline	LDGV	Light-Duty Vehicles (Passenger Cars)	0.073	0.003	0.926	0.112	0.047	0.020	299.798	0.023
	Gasoline	LDGT	Light-Duty Trucks (0-8,500 lbs)	0.116	0.004	1.244	0.173	0.047	0.020	392.713	0.024
	Gasoline	HDGV	Heavy-Duty Vehicles (8,501 + lbs)	0.345	0.006	2.398	0.319	0.055	0.023	592.232	0.045
	Diesel	LDDV	Light-Duty Vehicles (Passenger Cars)	0.096	0.003	0.279	0.024	0.058	0.030	270.687	0.008
	Diesel	LDDT	Light-Duty Trucks (0-8,500 lbs)	0.090	0.003	0.199	0.025	0.056	0.029	353.304	0.008
	Diesel	HDDV	Heavy-Duty Vehicles (8,501 + lbs)	3.045	0.010	0.751	0.104	0.159	0.080	1164.114	0.027
	NA	MC	Motorcycles	1.220	0.002	22.074	4.563	0.019	0.009	191.023	0.053
Placer	Gasoline	LDGV	Light-Duty Vehicles (Passenger Cars)	0.080	0.003	0.966	0.110	0.047	0.020	286.633	0.023
	Gasoline	LDGT	Light-Duty Trucks (0-8,500 lbs)	0.139	0.004	1.399	0.198	0.047	0.020	380.208	0.024
	Gasoline	HDGV	Heavy-Duty Vehicles (8,501 + lbs)	0.388	0.006	2.678	0.371	0.054	0.023	580.693	0.045
	Diesel	LDDV	Light-Duty Vehicles (Passenger Cars)	0.149	0.003	0.259	0.024	0.060	0.032	264.849	0.008
	Diesel	LDDT	Light-Duty Trucks (0-8,500 lbs)	0.162	0.003	0.220	0.031	0.063	0.035	340.259	0.008
	Diesel	HDDV	Heavy-Duty Vehicles (8,501 + lbs)	3.849	0.012	0.700	0.151	0.149	0.076	1310.592	0.027
	NA	MC	Motorcycles	1.316	0.002	26.270	4.899	0.019	0.009	179.014	0.053
Plumas	Gasoline	LDGV	Light-Duty Vehicles (Passenger Cars)	0.137	0.003	1.519	0.168	0.048	0.021	326.360	0.023
	Gasoline	LDGT	Light-Duty Trucks (0-8,500 lbs)	0.427	0.005	3.895	0.548	0.049	0.021	456.792	0.024
	Gasoline	HDGV	Heavy-Duty Vehicles (8,501 + lbs)	1.179	0.007	7.599	1.144	0.058	0.026	680.361	0.045
	Diesel	LDDV	Light-Duty Vehicles (Passenger Cars)	0.217	0.003	0.503	0.040	0.063	0.035	305.418	0.008
	Diesel	LDDT	Light-Duty Trucks (0-8,500 lbs)	0.231	0.004	0.443	0.060	0.074	0.046	411.205	0.008
	Diesel	HDDV	Heavy-Duty Vehicles (8,501 + lbs)	5.403	0.010	0.966	0.207	0.163	0.094	1103.346	0.027
	NA	MC	Motorcycles	1.391	0.003	31.421	6.496	0.020	0.010	205.471	0.053

Table 5-38. 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	SOx	CO	ROG	PM_{10}	$PM_{2.5}$	CO_2e	NH_3
Riverside	Gasoline	LDGV	Light-Duty Vehicles (Passenger Cars)	0.075	0.003	0.911	0.112	0.047	0.020	289.356	0.023
	Gasoline	LDGT	Light-Duty Trucks (0-8,500 lbs)	0.134	0.004	1.365	0.206	0.047	0.020	378.067	0.024
	Gasoline	HDGV	Heavy-Duty Vehicles (8,501 + lbs)	0.379	0.006	2.593	0.361	0.054	0.023	568.296	0.045
	Diesel	LDDV	Light-Duty Vehicles (Passenger Cars)	0.102	0.002	0.210	0.018	0.056	0.028	258.563	0.008
	Diesel	LDDT	Light-Duty Trucks (0-8,500 lbs)	0.106	0.003	0.176	0.024	0.058	0.031	333.099	0.008
	Diesel	HDDV	Heavy-Duty Vehicles (8,501 + lbs)	3.331	0.012	0.529	0.084	0.135	0.065	1322.082	0.027
	NA	MC	Motorcycles	1.225	0.002	23.015	4.449	0.018	0.009	178.510	0.053
Sacramento	Gasoline	LDGV	Light-Duty Vehicles (Passenger Cars)	0.085	0.003	1.053	0.122	0.047	0.020	296.235	0.023
	Gasoline	LDGT	Light-Duty Trucks (0-8,500 lbs)	0.154	0.004	1.564	0.225	0.047	0.020	390.428	0.024
	Gasoline	HDGV	Heavy-Duty Vehicles (8,501 + lbs)	0.433	0.006	2.955	0.404	0.056	0.024	605.258	0.045
	Diesel	LDDV	Light-Duty Vehicles (Passenger Cars)	0.135	0.003	0.273	0.026	0.060	0.032	266.313	0.008
	Diesel	LDDT	Light-Duty Trucks (0-8,500 lbs)	0.354	0.003	0.383	0.051	0.076	0.047	350.841	0.008
	Diesel	HDDV	Heavy-Duty Vehicles (8,501 + lbs)	4.337	0.012	1.006	0.169	0.165	0.086	1291.390	0.027
	NA	MC	Motorcycles	1.260	0.002	24.326	4.733	0.019	0.009	180.652	0.053
San Benito	Gasoline	LDGV	Light-Duty Vehicles (Passenger Cars)	0.095	0.003	1.001	0.105	0.047	0.020	279.237	0.023
	Gasoline	LDGT	Light-Duty Trucks (0-8,500 lbs)	0.194	0.004	1.610	0.248	0.047	0.020	371.014	0.024
	Gasoline	HDGV	Heavy-Duty Vehicles (8,501 + lbs)	0.519	0.006	3.142	0.458	0.054	0.023	581.316	0.045
	Diesel	LDDV	Light-Duty Vehicles (Passenger Cars)	0.197	0.003	0.297	0.025	0.059	0.031	267.214	0.008
	Diesel	LDDT	Light-Duty Trucks (0-8,500 lbs)	0.069	0.003	0.171	0.022	0.055	0.027	344.288	0.008
	Diesel	HDDV	Heavy-Duty Vehicles (8,501 + lbs)	4.397	0.014	0.709	0.155	0.129	0.064	1514.073	0.027
	NA	MC	Motorcycles	1.292	0.002	25.274	4.239	0.019	0.009	172.673	0.053
San Bernardino	Gasoline	LDGV	Light-Duty Vehicles (Passenger Cars)	0.080	0.003	0.927	0.106	0.045	0.019	283.229	0.023
	Gasoline	LDGT	Light-Duty Trucks (0-8,500 lbs)	0.159	0.004	1.498	0.216	0.045	0.019	370.543	0.024
	Gasoline	HDGV	Heavy-Duty Vehicles (8,501 + lbs)	0.400	0.006	2.679	0.354	0.052	0.022	553.404	0.045
	Diesel	LDDV	Light-Duty Vehicles (Passenger Cars)	0.099	0.002	0.220	0.019	0.055	0.028	254.704	0.008
	Diesel	LDDT	Light-Duty Trucks (0-8,500 lbs)	0.135	0.003	0.205	0.028	0.060	0.033	327.187	0.008
	Diesel	HDDV	Heavy-Duty Vehicles (8,501 + lbs)	3.374	0.012	0.594	0.093	0.138	0.066	1336.050	0.027
	NA	MC	Motorcycles	1.368	0.002	26.433	4.409	0.020	0.009	193.586	0.053
San Diego	Gasoline	LDGV	Light-Duty Vehicles (Passenger Cars)	0.102	0.003	1.071	0.121	0.047	0.020	304.928	0.023
	Gasoline	LDGT	Light-Duty Trucks (0-8,500 lbs)	0.140	0.004	1.368	0.211	0.047	0.020	404.860	0.024
	Gasoline	HDGV	Heavy-Duty Vehicles (8,501 + lbs)	0.351	0.006	2.374	0.326	0.055	0.023	610.001	0.045
	Diesel	LDDV	Light-Duty Vehicles (Passenger Cars)	0.117	0.003	0.276	0.024	0.059	0.031	288.628	0.008
	Diesel	LDDT	Light-Duty Trucks (0-8,500 lbs)	0.180	0.004	0.282	0.038	0.068	0.040	375.532	0.008
	Diesel	HDDV	Heavy-Duty Vehicles (8,501 + lbs)	3.961	0.012	1.018	0.163	0.163	0.083	1298.972	0.027
	NA	MC	Motorcycles	1.255	0.002	24.312	4.373	0.019	0.009	192.763	0.053
San Francisco	Gasoline	LDGV	Light-Duty Vehicles (Passenger Cars)	0.081	0.003	0.997	0.124	0.047	0.020	320.448	0.023
	Gasoline	LDGT	Light-Duty Trucks (0-8,500 lbs)	0.116	0.004	1.221	0.174	0.047	0.020	416.528	0.024
	Gasoline	HDGV	Heavy-Duty Vehicles (8,501 + lbs)	0.374	0.006	2.361	0.334	0.060	0.025	640.275	0.045
	Diesel	LDDV	Light-Duty Vehicles (Passenger Cars)	0.111	0.003	0.386	0.029	0.057	0.030	302.447	0.008
	Diesel	LDDT	Light-Duty Trucks (0-8,500 lbs)	0.126	0.004	0.289	0.034	0.058	0.030	389.127	0.008
	Diesel	HDDV	Heavy-Duty Vehicles (8,501 + lbs)	4.604	0.012	1.205	0.204	0.241	0.131	1329.086	0.027
	NA	MC	Motorcycles	1.289	0.003	25.458	5.289	0.020	0.010	204.287	0.053
San Joaquin	Gasoline	LDGV	Light-Duty Vehicles (Passenger Cars)	0.083	0.003	0.941	0.113	0.047	0.020	297.361	0.023
	Gasoline	LDGT	Light-Duty Trucks (0-8,500 lbs)	0.161	0.004	1.485	0.225	0.047	0.020	392.696	0.024
	Gasoline	HDGV	Heavy-Duty Vehicles (8,501 + lbs)	0.419	0.006	2.811	0.395	0.053	0.023	597.091	0.045
	Diesel	LDDV	Light-Duty Vehicles (Passenger Cars)	0.133	0.003	0.228	0.022	0.059	0.031	271.825	0.008
	Diesel	LDDT	Light-Duty Trucks (0-8,500 lbs)	0.187	0.003	0.238	0.031	0.066	0.038	350.344	0.008
	Diesel	HDDV	Heavy-Duty Vehicles (8,501 + lbs)	4.279	0.013	0.790	0.164	0.148	0.076	1412.420	0.027
	NA	MC	Motorcycles	1.288	0.002	26.120	4.444	0.019	0.009	181.545	0.053
San Luis Obispo	Gasoline	LDGV	Light-Duty Vehicles (Passenger Cars)	0.095	0.003	0.999	0.116	0.047	0.020	280.843	0.023
	Gasoline	LDGT	Light-Duty Trucks (0-8,500 lbs)	0.246	0.004	1.939	0.282	0.047	0.020	383.412	0.024
	Gasoline	HDGV	Heavy-Duty Vehicles (8,501 + lbs)	0.548	0.006	3.328	0.473	0.055	0.024	586.037	0.045
	Diesel	LDDV	Light-Duty Vehicles (Passenger Cars)	0.172	0.003	0.282	0.026	0.061	0.033	273.572	0.008
	Diesel	LDDT	Light-Duty Trucks (0-8,500 lbs)	0.251	0.003	0.331	0.047	0.077	0.049	351.789	0.008
	Diesel	HDDV	Heavy-Duty Vehicles (8,501 + lbs)	4.802	0.011	0.923	0.191	0.166	0.093	1153.905	0.027
	NA	MC	Motorcycles	1.335	0.002	26.562	5.474	0.020	0.010	179.027	0.053

Table 5-38. 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	SOx	CO	ROG	PM_{10}	$PM_{2.5}$	CO_2e	NH_3
San Mateo	Gasoline	LDGV	Light-Duty Vehicles (Passenger Cars)	0.082	0.003	0.976	0.133	0.047	0.020	284.714	0.023
	Gasoline	LDGT	Light-Duty Trucks (0-8,500 lbs)	0.101	0.004	1.026	0.147	0.047	0.020	366.832	0.024
	Gasoline	HDGV	Heavy-Duty Vehicles (8,501 + lbs)	0.292	0.006	1.969	0.277	0.055	0.023	559.711	0.045
	Diesel	LDDV	Light-Duty Vehicles (Passenger Cars)	0.126	0.003	0.241	0.023	0.059	0.031	265.536	0.008
	Diesel	LDDT	Light-Duty Trucks (0-8,500 lbs)	0.076	0.003	0.147	0.019	0.054	0.027	340.718	0.008
	Diesel	HDDV	Heavy-Duty Vehicles (8,501 + lbs)	3.212	0.011	0.825	0.148	0.194	0.102	1146.034	0.027
	NA	MC	Motorcycles	1.236	0.002	21.844	3.619	0.019	0.009	182.377	0.053
Santa Barbara	Gasoline	LDGV	Light-Duty Vehicles (Passenger Cars)	0.104	0.003	1.070	0.129	0.047	0.020	273.763	0.023
	Gasoline	LDGT	Light-Duty Trucks (0-8,500 lbs)	0.254	0.004	1.942	0.295	0.047	0.020	371.296	0.024
	Gasoline	HDGV	Heavy-Duty Vehicles (8,501 + lbs)	0.558	0.006	3.375	0.470	0.062	0.026	579.847	0.045
	Diesel	LDDV	Light-Duty Vehicles (Passenger Cars)	0.154	0.003	0.244	0.022	0.058	0.031	265.298	0.008
	Diesel	LDDT	Light-Duty Trucks (0-8,500 lbs)	0.207	0.003	0.258	0.038	0.071	0.043	337.391	0.008
	Diesel	HDDV	Heavy-Duty Vehicles (8,501 + lbs)	4.532	0.012	0.968	0.173	0.192	0.104	1272.781	0.027
	NA	MC	Motorcycles	1.288	0.002	23.916	4.170	0.019	0.009	170.188	0.053
Santa Clara	Gasoline	LDGV	Light-Duty Vehicles (Passenger Cars)	0.080	0.003	0.951	0.114	0.047	0.020	288.112	0.023
	Gasoline	LDGT	Light-Duty Trucks (0-8,500 lbs)	0.140	0.004	1.377	0.198	0.047	0.020	381.197	0.024
	Gasoline	HDGV	Heavy-Duty Vehicles (8,501 + lbs)	0.383	0.006	2.612	0.355	0.055	0.023	574.339	0.045
	Diesel	LDDV	Light-Duty Vehicles (Passenger Cars)	0.107	0.003	0.231	0.020	0.056	0.029	266.275	0.008
	Diesel	LDDT	Light-Duty Trucks (0-8,500 lbs)	0.118	0.003	0.195	0.027	0.060	0.033	346.919	0.008
	Diesel	HDDV	Heavy-Duty Vehicles (8,501 + lbs)	4.063	0.012	0.794	0.161	0.164	0.086	1306.125	0.027
	NA	MC	Motorcycles	1.250	0.002	22.864	4.196	0.019	0.009	180.954	0.053
Santa Cruz	Gasoline	LDGV	Light-Duty Vehicles (Passenger Cars)	0.125	0.003	1.336	0.142	0.047	0.020	306.540	0.023
	Gasoline	LDGT	Light-Duty Trucks (0-8,500 lbs)	0.309	0.004	2.452	0.348	0.048	0.021	412.195	0.024
	Gasoline	HDGV	Heavy-Duty Vehicles (8,501 + lbs)	0.619	0.006	3.826	0.499	0.057	0.025	621.807	0.045
	Diesel	LDDV	Light-Duty Vehicles (Passenger Cars)	0.315	0.003	0.474	0.049	0.075	0.046	299.647	0.008
	Diesel	LDDT	Light-Duty Trucks (0-8,500 lbs)	0.327	0.003	0.403	0.068	0.092	0.062	366.031	0.008
	Diesel	HDDV	Heavy-Duty Vehicles (8,501 + lbs)	5.158	0.011	1.056	0.210	0.215	0.124	1201.212	0.027
	NA	MC	Motorcycles	1.323	0.002	26.754	5.537	0.020	0.010	188.722	0.053
Shasta	Gasoline	LDGV	Light-Duty Vehicles (Passenger Cars)	0.102	0.003	1.126	0.128	0.047	0.020	304.642	0.023
	Gasoline	LDGT	Light-Duty Trucks (0-8,500 lbs)	0.236	0.004	2.015	0.313	0.047	0.020	405.370	0.024
	Gasoline	HDGV	Heavy-Duty Vehicles (8,501 + lbs)	0.597	0.006	3.921	0.591	0.056	0.024	624.967	0.045
	Diesel	LDDV	Light-Duty Vehicles (Passenger Cars)	0.182	0.003	0.338	0.031	0.063	0.035	277.624	0.008
	Diesel	LDDT	Light-Duty Trucks (0-8,500 lbs)	0.255	0.003	0.350	0.050	0.076	0.048	357.208	0.008
	Diesel	HDDV	Heavy-Duty Vehicles (8,501 + lbs)	4.736	0.013	0.783	0.173	0.143	0.075	1390.068	0.027
	NA	MC	Motorcycles	1.332	0.002	28.137	5.876	0.019	0.009	187.452	0.053
Sierra	Gasoline	LDGV	Light-Duty Vehicles (Passenger Cars)	0.133	0.003	1.432	0.151	0.048	0.021	336.637	0.023
	Gasoline	LDGT	Light-Duty Trucks (0-8,500 lbs)	0.347	0.005	3.112	0.428	0.048	0.021	456.193	0.024
	Gasoline	HDGV	Heavy-Duty Vehicles (8,501 + lbs)	0.950	0.007	5.960	0.897	0.057	0.025	683.088	0.045
	Diesel	LDDV	Light-Duty Vehicles (Passenger Cars)	0.126	0.003	0.489	0.038	0.061	0.033	307.451	0.008
	Diesel	LDDT	Light-Duty Trucks (0-8,500 lbs)	0.203	0.004	0.476	0.068	0.078	0.050	393.016	0.008
	Diesel	HDDV	Heavy-Duty Vehicles (8,501 + lbs)	5.095	0.009	1.082	0.220	0.166	0.095	958.728	0.027
	NA	MC	Motorcycles	1.384	0.003	30.340	5.836	0.020	0.010	211.424	0.053
Siskiyou	Gasoline	LDGV	Light-Duty Vehicles (Passenger Cars)	0.134	0.003	1.401	0.150	0.048	0.020	326.444	0.023
	Gasoline	LDGT	Light-Duty Trucks (0-8,500 lbs)	0.347	0.004	3.005	0.453	0.048	0.021	441.154	0.024
	Gasoline	HDGV	Heavy-Duty Vehicles (8,501 + lbs)	0.919	0.007	5.753	0.922	0.058	0.025	665.051	0.045
	Diesel	LDDV	Light-Duty Vehicles (Passenger Cars)	0.212	0.003	0.467	0.039	0.064	0.036	304.161	0.008
	Diesel	LDDT	Light-Duty Trucks (0-8,500 lbs)	0.334	0.004	0.510	0.075	0.091	0.062	391.566	0.008
	Diesel	HDDV	Heavy-Duty Vehicles (8,501 + lbs)	4.568	0.014	0.785	0.170	0.138	0.071	1451.376	0.027
	NA	MC	Motorcycles	1.406	0.003	31.404	5.981	0.020	0.010	204.294	0.053
Solano	Gasoline	LDGV	Light-Duty Vehicles (Passenger Cars)	0.082	0.003	0.919	0.114	0.047	0.020	305.128	0.023
	Gasoline	LDGT	Light-Duty Trucks (0-8,500 lbs)	0.144	0.004	1.346	0.207	0.047	0.020	401.639	0.024
	Gasoline	HDGV	Heavy-Duty Vehicles (8,501 + lbs)	0.408	0.006	2.655	0.386	0.056	0.024	617.648	0.045
	Diesel	LDDV	Light-Duty Vehicles (Passenger Cars)	0.125	0.003	0.261	0.023	0.059	0.031	284.475	0.008
	Diesel	LDDT	Light-Duty Trucks (0-8,500 lbs)	0.168	0.003	0.244	0.030	0.063	0.035	364.966	0.008
	Diesel	HDDV	Heavy-Duty Vehicles (8,501 + lbs)	4.275	0.013	0.845	0.167	0.150	0.076	1386.483	0.027
	NA	MC	Motorcycles	1.295	0.002	26.871	4.331	0.019	0.009	189.295	0.053

