

## **Section 7.2**

### **Residential Natural Gas Combustion**

*(Revised November 2019)*

#### **Emission Inventory Source Category**

Miscellaneous Processes/ Residential Fuel Combustion

#### **Emission Inventory Codes and Description**

610-606-0110-0000 Residential Fuel Combustion - Natural Gas - Space Heating

610-608-0110-0000 Residential Fuel Combustion - Natural Gas - Water Heating

610-610-0110-0000 Residential Fuel Combustion - Natural Gas - Cooking

610-995-0110-0000 Residential Fuel Combustion - Natural Gas - Other

### **Overview**

This methodology is used to estimate the emissions resulting from the combustion of natural gas in the residential sector.<sup>1</sup> The combustion of natural gas in the residential sector is broken down into four categories: 1) space heating, 2) water heating, 3) cooking, and 4) other. The first category, residential space heating, involves the combustion of natural gas in a chamber to generate heat which is transferred to a suitable medium (such as air or water) to warm the living space. An example of residential space heating would be a central heating system, where a blower is used to push warm air through ducts to heat each room. The second category, water heating, represents water heaters that burn natural gas in a combustion chamber and transfers the heat to water stored in a tank. The residential cooking category represents the combustion of natural gas in the burners on top of a range or inside an oven. Finally, the unspecified category includes the combustion of natural gas in appliances such as clothes dryers, barbecues, and water heaters used for pools, spas and hot tubs.

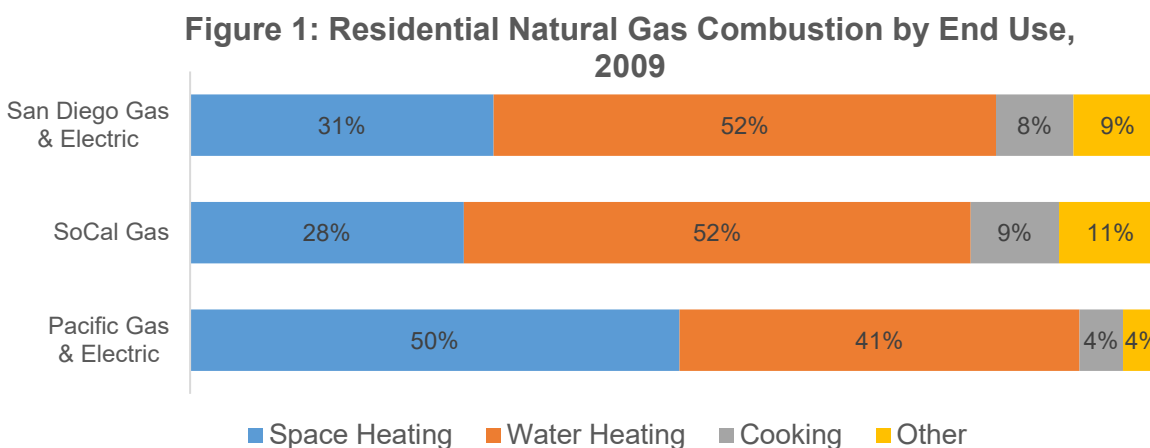
### **Activity Data**

Residential natural gas consumption by county was obtained from the California Energy Commission (CEC) (2019) California Energy Consumption Database. (See Appendix, Table 5 for 2017 values.) CARB allocated this county-level data to county-air basin-district proportional to population.

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<sup>1</sup> This methodology pertains to all Districts except for Ventura and Santa Barbara, who have opted to rely on their own methodology for this category.

CARB allocated residential natural gas consumption to each use category (space heating, water heating, cooking, and ‘other’) according to Table ES-3 of the *2009 California Residential Appliance Saturation Study* contracted by the CEC (KEMA, 2010). Use fractions are reported separately by utility area (see Figure 1 below). CARB mapped utility-specific use fractions to each county as reflected in the Appendix, Table 6 and Figure 2.



Source: KEMA, 2010

To convert the activity data from therms to cubic feet, CARB relied on the heat content according to the U.S. Energy Information Administration (EIA) (2019) State Energy Consumption, Price, and Expenditure Estimates. According to the EIA, heat content of natural gas in California in 2017 was 1,036 British thermal units (btu) per standard cubic foot (scf).

CARB made an effort to reflect District-specific methodologies where available. CARB relied on a heat content of 1,000 btu / scf for San Joaquin Valley Air Pollution Control District (SJVAPCD) to maintain consistency with its 2005 methodology (SJVAPCD, 2010).

The CEC did not report any residential natural gas use for the following counties: Alpine, Del Norte, Inyo, Lake, Modoc, Mono, Plumas, Sierra, Siskiyou, and Tuolumne.