Table 5-38. 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	SOx	CO	ROG	PM_{10}	$PM_{2.5}$	CO_2e	NH_3
Sonoma	Gasoline	LDGV	Light-Duty Vehicles (Passenger Cars)	0.104	0.003	1.070	0.129	0.047	0.020	273.763	0.023
	Gasoline	LDGT	Light-Duty Trucks (0-8,500 lbs)	0.254	0.004	1.942	0.295	0.047	0.020	371.296	0.024
	Gasoline	HDGV	Heavy-Duty Vehicles (8,501 + lbs)	0.558	0.006	3.375	0.470	0.062	0.026	579.847	0.045
	Diesel	LDDV	Light-Duty Vehicles (Passenger Cars)	0.154	0.003	0.244	0.022	0.058	0.031	265.298	0.008
	Diesel	LDDT	Light-Duty Trucks (0-8,500 lbs)	0.207	0.003	0.258	0.038	0.071	0.043	337.391	0.008
	Diesel	HDDV	Heavy-Duty Vehicles (8,501 + lbs)	4.532	0.012	0.968	0.173	0.192	0.104	1272.781	0.027
	NA	MC	Motorcycles	1.288	0.002	23.916	4.170	0.019	0.009	170.188	0.053
Stanislaus	Gasoline	LDGV	Light-Duty Vehicles (Passenger Cars)	0.085	0.003	1.017	0.116	0.047	0.020	308.205	0.023
	Gasoline	LDGT	Light-Duty Trucks (0-8,500 lbs)	0.173	0.004	1.698	0.256	0.047	0.020	408.886	0.024
	Gasoline	HDGV	Heavy-Duty Vehicles (8,501 + lbs)	0.454	0.006	3.165	0.443	0.054	0.023	622.104	0.045
	Diesel	LDDV	Light-Duty Vehicles (Passenger Cars)	0.132	0.003	0.312	0.026	0.059	0.031	275.763	0.008
	Diesel	LDDT	Light-Duty Trucks (0-8,500 lbs)	0.162	0.003	0.279	0.038	0.065	0.037	359.519	0.008
	Diesel	HDDV	Heavy-Duty Vehicles (8,501 + lbs)	4.304	0.014	0.736	0.160	0.142	0.073	1427.924	0.027
	NA	MC	Motorcycles	1.293	0.002	26.774	5.191	0.019	0.009	186.912	0.053
Sutter	Gasoline	LDGV	Light-Duty Vehicles (Passenger Cars)	0.089	0.003	0.979	0.108	0.047	0.020	277.464	0.023
	Gasoline	LDGT	Light-Duty Trucks (0-8,500 lbs)	0.218	0.004	1.833	0.286	0.047	0.020	367.647	0.024
	Gasoline	HDGV	Heavy-Duty Vehicles (8,501 + lbs)	0.523	0.006	3.343	0.487	0.053	0.022	572.291	0.045
	Diesel	LDDV	Light-Duty Vehicles (Passenger Cars)	0.102	0.002	0.201	0.015	0.053	0.026	250.503	0.008
	Diesel	LDDT	Light-Duty Trucks (0-8,500 lbs)	0.176	0.003	0.224	0.035	0.069	0.040	318.528	0.008
	Diesel	HDDV	Heavy-Duty Vehicles (8,501 + lbs)	4.152	0.014	0.695	0.156	0.136	0.069	1431.436	0.027
	NA	MC	Motorcycles	1.311	0.002	25.226	5.803	0.019	0.010	176.321	0.053
Tehama	Gasoline	LDGV	Light-Duty Vehicles (Passenger Cars)	0.102	0.003	1.075	0.117	0.047	0.020	301.179	0.023
	Gasoline	LDGT	Light-Duty Trucks (0-8,500 lbs)	0.263	0.004	2.190	0.324	0.048	0.020	402.150	0.024
	Gasoline	HDGV	Heavy-Duty Vehicles (8,501 + lbs)	0.584	0.006	3.846	0.552	0.055	0.023	613.963	0.045
	Diesel	LDDV	Light-Duty Vehicles (Passenger Cars)	0.171	0.003	0.328	0.029	0.061	0.033	277.624	0.008
	Diesel	LDDT	Light-Duty Trucks (0-8,500 lbs)	0.354	0.003	0.458	0.065	0.091	0.062	361.976	0.008
	Diesel	HDDV	Heavy-Duty Vehicles (8,501 + lbs)	4.608	0.014	0.764	0.168	0.136	0.069	1437.316	0.027
	NA	MC	Motorcycles	1.342	0.002	27.980	5.374	0.019	0.009	187.476	0.053
Trinity	Gasoline	LDGV	Light-Duty Vehicles (Passenger Cars)	0.157	0.004	1.687	0.177	0.048	0.021	361.384	0.023
	Gasoline	LDGT	Light-Duty Trucks (0-8,500 lbs)	0.575	0.005	4.967	0.642	0.050	0.023	498.167	0.024
	Gasoline	HDGV	Heavy-Duty Vehicles (8,501 + lbs)	1.152	0.007	7.321	1.135	0.059	0.026	728.485	0.045
	Diesel	LDDV	Light-Duty Vehicles (Passenger Cars)	0.353	0.003	0.686	0.074	0.088	0.059	333.047	0.008
	Diesel	LDDT	Light-Duty Trucks (0-8,500 lbs)	0.582	0.004	0.974	0.189	0.180	0.147	431.045	0.008
	Diesel	HDDV	Heavy-Duty Vehicles (8,501 + lbs)	5.047	0.013	0.857	0.190	0.143	0.077	1391.824	0.027
	NA	MC	Motorcycles	1.397	0.003	33.803	7.096	0.021	0.011	220.799	0.053
Tulare	Gasoline	LDGV	Light-Duty Vehicles (Passenger Cars)	0.078	0.003	0.915	0.108	0.047	0.020	287.969	0.023
	Gasoline	LDGT	Light-Duty Trucks (0-8,500 lbs)	0.182	0.004	1.720	0.277	0.047	0.020	380.665	0.024
	Gasoline	HDGV	Heavy-Duty Vehicles (8,501 + lbs)	0.445	0.006	3.152	0.428	0.053	0.022	586.910	0.045
	Diesel	LDDV	Light-Duty Vehicles (Passenger Cars)	0.101	0.002	0.201	0.018	0.056	0.029	255.425	0.008
	Diesel	LDDT	Light-Duty Trucks (0-8,500 lbs)	0.247	0.003	0.302	0.044	0.074	0.046	331.968	0.008
	Diesel	HDDV	Heavy-Duty Vehicles (8,501 + lbs)	4.328	0.014	0.751	0.160	0.144	0.073	1430.792	0.027
	NA	MC	Motorcycles	1.279	0.002	24.986	4.835	0.019	0.009	175.345	0.053
Tuolumne	Gasoline	LDGV	Light-Duty Vehicles (Passenger Cars)	0.155	0.003	1.627	0.180	0.048	0.020	307.664	0.023
	Gasoline	LDGT	Light-Duty Trucks (0-8,500 lbs)	0.460	0.004	4.049	0.580	0.049	0.021	419.606	0.024
	Gasoline	HDGV	Heavy-Duty Vehicles (8,501 + lbs)	0.991	0.006	5.891	0.962	0.057	0.025	639.543	0.045
	Diesel	LDDV	Light-Duty Vehicles (Passenger Cars)	0.229	0.003	0.404	0.038	0.066	0.038	283.876	0.008
	Diesel	LDDT	Light-Duty Trucks (0-8,500 lbs)	0.306	0.003	0.419	0.056	0.077	0.048	358.044	0.008
	Diesel	HDDV	Heavy-Duty Vehicles (8,501 + lbs)	5.288	0.009	0.977	0.214	0.178	0.102	990.261	0.027
	NA	MC	Motorcycles	1.365	0.002	30.122	6.128	0.020	0.010	188.911	0.053
Ventura	Gasoline	LDGV	Light-Duty Vehicles (Passenger Cars)	0.081	0.003	0.975	0.115	0.047	0.020	293.188	0.023
	Gasoline	LDGT	Light-Duty Trucks (0-8,500 lbs)	0.137	0.004	1.405	0.207	0.047	0.020	383.547	0.024
	Gasoline	HDGV	Heavy-Duty Vehicles (8,501 + lbs)	0.398	0.006	2.689	0.373	0.055	0.023	581.027	0.045
	Diesel	LDDV	Light-Duty Vehicles (Passenger Cars)	0.131	0.003	0.295	0.027	0.061	0.033	272.871	0.008
	Diesel	LDDT	Light-Duty Trucks (0-8,500 lbs)	0.154	0.003	0.246	0.033	0.063	0.035	351.570	0.008
	Diesel	HDDV	Heavy-Duty Vehicles (8,501 + lbs)	3.508	0.010	0.718	0.110	0.149	0.077	1133.002	0.027
	NA	MC	Motorcycles	1.292	0.002	24.901	5.595	0.020	0.010	191.624	0.053

Table 5-38. 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	SOx	CO	ROG	PM_{10}	$PM_{2.5}$	CO_2e	NH_3
Yolo	Gasoline	LDGV	Light-Duty Vehicles (Passenger Cars)	0.086	0.003	0.989	0.119	0.047	0.020	296.977	0.023
	Gasoline	LDGT	Light-Duty Trucks (0-8,500 lbs)	0.137	0.004	1.323	0.203	0.047	0.020	383.431	0.024
	Gasoline	HDGV	Heavy-Duty Vehicles (8,501 + lbs)	0.403	0.006	2.657	0.380	0.055	0.023	592.546	0.045
	Diesel	LDDV	Light-Duty Vehicles (Passenger Cars)	0.200	0.003	0.287	0.029	0.064	0.036	276.271	0.008
	Diesel	LDDT	Light-Duty Trucks (0-8,500 lbs)	0.198	0.003	0.243	0.031	0.066	0.038	349.091	0.008
	Diesel	HDDV	Heavy-Duty Vehicles (8,501 + lbs)	3.448	0.012	0.693	0.138	0.155	0.078	1299.557	0.027
	NA	MC	Motorcycles	1.287	0.002	25.982	4.602	0.019	0.009	179.616	0.053
Yuba	Gasoline	LDGV	Light-Duty Vehicles (Passenger Cars)	0.091	0.003	1.001	0.106	0.047	0.020	284.611	0.023
	Gasoline	LDGT	Light-Duty Trucks (0-8,500 lbs)	0.276	0.004	2.286	0.333	0.047	0.020	383.449	0.024
	Gasoline	HDGV	Heavy-Duty Vehicles (8,501 + lbs)	0.628	0.006	4.179	0.570	0.055	0.024	586.323	0.045
	Diesel	LDDV	Light-Duty Vehicles (Passenger Cars)	0.123	0.002	0.236	0.020	0.057	0.029	261.361	0.008
	Diesel	LDDT	Light-Duty Trucks (0-8,500 lbs)	0.212	0.003	0.246	0.037	0.071	0.042	329.003	0.008
	Diesel	HDDV	Heavy-Duty Vehicles (8,501 + lbs)	5.090	0.010	0.953	0.201	0.180	0.100	1097.423	0.027
	NA	MC	Motorcycles	1.294	0.002	25.636	4.958	0.019	0.009	174.653	0.053

Table 5-39. EMFAC County-Specific On-Road Vehicle EFs – 2021

County	Fuel Type	Vehicle Type		Emission Factors (g/mi)							
				Criteria Pollutants and Ozone Precursors							
				NO_X	SOx	CO	ROG	PM_{10}	$PM_{2.5}$	CO_2e	NH_3
Alameda	Gasoline	LDGV	Light-Duty Vehicles (Passenger Cars)	0.076	0.003	0.889	0.108	0.042	0.018	263.127	0.022
	Gasoline	LDGT	Light-Duty Trucks (0-8,500 lbs)	0.115	0.003	1.138	0.165	0.042	0.018	339.951	0.024
	Gasoline	HDGV	Heavy-Duty Vehicles (8,501 + lbs)	0.346	0.005	2.285	0.313	0.050	0.021	531.189	0.045
	Diesel	LDDV	Light-Duty Vehicles (Passenger Cars)	0.141	0.002	0.270	0.025	0.056	0.031	252.530	0.008
	Diesel	LDDT	Light-Duty Trucks (0-8,500 lbs)	0.127	0.003	0.209	0.029	0.058	0.032	319.755	0.008
	Diesel	HDDV	Heavy-Duty Vehicles (8,501 + lbs)	4.110	0.013	0.804	0.153	0.158	0.079	1421.816	0.027
	NA	MC	Motorcycles	1.137	0.002	21.601	3.873	0.017	0.008	166.734	0.054
Alpine	Gasoline	LDGV	Light-Duty Vehicles (Passenger Cars)	0.104	0.002	1.128	0.117	0.042	0.018	241.510	0.022
	Gasoline	LDGT	Light-Duty Trucks (0-8,500 lbs)	0.224	0.003	1.971	0.289	0.042	0.018	322.584	0.024
	Gasoline	HDGV	Heavy-Duty Vehicles (8,501 + lbs)	0.680	0.005	3.973	0.631	0.051	0.022	518.252	0.045
	Diesel	LDDV	Light-Duty Vehicles (Passenger Cars)	0.128	0.002	0.262	0.022	0.052	0.027	229.458	0.008
	Diesel	LDDT	Light-Duty Trucks (0-8,500 lbs)	0.134	0.003	0.217	0.029	0.057	0.031	297.956	0.008
	Diesel	HDDV	Heavy-Duty Vehicles (8,501 + lbs)	3.806	0.013	0.695	0.143	0.132	0.064	1361.466	0.027
	NA	MC	Motorcycles	1.248	0.002	25.095	4.355	0.017	0.008	158.739	0.054
Amador	Gasoline	LDGV	Light-Duty Vehicles (Passenger Cars)	0.119	0.002	1.248	0.151	0.043	0.018	241.871	0.022
	Gasoline	LDGT	Light-Duty Trucks (0-8,500 lbs)	0.306	0.003	2.635	0.465	0.043	0.018	324.543	0.024
	Gasoline	HDGV	Heavy-Duty Vehicles (8,501 + lbs)	0.799	0.005	4.665	0.867	0.053	0.023	530.070	0.045
	Diesel	LDDV	Light-Duty Vehicles (Passenger Cars)	0.192	0.002	0.226	0.022	0.056	0.030	227.645	0.008
	Diesel	LDDT	Light-Duty Trucks (0-8,500 lbs)	0.136	0.003	0.209	0.029	0.060	0.034	284.768	0.008
	Diesel	HDDV	Heavy-Duty Vehicles (8,501 + lbs)	4.587	0.010	0.800	0.172	0.151	0.082	1009.186	0.027
	NA	MC	Motorcycles	1.211	0.002	23.708	4.625	0.017	0.008	150.187	0.054
Butte	Gasoline	LDGV	Light-Duty Vehicles (Passenger Cars)	0.097	0.003	1.079	0.118	0.044	0.019	277.106	0.022
	Gasoline	LDGT	Light-Duty Trucks (0-8,500 lbs)	0.271	0.004	2.285	0.330	0.044	0.019	364.333	0.024
	Gasoline	HDGV	Heavy-Duty Vehicles (8,501 + lbs)	0.541	0.006	3.580	0.514	0.051	0.022	548.782	0.045
	Diesel	LDDV	Light-Duty Vehicles (Passenger Cars)	0.174	0.003	0.296	0.029	0.061	0.034	262.777	0.008
	Diesel	LDDT	Light-Duty Trucks (0-8,500 lbs)	0.363	0.003	0.391	0.064	0.090	0.062	334.805	0.008
	Diesel	HDDV	Heavy-Duty Vehicles (8,501 + lbs)	4.115	0.013	0.754	0.153	0.135	0.067	1320.804	0.027
	NA	MC	Motorcycles	1.191	0.002	24.122	5.272	0.018	0.009	167.139	0.054
Calaveras	Gasoline	LDGV	Light-Duty Vehicles (Passenger Cars)	0.120	0.003	1.321	0.149	0.043	0.018	266.658	0.022
	Gasoline	LDGT	Light-Duty Trucks (0-8,500 lbs)	0.324	0.004	2.955	0.507	0.044	0.019	359.644	0.024
	Gasoline	HDGV	Heavy-Duty Vehicles (8,501 + lbs)	0.868	0.006	5.155	0.955	0.053	0.023	568.284	0.045
	Diesel	LDDV	Light-Duty Vehicles (Passenger Cars)	0.227	0.002	0.362	0.037	0.064	0.038	251.050	0.008
	Diesel	LDDT	Light-Duty Trucks (0-8,500 lbs)	0.230	0.003	0.372	0.059	0.078	0.052	321.894	0.008
	Diesel	HDDV	Heavy-Duty Vehicles (8,501 + lbs)	4.588	0.010	0.796	0.170	0.145	0.078	1064.396	0.027
	NA	MC	Motorcycles	1.223	0.002	25.149	5.547	0.018	0.009	169.061	0.054
Colusa	Gasoline	LDGV	Light-Duty Vehicles (Passenger Cars)	0.082	0.003	0.880	0.105	0.042	0.018	259.996	0.022
	Gasoline	LDGT	Light-Duty Trucks (0-8,500 lbs)	0.166	0.003	1.431	0.221	0.043	0.018	341.095	0.024
	Gasoline	HDGV	Heavy-Duty Vehicles (8,501 + lbs)	0.410	0.005	2.556	0.382	0.049	0.021	528.911	0.045
	Diesel	LDDV	Light-Duty Vehicles (Passenger Cars)	0.134	0.002	0.251	0.023	0.055	0.030	243.075	0.008
	Diesel	LDDT	Light-Duty Trucks (0-8,500 lbs)	0.174	0.003	0.263	0.035	0.064	0.038	312.720	0.008
	Diesel	HDDV	Heavy-Duty Vehicles (8,501 + lbs)	3.908	0.013	0.715	0.150	0.130	0.065	1324.802	0.027
	NA	MC	Motorcycles	1.162	0.002	22.033	4.188	0.017	0.008	163.973	0.054
Contra Costa	Gasoline	LDGV	Light-Duty Vehicles (Passenger Cars)	0.072	0.003	0.848	0.102	0.042	0.018	260.577	0.022
	Gasoline	LDGT	Light-Duty Trucks (0-8,500 lbs)	0.111	0.003	1.110	0.164	0.042	0.018	337.734	0.024
	Gasoline	HDGV	Heavy-Duty Vehicles (8,501 + lbs)	0.323	0.005	2.170	0.305	0.049	0.021	522.929	0.045
	Diesel	LDDV	Light-Duty Vehicles (Passenger Cars)	0.115	0.002	0.239	0.023	0.055	0.030	248.783	0.008
	Diesel	LDDT	Light-Duty Trucks (0-8,500 lbs)	0.098	0.003	0.173	0.022	0.053	0.028	316.387	0.008
	Diesel	HDDV	Heavy-Duty Vehicles (8,501 + lbs)	3.963	0.012	0.734	0.146	0.172	0.084	1283.251	0.027
	NA	MC	Motorcycles	1.136	0.002	21.715	3.935	0.017	0.008	165.224	0.054
Del Norte	Gasoline	LDGV	Light-Duty Vehicles (Passenger Cars)	0.128	0.003	1.285	0.147	0.044	0.019	285.757	0.022
	Gasoline	LDGT	Light-Duty Trucks (0-8,500 lbs)	0.431	0.004	3.192	0.503	0.045	0.020	391.822	0.024
	Gasoline	HDGV	Heavy-Duty Vehicles (8,501 + lbs)	0.816	0.006	4.691	0.793	0.052	0.022	594.466	0.045
	Diesel	LDDV	Light-Duty Vehicles (Passenger Cars)	0.212	0.003	0.401	0.039	0.065	0.039	279.274	0.008
	Diesel	LDDT	Light-Duty Trucks (0-8,500 lbs)	0.597	0.003	0.844	0.136	0.142	0.113	360.687	0.008
	Diesel	HDDV	Heavy-Duty Vehicles (8,501 + lbs)	4.856	0.008	0.995	0.205	0.158	0.091	831.128	0.027
	NA	MC	Motorcycles	1.273	0.002	27.442	5.659	0.019	0.009	179.609	0.054

Table 5-39. EMFAC County-Specific On-Road Vehicle EFs – 2021 (cont.)

County	Fuel Type	Vehicle Type		Emission Factors (g/mi)							
				Criteria Pollutants and Ozone Precursors							
				NO_X	SOx	CO	ROG	PM_{10}	$PM_{2.5}$	CO_2e	NH_3
El Dorado	Gasoline	LDGV	Light-Duty Vehicles (Passenger Cars)	0.069	0.003	0.856	0.094	0.043	0.018	261.108	0.022
	Gasoline	LDGT	Light-Duty Trucks (0-8,500 lbs)	0.160	0.004	1.627	0.265	0.043	0.018	357.406	0.024
	Gasoline	HDGV	Heavy-Duty Vehicles (8,501 + lbs)	0.436	0.005	2.994	0.500	0.049	0.021	542.261	0.045
	Diesel	LDDV	Light-Duty Vehicles (Passenger Cars)	0.115	0.002	0.243	0.019	0.052	0.026	245.470	0.008
	Diesel	LDDT	Light-Duty Trucks (0-8,500 lbs)	0.159	0.003	0.230	0.029	0.059	0.033	324.903	0.008
	Diesel	HDDV	Heavy-Duty Vehicles (8,501 + lbs)	4.065	0.009	0.778	0.159	0.148	0.078	974.178	0.027
	NA	MC	Motorcycles	1.256	0.002	26.140	5.720	0.018	0.009	174.537	0.054
Fresno	Gasoline	LDGV	Light-Duty Vehicles (Passenger Cars)	0.066	0.003	0.780	0.100	0.043	0.018	260.322	0.022
	Gasoline	LDGT	Light-Duty Trucks (0-8,500 lbs)	0.135	0.004	1.310	0.226	0.043	0.018	348.445	0.024
	Gasoline	HDGV	Heavy-Duty Vehicles (8,501 + lbs)	0.351	0.005	2.399	0.368	0.048	0.020	532.369	0.045
	Diesel	LDDV	Light-Duty Vehicles (Passenger Cars)	0.071	0.002	0.172	0.013	0.050	0.024	238.763	0.008
	Diesel	LDDT	Light-Duty Trucks (0-8,500 lbs)	0.129	0.003	0.196	0.025	0.058	0.032	319.044	0.008
	Diesel	HDDV	Heavy-Duty Vehicles (8,501 + lbs)	3.927	0.014	0.666	0.139	0.133	0.063	1503.013	0.027
	NA	MC	Motorcycles	1.165	0.002	23.168	4.165	0.017	0.008	161.329	0.054
Glenn	Gasoline	LDGV	Light-Duty Vehicles (Passenger Cars)	0.084	0.003	0.940	0.107	0.043	0.018	271.911	0.022
	Gasoline	LDGT	Light-Duty Trucks (0-8,500 lbs)	0.192	0.004	1.699	0.272	0.043	0.018	353.140	0.024
	Gasoline	HDGV	Heavy-Duty Vehicles (8,501 + lbs)	0.459	0.005	3.025	0.462	0.049	0.021	544.877	0.045
	Diesel	LDDV	Light-Duty Vehicles (Passenger Cars)	0.119	0.002	0.289	0.024	0.055	0.029	254.249	0.008
	Diesel	LDDT	Light-Duty Trucks (0-8,500 lbs)	0.198	0.003	0.329	0.044	0.070	0.044	318.670	0.008
	Diesel	HDDV	Heavy-Duty Vehicles (8,501 + lbs)	4.044	0.012	0.727	0.153	0.130	0.066	1297.057	0.027
	NA	MC	Motorcycles	1.165	0.002	23.031	4.881	0.018	0.009	168.941	0.054
Humboldt	Gasoline	LDGV	Light-Duty Vehicles (Passenger Cars)	0.133	0.003	1.318	0.149	0.044	0.019	270.212	0.022
	Gasoline	LDGT	Light-Duty Trucks (0-8,500 lbs)	0.382	0.004	2.938	0.455	0.045	0.019	367.463	0.024
	Gasoline	HDGV	Heavy-Duty Vehicles (8,501 + lbs)	0.816	0.006	4.507	0.788	0.052	0.022	557.698	0.045
	Diesel	LDDV	Light-Duty Vehicles (Passenger Cars)	0.375	0.003	0.422	0.045	0.071	0.044	265.728	0.008
	Diesel	LDDT	Light-Duty Trucks (0-8,500 lbs)	0.373	0.003	0.470	0.076	0.099	0.071	342.431	0.008
	Diesel	HDDV	Heavy-Duty Vehicles (8,501 + lbs)	4.876	0.011	0.844	0.183	0.147	0.080	1165.143	0.027
	NA	MC	Motorcycles	1.280	0.002	26.921	5.323	0.018	0.009	168.276	0.054
Imperial	Gasoline	LDGV	Light-Duty Vehicles (Passenger Cars)	0.288	0.003	2.665	0.227	0.042	0.018	253.090	0.022
	Gasoline	LDGT	Light-Duty Trucks (0-8,500 lbs)	0.198	0.003	1.852	0.383	0.042	0.018	335.485	0.024
	Gasoline	HDGV	Heavy-Duty Vehicles (8,501 + lbs)	0.524	0.005	3.311	0.554	0.049	0.021	520.530	0.045
	Diesel	LDDV	Light-Duty Vehicles (Passenger Cars)	0.092	0.002	0.173	0.017	0.052	0.027	222.823	0.008
	Diesel	LDDT	Light-Duty Trucks (0-8,500 lbs)	0.167	0.003	0.187	0.025	0.057	0.032	294.102	0.008
	Diesel	HDDV	Heavy-Duty Vehicles (8,501 + lbs)	2.943	0.013	0.360	0.071	0.120	0.054	1356.742	0.027
	NA	MC	Motorcycles	1.074	0.002	19.533	3.855	0.016	0.008	153.142	0.054
Inyo	Gasoline	LDGV	Light-Duty Vehicles (Passenger Cars)	0.096	0.003	1.026	0.132	0.042	0.018	269.261	0.022
	Gasoline	LDGT	Light-Duty Trucks (0-8,500 lbs)	0.225	0.004	1.981	0.371	0.043	0.018	360.935	0.024
	Gasoline	HDGV	Heavy-Duty Vehicles (8,501 + lbs)	0.674	0.006	3.957	0.746	0.052	0.022	570.037	0.045
	Diesel	LDDV	Light-Duty Vehicles (Passenger Cars)	0.123	0.002	0.281	0.023	0.053	0.028	246.835	0.008
	Diesel	LDDT	Light-Duty Trucks (0-8,500 lbs)	0.150	0.003	0.261	0.035	0.061	0.035	322.430	0.008
	Diesel	HDDV	Heavy-Duty Vehicles (8,501 + lbs)	3.956	0.012	0.752	0.151	0.144	0.072	1264.532	0.027
	NA	MC	Motorcycles	1.198	0.002	24.252	4.913	0.017	0.008	171.556	0.054
Kern	Gasoline	LDGV	Light-Duty Vehicles (Passenger Cars)	0.066	0.003	0.768	0.098	0.042	0.018	277.166	0.022
	Gasoline	LDGT	Light-Duty Trucks (0-8,500 lbs)	0.131	0.004	1.254	0.211	0.043	0.018	374.087	0.024
	Gasoline	HDGV	Heavy-Duty Vehicles (8,501 + lbs)	0.353	0.006	2.358	0.366	0.050	0.021	574.489	0.045
	Diesel	LDDV	Light-Duty Vehicles (Passenger Cars)	0.076	0.002	0.216	0.016	0.049	0.024	255.255	0.008
	Diesel	LDDT	Light-Duty Trucks (0-8,500 lbs)	0.128	0.003	0.220	0.028	0.059	0.032	345.434	0.008
	Diesel	HDDV	Heavy-Duty Vehicles (8,501 + lbs)	3.819	0.014	0.659	0.136	0.127	0.059	1488.448	0.027
	NA	MC	Motorcycles	1.168	0.002	23.835	4.114	0.017	0.008	172.632	0.054
Kings	Gasoline	LDGV	Light-Duty Vehicles (Passenger Cars)	0.073	0.003	0.814	0.096	0.043	0.018	257.076	0.022
	Gasoline	LDGT	Light-Duty Trucks (0-8,500 lbs)	0.176	0.003	1.565	0.245	0.043	0.018	346.828	0.024
	Gasoline	HDGV	Heavy-Duty Vehicles (8,501 + lbs)	0.389	0.005	2.487	0.382	0.049	0.021	530.491	0.045
	Diesel	LDDV	Light-Duty Vehicles (Passenger Cars)	0.078	0.002	0.222	0.017	0.051	0.025	233.526	0.008
	Diesel	LDDT	Light-Duty Trucks (0-8,500 lbs)	0.157	0.003	0.248	0.030	0.061	0.034	310.123	0.008
	Diesel	HDDV	Heavy-Duty Vehicles (8,501 + lbs)	4.039	0.014	0.684	0.144	0.124	0.059	1517.799	0.027
	NA	MC	Motorcycles	1.141	0.002	21.516	3.944	0.017	0.008	159.055	0.054

Table 5-39. EMFAC County-Specific On-Road Vehicle EFs – 2021 (cont.)

County	Fuel Type	Vehicle Type		Emission Factors (g/mi)							
				Criteria Pollutants and Ozone Precursors							
				NO_X	SOx	CO	ROG	PM_{10}	$PM_{2.5}$	CO_2e	NH_3
Lake	Gasoline	LDGV	Light-Duty Vehicles (Passenger Cars)	0.140	0.003	1.471	0.185	0.044	0.019	278.890	0.022
	Gasoline	LDGT	Light-Duty Trucks (0-8,500 lbs)	0.316	0.004	2.685	0.484	0.044	0.019	368.016	0.024
	Gasoline	HDGV	Heavy-Duty Vehicles (8,501 + lbs)	0.947	0.006	5.617	1.044	0.054	0.023	584.910	0.045
	Diesel	LDDV	Light-Duty Vehicles (Passenger Cars)	0.226	0.002	0.350	0.032	0.062	0.035	261.180	0.008
	Diesel	LDDT	Light-Duty Trucks (0-8,500 lbs)	0.335	0.003	0.377	0.053	0.078	0.051	327.463	0.008
	Diesel	HDDV	Heavy-Duty Vehicles (8,501 + lbs)	4.829	0.010	0.893	0.201	0.162	0.093	1088.425	0.027
	NA	MC	Motorcycles	1.258	0.002	27.159	6.005	0.019	0.009	171.352	0.054
Lassen	Gasoline	LDGV	Light-Duty Vehicles (Passenger Cars)	0.117	0.003	1.260	0.139	0.044	0.019	285.541	0.022
	Gasoline	LDGT	Light-Duty Trucks (0-8,500 lbs)	0.287	0.004	2.547	0.425	0.044	0.019	388.074	0.024
	Gasoline	HDGV	Heavy-Duty Vehicles (8,501 + lbs)	0.890	0.006	5.286	0.965	0.053	0.023	602.447	0.045
	Diesel	LDDV	Light-Duty Vehicles (Passenger Cars)	0.145	0.003	0.359	0.028	0.054	0.029	263.923	0.008
	Diesel	LDDT	Light-Duty Trucks (0-8,500 lbs)	0.169	0.003	0.333	0.044	0.065	0.038	347.282	0.008
	Diesel	HDDV	Heavy-Duty Vehicles (8,501 + lbs)	4.733	0.008	1.001	0.203	0.162	0.092	858.064	0.027
	NA	MC	Motorcycles	1.275	0.002	27.714	5.458	0.018	0.009	181.308	0.054
Los Angeles	Gasoline	LDGV	Light-Duty Vehicles (Passenger Cars)	0.074	0.003	0.948	0.112	0.041	0.018	279.064	0.022
	Gasoline	LDGT	Light-Duty Trucks (0-8,500 lbs)	0.129	0.004	1.373	0.180	0.043	0.018	372.114	0.024
	Gasoline	HDGV	Heavy-Duty Vehicles (8,501 + lbs)	0.320	0.006	2.359	0.295	0.050	0.021	553.338	0.045
	Diesel	LDDV	Light-Duty Vehicles (Passenger Cars)	0.115	0.002	0.325	0.032	0.058	0.033	251.821	0.008
	Diesel	LDDT	Light-Duty Trucks (0-8,500 lbs)	0.131	0.003	0.262	0.035	0.059	0.033	342.094	0.008
	Diesel	HDDV	Heavy-Duty Vehicles (8,501 + lbs)	3.174	0.012	0.843	0.112	0.147	0.069	1278.473	0.027
	NA	MC	Motorcycles	1.111	0.002	20.267	4.267	0.017	0.008	181.955	0.054
Madera	Gasoline	LDGV	Light-Duty Vehicles (Passenger Cars)	0.070	0.003	0.879	0.096	0.043	0.018	278.616	0.022
	Gasoline	LDGT	Light-Duty Trucks (0-8,500 lbs)	0.153	0.004	1.569	0.250	0.043	0.018	368.396	0.024
	Gasoline	HDGV	Heavy-Duty Vehicles (8,501 + lbs)	0.388	0.006	2.757	0.406	0.050	0.021	564.655	0.045
	Diesel	LDDV	Light-Duty Vehicles (Passenger Cars)	0.105	0.002	0.309	0.024	0.054	0.028	253.141	0.008
	Diesel	LDDT	Light-Duty Trucks (0-8,500 lbs)	0.177	0.003	0.285	0.039	0.064	0.037	328.175	0.008
	Diesel	HDDV	Heavy-Duty Vehicles (8,501 + lbs)	4.039	0.014	0.730	0.149	0.131	0.063	1443.789	0.027
	NA	MC	Motorcycles	1.142	0.002	22.340	4.044	0.017	0.008	167.625	0.054
Marin	Gasoline	LDGV	Light-Duty Vehicles (Passenger Cars)	0.073	0.003	0.832	0.111	0.042	0.018	260.671	0.022
	Gasoline	LDGT	Light-Duty Trucks (0-8,500 lbs)	0.111	0.003	1.081	0.176	0.041	0.017	339.381	0.024
	Gasoline	HDGV	Heavy-Duty Vehicles (8,501 + lbs)	0.317	0.005	2.067	0.319	0.049	0.021	522.857	0.045
	Diesel	LDDV	Light-Duty Vehicles (Passenger Cars)	0.149	0.002	0.275	0.025	0.056	0.031	257.482	0.008
	Diesel	LDDT	Light-Duty Trucks (0-8,500 lbs)	0.107	0.003	0.196	0.024	0.053	0.028	332.606	0.008
	Diesel	HDDV	Heavy-Duty Vehicles (8,501 + lbs)	4.198	0.011	1.026	0.183	0.210	0.111	1185.886	0.027
	NA	MC	Motorcycles	1.157	0.002	22.546	4.130	0.017	0.008	168.179	0.054
Mariposa	Gasoline	LDGV	Light-Duty Vehicles (Passenger Cars)	0.117	0.003	1.282	0.152	0.044	0.019	278.320	0.022
	Gasoline	LDGT	Light-Duty Trucks (0-8,500 lbs)	0.420	0.004	3.683	0.587	0.045	0.020	380.267	0.024
	Gasoline	HDGV	Heavy-Duty Vehicles (8,501 + lbs)	0.889	0.006	5.390	0.978	0.053	0.023	587.492	0.045
	Diesel	LDDV	Light-Duty Vehicles (Passenger Cars)	0.213	0.002	0.386	0.030	0.056	0.030	261.718	0.008
	Diesel	LDDT	Light-Duty Trucks (0-8,500 lbs)	0.278	0.003	0.522	0.081	0.090	0.062	329.386	0.008
	Diesel	HDDV	Heavy-Duty Vehicles (8,501 + lbs)	4.956	0.008	0.934	0.200	0.157	0.088	830.070	0.027
	NA	MC	Motorcycles	1.258	0.002	27.226	5.645	0.018	0.009	176.089	0.054
Mendocino	Gasoline	LDGV	Light-Duty Vehicles (Passenger Cars)	0.114	0.003	1.168	0.133	0.043	0.018	261.738	0.022
	Gasoline	LDGT	Light-Duty Trucks (0-8,500 lbs)	0.374	0.004	3.004	0.463	0.045	0.019	366.031	0.024
	Gasoline	HDGV	Heavy-Duty Vehicles (8,501 + lbs)	0.835	0.006	4.681	0.806	0.052	0.023	564.383	0.045
	Diesel	LDDV	Light-Duty Vehicles (Passenger Cars)	0.380	0.002	0.401	0.039	0.065	0.040	257.272	0.008
	Diesel	LDDT	Light-Duty Trucks (0-8,500 lbs)	0.555	0.003	0.562	0.103	0.123	0.094	336.688	0.008
	Diesel	HDDV	Heavy-Duty Vehicles (8,501 + lbs)	4.523	0.012	0.772	0.170	0.138	0.073	1268.598	0.027
	NA	MC	Motorcycles	1.255	0.002	26.117	5.186	0.018	0.009	167.068	0.054
Merced	Gasoline	LDGV	Light-Duty Vehicles (Passenger Cars)	0.074	0.003	0.889	0.099	0.043	0.018	277.369	0.022
	Gasoline	LDGT	Light-Duty Trucks (0-8,500 lbs)	0.156	0.004	1.524	0.232	0.043	0.018	363.879	0.024
	Gasoline	HDGV	Heavy-Duty Vehicles (8,501 + lbs)	0.403	0.006	2.843	0.384	0.051	0.022	566.289	0.045
	Diesel	LDDV	Light-Duty Vehicles (Passenger Cars)	0.118	0.002	0.284	0.023	0.054	0.028	254.487	0.008
	Diesel	LDDT	Light-Duty Trucks (0-8,500 lbs)	0.178	0.003	0.288	0.038	0.064	0.038	333.559	0.008
	Diesel	HDDV	Heavy-Duty Vehicles (8,501 + lbs)	4.098	0.014	0.697	0.147	0.130	0.062	1516.636	0.027
	NA	MC	Motorcycles	1.145	0.002	22.433	3.720	0.017	0.008	165.741	0.054

Table 5-39. EMFAC County-Specific On-Road Vehicle EFs – 2021 (cont.)

County	Fuel Type	Vehicle Type		Emission Factors (g/mi)							
				Criteria Pollutants and Ozone Precursors							
				NO_X	SOx	CO	ROG	PM_{10}	$PM_{2.5}$	CO_2e	NH_3
Modoc	Gasoline	LDGV	Light-Duty Vehicles (Passenger Cars)	0.129	0.003	1.397	0.146	0.044	0.019	315.463	0.022
	Gasoline	LDGT	Light-Duty Trucks (0-8,500 lbs)	0.318	0.004	2.954	0.438	0.044	0.020	426.434	0.024
	Gasoline	HDGV	Heavy-Duty Vehicles (8,501 + lbs)	1.002	0.007	6.315	1.094	0.053	0.023	649.158	0.045
	Diesel	LDDV	Light-Duty Vehicles (Passenger Cars)	0.177	0.003	0.528	0.045	0.063	0.037	294.003	0.008
	Diesel	LDDT	Light-Duty Trucks (0-8,500 lbs)	0.299	0.004	0.473	0.060	0.071	0.045	397.014	0.008
	Diesel	HDDV	Heavy-Duty Vehicles (8,501 + lbs)	4.731	0.009	0.931	0.196	0.156	0.087	922.832	0.027
	NA	MC	Motorcycles	1.294	0.003	28.661	5.834	0.019	0.009	201.374	0.054
Mono	Gasoline	LDGV	Light-Duty Vehicles (Passenger Cars)	0.102	0.003	1.065	0.113	0.042	0.018	259.855	0.022
	Gasoline	LDGT	Light-Duty Trucks (0-8,500 lbs)	0.246	0.004	2.096	0.327	0.043	0.018	351.903	0.024
	Gasoline	HDGV	Heavy-Duty Vehicles (8,501 + lbs)	0.735	0.006	4.348	0.715	0.052	0.022	554.886	0.045
	Diesel	LDDV	Light-Duty Vehicles (Passenger Cars)	0.146	0.002	0.307	0.025	0.053	0.028	249.175	0.008
	Diesel	LDDT	Light-Duty Trucks (0-8,500 lbs)	0.285	0.003	0.325	0.036	0.060	0.035	326.014	0.008
	Diesel	HDDV	Heavy-Duty Vehicles (8,501 + lbs)	3.932	0.012	0.713	0.148	0.130	0.065	1302.034	0.027
	NA	MC	Motorcycles	1.317	0.002	29.170	4.934	0.017	0.008	172.587	0.054
Monterey	Gasoline	LDGV	Light-Duty Vehicles (Passenger Cars)	0.100	0.003	1.082	0.119	0.043	0.018	284.139	0.022
	Gasoline	LDGT	Light-Duty Trucks (0-8,500 lbs)	0.238	0.004	1.902	0.263	0.044	0.019	386.943	0.024
	Gasoline	HDGV	Heavy-Duty Vehicles (8,501 + lbs)	0.514	0.006	3.089	0.420	0.051	0.022	586.570	0.045
	Diesel	LDDV	Light-Duty Vehicles (Passenger Cars)	0.164	0.003	0.398	0.037	0.062	0.036	268.897	0.008
	Diesel	LDDT	Light-Duty Trucks (0-8,500 lbs)	0.295	0.003	0.446	0.087	0.099	0.071	365.097	0.008
	Diesel	HDDV	Heavy-Duty Vehicles (8,501 + lbs)	3.958	0.012	0.804	0.147	0.157	0.078	1255.299	0.027
	NA	MC	Motorcycles	1.147	0.002	22.005	3.735	0.017	0.008	173.821	0.054
Napa	Gasoline	LDGV	Light-Duty Vehicles (Passenger Cars)	0.072	0.003	0.856	0.096	0.043	0.018	256.350	0.022
	Gasoline	LDGT	Light-Duty Trucks (0-8,500 lbs)	0.133	0.003	1.314	0.196	0.042	0.018	329.843	0.024
	Gasoline	HDGV	Heavy-Duty Vehicles (8,501 + lbs)	0.414	0.005	2.706	0.393	0.050	0.021	531.261	0.045
	Diesel	LDDV	Light-Duty Vehicles (Passenger Cars)	0.132	0.002	0.250	0.024	0.057	0.031	247.591	0.008
	Diesel	LDDT	Light-Duty Trucks (0-8,500 lbs)	0.103	0.003	0.178	0.021	0.054	0.028	314.550	0.008
	Diesel	HDDV	Heavy-Duty Vehicles (8,501 + lbs)	4.172	0.012	0.773	0.153	0.143	0.071	1304.936	0.027
	NA	MC	Motorcycles	1.138	0.002	21.645	3.869	0.017	0.008	159.373	0.054
Nevada	Gasoline	LDGV	Light-Duty Vehicles (Passenger Cars)	0.097	0.003	1.030	0.116	0.043	0.018	255.388	0.022
	Gasoline	LDGT	Light-Duty Trucks (0-8,500 lbs)	0.261	0.004	2.064	0.317	0.044	0.018	360.707	0.024
	Gasoline	HDGV	Heavy-Duty Vehicles (8,501 + lbs)	0.631	0.006	3.988	0.571	0.051	0.022	553.240	0.045
	Diesel	LDDV	Light-Duty Vehicles (Passenger Cars)	0.222	0.002	0.320	0.033	0.063	0.037	249.492	0.008
	Diesel	LDDT	Light-Duty Trucks (0-8,500 lbs)	0.363	0.003	0.350	0.043	0.070	0.043	328.531	0.008
	Diesel	HDDV	Heavy-Duty Vehicles (8,501 + lbs)	4.181	0.012	0.734	0.154	0.129	0.065	1286.041	0.027
	NA	MC	Motorcycles	1.293	0.002	27.689	5.691	0.018	0.009	166.099	0.054
Orange	Gasoline	LDGV	Light-Duty Vehicles (Passenger Cars)	0.062	0.003	0.798	0.099	0.041	0.017	259.110	0.022
	Gasoline	LDGT	Light-Duty Trucks (0-8,500 lbs)	0.096	0.003	1.063	0.154	0.041	0.018	340.417	0.024
	Gasoline	HDGV	Heavy-Duty Vehicles (8,501 + lbs)	0.296	0.005	2.065	0.288	0.049	0.021	523.873	0.045
	Diesel	LDDV	Light-Duty Vehicles (Passenger Cars)	0.080	0.002	0.249	0.021	0.051	0.027	237.347	0.008
	Diesel	LDDT	Light-Duty Trucks (0-8,500 lbs)	0.076	0.003	0.182	0.022	0.050	0.025	313.537	0.008
	Diesel	HDDV	Heavy-Duty Vehicles (8,501 + lbs)	2.699	0.011	0.697	0.087	0.147	0.067	1190.525	0.027
	NA	MC	Motorcycles	1.095	0.002	19.715	4.174	0.017	0.008	171.739	0.054
Placer	Gasoline	LDGV	Light-Duty Vehicles (Passenger Cars)	0.069	0.003	0.843	0.098	0.042	0.018	253.072	0.022
	Gasoline	LDGT	Light-Duty Trucks (0-8,500 lbs)	0.118	0.003	1.216	0.179	0.043	0.018	338.712	0.024
	Gasoline	HDGV	Heavy-Duty Vehicles (8,501 + lbs)	0.336	0.005	2.310	0.337	0.049	0.021	518.667	0.045
	Diesel	LDDV	Light-Duty Vehicles (Passenger Cars)	0.121	0.002	0.231	0.021	0.053	0.028	237.261	0.008
	Diesel	LDDT	Light-Duty Trucks (0-8,500 lbs)	0.136	0.003	0.197	0.027	0.057	0.031	310.527	0.008
	Diesel	HDDV	Heavy-Duty Vehicles (8,501 + lbs)	3.414	0.012	0.634	0.129	0.136	0.065	1282.342	0.027
	NA	MC	Motorcycles	1.201	0.002	23.820	4.558	0.017	0.008	164.054	0.054
Plumas	Gasoline	LDGV	Light-Duty Vehicles (Passenger Cars)	0.118	0.003	1.317	0.147	0.043	0.019	291.344	0.022
	Gasoline	LDGT	Light-Duty Trucks (0-8,500 lbs)	0.367	0.004	3.336	0.493	0.045	0.020	413.963	0.024
	Gasoline	HDGV	Heavy-Duty Vehicles (8,501 + lbs)	1.064	0.006	6.746	1.072	0.054	0.024	626.682	0.045
	Diesel	LDDV	Light-Duty Vehicles (Passenger Cars)	0.174	0.003	0.453	0.034	0.056	0.030	272.955	0.008
	Diesel	LDDT	Light-Duty Trucks (0-8,500 lbs)	0.201	0.004	0.413	0.053	0.068	0.041	381.659	0.008
	Diesel	HDDV	Heavy-Duty Vehicles (8,501 + lbs)	4.879	0.010	0.880	0.182	0.147	0.081	1080.032	0.027
	NA	MC	Motorcycles	1.285	0.002	28.817	6.062	0.019	0.010	190.156	0.054

Table 5-39. EMFAC County-Specific On-Road Vehicle EFs – 2021 (cont.)

County	Fuel Type	Vehicle Type		Emission Factors (g/mi)							
				Criteria Pollutants and Ozone Precursors							
				NO_X	SOx	CO	ROG	PM_{10}	$PM_{2.5}$	CO_2e	NH_3
Riverside	Gasoline	LDGV	Light-Duty Vehicles (Passenger Cars)	0.064	0.003	0.797	0.100	0.042	0.018	256.535	0.022
	Gasoline	LDGT	Light-Duty Trucks (0-8,500 lbs)	0.114	0.003	1.180	0.185	0.042	0.018	335.940	0.024
	Gasoline	HDGV	Heavy-Duty Vehicles (8,501 + lbs)	0.330	0.005	2.252	0.331	0.049	0.021	511.253	0.045
	Diesel	LDDV	Light-Duty Vehicles (Passenger Cars)	0.085	0.002	0.191	0.016	0.050	0.025	233.051	0.008
	Diesel	LDDT	Light-Duty Trucks (0-8,500 lbs)	0.090	0.003	0.161	0.021	0.053	0.027	303.826	0.008
	Diesel	HDDV	Heavy-Duty Vehicles (8,501 + lbs)	2.932	0.012	0.488	0.075	0.126	0.057	1294.411	0.027
	NA	MC	Motorcycles	1.106	0.002	20.634	4.104	0.017	0.008	161.674	0.054
Sacramento	Gasoline	LDGV	Light-Duty Vehicles (Passenger Cars)	0.073	0.003	0.918	0.108	0.043	0.018	264.042	0.022
	Gasoline	LDGT	Light-Duty Trucks (0-8,500 lbs)	0.131	0.004	1.361	0.202	0.043	0.018	350.332	0.024
	Gasoline	HDGV	Heavy-Duty Vehicles (8,501 + lbs)	0.375	0.005	2.558	0.367	0.050	0.021	543.123	0.045
	Diesel	LDDV	Light-Duty Vehicles (Passenger Cars)	0.112	0.002	0.249	0.022	0.055	0.029	242.970	0.008
	Diesel	LDDT	Light-Duty Trucks (0-8,500 lbs)	0.293	0.003	0.334	0.044	0.068	0.042	319.446	0.008
	Diesel	HDDV	Heavy-Duty Vehicles (8,501 + lbs)	3.931	0.012	0.929	0.148	0.153	0.075	1284.620	0.027
	NA	MC	Motorcycles	1.158	0.002	22.182	4.419	0.017	0.008	166.363	0.054
San Benito	Gasoline	LDGV	Light-Duty Vehicles (Passenger Cars)	0.081	0.002	0.875	0.093	0.042	0.018	247.157	0.022
	Gasoline	LDGT	Light-Duty Trucks (0-8,500 lbs)	0.164	0.003	1.394	0.220	0.042	0.018	331.952	0.024
	Gasoline	HDGV	Heavy-Duty Vehicles (8,501 + lbs)	0.452	0.005	2.733	0.419	0.048	0.021	520.270	0.045
	Diesel	LDDV	Light-Duty Vehicles (Passenger Cars)	0.157	0.002	0.269	0.022	0.052	0.028	238.272	0.008
	Diesel	LDDT	Light-Duty Trucks (0-8,500 lbs)	0.058	0.003	0.164	0.020	0.050	0.024	313.979	0.008
	Diesel	HDDV	Heavy-Duty Vehicles (8,501 + lbs)	3.972	0.014	0.670	0.142	0.122	0.059	1478.337	0.027
	NA	MC	Motorcycles	1.163	0.002	22.607	3.925	0.017	0.008	157.269	0.054
San Bernardino	Gasoline	LDGV	Light-Duty Vehicles (Passenger Cars)	0.068	0.003	0.810	0.094	0.041	0.017	250.591	0.022
	Gasoline	LDGT	Light-Duty Trucks (0-8,500 lbs)	0.134	0.003	1.294	0.192	0.041	0.017	329.152	0.024
	Gasoline	HDGV	Heavy-Duty Vehicles (8,501 + lbs)	0.346	0.005	2.318	0.321	0.047	0.020	496.843	0.045
	Diesel	LDDV	Light-Duty Vehicles (Passenger Cars)	0.082	0.002	0.202	0.017	0.050	0.025	229.118	0.008
	Diesel	LDDT	Light-Duty Trucks (0-8,500 lbs)	0.115	0.003	0.188	0.025	0.054	0.030	298.559	0.008
	Diesel	HDDV	Heavy-Duty Vehicles (8,501 + lbs)	3.016	0.012	0.559	0.084	0.130	0.059	1324.579	0.027
	NA	MC	Motorcycles	1.229	0.002	23.477	4.043	0.018	0.008	174.788	0.054
San Diego	Gasoline	LDGV	Light-Duty Vehicles (Passenger Cars)	0.089	0.003	0.954	0.108	0.042	0.018	267.645	0.022
	Gasoline	LDGT	Light-Duty Trucks (0-8,500 lbs)	0.116	0.004	1.171	0.187	0.042	0.018	351.800	0.024
	Gasoline	HDGV	Heavy-Duty Vehicles (8,501 + lbs)	0.299	0.005	2.033	0.292	0.049	0.021	537.730	0.045
	Diesel	LDDV	Light-Duty Vehicles (Passenger Cars)	0.096	0.002	0.252	0.021	0.053	0.028	256.365	0.008
	Diesel	LDDT	Light-Duty Trucks (0-8,500 lbs)	0.152	0.003	0.253	0.033	0.060	0.035	334.716	0.008
	Diesel	HDDV	Heavy-Duty Vehicles (8,501 + lbs)	3.576	0.012	0.958	0.143	0.152	0.074	1289.636	0.027
	NA	MC	Motorcycles	1.119	0.002	21.455	3.995	0.017	0.008	172.870	0.054
San Francisco	Gasoline	LDGV	Light-Duty Vehicles (Passenger Cars)	0.068	0.003	0.851	0.109	0.041	0.018	275.831	0.022
	Gasoline	LDGT	Light-Duty Trucks (0-8,500 lbs)	0.096	0.004	1.042	0.155	0.042	0.018	360.058	0.024
	Gasoline	HDGV	Heavy-Duty Vehicles (8,501 + lbs)	0.325	0.006	2.060	0.304	0.054	0.023	568.151	0.045
	Diesel	LDDV	Light-Duty Vehicles (Passenger Cars)	0.088	0.003	0.340	0.024	0.050	0.025	262.707	0.008
	Diesel	LDDT	Light-Duty Trucks (0-8,500 lbs)	0.103	0.003	0.259	0.030	0.051	0.026	341.853	0.008
	Diesel	HDDV	Heavy-Duty Vehicles (8,501 + lbs)	4.179	0.012	1.112	0.174	0.223	0.115	1339.256	0.027
	NA	MC	Motorcycles	1.146	0.002	22.451	4.783	0.017	0.009	181.736	0.054
San Joaquin	Gasoline	LDGV	Light-Duty Vehicles (Passenger Cars)	0.072	0.003	0.825	0.100	0.043	0.018	265.349	0.022
	Gasoline	LDGT	Light-Duty Trucks (0-8,500 lbs)	0.136	0.004	1.291	0.201	0.043	0.018	352.774	0.024
	Gasoline	HDGV	Heavy-Duty Vehicles (8,501 + lbs)	0.361	0.005	2.423	0.358	0.049	0.021	535.231	0.045
	Diesel	LDDV	Light-Duty Vehicles (Passenger Cars)	0.110	0.002	0.205	0.019	0.054	0.028	247.765	0.008
	Diesel	LDDT	Light-Duty Trucks (0-8,500 lbs)	0.159	0.003	0.213	0.027	0.060	0.034	324.718	0.008
	Diesel	HDDV	Heavy-Duty Vehicles (8,501 + lbs)	3.872	0.013	0.739	0.147	0.138	0.068	1391.429	0.027
	NA	MC	Motorcycles	1.176	0.002	23.482	4.121	0.017	0.008	166.010	0.054
San Luis Obispo	Gasoline	LDGV	Light-Duty Vehicles (Passenger Cars)	0.082	0.003	0.873	0.103	0.043	0.018	250.780	0.022
	Gasoline	LDGT	Light-Duty Trucks (0-8,500 lbs)	0.210	0.003	1.677	0.253	0.043	0.018	344.185	0.024
	Gasoline	HDGV	Heavy-Duty Vehicles (8,501 + lbs)	0.479	0.005	2.881	0.432	0.050	0.021	527.008	0.045
	Diesel	LDDV	Light-Duty Vehicles (Passenger Cars)	0.141	0.002	0.252	0.023	0.055	0.029	246.146	0.008
	Diesel	LDDT	Light-Duty Trucks (0-8,500 lbs)	0.216	0.003	0.297	0.042	0.070	0.043	324.351	0.008
	Diesel	HDDV	Heavy-Duty Vehicles (8,501 + lbs)	4.190	0.010	0.823	0.160	0.146	0.077	1100.904	0.027
	NA	MC	Motorcycles	1.202	0.002	23.761	5.061	0.018	0.009	161.850	0.054

Table 5-39. EMFAC County-Specific On-Road Vehicle EFs – 2021 (cont.)