### Emission Factors

Uncontrolled emission factors for residential natural gas combustion were obtained from EPA AP-42:

**Table 1: Emission Factors (Pounds per Million Cubic Feet)**

CO	NOx	SOx	TOG	PM
40	94	0.6	11	7.6

CARB made an effort to reflect District-specific methodologies where available. To that end, CARB relied on the following control factors for San Joaquin Valley Air Pollution Control District: SOx 2.14 lb/MMSCF, VOC 5.5 lb/MMSCF (SJVAPCD, 2010).

### **Control Factors**

CARB applied control factors to reflect emission reductions due to rules and regulations that have affected emissions in this category since 1990. These control factors were calculated according to the latest control profiles in CARB's California Emission Projection Analysis Model (CEPAM) and are reflected in Table 7.

### **Speciation**

CARB speciated emissions for VOC, ROG, PM10 and PM2.5 according to the latest speciation fractions in the California Emissions Inventory Development and Reporting System (CEIDARS). For San Joaquin Valley Air Pollution Control District, CARB speciated TOG from VOC to maintain consistency with their District-specific VOC emission factor.

### **Temporal Activity**

CARB maintained the temporal activity profiles from its prior (1998) methodology:

#### Space Heating (61060601100000)

Daily Activity Code: 33 - The maximum activity occurs in the early daylight hours and in the evening hours, with average activity during the day and low activity at night.

Weekly Activity Code: 7 - The activity is uniform seven days a week.

Monthly Activity: The monthly activity was based on monthly residential gas sales from the CEC. Activity occurs from November to June, with the highest months being December through April.

**Table 2: Temporal Activity - Space Heating**

<b>JAN</b>	<b>FEB</b>	<b>MAR</b>	<b>APR</b>	<b>MAY</b>	<b>JUN</b>	<b>JUL</b>	<b>AUG</b>	<b>SEP</b>	<b>OCT</b>	<b>NOV</b>	<b>DEC</b>
21.4%	14.5%	13.2%	12.4%	8.4%	7.1%	0.0%	0.0%	0.0%	0.0%	8.2%	14.8%

#### Water Heating (61060801100000); Other (61099501100000)

Daily Activity Code: 33 - The maximum activity occurs in the early daylight hours and in the evening hours, with average activity during the day and low activity at night.

Weekly Activity Code: 7 - The activity is uniform seven days a week.

Monthly Activity: The monthly activity is assumed to be uniform throughout the year.

**Table 3: Temporal Activity - Water Heating**

JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC
8.3%	8.3%	8.3%	8.3%	8.3%	8.3%	8.3%	8.3%	8.3%	8.3%	8.3%	8.3%

Cooking (61061001100000)

Daily Activity Code: 38 - The activity occurs during meal time hours.

Weekly Activity Code: 7 - The activity is uniform seven days a week.

Monthly Activity: The monthly activity is assumed to be uniform throughout the year.

**Table 4: Temporal Activity - Cooking**

JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC
8.3%	8.3%	8.3%	8.3%	8.3%	8.3%	8.3%	8.3%	8.3%	8.3%	8.3%	8.3%

CARB also maintained any District-specific control profiles found in CEIDARS.

**Sample Calculations**

The emissions for each criteria pollutant within this area source methodology can be calculated using the following equation:

*Emissions (tons / year) =*

*County Natural Gas Fuel Consumption (therms / year)*

*x County-Air Basin-District Split*

*x End Use Fraction*

*x (btu / therm) x (scf / btu) x (MMSCF/scf)*

*x Emission Factor (lbs/MMSCF)*

*x (ton / lbs)*

*x Control Factor*

TOG emissions for space heating in Alameda County = (214,981,949 / year) x 1 x 0.5034 x 100,000 x (1/1,036) x (1/1,000,000) x 11 x (1/2,000) = 57.49 tons per year

Emissions estimates for all EICs, pollutants, and regions are reported in Tables 8 through 11 in the Appendix.

### **Changes in Methodology**

CARB made the following changes in 2019 relative to the prior (1998) methodology:

- Updated activity data to reflect 2017 values per the CEC California Energy Consumption Database
- Updated fraction of residential natural gas consumption attributable space heating, water heating, cooking, and 'other' per the *2009 California Residential Appliance Saturation Study* contracted by the CEC
- Updated the heat content of natural gas to reflect 2017 values per the EIA State Energy Consumption, Price, and Expenditure Estimates
- Re-estimated controlled emissions based on the latest available control profiles in CARB's CEPAM model

### **References**

California Air Resources Board. (1998). Area-Wide Source Methodologies: Section 7.2 - Residential Natural Gas Combustion.

California Energy Commission. (1998). *Breakdown of California Natural Gas Usage by Appliance and by Utility Company for All Housing Types Combined*.

California Energy Commission. (2019). California Energy Consumption Database. <https://ecdms.energy.ca.gov/>

KEMA, Inc. (2010). *2009 California Residential Appliance Saturation Study*. California Energy Commission. Publication number: CEC-200-2010-004-ES.