County	Fuel Type	Vehicle Type		Emission Factors (g/mi)							
				Criteria Pollutants and Ozone Precursors							
				NO_X	SOx	CO	ROG	PM_{10}	$PM_{2.5}$	CO_2e	NH_3
San Mateo	Gasoline	LDGV	Light-Duty Vehicles (Passenger Cars)	0.066	0.002	0.801	0.113	0.038	0.016	232.878	0.022
	Gasoline	LDGT	Light-Duty Trucks (0-8,500 lbs)	0.086	0.003	0.894	0.133	0.042	0.018	321.802	0.024
	Gasoline	HDGV	Heavy-Duty Vehicles (8,501 + lbs)	0.253	0.005	1.722	0.253	0.050	0.021	499.570	0.045
	Diesel	LDDV	Light-Duty Vehicles (Passenger Cars)	0.097	0.002	0.197	0.018	0.048	0.026	217.958	0.008
	Diesel	LDDT	Light-Duty Trucks (0-8,500 lbs)	0.064	0.003	0.134	0.016	0.049	0.024	303.510	0.008
	Diesel	HDDV	Heavy-Duty Vehicles (8,501 + lbs)	2.879	0.011	0.764	0.124	0.180	0.088	1158.838	0.027
	NA	MC	Motorcycles	1.107	0.002	19.452	3.284	0.017	0.008	163.468	0.054
Santa Barbara	Gasoline	LDGV	Light-Duty Vehicles (Passenger Cars)	0.088	0.002	0.924	0.114	0.042	0.018	242.771	0.022
	Gasoline	LDGT	Light-Duty Trucks (0-8,500 lbs)	0.218	0.003	1.685	0.266	0.043	0.018	334.358	0.024
	Gasoline	HDGV	Heavy-Duty Vehicles (8,501 + lbs)	0.489	0.005	2.944	0.431	0.056	0.024	523.614	0.045
	Diesel	LDDV	Light-Duty Vehicles (Passenger Cars)	0.126	0.002	0.218	0.019	0.053	0.027	238.495	0.008
	Diesel	LDDT	Light-Duty Trucks (0-8,500 lbs)	0.177	0.003	0.231	0.033	0.065	0.038	312.260	0.008
	Diesel	HDDV	Heavy-Duty Vehicles (8,501 + lbs)	3.992	0.011	0.881	0.143	0.171	0.087	1230.350	0.027
	NA	MC	Motorcycles	1.162	0.002	21.432	3.843	0.017	0.008	154.030	0.054
Santa Clara	Gasoline	LDGV	Light-Duty Vehicles (Passenger Cars)	0.068	0.003	0.820	0.100	0.042	0.018	252.918	0.022
	Gasoline	LDGT	Light-Duty Trucks (0-8,500 lbs)	0.116	0.003	1.175	0.175	0.042	0.018	334.633	0.024
	Gasoline	HDGV	Heavy-Duty Vehicles (8,501 + lbs)	0.332	0.005	2.261	0.321	0.050	0.021	515.024	0.045
	Diesel	LDDV	Light-Duty Vehicles (Passenger Cars)	0.087	0.002	0.206	0.017	0.050	0.025	237.663	0.008
	Diesel	LDDT	Light-Duty Trucks (0-8,500 lbs)	0.100	0.003	0.177	0.023	0.054	0.029	313.254	0.008
	Diesel	HDDV	Heavy-Duty Vehicles (8,501 + lbs)	3.696	0.012	0.749	0.144	0.154	0.076	1296.831	0.027
	NA	MC	Motorcycles	1.119	0.002	20.340	3.820	0.017	0.008	162.459	0.054
Santa Cruz	Gasoline	LDGV	Light-Duty Vehicles (Passenger Cars)	0.108	0.003	1.169	0.126	0.044	0.019	279.340	0.022
	Gasoline	LDGT	Light-Duty Trucks (0-8,500 lbs)	0.264	0.004	2.127	0.311	0.044	0.019	372.556	0.024
	Gasoline	HDGV	Heavy-Duty Vehicles (8,501 + lbs)	0.544	0.006	3.334	0.454	0.052	0.022	565.660	0.045
	Diesel	LDDV	Light-Duty Vehicles (Passenger Cars)	0.262	0.003	0.436	0.044	0.067	0.041	274.464	0.008
	Diesel	LDDT	Light-Duty Trucks (0-8,500 lbs)	0.277	0.003	0.367	0.061	0.082	0.055	338.405	0.008
	Diesel	HDDV	Heavy-Duty Vehicles (8,501 + lbs)	4.445	0.011	0.905	0.164	0.183	0.098	1155.331	0.027
	NA	MC	Motorcycles	1.195	0.002	24.060	5.132	0.018	0.009	171.942	0.054
Shasta	Gasoline	LDGV	Light-Duty Vehicles (Passenger Cars)	0.089	0.003	0.988	0.114	0.043	0.018	274.770	0.022
	Gasoline	LDGT	Light-Duty Trucks (0-8,500 lbs)	0.197	0.004	1.713	0.276	0.043	0.018	358.000	0.024
	Gasoline	HDGV	Heavy-Duty Vehicles (8,501 + lbs)	0.511	0.006	3.317	0.530	0.051	0.022	553.390	0.045
	Diesel	LDDV	Light-Duty Vehicles (Passenger Cars)	0.149	0.002	0.308	0.027	0.057	0.031	254.287	0.008
	Diesel	LDDT	Light-Duty Trucks (0-8,500 lbs)	0.210	0.003	0.307	0.043	0.067	0.041	323.269	0.008
	Diesel	HDDV	Heavy-Duty Vehicles (8,501 + lbs)	4.207	0.013	0.720	0.154	0.132	0.066	1338.541	0.027
	NA	MC	Motorcycles	1.213	0.002	25.454	5.479	0.018	0.009	171.275	0.054
Sierra	Gasoline	LDGV	Light-Duty Vehicles (Passenger Cars)	0.112	0.003	1.233	0.132	0.043	0.018	295.320	0.022
	Gasoline	LDGT	Light-Duty Trucks (0-8,500 lbs)	0.294	0.004	2.653	0.383	0.044	0.019	405.936	0.024
	Gasoline	HDGV	Heavy-Duty Vehicles (8,501 + lbs)	0.840	0.006	5.190	0.828	0.052	0.023	616.976	0.045
	Diesel	LDDV	Light-Duty Vehicles (Passenger Cars)	0.104	0.003	0.444	0.033	0.054	0.029	273.466	0.008
	Diesel	LDDT	Light-Duty Trucks (0-8,500 lbs)	0.172	0.003	0.430	0.060	0.069	0.043	358.249	0.008
	Diesel	HDDV	Heavy-Duty Vehicles (8,501 + lbs)	4.445	0.008	0.973	0.193	0.148	0.083	887.654	0.027
	NA	MC	Motorcycles	1.257	0.002	27.325	5.357	0.018	0.009	192.237	0.054
Siskiyou	Gasoline	LDGV	Light-Duty Vehicles (Passenger Cars)	0.114	0.003	1.214	0.132	0.043	0.018	290.589	0.022
	Gasoline	LDGT	Light-Duty Trucks (0-8,500 lbs)	0.294	0.004	2.567	0.406	0.044	0.019	394.832	0.024
	Gasoline	HDGV	Heavy-Duty Vehicles (8,501 + lbs)	0.815	0.006	5.066	0.858	0.053	0.023	602.224	0.045
	Diesel	LDDV	Light-Duty Vehicles (Passenger Cars)	0.172	0.003	0.422	0.034	0.057	0.032	273.482	0.008
	Diesel	LDDT	Light-Duty Trucks (0-8,500 lbs)	0.281	0.003	0.453	0.065	0.080	0.053	356.452	0.008
	Diesel	HDDV	Heavy-Duty Vehicles (8,501 + lbs)	4.053	0.013	0.726	0.154	0.128	0.064	1385.787	0.027
	NA	MC	Motorcycles	1.285	0.002	28.479	5.540	0.018	0.009	187.105	0.054
Solano	Gasoline	LDGV	Light-Duty Vehicles (Passenger Cars)	0.070	0.003	0.797	0.101	0.042	0.018	268.805	0.022
	Gasoline	LDGT	Light-Duty Trucks (0-8,500 lbs)	0.120	0.004	1.143	0.182	0.042	0.018	351.390	0.024
	Gasoline	HDGV	Heavy-Duty Vehicles (8,501 + lbs)	0.352	0.006	2.280	0.349	0.050	0.021	547.749	0.045
	Diesel	LDDV	Light-Duty Vehicles (Passenger Cars)	0.102	0.002	0.232	0.020	0.053	0.027	254.758	0.008
	Diesel	LDDT	Light-Duty Trucks (0-8,500 lbs)	0.138	0.003	0.213	0.026	0.056	0.030	327.578	0.008
	Diesel	HDDV	Heavy-Duty Vehicles (8,501 + lbs)	3.871	0.013	0.793	0.152	0.141	0.069	1357.826	0.027
	NA	MC	Motorcycles	1.152	0.002	23.420	3.908	0.017	0.008	169.713	0.054

Table 5-39. EMFAC County-Specific On-Road Vehicle EFs – 2021 (cont.)

County	Fuel Type	Vehicle Type		Emission Factors (g/mi)							
				Criteria Pollutants and Ozone Precursors							
				NO_X	SOx	CO	ROG	PM_{10}	$PM_{2.5}$	CO_2e	NH_3
Sonoma	Gasoline	LDGV	Light-Duty Vehicles (Passenger Cars)	0.088	0.002	0.924	0.114	0.042	0.018	242.771	0.022
	Gasoline	LDGT	Light-Duty Trucks (0-8,500 lbs)	0.218	0.003	1.685	0.266	0.043	0.018	334.358	0.024
	Gasoline	HDGV	Heavy-Duty Vehicles (8,501 + lbs)	0.489	0.005	2.944	0.431	0.056	0.024	523.614	0.045
	Diesel	LDDV	Light-Duty Vehicles (Passenger Cars)	0.126	0.002	0.218	0.019	0.053	0.027	238.495	0.008
	Diesel	LDDT	Light-Duty Trucks (0-8,500 lbs)	0.177	0.003	0.231	0.033	0.065	0.038	312.260	0.008
	Diesel	HDDV	Heavy-Duty Vehicles (8,501 + lbs)	3.992	0.011	0.881	0.143	0.171	0.087	1230.350	0.027
	NA	MC	Motorcycles	1.162	0.002	21.432	3.843	0.017	0.008	154.030	0.054
Stanislaus	Gasoline	LDGV	Light-Duty Vehicles (Passenger Cars)	0.073	0.003	0.895	0.103	0.043	0.018	279.379	0.022
	Gasoline	LDGT	Light-Duty Trucks (0-8,500 lbs)	0.147	0.004	1.473	0.228	0.043	0.018	369.737	0.024
	Gasoline	HDGV	Heavy-Duty Vehicles (8,501 + lbs)	0.392	0.006	2.730	0.401	0.050	0.021	560.264	0.045
	Diesel	LDDV	Light-Duty Vehicles (Passenger Cars)	0.109	0.002	0.297	0.024	0.054	0.028	256.372	0.008
	Diesel	LDDT	Light-Duty Trucks (0-8,500 lbs)	0.139	0.003	0.263	0.035	0.061	0.034	336.679	0.008
	Diesel	HDDV	Heavy-Duty Vehicles (8,501 + lbs)	3.919	0.013	0.692	0.144	0.134	0.065	1417.222	0.027
	NA	MC	Motorcycles	1.186	0.002	24.327	4.861	0.017	0.008	172.621	0.054
Sutter	Gasoline	LDGV	Light-Duty Vehicles (Passenger Cars)	0.077	0.003	0.864	0.097	0.043	0.018	251.562	0.022
	Gasoline	LDGT	Light-Duty Trucks (0-8,500 lbs)	0.183	0.003	1.573	0.253	0.043	0.018	328.699	0.024
	Gasoline	HDGV	Heavy-Duty Vehicles (8,501 + lbs)	0.453	0.005	2.876	0.442	0.048	0.020	510.399	0.045
	Diesel	LDDV	Light-Duty Vehicles (Passenger Cars)	0.083	0.002	0.186	0.013	0.050	0.024	232.164	0.008
	Diesel	LDDT	Light-Duty Trucks (0-8,500 lbs)	0.148	0.003	0.200	0.030	0.062	0.036	294.405	0.008
	Diesel	HDDV	Heavy-Duty Vehicles (8,501 + lbs)	3.766	0.014	0.649	0.140	0.128	0.062	1415.172	0.027
	NA	MC	Motorcycles	1.206	0.002	23.068	5.446	0.018	0.009	162.854	0.054
Tehama	Gasoline	LDGV	Light-Duty Vehicles (Passenger Cars)	0.087	0.003	0.939	0.104	0.043	0.018	270.746	0.022
	Gasoline	LDGT	Light-Duty Trucks (0-8,500 lbs)	0.221	0.004	1.865	0.286	0.043	0.018	355.948	0.024
	Gasoline	HDGV	Heavy-Duty Vehicles (8,501 + lbs)	0.499	0.005	3.259	0.495	0.049	0.021	543.879	0.045
	Diesel	LDDV	Light-Duty Vehicles (Passenger Cars)	0.138	0.002	0.297	0.025	0.055	0.029	253.449	0.008
	Diesel	LDDT	Light-Duty Trucks (0-8,500 lbs)	0.298	0.003	0.401	0.056	0.080	0.054	328.052	0.008
	Diesel	HDDV	Heavy-Duty Vehicles (8,501 + lbs)	4.103	0.013	0.711	0.152	0.127	0.063	1383.658	0.027
	NA	MC	Motorcycles	1.219	0.002	25.232	4.985	0.018	0.009	170.856	0.054
Trinity	Gasoline	LDGV	Light-Duty Vehicles (Passenger Cars)	0.137	0.003	1.485	0.158	0.045	0.019	328.866	0.022
	Gasoline	LDGT	Light-Duty Trucks (0-8,500 lbs)	0.498	0.005	4.252	0.576	0.046	0.021	453.986	0.024
	Gasoline	HDGV	Heavy-Duty Vehicles (8,501 + lbs)	1.037	0.007	6.459	1.059	0.054	0.024	669.640	0.045
	Diesel	LDDV	Light-Duty Vehicles (Passenger Cars)	0.297	0.003	0.631	0.065	0.079	0.052	305.665	0.008
	Diesel	LDDT	Light-Duty Trucks (0-8,500 lbs)	0.506	0.004	0.872	0.165	0.159	0.129	398.594	0.008
	Diesel	HDDV	Heavy-Duty Vehicles (8,501 + lbs)	4.500	0.013	0.792	0.172	0.133	0.070	1330.565	0.027
	NA	MC	Motorcycles	1.290	0.003	30.964	6.652	0.019	0.010	204.058	0.054
Tulare	Gasoline	LDGV	Light-Duty Vehicles (Passenger Cars)	0.068	0.003	0.806	0.096	0.043	0.018	262.341	0.022
	Gasoline	LDGT	Light-Duty Trucks (0-8,500 lbs)	0.154	0.003	1.479	0.246	0.043	0.018	345.260	0.024
	Gasoline	HDGV	Heavy-Duty Vehicles (8,501 + lbs)	0.385	0.005	2.712	0.388	0.048	0.020	530.012	0.045
	Diesel	LDDV	Light-Duty Vehicles (Passenger Cars)	0.084	0.002	0.185	0.016	0.052	0.026	239.131	0.008
	Diesel	LDDT	Light-Duty Trucks (0-8,500 lbs)	0.212	0.003	0.270	0.039	0.068	0.041	311.542	0.008
	Diesel	HDDV	Heavy-Duty Vehicles (8,501 + lbs)	3.923	0.013	0.702	0.144	0.134	0.065	1408.117	0.027
	NA	MC	Motorcycles	1.174	0.002	22.854	4.535	0.017	0.008	161.800	0.054
Tuolumne	Gasoline	LDGV	Light-Duty Vehicles (Passenger Cars)	0.134	0.003	1.422	0.159	0.044	0.019	279.464	0.022
	Gasoline	LDGT	Light-Duty Trucks (0-8,500 lbs)	0.397	0.004	3.467	0.521	0.045	0.020	379.975	0.024
	Gasoline	HDGV	Heavy-Duty Vehicles (8,501 + lbs)	0.891	0.006	5.264	0.904	0.052	0.023	584.535	0.045
	Diesel	LDDV	Light-Duty Vehicles (Passenger Cars)	0.191	0.002	0.372	0.033	0.061	0.034	261.747	0.008
	Diesel	LDDT	Light-Duty Trucks (0-8,500 lbs)	0.262	0.003	0.380	0.050	0.070	0.043	334.774	0.008
	Diesel	HDDV	Heavy-Duty Vehicles (8,501 + lbs)	4.706	0.009	0.868	0.181	0.157	0.085	950.966	0.027
	NA	MC	Motorcycles	1.270	0.002	27.815	5.781	0.019	0.009	176.315	0.054
Ventura	Gasoline	LDGV	Light-Duty Vehicles (Passenger Cars)	0.069	0.003	0.852	0.103	0.042	0.018	259.317	0.022
	Gasoline	LDGT	Light-Duty Trucks (0-8,500 lbs)	0.114	0.003	1.194	0.182	0.041	0.018	333.806	0.024
	Gasoline	HDGV	Heavy-Duty Vehicles (8,501 + lbs)	0.340	0.005	2.296	0.334	0.049	0.021	512.990	0.045
	Diesel	LDDV	Light-Duty Vehicles (Passenger Cars)	0.109	0.002	0.272	0.024	0.055	0.029	244.680	0.008
	Diesel	LDDT	Light-Duty Trucks (0-8,500 lbs)	0.130	0.003	0.224	0.030	0.056	0.031	313.913	0.008
	Diesel	HDDV	Heavy-Duty Vehicles (8,501 + lbs)	3.140	0.010	0.670	0.096	0.139	0.066	1139.105	0.027
	NA	MC	Motorcycles	1.160	0.002	22.260	5.149	0.018	0.009	173.130	0.054

Table 5-39. EMFAC County-Specific On-Road Vehicle EFs – 2021 (cont.)

County	Fuel Type	Vehicle Type		Emission Factors (g/mi)							
				Criteria Pollutants and Ozone Precursors							
				NO_X	SOx	CO	ROG	PM_{10}	$PM_{2.5}$	CO_2e	NH_3
Yolo	Gasoline	LDGV	Light-Duty Vehicles (Passenger Cars)	0.074	0.003	0.866	0.106	0.043	0.018	266.492	0.022
	Gasoline	LDGT	Light-Duty Trucks (0-8,500 lbs)	0.116	0.003	1.145	0.182	0.043	0.018	341.816	0.024
	Gasoline	HDGV	Heavy-Duty Vehicles (8,501 + lbs)	0.349	0.005	2.288	0.345	0.050	0.021	530.795	0.045
	Diesel	LDDV	Light-Duty Vehicles (Passenger Cars)	0.164	0.002	0.256	0.025	0.058	0.032	252.230	0.008
	Diesel	LDDT	Light-Duty Trucks (0-8,500 lbs)	0.163	0.003	0.212	0.026	0.059	0.033	317.831	0.008
	Diesel	HDDV	Heavy-Duty Vehicles (8,501 + lbs)	3.175	0.013	0.639	0.120	0.147	0.070	1326.864	0.027
	NA	MC	Motorcycles	1.178	0.002	23.580	4.282	0.017	0.008	165.030	0.054
Yuba	Gasoline	LDGV	Light-Duty Vehicles (Passenger Cars)	0.079	0.003	0.883	0.095	0.043	0.018	258.698	0.022
	Gasoline	LDGT	Light-Duty Trucks (0-8,500 lbs)	0.232	0.003	1.944	0.294	0.043	0.018	341.313	0.024
	Gasoline	HDGV	Heavy-Duty Vehicles (8,501 + lbs)	0.540	0.005	3.543	0.512	0.050	0.021	522.465	0.045
	Diesel	LDDV	Light-Duty Vehicles (Passenger Cars)	0.101	0.002	0.217	0.018	0.052	0.026	242.017	0.008
	Diesel	LDDT	Light-Duty Trucks (0-8,500 lbs)	0.178	0.003	0.220	0.032	0.064	0.037	303.974	0.008
	Diesel	HDDV	Heavy-Duty Vehicles (8,501 + lbs)	4.491	0.010	0.856	0.175	0.162	0.087	1040.823	0.027
	NA	MC	Motorcycles	1.181	0.002	23.244	4.629	0.017	0.008	160.031	0.054

Table 5-40. EMFAC County-Specific On-Road Vehicle EFs – 2022

County	Fuel Type	Vehicle Type		Emission Factors (g/mi)							
				Criteria Pollutants and Ozone Precursors							
				NO_X	SOx	CO	ROG	PM_{10}	$PM_{2.5}$	CO_2e	NH_3
Alameda	Gasoline	LDGV	Light-Duty Vehicles (Passenger Cars)	0.065	0.002	0.774	0.096	0.037	0.016	231.461	0.022
	Gasoline	LDGT	Light-Duty Trucks (0-8,500 lbs)	0.098	0.003	0.984	0.149	0.037	0.016	298.036	0.023
	Gasoline	HDGV	Heavy-Duty Vehicles (8,501 + lbs)	0.301	0.005	1.960	0.285	0.045	0.019	476.323	0.045
	Diesel	LDDV	Light-Duty Vehicles (Passenger Cars)	0.117	0.002	0.243	0.022	0.050	0.027	225.777	0.008
	Diesel	LDDT	Light-Duty Trucks (0-8,500 lbs)	0.110	0.003	0.190	0.025	0.052	0.029	286.870	0.008
	Diesel	HDDV	Heavy-Duty Vehicles (8,501 + lbs)	3.818	0.013	0.778	0.145	0.152	0.075	1387.404	0.027
	NA	MC	Motorcycles	1.021	0.002	19.291	3.545	0.015	0.007	149.842	0.054
Alpine	Gasoline	LDGV	Light-Duty Vehicles (Passenger Cars)	0.090	0.002	0.991	0.106	0.037	0.015	211.346	0.022
	Gasoline	LDGT	Light-Duty Trucks (0-8,500 lbs)	0.192	0.003	1.700	0.263	0.037	0.016	284.059	0.023
	Gasoline	HDGV	Heavy-Duty Vehicles (8,501 + lbs)	0.597	0.005	3.440	0.584	0.045	0.019	461.338	0.045
	Diesel	LDDV	Light-Duty Vehicles (Passenger Cars)	0.106	0.002	0.236	0.019	0.046	0.024	203.030	0.008
	Diesel	LDDT	Light-Duty Trucks (0-8,500 lbs)	0.115	0.003	0.199	0.026	0.051	0.028	268.272	0.008
	Diesel	HDDV	Heavy-Duty Vehicles (8,501 + lbs)	3.384	0.012	0.648	0.131	0.123	0.059	1288.875	0.027
	NA	MC	Motorcycles	1.121	0.002	22.532	4.013	0.015	0.007	142.862	0.054
Amador	Gasoline	LDGV	Light-Duty Vehicles (Passenger Cars)	0.106	0.002	1.118	0.138	0.040	0.017	218.813	0.022
	Gasoline	LDGT	Light-Duty Trucks (0-8,500 lbs)	0.266	0.003	2.272	0.425	0.039	0.017	292.237	0.023
	Gasoline	HDGV	Heavy-Duty Vehicles (8,501 + lbs)	0.716	0.005	4.087	0.816	0.048	0.021	482.853	0.045
	Diesel	LDDV	Light-Duty Vehicles (Passenger Cars)	0.161	0.002	0.204	0.019	0.051	0.027	208.335	0.008
	Diesel	LDDT	Light-Duty Trucks (0-8,500 lbs)	0.119	0.003	0.190	0.025	0.055	0.031	265.015	0.008
	Diesel	HDDV	Heavy-Duty Vehicles (8,501 + lbs)	4.229	0.009	0.747	0.159	0.143	0.077	975.222	0.027
	NA	MC	Motorcycles	1.120	0.002	21.820	4.371	0.016	0.008	139.352	0.054
Butte	Gasoline	LDGV	Light-Duty Vehicles (Passenger Cars)	0.086	0.003	0.968	0.107	0.041	0.017	254.843	0.022
	Gasoline	LDGT	Light-Duty Trucks (0-8,500 lbs)	0.235	0.003	1.989	0.299	0.040	0.017	326.909	0.023
	Gasoline	HDGV	Heavy-Duty Vehicles (8,501 + lbs)	0.464	0.005	2.960	0.461	0.046	0.019	490.026	0.045
	Diesel	LDDV	Light-Duty Vehicles (Passenger Cars)	0.147	0.002	0.276	0.026	0.056	0.031	245.279	0.008
	Diesel	LDDT	Light-Duty Trucks (0-8,500 lbs)	0.313	0.003	0.349	0.055	0.080	0.055	307.629	0.008
	Diesel	HDDV	Heavy-Duty Vehicles (8,501 + lbs)	3.696	0.012	0.706	0.141	0.127	0.063	1259.747	0.027
	NA	MC	Motorcycles	1.095	0.002	22.093	4.973	0.017	0.008	153.988	0.054
Calaveras	Gasoline	LDGV	Light-Duty Vehicles (Passenger Cars)	0.106	0.002	1.179	0.135	0.040	0.017	241.232	0.022
	Gasoline	LDGT	Light-Duty Trucks (0-8,500 lbs)	0.282	0.003	2.538	0.462	0.040	0.017	324.442	0.023
	Gasoline	HDGV	Heavy-Duty Vehicles (8,501 + lbs)	0.780	0.005	4.582	0.902	0.048	0.021	517.182	0.045
	Diesel	LDDV	Light-Duty Vehicles (Passenger Cars)	0.191	0.002	0.331	0.032	0.057	0.033	228.760	0.008
	Diesel	LDDT	Light-Duty Trucks (0-8,500 lbs)	0.202	0.003	0.340	0.052	0.071	0.046	296.591	0.008
	Diesel	HDDV	Heavy-Duty Vehicles (8,501 + lbs)	4.167	0.010	0.738	0.156	0.136	0.072	1013.573	0.027
	NA	MC	Motorcycles	1.133	0.002	23.195	5.255	0.017	0.008	157.032	0.054
Colusa	Gasoline	LDGV	Light-Duty Vehicles (Passenger Cars)	0.072	0.002	0.782	0.095	0.038	0.016	232.067	0.022
	Gasoline	LDGT	Light-Duty Trucks (0-8,500 lbs)	0.143	0.003	1.244	0.200	0.038	0.016	303.721	0.023
	Gasoline	HDGV	Heavy-Duty Vehicles (8,501 + lbs)	0.355	0.005	2.184	0.348	0.044	0.018	471.435	0.045
	Diesel	LDDV	Light-Duty Vehicles (Passenger Cars)	0.112	0.002	0.229	0.020	0.050	0.027	220.344	0.008
	Diesel	LDDT	Light-Duty Trucks (0-8,500 lbs)	0.150	0.003	0.236	0.030	0.057	0.033	284.608	0.008
	Diesel	HDDV	Heavy-Duty Vehicles (8,501 + lbs)	3.491	0.012	0.671	0.138	0.122	0.060	1258.425	0.027
	NA	MC	Motorcycles	1.056	0.002	19.950	3.902	0.016	0.007	149.246	0.054
Contra Costa	Gasoline	LDGV	Light-Duty Vehicles (Passenger Cars)	0.062	0.002	0.748	0.093	0.038	0.016	230.382	0.022
	Gasoline	LDGT	Light-Duty Trucks (0-8,500 lbs)	0.094	0.003	0.961	0.147	0.037	0.016	295.592	0.023
	Gasoline	HDGV	Heavy-Duty Vehicles (8,501 + lbs)	0.281	0.005	1.864	0.279	0.044	0.018	466.561	0.045
	Diesel	LDDV	Light-Duty Vehicles (Passenger Cars)	0.098	0.002	0.217	0.020	0.050	0.027	223.534	0.008
	Diesel	LDDT	Light-Duty Trucks (0-8,500 lbs)	0.083	0.003	0.157	0.019	0.047	0.024	283.320	0.008
	Diesel	HDDV	Heavy-Duty Vehicles (8,501 + lbs)	3.636	0.012	0.705	0.137	0.164	0.079	1239.687	0.027
	NA	MC	Motorcycles	1.018	0.002	19.353	3.603	0.015	0.007	148.201	0.054
Del Norte	Gasoline	LDGV	Light-Duty Vehicles (Passenger Cars)	0.114	0.003	1.155	0.135	0.041	0.017	262.072	0.022
	Gasoline	LDGT	Light-Duty Trucks (0-8,500 lbs)	0.380	0.004	2.797	0.464	0.042	0.018	360.138	0.023
	Gasoline	HDGV	Heavy-Duty Vehicles (8,501 + lbs)	0.739	0.006	4.150	0.755	0.048	0.021	548.197	0.045
	Diesel	LDDV	Light-Duty Vehicles (Passenger Cars)	0.183	0.002	0.374	0.035	0.060	0.035	258.933	0.008
	Diesel	LDDT	Light-Duty Trucks (0-8,500 lbs)	0.526	0.003	0.754	0.121	0.128	0.100	335.345	0.008
	Diesel	HDDV	Heavy-Duty Vehicles (8,501 + lbs)	4.355	0.007	0.910	0.186	0.145	0.083	771.508	0.027
	NA	MC	Motorcycles	1.176	0.002	25.175	5.308	0.017	0.009	166.142	0.054

Table 5-40. EMFAC County-Specific On-Road Vehicle EFs – 2022 (cont.)

County	Fuel Type	Vehicle Type		Emission Factors (g/mi)							
				Criteria Pollutants and Ozone Precursors							
				NO_X	SOx	CO	ROG	PM_{10}	$PM_{2.5}$	CO_2e	NH_3
El Dorado	Gasoline	LDGV	Light-Duty Vehicles (Passenger Cars)	0.061	0.002	0.767	0.087	0.039	0.016	232.808	0.022
	Gasoline	LDGT	Light-Duty Trucks (0-8,500 lbs)	0.140	0.003	1.441	0.246	0.039	0.017	321.135	0.023
	Gasoline	HDGV	Heavy-Duty Vehicles (8,501 + lbs)	0.391	0.005	2.655	0.471	0.045	0.019	491.036	0.045
	Diesel	LDDV	Light-Duty Vehicles (Passenger Cars)	0.095	0.002	0.222	0.017	0.047	0.023	220.963	0.008
	Diesel	LDDT	Light-Duty Trucks (0-8,500 lbs)	0.136	0.003	0.209	0.026	0.053	0.029	297.100	0.008
	Diesel	HDDV	Heavy-Duty Vehicles (8,501 + lbs)	3.720	0.009	0.723	0.147	0.139	0.072	937.807	0.027
	NA	MC	Motorcycles	1.160	0.002	24.054	5.417	0.017	0.008	161.594	0.054
Fresno	Gasoline	LDGV	Light-Duty Vehicles (Passenger Cars)	0.058	0.002	0.695	0.091	0.039	0.016	232.950	0.022
	Gasoline	LDGT	Light-Duty Trucks (0-8,500 lbs)	0.117	0.003	1.152	0.207	0.039	0.017	314.244	0.023
	Gasoline	HDGV	Heavy-Duty Vehicles (8,501 + lbs)	0.303	0.005	2.039	0.335	0.044	0.018	477.494	0.045
	Diesel	LDDV	Light-Duty Vehicles (Passenger Cars)	0.060	0.002	0.159	0.012	0.046	0.022	218.631	0.008
	Diesel	LDDT	Light-Duty Trucks (0-8,500 lbs)	0.112	0.003	0.180	0.022	0.054	0.029	295.642	0.008
	Diesel	HDDV	Heavy-Duty Vehicles (8,501 + lbs)	3.578	0.014	0.640	0.130	0.128	0.060	1460.817	0.027
	NA	MC	Motorcycles	1.065	0.002	21.048	3.905	0.015	0.007	147.780	0.054
Glenn	Gasoline	LDGV	Light-Duty Vehicles (Passenger Cars)	0.074	0.002	0.838	0.097	0.039	0.017	244.707	0.022
	Gasoline	LDGT	Light-Duty Trucks (0-8,500 lbs)	0.164	0.003	1.462	0.245	0.038	0.016	312.228	0.023
	Gasoline	HDGV	Heavy-Duty Vehicles (8,501 + lbs)	0.394	0.005	2.541	0.416	0.044	0.019	481.542	0.045
	Diesel	LDDV	Light-Duty Vehicles (Passenger Cars)	0.100	0.002	0.268	0.021	0.050	0.026	232.175	0.008
	Diesel	LDDT	Light-Duty Trucks (0-8,500 lbs)	0.169	0.003	0.294	0.038	0.062	0.038	288.458	0.008
	Diesel	HDDV	Heavy-Duty Vehicles (8,501 + lbs)	3.604	0.012	0.679	0.141	0.121	0.061	1229.701	0.027
	NA	MC	Motorcycles	1.057	0.002	20.810	4.542	0.016	0.008	153.434	0.054
Humboldt	Gasoline	LDGV	Light-Duty Vehicles (Passenger Cars)	0.118	0.003	1.183	0.137	0.041	0.017	249.178	0.022
	Gasoline	LDGT	Light-Duty Trucks (0-8,500 lbs)	0.337	0.003	2.583	0.423	0.041	0.018	339.009	0.023
	Gasoline	HDGV	Heavy-Duty Vehicles (8,501 + lbs)	0.745	0.005	4.076	0.757	0.048	0.021	516.337	0.045
	Diesel	LDDV	Light-Duty Vehicles (Passenger Cars)	0.313	0.002	0.378	0.039	0.064	0.039	244.381	0.008
	Diesel	LDDT	Light-Duty Trucks (0-8,500 lbs)	0.330	0.003	0.428	0.068	0.091	0.064	323.021	0.008
	Diesel	HDDV	Heavy-Duty Vehicles (8,501 + lbs)	4.416	0.011	0.785	0.168	0.136	0.073	1107.796	0.027
	NA	MC	Motorcycles	1.183	0.002	24.782	5.029	0.017	0.008	156.023	0.054
Imperial	Gasoline	LDGV	Light-Duty Vehicles (Passenger Cars)	0.268	0.002	2.485	0.215	0.037	0.016	223.952	0.022
	Gasoline	LDGT	Light-Duty Trucks (0-8,500 lbs)	0.170	0.003	1.592	0.349	0.038	0.016	296.400	0.023
	Gasoline	HDGV	Heavy-Duty Vehicles (8,501 + lbs)	0.461	0.005	2.873	0.517	0.045	0.019	468.967	0.045
	Diesel	LDDV	Light-Duty Vehicles (Passenger Cars)	0.078	0.002	0.158	0.015	0.047	0.024	200.753	0.008
	Diesel	LDDT	Light-Duty Trucks (0-8,500 lbs)	0.142	0.003	0.167	0.022	0.052	0.028	265.015	0.008
	Diesel	HDDV	Heavy-Duty Vehicles (8,501 + lbs)	2.600	0.012	0.339	0.066	0.114	0.051	1304.304	0.027
	NA	MC	Motorcycles	0.970	0.002	17.574	3.597	0.015	0.007	138.410	0.054
Inyo	Gasoline	LDGV	Light-Duty Vehicles (Passenger Cars)	0.084	0.002	0.906	0.119	0.038	0.016	237.571	0.022
	Gasoline	LDGT	Light-Duty Trucks (0-8,500 lbs)	0.193	0.003	1.703	0.338	0.038	0.016	320.014	0.023
	Gasoline	HDGV	Heavy-Duty Vehicles (8,501 + lbs)	0.598	0.005	3.446	0.699	0.047	0.020	512.210	0.045
	Diesel	LDDV	Light-Duty Vehicles (Passenger Cars)	0.102	0.002	0.254	0.020	0.047	0.024	220.243	0.008
	Diesel	LDDT	Light-Duty Trucks (0-8,500 lbs)	0.129	0.003	0.238	0.031	0.055	0.031	292.456	0.008
	Diesel	HDDV	Heavy-Duty Vehicles (8,501 + lbs)	3.531	0.011	0.700	0.138	0.134	0.066	1194.406	0.027
	NA	MC	Motorcycles	1.089	0.002	21.966	4.598	0.016	0.008	156.208	0.054
Kern	Gasoline	LDGV	Light-Duty Vehicles (Passenger Cars)	0.058	0.002	0.685	0.090	0.038	0.016	245.940	0.022
	Gasoline	LDGT	Light-Duty Trucks (0-8,500 lbs)	0.114	0.003	1.112	0.196	0.040	0.017	338.464	0.023
	Gasoline	HDGV	Heavy-Duty Vehicles (8,501 + lbs)	0.307	0.005	2.022	0.336	0.045	0.019	516.579	0.045
	Diesel	LDDV	Light-Duty Vehicles (Passenger Cars)	0.064	0.002	0.198	0.014	0.045	0.022	229.522	0.008
	Diesel	LDDT	Light-Duty Trucks (0-8,500 lbs)	0.112	0.003	0.204	0.025	0.054	0.029	318.978	0.008
	Diesel	HDDV	Heavy-Duty Vehicles (8,501 + lbs)	3.451	0.014	0.630	0.127	0.121	0.056	1436.948	0.027
	NA	MC	Motorcycles	1.065	0.002	21.595	3.838	0.016	0.007	157.702	0.054
Kings	Gasoline	LDGV	Light-Duty Vehicles (Passenger Cars)	0.065	0.002	0.728	0.088	0.038	0.016	229.792	0.022
	Gasoline	LDGT	Light-Duty Trucks (0-8,500 lbs)	0.154	0.003	1.382	0.225	0.040	0.017	314.244	0.023
	Gasoline	HDGV	Heavy-Duty Vehicles (8,501 + lbs)	0.337	0.005	2.135	0.350	0.044	0.019	473.475	0.045
	Diesel	LDDV	Light-Duty Vehicles (Passenger Cars)	0.067	0.002	0.207	0.015	0.046	0.023	212.982	0.008
	Diesel	LDDT	Light-Duty Trucks (0-8,500 lbs)	0.137	0.003	0.230	0.028	0.056	0.031	288.621	0.008
	Diesel	HDDV	Heavy-Duty Vehicles (8,501 + lbs)	3.669	0.014	0.656	0.135	0.119	0.055	1470.682	0.027
	NA	MC	Motorcycles	1.039	0.002	19.493	3.683	0.015	0.007	145.050	0.054

Table 5-40. EMFAC County-Specific On-Road Vehicle EFs – 2022 (cont.)

County	Fuel Type	Vehicle Type		Emission Factors (g/mi)							
				Criteria Pollutants and Ozone Precursors							
				NO_X	SOx	CO	ROG	PM_{10}	$PM_{2.5}$	CO_2e	NH_3
Lake	Gasoline	LDGV	Light-Duty Vehicles (Passenger Cars)	0.124	0.003	1.311	0.168	0.041	0.017	255.972	0.022
	Gasoline	LDGT	Light-Duty Trucks (0-8,500 lbs)	0.274	0.003	2.319	0.442	0.041	0.017	336.467	0.023
	Gasoline	HDGV	Heavy-Duty Vehicles (8,501 + lbs)	0.862	0.005	5.053	0.997	0.050	0.022	541.083	0.045
	Diesel	LDDV	Light-Duty Vehicles (Passenger Cars)	0.191	0.002	0.323	0.028	0.057	0.032	243.188	0.008
	Diesel	LDDT	Light-Duty Trucks (0-8,500 lbs)	0.285	0.003	0.337	0.046	0.070	0.045	306.225	0.008
	Diesel	HDDV	Heavy-Duty Vehicles (8,501 + lbs)	4.459	0.010	0.839	0.187	0.153	0.086	1061.047	0.027
	NA	MC	Motorcycles	1.168	0.002	25.092	5.703	0.017	0.009	159.552	0.054
Lassen	Gasoline	LDGV	Light-Duty Vehicles (Passenger Cars)	0.103	0.003	1.116	0.126	0.040	0.017	257.733	0.022
	Gasoline	LDGT	Light-Duty Trucks (0-8,500 lbs)	0.248	0.004	2.180	0.388	0.040	0.017	350.609	0.023
	Gasoline	HDGV	Heavy-Duty Vehicles (8,501 + lbs)	0.802	0.006	4.695	0.916	0.048	0.021	549.595	0.045
	Diesel	LDDV	Light-Duty Vehicles (Passenger Cars)	0.121	0.002	0.333	0.024	0.049	0.025	241.232	0.008
	Diesel	LDDT	Light-Duty Trucks (0-8,500 lbs)	0.145	0.003	0.307	0.039	0.059	0.034	320.831	0.008
	Diesel	HDDV	Heavy-Duty Vehicles (8,501 + lbs)	4.247	0.008	0.915	0.184	0.149	0.084	798.931	0.027
	NA	MC	Motorcycles	1.171	0.002	25.347	5.118	0.016	0.008	166.685	0.054
Los Angeles	Gasoline	LDGV	Light-Duty Vehicles (Passenger Cars)	0.063	0.002	0.824	0.101	0.036	0.015	242.089	0.022
	Gasoline	LDGT	Light-Duty Trucks (0-8,500 lbs)	0.112	0.003	1.207	0.165	0.039	0.017	330.958	0.023
	Gasoline	HDGV	Heavy-Duty Vehicles (8,501 + lbs)	0.275	0.005	1.996	0.265	0.046	0.019	495.916	0.045
	Diesel	LDDV	Light-Duty Vehicles (Passenger Cars)	0.099	0.002	0.295	0.028	0.051	0.029	221.750	0.008
	Diesel	LDDT	Light-Duty Trucks (0-8,500 lbs)	0.116	0.003	0.245	0.031	0.053	0.030	311.512	0.008
	Diesel	HDDV	Heavy-Duty Vehicles (8,501 + lbs)	2.891	0.011	0.804	0.105	0.141	0.065	1236.702	0.027
	NA	MC	Motorcycles	1.000	0.002	18.195	3.927	0.016	0.008	163.505	0.054
Madera	Gasoline	LDGV	Light-Duty Vehicles (Passenger Cars)	0.062	0.003	0.790	0.088	0.040	0.017	251.530	0.022
	Gasoline	LDGT	Light-Duty Trucks (0-8,500 lbs)	0.132	0.003	1.372	0.227	0.039	0.017	330.638	0.023
	Gasoline	HDGV	Heavy-Duty Vehicles (8,501 + lbs)	0.335	0.005	2.354	0.367	0.045	0.019	504.274	0.045
	Diesel	LDDV	Light-Duty Vehicles (Passenger Cars)	0.089	0.002	0.290	0.022	0.049	0.025	232.727	0.008
	Diesel	LDDT	Light-Duty Trucks (0-8,500 lbs)	0.154	0.003	0.266	0.035	0.058	0.034	303.243	0.008
	Diesel	HDDV	Heavy-Duty Vehicles (8,501 + lbs)	3.674	0.013	0.697	0.140	0.126	0.060	1397.794	0.027
	NA	MC	Motorcycles	1.043	0.002	20.291	3.766	0.016	0.007	153.371	0.054
Marin	Gasoline	LDGV	Light-Duty Vehicles (Passenger Cars)	0.063	0.002	0.730	0.101	0.037	0.016	228.291	0.022
	Gasoline	LDGT	Light-Duty Trucks (0-8,500 lbs)	0.094	0.003	0.935	0.159	0.036	0.015	295.373	0.023
	Gasoline	HDGV	Heavy-Duty Vehicles (8,501 + lbs)	0.275	0.005	1.776	0.292	0.044	0.019	463.888	0.045
	Diesel	LDDV	Light-Duty Vehicles (Passenger Cars)	0.124	0.002	0.244	0.022	0.049	0.027	226.931	0.008
	Diesel	LDDT	Light-Duty Trucks (0-8,500 lbs)	0.090	0.003	0.174	0.021	0.047	0.025	293.650	0.008
	Diesel	HDDV	Heavy-Duty Vehicles (8,501 + lbs)	3.809	0.011	0.959	0.167	0.195	0.102	1130.227	0.027
	NA	MC	Motorcycles	1.033	0.002	20.022	3.773	0.015	0.007	150.321	0.054
Mariposa	Gasoline	LDGV	Light-Duty Vehicles (Passenger Cars)	0.103	0.003	1.148	0.138	0.040	0.017	252.953	0.022
	Gasoline	LDGT	Light-Duty Trucks (0-8,500 lbs)	0.365	0.003	3.136	0.533	0.041	0.018	342.953	0.023
	Gasoline	HDGV	Heavy-Duty Vehicles (8,501 + lbs)	0.794	0.005	4.707	0.916	0.048	0.021	534.564	0.045
	Diesel	LDDV	Light-Duty Vehicles (Passenger Cars)	0.178	0.002	0.355	0.027	0.051	0.027	239.036	0.008
	Diesel	LDDT	Light-Duty Trucks (0-8,500 lbs)	0.242	0.003	0.471	0.071	0.081	0.055	305.583	0.008
	Diesel	HDDV	Heavy-Duty Vehicles (8,501 + lbs)	4.478	0.007	0.857	0.182	0.145	0.080	777.658	0.027
	NA	MC	Motorcycles	1.165	0.002	25.086	5.316	0.017	0.008	163.553	0.054
Mendocino	Gasoline	LDGV	Light-Duty Vehicles (Passenger Cars)	0.100	0.002	1.038	0.121	0.040	0.017	237.390	0.022
	Gasoline	LDGT	Light-Duty Trucks (0-8,500 lbs)	0.331	0.003	2.634	0.429	0.042	0.018	337.845	0.023
	Gasoline	HDGV	Heavy-Duty Vehicles (8,501 + lbs)	0.762	0.005	4.218	0.771	0.049	0.021	522.642	0.045
	Diesel	LDDV	Light-Duty Vehicles (Passenger Cars)	0.313	0.002	0.353	0.033	0.058	0.035	232.151	0.008
	Diesel	LDDT	Light-Duty Trucks (0-8,500 lbs)	0.492	0.003	0.510	0.093	0.112	0.084	316.845	0.008
	Diesel	HDDV	Heavy-Duty Vehicles (8,501 + lbs)	4.096	0.012	0.722	0.157	0.129	0.068	1208.772	0.027
	NA	MC	Motorcycles	1.162	0.002	24.066	4.896	0.016	0.008	155.035	0.054
Merced	Gasoline	LDGV	Light-Duty Vehicles (Passenger Cars)	0.065	0.003	0.794	0.090	0.040	0.017	251.447	0.022
	Gasoline	LDGT	Light-Duty Trucks (0-8,500 lbs)	0.135	0.003	1.337	0.210	0.040	0.017	328.128	0.023
	Gasoline	HDGV	Heavy-Duty Vehicles (8,501 + lbs)	0.348	0.005	2.423	0.347	0.046	0.020	510.196	0.045
	Diesel	LDDV	Light-Duty Vehicles (Passenger Cars)	0.099	0.002	0.266	0.020	0.050	0.026	235.825	0.008
	Diesel	LDDT	Light-Duty Trucks (0-8,500 lbs)	0.155	0.003	0.266	0.034	0.059	0.034	309.048	0.008
	Diesel	HDDV	Heavy-Duty Vehicles (8,501 + lbs)	3.731	0.014	0.670	0.138	0.125	0.058	1470.969	0.027
	NA	MC	Motorcycles	1.049	0.002	20.430	3.467	0.015	0.007	152.168	0.054

Table 5-40. EMFAC County-Specific On-Road Vehicle EFs – 2022 (cont.)

County	Fuel Type	Vehicle Type		Emission Factors (g/mi)							
				Criteria Pollutants and Ozone Precursors							
				NO_X	SOx	CO	ROG	PM_{10}	$PM_{2.5}$	CO_2e	NH_3
Modoc	Gasoline	LDGV	Light-Duty Vehicles (Passenger Cars)	0.113	0.003	1.235	0.131	0.040	0.017	282.874	0.022
	Gasoline	LDGT	Light-Duty Trucks (0-8,500 lbs)	0.274	0.004	2.494	0.395	0.040	0.018	383.599	0.023
	Gasoline	HDGV	Heavy-Duty Vehicles (8,501 + lbs)	0.895	0.006	5.519	1.022	0.048	0.021	589.239	0.045
	Diesel	LDDV	Light-Duty Vehicles (Passenger Cars)	0.150	0.003	0.491	0.041	0.057	0.034	266.695	0.008
	Diesel	LDDT	Light-Duty Trucks (0-8,500 lbs)	0.253	0.003	0.431	0.053	0.063	0.039	359.136	0.008
	Diesel	HDDV	Heavy-Duty Vehicles (8,501 + lbs)	4.224	0.008	0.851	0.177	0.143	0.080	858.972	0.027
	NA	MC	Motorcycles	1.185	0.002	26.107	5.419	0.017	0.009	184.359	0.054
Mono	Gasoline	LDGV	Light-Duty Vehicles (Passenger Cars)	0.089	0.002	0.942	0.103	0.038	0.016	229.666	0.022
	Gasoline	LDGT	Light-Duty Trucks (0-8,500 lbs)	0.212	0.003	1.812	0.299	0.038	0.016	312.011	0.023
	Gasoline	HDGV	Heavy-Duty Vehicles (8,501 + lbs)	0.653	0.005	3.811	0.669	0.047	0.020	498.699	0.045
	Diesel	LDDV	Light-Duty Vehicles (Passenger Cars)	0.120	0.002	0.275	0.021	0.048	0.025	221.843	0.008
	Diesel	LDDT	Light-Duty Trucks (0-8,500 lbs)	0.238	0.003	0.287	0.032	0.054	0.030	293.005	0.008
	Diesel	HDDV	Heavy-Duty Vehicles (8,501 + lbs)	3.495	0.012	0.665	0.135	0.122	0.060	1228.966	0.027
	NA	MC	Motorcycles	1.197	0.002	26.430	4.570	0.016	0.008	157.149	0.054
Monterey	Gasoline	LDGV	Light-Duty Vehicles (Passenger Cars)	0.087	0.003	0.953	0.107	0.039	0.017	254.436	0.022
	Gasoline	LDGT	Light-Duty Trucks (0-8,500 lbs)	0.208	0.004	1.682	0.240	0.040	0.017	351.300	0.023
	Gasoline	HDGV	Heavy-Duty Vehicles (8,501 + lbs)	0.454	0.005	2.690	0.386	0.047	0.020	530.580	0.045
	Diesel	LDDV	Light-Duty Vehicles (Passenger Cars)	0.139	0.002	0.368	0.032	0.056	0.032	244.886	0.008
	Diesel	LDDT	Light-Duty Trucks (0-8,500 lbs)	0.244	0.003	0.397	0.071	0.084	0.058	337.079	0.008
	Diesel	HDDV	Heavy-Duty Vehicles (8,501 + lbs)	3.610	0.011	0.760	0.137	0.149	0.074	1211.379	0.027
	NA	MC	Motorcycles	1.040	0.002	19.836	3.430	0.015	0.007	157.667	0.054
Napa	Gasoline	LDGV	Light-Duty Vehicles (Passenger Cars)	0.063	0.002	0.759	0.087	0.039	0.016	229.232	0.022
	Gasoline	LDGT	Light-Duty Trucks (0-8,500 lbs)	0.112	0.003	1.124	0.175	0.037	0.015	287.563	0.023
	Gasoline	HDGV	Heavy-Duty Vehicles (8,501 + lbs)	0.358	0.005	2.304	0.357	0.045	0.019	472.074	0.045
	Diesel	LDDV	Light-Duty Vehicles (Passenger Cars)	0.111	0.002	0.228	0.021	0.051	0.028	224.588	0.008
	Diesel	LDDT	Light-Duty Trucks (0-8,500 lbs)	0.088	0.003	0.162	0.019	0.048	0.025	280.758	0.008
	Diesel	HDDV	Heavy-Duty Vehicles (8,501 + lbs)	3.807	0.012	0.741	0.143	0.135	0.067	1257.443	0.027
	NA	MC	Motorcycles	1.018	0.002	19.277	3.546	0.015	0.007	142.880	0.054
Nevada	Gasoline	LDGV	Light-Duty Vehicles (Passenger Cars)	0.085	0.002	0.920	0.106	0.039	0.017	230.165	0.022
	Gasoline	LDGT	Light-Duty Trucks (0-8,500 lbs)	0.230	0.003	1.838	0.294	0.040	0.017	330.016	0.023
	Gasoline	HDGV	Heavy-Duty Vehicles (8,501 + lbs)	0.567	0.005	3.410	0.533	0.048	0.020	514.203	0.045
	Diesel	LDDV	Light-Duty Vehicles (Passenger Cars)	0.187	0.002	0.289	0.030	0.057	0.033	225.854	0.008
	Diesel	LDDT	Light-Duty Trucks (0-8,500 lbs)	0.313	0.003	0.315	0.038	0.064	0.039	304.771	0.008
	Diesel	HDDV	Heavy-Duty Vehicles (8,501 + lbs)	3.762	0.012	0.687	0.142	0.121	0.060	1224.726	0.027
	NA	MC	Motorcycles	1.197	0.002	25.541	5.396	0.017	0.008	154.301	0.054
Orange	Gasoline	LDGV	Light-Duty Vehicles (Passenger Cars)	0.053	0.002	0.699	0.090	0.036	0.015	224.103	0.022
	Gasoline	LDGT	Light-Duty Trucks (0-8,500 lbs)	0.082	0.003	0.926	0.141	0.036	0.015	295.794	0.023
	Gasoline	HDGV	Heavy-Duty Vehicles (8,501 + lbs)	0.256	0.005	1.775	0.262	0.044	0.019	464.079	0.045
	Diesel	LDDV	Light-Duty Vehicles (Passenger Cars)	0.068	0.002	0.225	0.018	0.045	0.023	208.149	0.008
	Diesel	LDDT	Light-Duty Trucks (0-8,500 lbs)	0.066	0.003	0.168	0.020	0.045	0.023	277.706	0.008
	Diesel	HDDV	Heavy-Duty Vehicles (8,501 + lbs)	2.472	0.010	0.670	0.081	0.142	0.064	1154.810	0.027
	NA	MC	Motorcycles	0.982	0.002	17.652	3.843	0.015	0.007	153.963	0.054
Placer	Gasoline	LDGV	Light-Duty Vehicles (Passenger Cars)	0.060	0.002	0.749	0.090	0.038	0.016	223.718	0.022
	Gasoline	LDGT	Light-Duty Trucks (0-8,500 lbs)	0.103	0.003	1.074	0.165	0.038	0.016	302.321	0.023
	Gasoline	HDGV	Heavy-Duty Vehicles (8,501 + lbs)	0.291	0.005	1.987	0.309	0.044	0.019	463.849	0.045
	Diesel	LDDV	Light-Duty Vehicles (Passenger Cars)	0.101	0.002	0.209	0.018	0.048	0.025	212.458	0.008
	Diesel	LDDT	Light-Duty Trucks (0-8,500 lbs)	0.115	0.003	0.180	0.024	0.052	0.028	282.971	0.008
	Diesel	HDDV	Heavy-Duty Vehicles (8,501 + lbs)	3.104	0.012	0.598	0.120	0.130	0.062	1236.261	0.027
	NA	MC	Motorcycles	1.098	0.002	21.693	4.269	0.016	0.008	150.192	0.054
Plumas	Gasoline	LDGV	Light-Duty Vehicles (Passenger Cars)	0.103	0.003	1.164	0.132	0.039	0.017	260.194	0.022
	Gasoline	LDGT	Light-Duty Trucks (0-8,500 lbs)	0.319	0.004	2.862	0.449	0.041	0.018	375.671	0.023
	Gasoline	HDGV	Heavy-Duty Vehicles (8,501 + lbs)	0.960	0.006	5.901	1.005	0.049	0.022	577.438	0.045
	Diesel	LDDV	Light-Duty Vehicles (Passenger Cars)	0.143	0.002	0.413	0.030	0.049	0.026	244.187	0.008
	Diesel	LDDT	Light-Duty Trucks (0-8,500 lbs)	0.177	0.003	0.387	0.048	0.062	0.037	352.442	0.008
	Diesel	HDDV	Heavy-Duty Vehicles (8,501 + lbs)	4.501	0.010	0.827	0.170	0.138	0.076	1054.339	0.027
	NA	MC	Motorcycles	1.186	0.002	26.478	5.700	0.017	0.009	175.607	0.054

Table 5-40. EMFAC County-Specific On-Road Vehicle EFs – 2022 (cont.)

County	Fuel Type	Vehicle Type		Emission Factors (g/mi)							
				Criteria Pollutants and Ozone Precursors							
				NO_X	SOx	CO	ROG	PM_{10}	$PM_{2.5}$	CO_2e	NH_3
Riverside	Gasoline	LDGV	Light-Duty Vehicles (Passenger Cars)	0.057	0.002	0.712	0.092	0.038	0.016	227.426	0.022
	Gasoline	LDGT	Light-Duty Trucks (0-8,500 lbs)	0.099	0.003	1.041	0.170	0.038	0.016	299.009	0.023
	Gasoline	HDGV	Heavy-Duty Vehicles (8,501 + lbs)	0.288	0.005	1.949	0.305	0.045	0.019	460.122	0.045
	Diesel	LDDV	Light-Duty Vehicles (Passenger Cars)	0.072	0.002	0.175	0.014	0.046	0.023	209.895	0.008
	Diesel	LDDT	Light-Duty Trucks (0-8,500 lbs)	0.079	0.003	0.149	0.019	0.048	0.025	276.474	0.008
	Diesel	HDDV	Heavy-Duty Vehicles (8,501 + lbs)	2.596	0.012	0.462	0.069	0.120	0.054	1246.660	0.027
	NA	MC	Motorcycles	0.998	0.002	18.560	3.815	0.015	0.007	146.036	0.054
Sacramento	Gasoline	LDGV	Light-Duty Vehicles (Passenger Cars)	0.064	0.002	0.813	0.098	0.038	0.016	235.350	0.022
	Gasoline	LDGT	Light-Duty Trucks (0-8,500 lbs)	0.114	0.003	1.202	0.186	0.039	0.017	314.790	0.023
	Gasoline	HDGV	Heavy-Duty Vehicles (8,501 + lbs)	0.326	0.005	2.208	0.336	0.046	0.019	487.652	0.045
	Diesel	LDDV	Light-Duty Vehicles (Passenger Cars)	0.094	0.002	0.230	0.020	0.050	0.026	221.338	0.008
	Diesel	LDDT	Light-Duty Trucks (0-8,500 lbs)	0.248	0.003	0.298	0.039	0.061	0.037	290.869	0.008
	Diesel	HDDV	Heavy-Duty Vehicles (8,501 + lbs)	3.613	0.011	0.877	0.138	0.145	0.071	1243.954	0.027
	NA	MC	Motorcycles	1.063	0.002	20.304	4.154	0.016	0.007	152.975	0.054
San Benito	Gasoline	LDGV	Light-Duty Vehicles (Passenger Cars)	0.071	0.002	0.771	0.085	0.037	0.016	217.404	0.022
	Gasoline	LDGT	Light-Duty Trucks (0-8,500 lbs)	0.141	0.003	1.220	0.201	0.038	0.016	295.860	0.023
	Gasoline	HDGV	Heavy-Duty Vehicles (8,501 + lbs)	0.395	0.005	2.368	0.385	0.044	0.018	463.405	0.045
	Diesel	LDDV	Light-Duty Vehicles (Passenger Cars)	0.128	0.002	0.240	0.019	0.047	0.024	211.390	0.008
	Diesel	LDDT	Light-Duty Trucks (0-8,500 lbs)	0.049	0.003	0.152	0.017	0.045	0.022	283.900	0.008
	Diesel	HDDV	Heavy-Duty Vehicles (8,501 + lbs)	3.588	0.014	0.639	0.132	0.117	0.055	1427.329	0.027
	NA	MC	Motorcycles	1.048	0.002	20.283	3.610	0.015	0.007	142.022	0.054
San Bernardino	Gasoline	LDGV	Light-Duty Vehicles (Passenger Cars)	0.060	0.002	0.717	0.086	0.036	0.015	221.570	0.022
	Gasoline	LDGT	Light-Duty Trucks (0-8,500 lbs)	0.116	0.003	1.135	0.175	0.037	0.016	292.754	0.023
	Gasoline	HDGV	Heavy-Duty Vehicles (8,501 + lbs)	0.301	0.004	1.983	0.294	0.043	0.018	445.728	0.045
	Diesel	LDDV	Light-Duty Vehicles (Passenger Cars)	0.070	0.002	0.185	0.015	0.045	0.023	206.193	0.008
	Diesel	LDDT	Light-Duty Trucks (0-8,500 lbs)	0.101	0.003	0.173	0.023	0.049	0.027	271.751	0.008
	Diesel	HDDV	Heavy-Duty Vehicles (8,501 + lbs)	2.688	0.012	0.530	0.078	0.124	0.056	1279.482	0.027
	NA	MC	Motorcycles	1.106	0.002	21.023	3.730	0.016	0.008	157.529	0.054
San Diego	Gasoline	LDGV	Light-Duty Vehicles (Passenger Cars)	0.080	0.002	0.859	0.100	0.037	0.016	234.731	0.022
	Gasoline	LDGT	Light-Duty Trucks (0-8,500 lbs)	0.099	0.003	1.013	0.170	0.037	0.016	306.179	0.023
	Gasoline	HDGV	Heavy-Duty Vehicles (8,501 + lbs)	0.257	0.005	1.723	0.264	0.044	0.019	474.465	0.045
	Diesel	LDDV	Light-Duty Vehicles (Passenger Cars)	0.081	0.002	0.228	0.019	0.047	0.025	227.529	0.008
	Diesel	LDDT	Light-Duty Trucks (0-8,500 lbs)	0.131	0.003	0.229	0.029	0.054	0.031	297.741	0.008
	Diesel	HDDV	Heavy-Duty Vehicles (8,501 + lbs)	3.271	0.011	0.916	0.134	0.145	0.069	1245.770	0.027
	NA	MC	Motorcycles	1.000	0.002	19.093	3.662	0.015	0.007	154.476	0.054
San Francisco	Gasoline	LDGV	Light-Duty Vehicles (Passenger Cars)	0.058	0.002	0.741	0.098	0.036	0.015	237.795	0.022
	Gasoline	LDGT	Light-Duty Trucks (0-8,500 lbs)	0.082	0.003	0.907	0.141	0.036	0.016	312.113	0.023
	Gasoline	HDGV	Heavy-Duty Vehicles (8,501 + lbs)	0.287	0.005	1.823	0.283	0.048	0.021	505.865	0.045
	Diesel	LDDV	Light-Duty Vehicles (Passenger Cars)	0.072	0.002	0.303	0.021	0.043	0.022	228.060	0.008
	Diesel	LDDT	Light-Duty Trucks (0-8,500 lbs)	0.086	0.003	0.234	0.026	0.045	0.023	299.368	0.008
	Diesel	HDDV	Heavy-Duty Vehicles (8,501 + lbs)	3.881	0.012	1.056	0.162	0.211	0.108	1300.468	0.027
	NA	MC	Motorcycles	1.018	0.002	19.860	4.360	0.015	0.008	161.387	0.054
San Joaquin	Gasoline	LDGV	Light-Duty Vehicles (Passenger Cars)	0.063	0.002	0.733	0.091	0.039	0.016	237.890	0.022
	Gasoline	LDGT	Light-Duty Trucks (0-8,500 lbs)	0.118	0.003	1.138	0.184	0.039	0.017	318.905	0.023
	Gasoline	HDGV	Heavy-Duty Vehicles (8,501 + lbs)	0.312	0.005	2.065	0.326	0.044	0.019	481.117	0.045
	Diesel	LDDV	Light-Duty Vehicles (Passenger Cars)	0.093	0.002	0.188	0.017	0.049	0.026	226.922	0.008
	Diesel	LDDT	Light-Duty Trucks (0-8,500 lbs)	0.139	0.003	0.195	0.025	0.056	0.031	302.151	0.008
	Diesel	HDDV	Heavy-Duty Vehicles (8,501 + lbs)	3.533	0.013	0.705	0.138	0.132	0.064	1346.594	0.027
	NA	MC	Motorcycles	1.074	0.002	21.339	3.853	0.016	0.007	152.015	0.054
San Luis Obispo	Gasoline	LDGV	Light-Duty Vehicles (Passenger Cars)	0.072	0.002	0.779	0.095	0.038	0.016	224.077	0.022
	Gasoline	LDGT	Light-Duty Trucks (0-8,500 lbs)	0.183	0.003	1.477	0.233	0.039	0.016	309.772	0.023
	Gasoline	HDGV	Heavy-Duty Vehicles (8,501 + lbs)	0.420	0.005	2.470	0.397	0.046	0.019	474.157	0.045
	Diesel	LDDV	Light-Duty Vehicles (Passenger Cars)	0.117	0.002	0.227	0.020	0.049	0.026	221.136	0.008
	Diesel	LDDT	Light-Duty Trucks (0-8,500 lbs)	0.186	0.003	0.268	0.036	0.063	0.038	297.730	0.008
	Diesel	HDDV	Heavy-Duty Vehicles (8,501 + lbs)	3.769	0.010	0.770	0.146	0.136	0.071	1043.809	0.027
	NA	MC	Motorcycles	1.082	0.002	21.321	4.695	0.016	0.008	146.093	0.054

Table 5-40. EMFAC County-Specific On-Road Vehicle EFs – 2022 (cont.)

County	Fuel Type	Vehicle Type		Emission Factors (g/mi)							
				Criteria Pollutants and Ozone Precursors							
				NO_X	SOx	CO	ROG	PM_{10}	$PM_{2.5}$	CO_2e	NH_3
San Mateo	Gasoline	LDGV	Light-Duty Vehicles (Passenger Cars)	0.055	0.002	0.670	0.099	0.032	0.013	191.459	0.022
	Gasoline	LDGT	Light-Duty Trucks (0-8,500 lbs)	0.075	0.003	0.795	0.124	0.037	0.016	283.042	0.023
	Gasoline	HDGV	Heavy-Duty Vehicles (8,501 + lbs)	0.222	0.004	1.520	0.236	0.045	0.019	446.966	0.045
	Diesel	LDDV	Light-Duty Vehicles (Passenger Cars)	0.077	0.002	0.167	0.015	0.040	0.021	179.723	0.008
	Diesel	LDDT	Light-Duty Trucks (0-8,500 lbs)	0.055	0.003	0.123	0.015	0.044	0.021	270.259	0.008
	Diesel	HDDV	Heavy-Duty Vehicles (8,501 + lbs)	2.667	0.010	0.731	0.116	0.171	0.083	1119.610	0.027
	NA	MC	Motorcycles	0.989	0.002	17.349	2.997	0.015	0.007	146.070	0.054
Santa Barbara	Gasoline	LDGV	Light-Duty Vehicles (Passenger Cars)	0.077	0.002	0.812	0.103	0.038	0.016	215.558	0.022
	Gasoline	LDGT	Light-Duty Trucks (0-8,500 lbs)	0.190	0.003	1.486	0.244	0.039	0.017	301.836	0.023
	Gasoline	HDGV	Heavy-Duty Vehicles (8,501 + lbs)	0.426	0.005	2.496	0.392	0.052	0.022	472.839	0.045
	Diesel	LDDV	Light-Duty Vehicles (Passenger Cars)	0.105	0.002	0.196	0.016	0.047	0.024	214.313	0.008
	Diesel	LDDT	Light-Duty Trucks (0-8,500 lbs)	0.153	0.003	0.211	0.029	0.059	0.035	287.976	0.008
	Diesel	HDDV	Heavy-Duty Vehicles (8,501 + lbs)	3.647	0.011	0.844	0.133	0.161	0.081	1182.784	0.027
	NA	MC	Motorcycles	1.047	0.002	19.255	3.557	0.015	0.007	139.112	0.054
Santa Clara	Gasoline	LDGV	Light-Duty Vehicles (Passenger Cars)	0.058	0.002	0.719	0.091	0.037	0.016	222.243	0.022
	Gasoline	LDGT	Light-Duty Trucks (0-8,500 lbs)	0.099	0.003	1.020	0.159	0.037	0.016	294.383	0.023
	Gasoline	HDGV	Heavy-Duty Vehicles (8,501 + lbs)	0.289	0.005	1.953	0.294	0.045	0.019	462.523	0.045
	Diesel	LDDV	Light-Duty Vehicles (Passenger Cars)	0.073	0.002	0.188	0.015	0.045	0.023	212.139	0.008
	Diesel	LDDT	Light-Duty Trucks (0-8,500 lbs)	0.087	0.003	0.162	0.021	0.049	0.026	281.936	0.008
	Diesel	HDDV	Heavy-Duty Vehicles (8,501 + lbs)	3.401	0.012	0.721	0.135	0.147	0.072	1254.909	0.027
	NA	MC	Motorcycles	1.002	0.002	18.138	3.502	0.015	0.007	145.449	0.054
Santa Cruz	Gasoline	LDGV	Light-Duty Vehicles (Passenger Cars)	0.095	0.003	1.038	0.114	0.040	0.017	253.001	0.022
	Gasoline	LDGT	Light-Duty Trucks (0-8,500 lbs)	0.229	0.003	1.864	0.283	0.040	0.017	335.291	0.023
	Gasoline	HDGV	Heavy-Duty Vehicles (8,501 + lbs)	0.479	0.005	2.873	0.416	0.048	0.020	511.995	0.045
	Diesel	LDDV	Light-Duty Vehicles (Passenger Cars)	0.220	0.002	0.399	0.038	0.061	0.037	249.680	0.008
	Diesel	LDDT	Light-Duty Trucks (0-8,500 lbs)	0.237	0.003	0.334	0.053	0.073	0.048	311.320	0.008
	Diesel	HDDV	Heavy-Duty Vehicles (8,501 + lbs)	4.064	0.010	0.846	0.151	0.172	0.091	1107.063	0.027
	NA	MC	Motorcycles	1.078	0.002	21.620	4.744	0.016	0.008	155.334	0.054
Shasta	Gasoline	LDGV	Light-Duty Vehicles (Passenger Cars)	0.078	0.002	0.883	0.104	0.040	0.017	247.909	0.022
	Gasoline	LDGT	Light-Duty Trucks (0-8,500 lbs)	0.168	0.003	1.479	0.250	0.038	0.016	316.625	0.023
	Gasoline	HDGV	Heavy-Duty Vehicles (8,501 + lbs)	0.439	0.005	2.781	0.478	0.045	0.019	490.083	0.045
	Diesel	LDDV	Light-Duty Vehicles (Passenger Cars)	0.124	0.002	0.283	0.024	0.052	0.028	232.685	0.008
	Diesel	LDDT	Light-Duty Trucks (0-8,500 lbs)	0.177	0.003	0.275	0.038	0.060	0.036	292.317	0.008
	Diesel	HDDV	Heavy-Duty Vehicles (8,501 + lbs)	3.761	0.012	0.672	0.142	0.123	0.061	1275.029	0.027
	NA	MC	Motorcycles	1.104	0.002	23.106	5.140	0.016	0.008	156.236	0.054
Sierra	Gasoline	LDGV	Light-Duty Vehicles (Passenger Cars)	0.098	0.003	1.083	0.119	0.038	0.016	259.390	0.022
	Gasoline	LDGT	Light-Duty Trucks (0-8,500 lbs)	0.253	0.004	2.270	0.347	0.039	0.017	361.898	0.023
	Gasoline	HDGV	Heavy-Duty Vehicles (8,501 + lbs)	0.752	0.006	4.598	0.777	0.047	0.021	557.781	0.045
	Diesel	LDDV	Light-Duty Vehicles (Passenger Cars)	0.088	0.002	0.407	0.029	0.048	0.026	243.234	0.008
	Diesel	LDDT	Light-Duty Trucks (0-8,500 lbs)	0.149	0.003	0.397	0.053	0.062	0.038	326.539	0.008
	Diesel	HDDV	Heavy-Duty Vehicles (8,501 + lbs)	3.940	0.008	0.888	0.173	0.135	0.075	819.669	0.027
	NA	MC	Motorcycles	1.141	0.002	24.713	4.970	0.016	0.008	174.429	0.054
Siskiyou	Gasoline	LDGV	Light-Duty Vehicles (Passenger Cars)	0.100	0.003	1.071	0.119	0.039	0.017	258.888	0.022
	Gasoline	LDGT	Light-Duty Trucks (0-8,500 lbs)	0.254	0.004	2.198	0.369	0.040	0.017	354.119	0.023
	Gasoline	HDGV	Heavy-Duty Vehicles (8,501 + lbs)	0.728	0.006	4.456	0.805	0.048	0.021	545.853	0.045
	Diesel	LDDV	Light-Duty Vehicles (Passenger Cars)	0.143	0.002	0.385	0.030	0.051	0.028	245.942	0.008
	Diesel	LDDT	Light-Duty Trucks (0-8,500 lbs)	0.241	0.003	0.408	0.057	0.071	0.046	324.337	0.008
	Diesel	HDDV	Heavy-Duty Vehicles (8,501 + lbs)	3.589	0.012	0.676	0.140	0.119	0.059	1306.337	0.027
	NA	MC	Motorcycles	1.173	0.002	25.890	5.160	0.016	0.008	170.916	0.054
Solano	Gasoline	LDGV	Light-Duty Vehicles (Passenger Cars)	0.061	0.002	0.702	0.091	0.038	0.016	236.959	0.022
	Gasoline	LDGT	Light-Duty Trucks (0-8,500 lbs)	0.102	0.003	0.988	0.165	0.037	0.016	308.203	0.023
	Gasoline	HDGV	Heavy-Duty Vehicles (8,501 + lbs)	0.305	0.005	1.954	0.318	0.045	0.019	486.376	0.045
	Diesel	LDDV	Light-Duty Vehicles (Passenger Cars)	0.086	0.002	0.210	0.017	0.047	0.024	228.106	0.008
	Diesel	LDDT	Light-Duty Trucks (0-8,500 lbs)	0.117	0.003	0.191	0.023	0.050	0.027	293.841	0.008
	Diesel	HDDV	Heavy-Duty Vehicles (8,501 + lbs)	3.518	0.012	0.754	0.142	0.134	0.065	1308.899	0.027
	NA	MC	Motorcycles	1.031	0.002	20.826	3.577	0.015	0.007	152.045	0.054

Table 5-40. EMFAC County-Specific On-Road Vehicle EFs – 2022 (cont.)

County	Fuel Type	Vehicle Type		Emission Factors (g/mi)							
				Criteria Pollutants and Ozone Precursors							
				NO_X	SOx	CO	ROG	PM_{10}	$PM_{2.5}$	CO_2e	NH_3
Sonoma	Gasoline	LDGV	Light-Duty Vehicles (Passenger Cars)	0.077	0.002	0.812	0.103	0.038	0.016	215.558	0.022
	Gasoline	LDGT	Light-Duty Trucks (0-8,500 lbs)	0.190	0.003	1.486	0.244	0.039	0.017	301.836	0.023
	Gasoline	HDGV	Heavy-Duty Vehicles (8,501 + lbs)	0.426	0.005	2.496	0.392	0.052	0.022	472.839	0.045
	Diesel	LDDV	Light-Duty Vehicles (Passenger Cars)	0.105	0.002	0.196	0.016	0.047	0.024	214.313	0.008
	Diesel	LDDT	Light-Duty Trucks (0-8,500 lbs)	0.153	0.003	0.211	0.029	0.059	0.035	287.976	0.008
	Diesel	HDDV	Heavy-Duty Vehicles (8,501 + lbs)	3.647	0.011	0.844	0.133	0.161	0.081	1182.784	0.027
	NA	MC	Motorcycles	1.047	0.002	19.255	3.557	0.015	0.007	139.112	0.054
Stanislaus	Gasoline	LDGV	Light-Duty Vehicles (Passenger Cars)	0.065	0.003	0.798	0.093	0.040	0.017	252.653	0.022
	Gasoline	LDGT	Light-Duty Trucks (0-8,500 lbs)	0.127	0.003	1.294	0.208	0.040	0.017	334.083	0.023
	Gasoline	HDGV	Heavy-Duty Vehicles (8,501 + lbs)	0.339	0.005	2.330	0.364	0.045	0.019	502.478	0.045
	Diesel	LDDV	Light-Duty Vehicles (Passenger Cars)	0.092	0.002	0.279	0.021	0.050	0.026	237.621	0.008
	Diesel	LDDT	Light-Duty Trucks (0-8,500 lbs)	0.120	0.003	0.246	0.031	0.056	0.031	313.446	0.008
	Diesel	HDDV	Heavy-Duty Vehicles (8,501 + lbs)	3.595	0.013	0.663	0.135	0.128	0.061	1378.453	0.027
	NA	MC	Motorcycles	1.088	0.002	22.181	4.562	0.016	0.008	158.600	0.054
Sutter	Gasoline	LDGV	Light-Duty Vehicles (Passenger Cars)	0.068	0.002	0.777	0.089	0.040	0.017	228.075	0.022
	Gasoline	LDGT	Light-Duty Trucks (0-8,500 lbs)	0.158	0.003	1.377	0.230	0.039	0.016	294.535	0.023
	Gasoline	HDGV	Heavy-Duty Vehicles (8,501 + lbs)	0.393	0.005	2.449	0.403	0.043	0.018	455.257	0.045
	Diesel	LDDV	Light-Duty Vehicles (Passenger Cars)	0.069	0.002	0.174	0.012	0.046	0.022	214.840	0.008
	Diesel	LDDT	Light-Duty Trucks (0-8,500 lbs)	0.128	0.003	0.182	0.027	0.057	0.032	271.916	0.008
	Diesel	HDDV	Heavy-Duty Vehicles (8,501 + lbs)	3.426	0.013	0.619	0.131	0.123	0.058	1369.519	0.027
	NA	MC	Motorcycles	1.111	0.002	21.198	5.159	0.016	0.008	150.334	0.054
Tehama	Gasoline	LDGV	Light-Duty Vehicles (Passenger Cars)	0.077	0.002	0.836	0.095	0.039	0.017	243.428	0.022
	Gasoline	LDGT	Light-Duty Trucks (0-8,500 lbs)	0.189	0.003	1.615	0.258	0.038	0.016	315.808	0.023
	Gasoline	HDGV	Heavy-Duty Vehicles (8,501 + lbs)	0.428	0.005	2.714	0.445	0.044	0.019	482.032	0.045
	Diesel	LDDV	Light-Duty Vehicles (Passenger Cars)	0.115	0.002	0.273	0.022	0.050	0.026	231.316	0.008
	Diesel	LDDT	Light-Duty Trucks (0-8,500 lbs)	0.256	0.003	0.358	0.049	0.072	0.047	297.165	0.008
	Diesel	HDDV	Heavy-Duty Vehicles (8,501 + lbs)	3.653	0.013	0.665	0.140	0.119	0.058	1316.673	0.027
	NA	MC	Motorcycles	1.108	0.002	22.843	4.649	0.016	0.008	155.458	0.054
Trinity	Gasoline	LDGV	Light-Duty Vehicles (Passenger Cars)	0.121	0.003	1.331	0.145	0.041	0.018	299.669	0.022
	Gasoline	LDGT	Light-Duty Trucks (0-8,500 lbs)	0.436	0.004	3.660	0.523	0.042	0.019	414.119	0.023
	Gasoline	HDGV	Heavy-Duty Vehicles (8,501 + lbs)	0.939	0.006	5.733	0.998	0.050	0.022	615.360	0.045
	Diesel	LDDV	Light-Duty Vehicles (Passenger Cars)	0.253	0.003	0.584	0.057	0.070	0.046	280.633	0.008
	Diesel	LDDT	Light-Duty Trucks (0-8,500 lbs)	0.445	0.004	0.792	0.147	0.142	0.114	368.789	0.008
	Diesel	HDDV	Heavy-Duty Vehicles (8,501 + lbs)	4.019	0.012	0.737	0.157	0.123	0.064	1258.428	0.027
	NA	MC	Motorcycles	1.188	0.002	28.317	6.201	0.018	0.009	187.973	0.054
Tulare	Gasoline	LDGV	Light-Duty Vehicles (Passenger Cars)	0.060	0.002	0.726	0.088	0.040	0.017	238.510	0.022
	Gasoline	LDGT	Light-Duty Trucks (0-8,500 lbs)	0.133	0.003	1.299	0.224	0.040	0.017	312.979	0.023
	Gasoline	HDGV	Heavy-Duty Vehicles (8,501 + lbs)	0.331	0.005	2.285	0.352	0.043	0.018	476.564	0.045
	Diesel	LDDV	Light-Duty Vehicles (Passenger Cars)	0.072	0.002	0.174	0.014	0.049	0.024	223.084	0.008
	Diesel	LDDT	Light-Duty Trucks (0-8,500 lbs)	0.183	0.003	0.243	0.034	0.062	0.037	291.413	0.008
	Diesel	HDDV	Heavy-Duty Vehicles (8,501 + lbs)	3.578	0.013	0.670	0.135	0.128	0.061	1361.356	0.027
	NA	MC	Motorcycles	1.075	0.002	20.815	4.259	0.016	0.007	148.515	0.054
Tuolumne	Gasoline	LDGV	Light-Duty Vehicles (Passenger Cars)	0.118	0.003	1.262	0.143	0.040	0.017	253.791	0.022
	Gasoline	LDGT	Light-Duty Trucks (0-8,500 lbs)	0.346	0.003	2.974	0.474	0.041	0.018	344.121	0.023
	Gasoline	HDGV	Heavy-Duty Vehicles (8,501 + lbs)	0.802	0.005	4.670	0.851	0.048	0.021	533.862	0.045
	Diesel	LDDV	Light-Duty Vehicles (Passenger Cars)	0.161	0.002	0.346	0.030	0.055	0.031	240.816	0.008
	Diesel	LDDT	Light-Duty Trucks (0-8,500 lbs)	0.229	0.003	0.352	0.045	0.065	0.039	312.648	0.008
	Diesel	HDDV	Heavy-Duty Vehicles (8,501 + lbs)	4.319	0.009	0.808	0.167	0.148	0.080	910.352	0.027
	NA	MC	Motorcycles	1.181	0.002	25.717	5.460	0.017	0.009	164.360	0.054
Ventura	Gasoline	LDGV	Light-Duty Vehicles (Passenger Cars)	0.061	0.002	0.755	0.094	0.037	0.016	228.351	0.022
	Gasoline	LDGT	Light-Duty Trucks (0-8,500 lbs)	0.097	0.003	1.032	0.165	0.036	0.015	289.936	0.023
	Gasoline	HDGV	Heavy-Duty Vehicles (8,501 + lbs)	0.291	0.005	1.942	0.301	0.043	0.018	451.378	0.045
	Diesel	LDDV	Light-Duty Vehicles (Passenger Cars)	0.094	0.002	0.249	0.022	0.049	0.026	218.445	0.008
	Diesel	LDDT	Light-Duty Trucks (0-8,500 lbs)	0.112	0.003	0.204	0.026	0.050	0.028	278.374	0.008
	Diesel	HDDV	Heavy-Duty Vehicles (8,501 + lbs)	2.848	0.010	0.639	0.090	0.133	0.063	1099.799	0.027
	NA	MC	Motorcycles	1.041	0.002	19.924	4.751	0.016	0.008	155.439	0.054

Table 5-40. EMFAC County-Specific On-Road Vehicle EFs – 2022 (cont.)

County	Fuel Type	Vehicle Type		Emission Factors (g/mi)							
				Criteria Pollutants and Ozone Precursors							
				NO_X	SOx	CO	ROG	PM_{10}	$PM_{2.5}$	CO_2e	NH_3
Yolo	Gasoline	LDGV	Light-Duty Vehicles (Passenger Cars)	0.065	0.002	0.772	0.097	0.039	0.016	239.179	0.022
	Gasoline	LDGT	Light-Duty Trucks (0-8,500 lbs)	0.101	0.003	1.009	0.167	0.038	0.016	305.197	0.023
	Gasoline	HDGV	Heavy-Duty Vehicles (8,501 + lbs)	0.304	0.005	1.970	0.316	0.045	0.019	475.855	0.045
	Diesel	LDDV	Light-Duty Vehicles (Passenger Cars)	0.136	0.002	0.231	0.022	0.052	0.029	230.037	0.008
	Diesel	LDDT	Light-Duty Trucks (0-8,500 lbs)	0.138	0.003	0.190	0.023	0.053	0.029	289.016	0.008
	Diesel	HDDV	Heavy-Duty Vehicles (8,501 + lbs)	2.972	0.012	0.612	0.113	0.144	0.067	1308.347	0.027
	NA	MC	Motorcycles	1.079	0.002	21.488	4.007	0.016	0.007	151.407	0.054
Yuba	Gasoline	LDGV	Light-Duty Vehicles (Passenger Cars)	0.070	0.002	0.794	0.087	0.040	0.017	235.100	0.022
	Gasoline	LDGT	Light-Duty Trucks (0-8,500 lbs)	0.199	0.003	1.672	0.265	0.039	0.016	304.490	0.023
	Gasoline	HDGV	Heavy-Duty Vehicles (8,501 + lbs)	0.464	0.005	2.954	0.462	0.045	0.019	465.769	0.045
	Diesel	LDDV	Light-Duty Vehicles (Passenger Cars)	0.084	0.002	0.202	0.016	0.048	0.024	223.774	0.008
	Diesel	LDDT	Light-Duty Trucks (0-8,500 lbs)	0.153	0.003	0.201	0.029	0.058	0.034	280.638	0.008
	Diesel	HDDV	Heavy-Duty Vehicles (8,501 + lbs)	4.027	0.009	0.789	0.160	0.149	0.079	982.813	0.027
	NA	MC	Motorcycles	1.078	0.002	21.143	4.337	0.016	0.007	146.415	0.054

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
2018	All Vehicles	0.558	0.003	4.885	0.474	0.016	0.015	419.104	0.026
2019	All Vehicles	0.491	0.003	4.571	0.432	0.015	0.013	408.692	0.025
2020	All Vehicles	0.436	0.003	4.308	0.398	0.014	0.012	398.311	0.024
2021	All Vehicles	0.389	0.003	4.046	0.368	0.012	0.011	387.530	0.024
2022	All Vehicles	0.349	0.003	3.816	0.343	0.011	0.010	376.696	0.023

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
2018	All Vehicles	1.669	0.005	4.978	0.448	0.056	0.051	682.303	0.024
2019	All Vehicles	1.498	0.005	4.607	0.401	0.049	0.045	668.737	0.023
2020	All Vehicles	1.349	0.005	4.295	0.362	0.043	0.040	655.886	0.023
2021	All Vehicles	1.220	0.005	4.003	0.327	0.038	0.035	643.067	0.022
2022	All Vehicles	1.110	0.005	3.747	0.298	0.034	0.031	630.710	0.022

Table 5-43. On Road Vehicle Speciated VOC Weight Fractions

VOC	HAP	LDGV[a]	LDDV[b]	LDGT[a]	LDDT[b]	HDGV[a]	HDDV[b]	MC[c]
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[a]	LDDV[b]	LDGT[a]	LDDT[b]	HDGV[a]	HDDV[b]	MC[c]
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[a]	LDDV[b]	LDGT[a]	LDDT[b]	HDGV[a]	HDDV[b]	MC[c]
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%	---	---	---	---
Methyl ethyl ketone		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[a]	LDDV[b]	LDGT[a]	LDDT[b]	HDGV[a]	HDDV[b]	MC[c]
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-Trimethylcyclopentane		---	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%

a. SOURCE: Data provided by the EPA's SPECIATE database version 4.4.

b. SOURCE: *Diesel Unregulated Emissions Characterization.* CRC Report No. E-75-2, Coordinating Research Council, Inc., July 2010.

c. 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 (GOVs)

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)** [a]				
Vehicle Identification Number (VIN) [b]	**Vehicle Description** [c]	**Bldg. Number** [d]	**Model Year**	**Miles Driven During Inventory Period (mi/yr)** [e]
			Average Model Year	
			Total Miles Driven on Installation During Inventory Period	

a. Vehicle Categories are listed in Table 5-1as the Air Force classification for on-road vehicles.
b. If the VIN is unavailable, please provide some other unique identifier for the vehicle.
c. Sedan, hatchback, station wagon, etc.
d. The primary location the vehicle was assigned to during the inventory period.
e. Only include the miles driven on the installation – if unknown, provide best estimate to the nearest 100 miles.

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)		

5.6 References

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USEPA, Mobile 6, MOBILE6 Vehicle Emission Modeling Software, United States Environmental Protection Agency

VEMSO, "Air Force Vehicle and Equipment Management Office"

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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 USAF 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 *VEHEs* are not addressed here since those emissions are accounted for in the EFs generated by the MOVES2014a model as explained in the previous chapter**. 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 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.

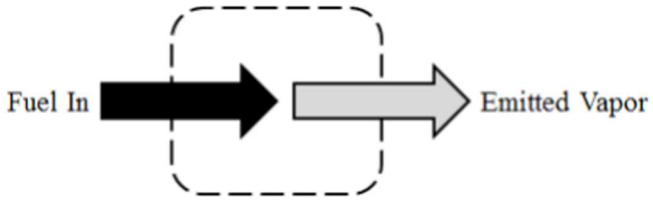


Figure 6-1. Simple Fuel Dispensing Control Volume

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. Therefore, turbulence is minimized and vapor emissions are greatly reduced when compared to the splash loading method. Each method is shown in Figure 6-2.

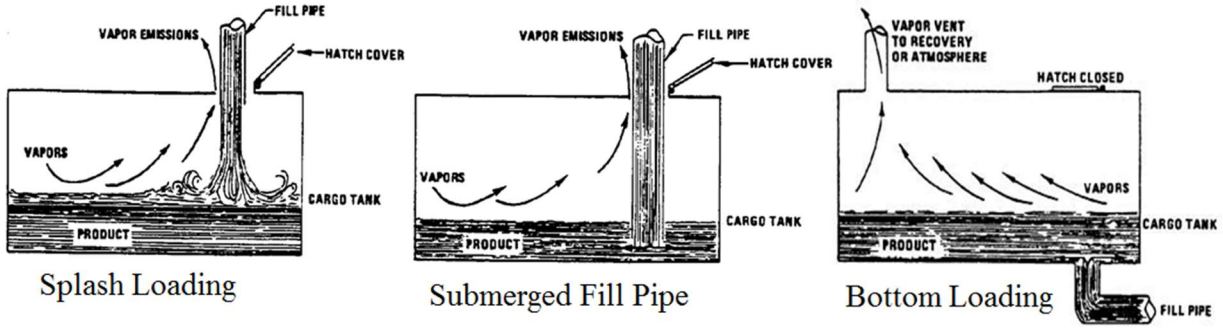


Figure 6-2. Splash Loading, Submerged Fill Pipe, and Bottom Loading Methods

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. 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.

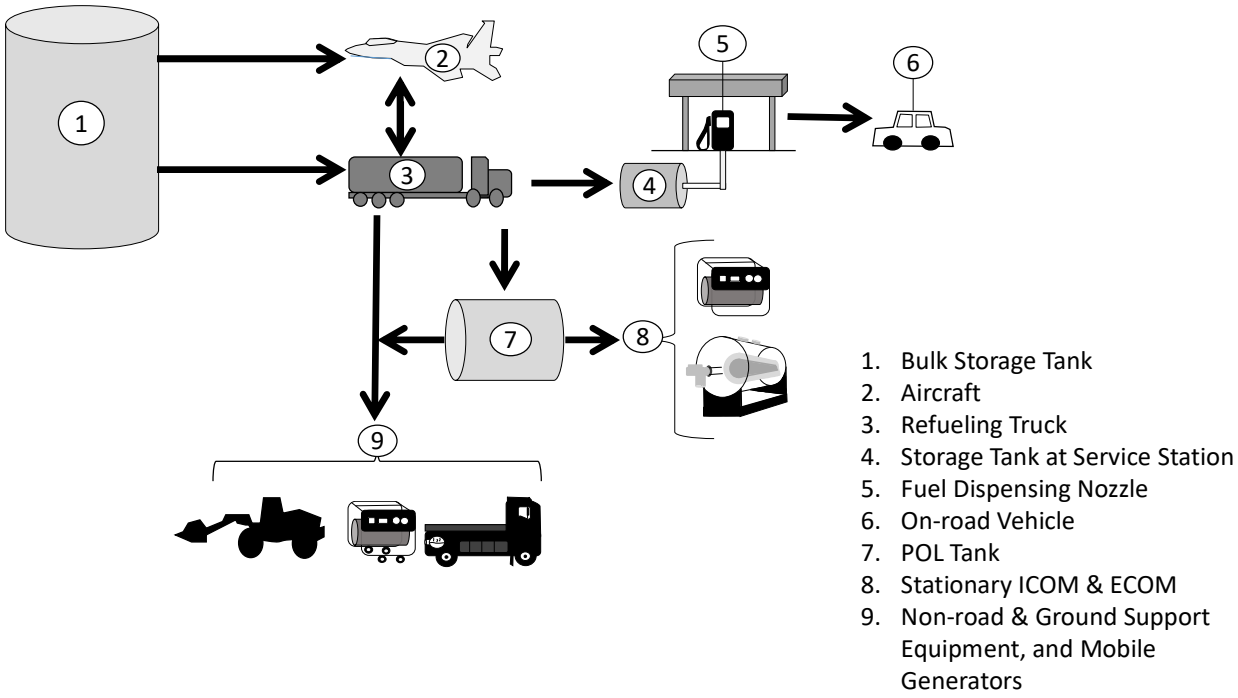
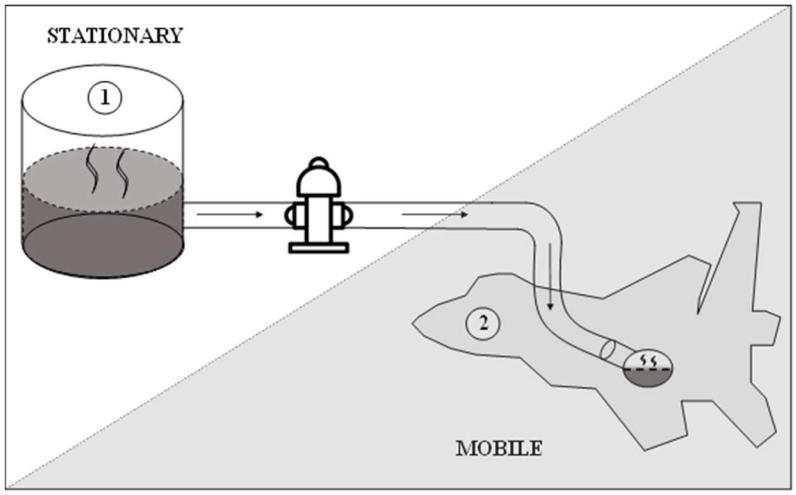
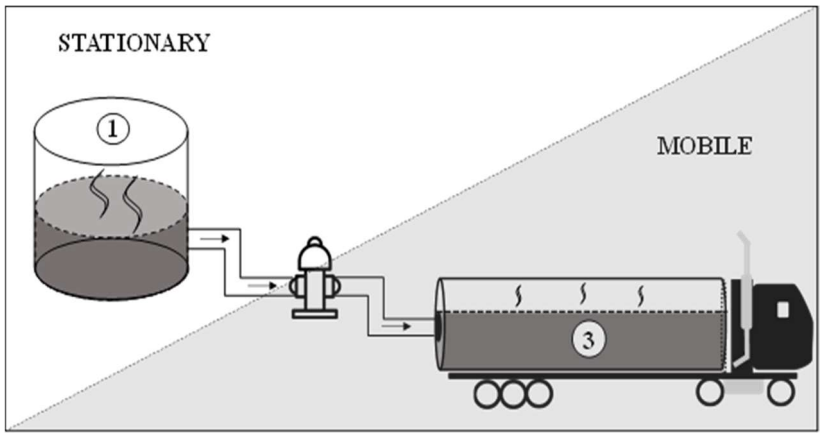


Figure 6-3. Typical On-Base Fuel Transfer Activities and Destinations.

Figure 6-3 shows the typical fuel transfer paths that fuel may go through at a USAF 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 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.

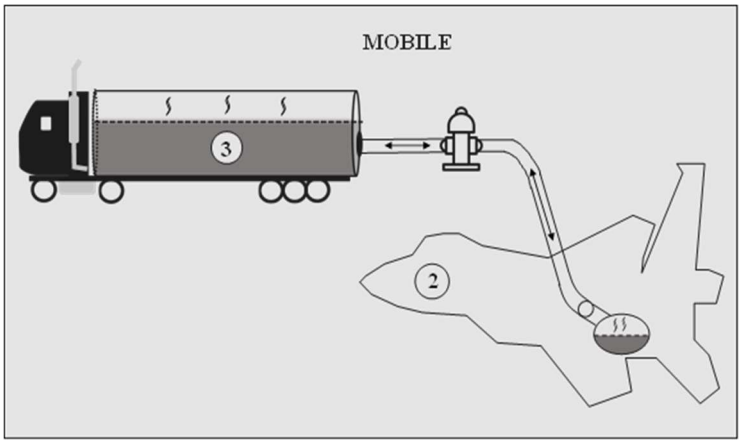


1 (Bulk Storage Tank) →2 (Aircraft) The figure above illustrates fuel transferred to refuel an aircraft from a bulk storage tank via a hydrant system. The vapors displaced within the storage tank as the liquid level lowers or rises are known as "working losses". The vapors generated in the space above 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.

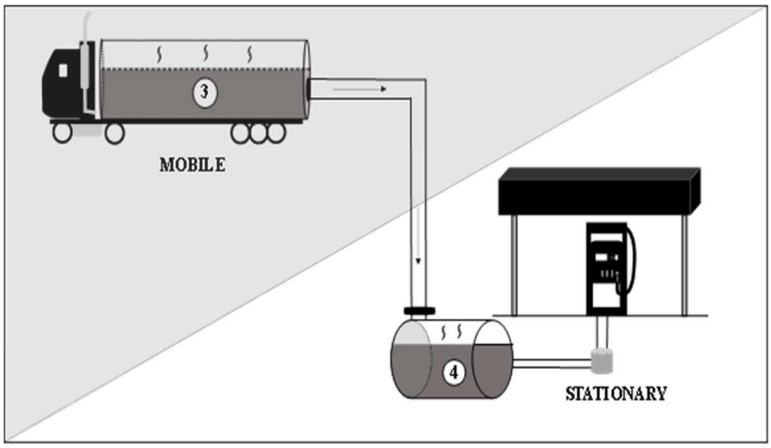


1 (Bulk Storage Tank) → 3 (Refueling Truck) The **stationary** source of emissions is the bulk storage tank producing working losses and breathing losses from the liquid fuel. The methodology for calculating these emissions is provided in the Stationary Guide.

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.

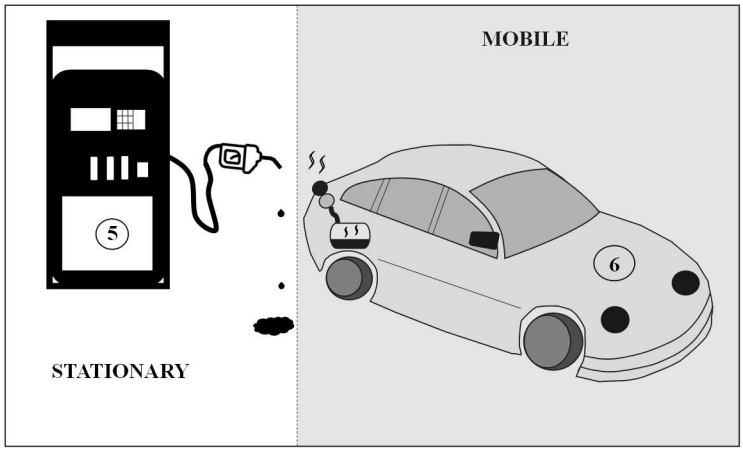


2 (Refueling Truck) ↔ 3 (Aircraft) The figure above illustrates the fueling and defueling of aircraft via a refueling truck. Both pieces of equipment are **mobile,** therefore all emissions generated from these activities should be reported in the mobile AEI and calculated as described later in this chapter. Emissions from both mobile pieces of equipment come from displaced vapors in the refueling truck and aircraft fuel tanks.



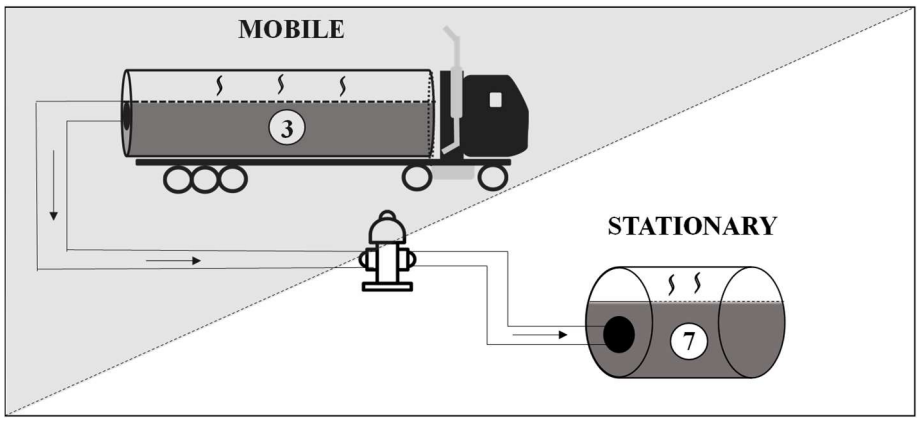
3 (Refueling Truck) → 4 (Storage Tank and Service Station) The figure above illustrates the loading of fuel from a refueling truck into a storage tank at a fuel service station. The **stationary** emissions from the refilling of a storage tank at a fuel dispensing location include breathing and working 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.



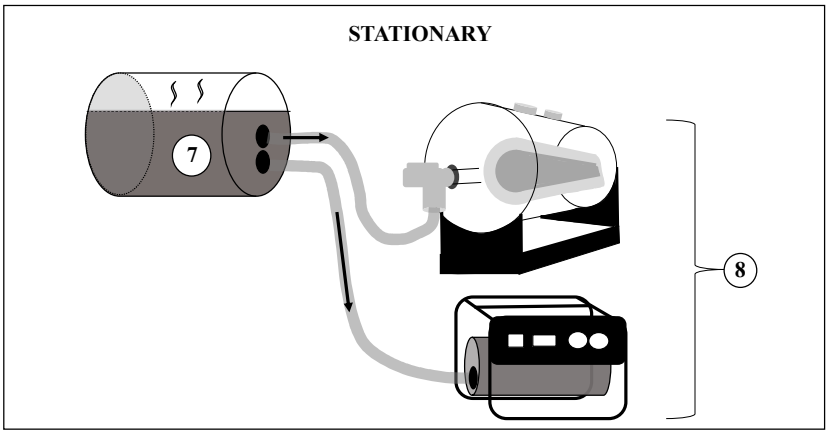
5 (Fuel Dispensing Nozzle) → 6 (On-Road Vehicle) The figure above illustrates the refueling of a vehicle at a service station. The **stationary** emissions are the result of the evaporation of spilled fuel from the fuel nozzle whose calculations are described in the Stationary Guide.

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 VEHE 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 VEHEs. 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 EFs found in the "On-Road Vehicles" chapter of this Guide.**

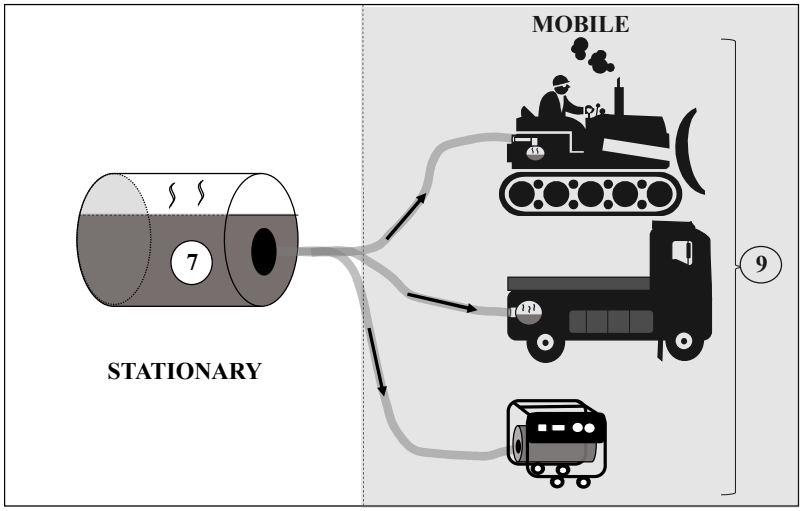


3 (Refueling Truck) → 7 (POL Tank) The fuel transfer pathway illustrates the loading of fuel from a refueling truck into a Petroleum, Oil, and Lubricants (POL) storage tank. The **stationary** emissions include the breathing and working losses from smaller storage tanks on base. The methodology for calculating 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.

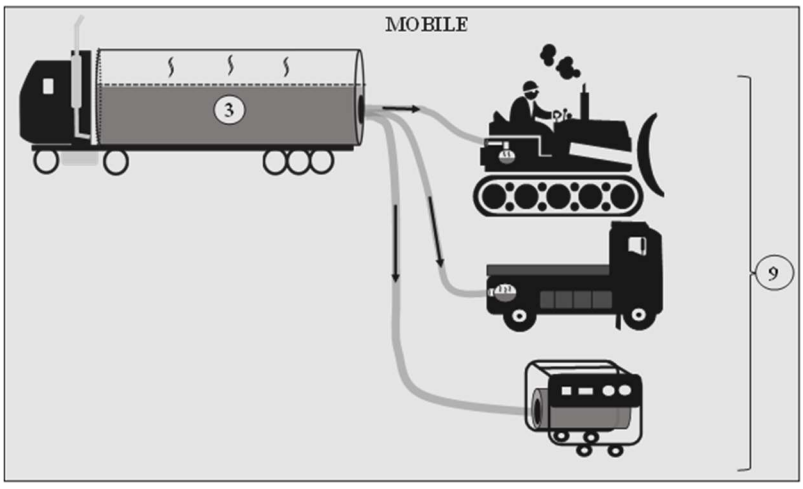


7 (POL Tank) → 8 (Stationary ICOM/ECOM) The figure above illustrates the loading of fuel from a storage tank into a stationary Internal Combustion (ICOM) piece of equipment, such as a generator, or External Combustion (ECOM) equipment, such as a boiler. The **stationary** emissions from the fuel outlet (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 the emissions from 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, 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. A detailed description on how to calculate these losses is provided in the next section of this document.

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 to the loading terminal after the fuel is unloaded to a storage tank, it is known as "dedicated vapor balance service." Section 5.2 of AP-42 provides the saturation factors, which are provided 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 [a]	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 [b]	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.

a. 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.

b. 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 considered. 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 [a]

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.

a. 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>.

a. Flares must meet 40 CFR 60.18 requirements of minimum heating value of waste gas and a maximum flare tip velocity.

b. 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.

c. Must have an alarm system that will prevent break through.

Alternatively, EFs 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 calculate the loading loss. Table 5.2-5 of AP-42 provides these EFs, 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 [a]	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.

a. Gasoline has an RVP of 10 psia

"---" Indicates No data available

6.4 Emission Calculations

Emissions of concern from fuel transferring 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 transferring are outlined below.

6.4.1 VOC Emissions Calculations (Preferred Method)

The preferred method for calculating VOC emissions from the transferring 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.

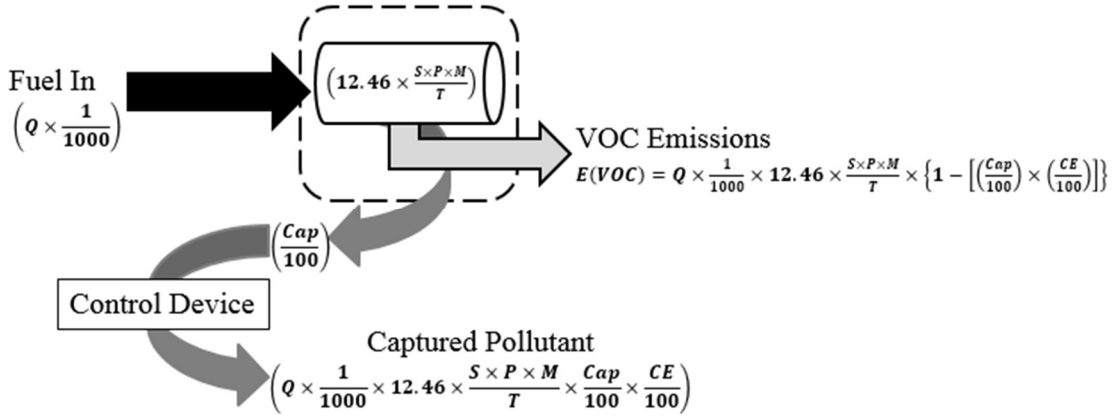


Figure 6-4. Fuel Transfer Control Volume – Preferred Method

6.4.2 VOC Emissions Calculations (Emission Factor Alternative Method)

Using the EF 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.

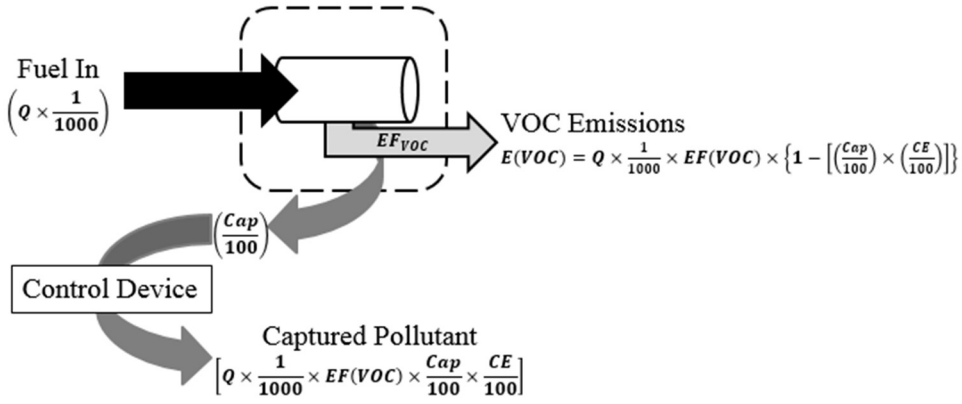


Figure 6-5. Fuel Transfer Control Volume – Emission Factor Method

6.4.3 HAP Emissions Calculation

The number 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 the Air Conformity Applicability Model, or ACAM, automatically calculate these values). Contact the fuel supplier for specific information regarding the weight percent of HAPs in fuels commonly used at USAF installations. In the absence of available data, Table 6-6 provides the typical weight percent of individual HAPs found in several fuels used at USAF 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 [a]	
	Liquid-Phase	Vapor-Phase [b]	Liquid-Phase	Vapor-Phase [b]	Liquid-Phase	Vapor-Phase [b]
Anthracene	2.83E-03 [c]	---	---	---	---	---
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 [c]	1.62E-03	---	---
Cumene (Isopropyl benzene)	---	---	5.00E-01	7.79E-03	1.81E-01	3.83E-01
Dibenzofuran	1.64E-02 [c]	---	---	---	---	---
Ethylbenzene	1.30E-02	3.10E-01	1.40E+00	4.67E-02	1.59E-01	7.20E-01
Fluorene	2.94E-02 [c]	---	---	---	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 [c]	2.15E-01	1.74E-01 [c]	1.54E-04	2.68E-01	3.23E-02
Phenanthrene	3.22E-02 [c]	---	---	---	---	---
Phenylbenzene (1,1'-biphenyl)	---	---	---	---	6.78E-02	---
Pyrene	3.62E-02 [c]	---	---	---	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.

a. 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.

b. 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.

c. 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) [b]
JP-8/Jet A	162	130	4.08E-02 [c]
Diesel	188	130	9.00E-03
Gasoline [a]	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.

a. Based on gasoline with a Reid Vapor Pressure of 10.

b. Based on Temperature of 70° F

c. 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 Reid Vapor Pressure (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, to calculate the EFs needed, the temperature must be converted to the correct units (degrees Rankin [°R]) 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 EF 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:

$$\mathrm{E}(VOC) = 150{,}000 \frac{\cancel{gal}}{yr} \times \frac{1}{1000}\left(\frac{10^3 \mathrm{gal}}{\cancel{gal}}\right) \times 12.46 \left(\frac{^\circ R\ lb-mo}{psia\ 10^3 gal}\right) \times \frac{1.45 \times 5.20(psia) \times 66\left(\frac{lb}{lb-m}\right)}{520.67^\circ R}\left\{1 - \left[\left(\frac{0\%}{100\%}\right) \times \left(\frac{0\%}{100\%}\right)\right]\right\}$$

$$\mathrm{E}(VOC) = 150\left(\frac{\cancel{10^3 \mathrm{gal}}}{yr}\right) \times 12.46 \left(\frac{^\circ R\ lb-mol}{psia\ \cancel{10^3 gal}}\right) \times \frac{1.45 \times 5.20(psia) \times 66\left(\frac{lb}{lb-mol}\right)}{520.67^\circ R}\{1\}$$

$$\mathbf{E(VOC)} = 1869\left(\frac{\cancel{^\circ R\ lb-mol}}{\cancel{psia}\ \mathrm{yr}}\right) \times 0.956\left(\frac{\cancel{psia}\ lb}{\cancel{^\circ R\ lb-mol}}\right) = \mathbf{1{,}786.8}\ \frac{\boldsymbol{lb}}{\boldsymbol{yr}}$$

For Diesel:

$$\mathrm{E}(VOC) = 85{,}000 \frac{\cancel{gal}}{yr} \times \frac{1}{1000}\left(\frac{10^3 \mathrm{gal}}{\cancel{gal}}\right) \times 12.46 \left(\frac{^\circ R\ lb-mo}{psia\ 10^3 gal}\right) \times \frac{1.45 \times 0.0065(psia) \times 130\left(\frac{lb}{lb-mo}\right)}{520.67^\circ R}\left\{1 - \left[\left(\frac{0\%}{100\%}\right) \times \left(\frac{0\%}{100\%}\right)\right]\right\}$$

$$\mathrm{E}(VOC) = 85\left(\frac{\cancel{10^3 \mathrm{gal}}}{yr}\right) \times 12.46 \left(\frac{^\circ R\ lb-mol}{psia\ \cancel{10^3 gal}}\right) \times \frac{1.45 \times 0.0065(psia) \times 130\left(\frac{lb}{lb-mol}\right)}{520.67^\circ R}\{1\}$$

$$\mathbf{E(VOC)} = 1059.1\left(\frac{\cancel{^\circ R\ lb-mol}}{\cancel{psia}\ \mathrm{yr}}\right) \times 0.002\left(\frac{\cancel{psia}\ lb}{\cancel{^\circ R\ lb-mol}}\right) = \mathbf{2.12}\ \frac{\boldsymbol{lb}}{\boldsymbol{yr}}$$

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 EFs 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 EF 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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APPENDIX A – EPA HAP LIST

CAS No.	Chemical/Compound
75070	Acetaldehyde
60355	Acetamide
75058	Acetonitrile
98862	Acetophenone
53963	2-Acetylaminofluorene
107028	Acrolein
79061	Acrylamide
79107	Acrylic Acid
107131	Acrylonitrile
107051	Allyl Chloride
92671	4-Aminobiphenyl
62533	Aniline
90040	o-Anisidine
1332214	Asbestos
71432	Benzene
92875	Benzidine
98077	Benzotrichloride
100447	Benzyl Chloride
92524	Biphenyl
117817	Bis(2-ethylhexyl)phthalate
542881	Bis(chloromethyl)ether
75252	Bromoform
106990	1,3-Butadiene
156627	Calcium Cyanamide
133062	Captan
63252	Carbaryl
75150	Carbon Disulfide
56235	Carbon Tetrachloride
463581	Carbonyl Sulfide
120809	Catechol
133904	Chloramben
57749	Chlordane
7782505	Chlorine
79118	Chloroacetic Acid
532274	2-Chloroacetophenone
108907	Chlorobenzene
510156	Chlorobenzilate
67663	Chloroform
107302	Chloromethyl methyl ether
126998	Chloroprene
1319773	Cresylic Acid
95487	o-Cresol
108394	m-Cresol
106445	p-Cresol
98828	Cumene
94757	2,4-D
3547044	DDE
334883	Diazomethane

CAS No.	Chemical/Compound
132649	Dibenzofurans
96128	1,2-Dibromo-3-chloropane
84742	Dibutylphthalate
106467	1,4-Dichlorobenzene
91941	3,3-Dichlorobenzidene
111444	Dichloroethyl ether
542756	1,3-Dichloropropene
62737	Dichlorvos
111422	Diethanolamine
121697	N,N-Dimethylaniline
64675	Diethyl Sulfate
119904	3,3-Dimethoxybenzidine
60117	Dimethyl Aminoazobenzene
119937	3,3'-Dimethyl Benzidine
79447	Dimethyl Carbamoyl Chloride
68122	Dimethyl Formamide
57147	1,1-Dimethyl Hydrazine
131113	Dimethyl Phthalate
77781	Dimethyl Sulfate
534521	4,6-Dinitro-o-cresol
51285	2,4-Dinitrophenol
121142	2,4-Dinitrotoluene
123911	1,4-Dioxane
122667	1,2-Diphenylhydrazine
106898	Epichlorohydrin
106887	1,2-Epoxybutane
140885	Ethyl Acrylate
100414	Ethyl Benzene
51796	Ethyl Carbamate
75003	Ethyl Chloride
106934	Ethylene Dibromide
107062	Ethylene Dichloride
107211	Ethylene Glycol
151564	Ethylene Imine
75218	Ethylene Oxide
96457	Ethylene Thiourea
75343	Ethylidene Dichloride
50000	Formaldehyde
76448	Heptachlor
118741	Hexachlorobenzene
87683	Hexachlorobutadiene
77474	Hexachlorocyclopentadiene
67721	Hexachloroethane
822060	Hexamethylene-1,6-diisocyanate
680319	Hexamethylphosphoramide
110543	Hexane
302012	Hydrazine
7647010	Hydrochloric Acid

CAS No.	Chemical/Compound
7664393	Hydrogen Fluoride
123319	Hydroquinone
78591	Isophorone
58899	Lindane
108316	Maleic Anhydride
67561	Methanol
72435	Methoxychlor
74839	Methyl Bromide
74873	Methyl Chloride
71556	Methyl Chloroform
60344	Methyl Hydrazine
74884	Methyl Iodide
108101	Methyl Isobutyl Ketone
624839	Methyl Isocyanate
80626	Methyl Methacrylate
1634044	Methyl tert Butyl Ether
101144	4,4-Methylene bis(2-Chloroaniline)
75092	Methylene Chloride
101688	Methylene Diphenyl Diisocyanate
101779	4,4'-Methylenedianiline
91203	Naphthalene
98953	Nitrobenzene
92933	4-Nitrobiphenyl
100027	4-Nitrophenol
79469	2-Nitropropane
684935	N-Nitroso-N-Methylurea
62759	N-Nitrosodimethylamine
59892	N-Nitrosomorpholine
56382	Parathion
82688	Pentachloronitrobenzene
87865	Pentachlorophenol
108952	Phenol
106503	p-Phenylenediamine
75445	Phosgene
7803512	Phosphine
7723140	Phosphorus
85449	Phthalic Anhydride
1336363	Polychlorinated Biphenyls
1120714	1,3-Propane Sultone
57578	beta-Propiolactone
123386	Propionaldehyde
114261	Propoxur
78875	Propylene Dichloride
75569	Propylene Oxide
75558	1,2-Proplenimine
91225	Quinoline
106514	Quinone
100425	Styrene

Appendix A – EPA HAP List (cont.)

CAS No.	Chemical/Compound
96093	Styrene Oxide
1746016	2,3,7,8-Tetrachlorodibenzo-p-dioxin
79345	1,1,2,2-Tetrachloroethane
127184	Tetrachloroethylene
7550450	Titanium Tetrachloride
108883	Toluene
95807	2,4-Toluene Diamine
584849	2,4-Toluene Diisocyanate
95534	o-Toluidine
8001352	Toxaphene
120821	1,2,4-Trichlorobenzene
79005	1,1,2-Trichloroethane
79016	Trichloroethylene
95954	2,4,5-Trichlorophenol
88062	2,4,6-Trichlorophenol

CAS No.	Chemical/Compound
121448	Triethylamine
1582098	Trifluralin
540841	2,2,4-Trimethylpentane
108054	Vinyl Acetate
593602	Vinyl Bromide
75014	Vinyl Chloride
75354	Vinylidene Chloride
1330207	Xylenes
95476	o-Xylene
108383	m-Xylene
106423	p-Xylene
---	Antimony Compounds
---	Arsenic Compounds
---	Beryllium Compounds
---	Cadmium Compounds

CAS No.	Chemical/Compound
---	Chromium Compounds
---	Cobalt Compounds
---	Coke Oven Emissions
---	Cyanide Compounds
---	Glycol Ethers
---	Lead Compounds
---	Manganese Compounds
---	Mercury Compounds
---	Fine Mineral Fibers
---	Nickel Compounds
---	Polycyclic Organic Matter
---	Radionuclides (including Radon)
---	Selenium Compounds