San Joaquin Valley Air Pollution Control District (APCD). (2010). *2005 Area Source Emissions Inventory Methodology 610 - Residential Natural Gas Combustion*.

U.S. Energy Information Administration. (2019). State Energy Consumption, Price, and Expenditure Estimates.

U.S. Environmental Protection Agency. (1998). *Compilation of Air Pollutant Emission Factors*. AP-42. Table 1.4-1.

## Appendix

**Table 5: Residential Natural Gas Consumption by County, 2017**

County	Million Therms	County	Million Therms
ALAMEDA	214.98	ORANGE	343.74
ALPINE	NA	PLACER	63.46
AMADOR	2.05	PLUMAS	NA
BUTTE	27.19	RIVERSIDE	254.26
CALAVERAS	0.43	SACRAMENTO	198.85
COLUSA	2.15	SAN BENITO	6.40
CONTRA COSTA	171.98	SAN BERNARDINO	235.26
DEL NORTE	NA	SAN DIEGO	272.80
EL DORADO	24.00	SAN FRANCISCO	132.69
FRESNO	102.33	SAN JOAQUIN	86.57
GLENN	2.48	SAN LUIS OBISPO	35.77
HUMBOLDT	20.40	SAN MATEO	116.44
IMPERIAL	7.35	SANTA CLARA	239.18
INYO	NA	SANTA CRUZ	32.11
KERN	92.47	SHASTA	18.64
KINGS	14.27	SIERRA	NA
LAKE	NA	SISKIYOU	NA
LASSEN	1.29	SOLANO	57.94
LOS ANGELES	1116.13	SONOMA	72.44
MADERA	7.92	STANISLAUS	61.08
MARIN	51.06	SUTTER	12.36
MARIPOSA	0.00	TEHAMA	3.96
MENDOCINO	5.88	TRINITY	0.02
MERCED	25.20	TULARE	48.31
MODOC	NA	TUOLUMNE	NA
MONO	NA	YOLO	25.29
MONTEREY	50.52	YUBA	7.12
NAPA	20.74		
NEVADA	14.25		

**Table 6: Utility Area Assignment**

County	Utility	County	Utility
ALAMEDA	Pacific Gas and Electric (PGE)	ORANGE	SCG
ALPINE	PGE	PLACER	PGE
AMADOR	PGE	PLUMAS	PGE
BUTTE	PGE	RIVERSIDE	SCG
CALAVERAS	PGE	SACRAMENTO	PGE
COLUSA	PGE	SAN BENITO	PGE
CONTRA COSTA	PGE	SAN BERNARDINO	SCG
DEL NORTE	PGE	SAN DIEGO	San Diego Gas and Electric (SDGE)
EL DORADO	PGE	SAN FRANCISCO	PGE
FRESNO	PGE	SAN JOAQUIN	PGE
GLENN	PGE	SAN LUIS OBISPO	SCG
HUMBOLDT	PGE	SAN MATEO	PGE
IMPERIAL	SoCal Gas (SCG)	SANTA CLARA	PGE
INYO	SCG	SANTA CRUZ	PGE
KERN	SCG	SHASTA	PGE
KINGS	SCG	SIERRA	PGE
LAKE	PGE	SISKIYOU	PGE
LASSEN	PGE	SOLANO	PGE
LOS ANGELES	SCG	SONOMA	PGE
MADERA	PGE	STANISLAUS	PGE
MARIN	PGE	SUTTER	PGE
MARIPOSA	PGE	TEHAMA	PGE
MENDOCINO	PGE	TRINITY	PGE
MERCED	PGE	TULARE	SCG
MODOC	PGE	TUOLUMNE	PGE
MONO	PGE	YOLO	PGE
MONTEREY	PGE	YUBA	PGE
NAPA	PGE		
NEVADA	PGE		

**Table 7: Control Factors**

<b>EIC</b>	<b>Use</b>	<b>District</b>	<b>Pollutant</b>	<b>Control Factor</b>
61060601100000	Space Heating	ANTELOPE VALLEY	NOX	0.89
61060601100000	Space Heating	MOJAVE DESERT	NOX	0.89
61060601100000	Space Heating	SAN JOAQUIN VALLEY	NOX	0.98
61060601100000	Space Heating	SOUTH COAST	NOX	0.80
61060601100000	Space Heating	YOLO-SOLANO	NOX	0.91
61060801100000	Water Heating	ANTELOPE VALLEY	NOX	0.81
61060801100000	Water Heating	BAY AREA	NOX	0.57
61060801100000	Water Heating	EL DORADO COUNTY	NOX	0.74
61060801100000	Water Heating	MOJAVE DESERT	NOX	0.81
61060801100000	Water Heating	PLACER COUNTY	NOX	0.74
61060801100000	Water Heating	SACRAMENTO METRO	NOX	0.34
61060801100000	Water Heating	SAN DIEGO COUNTY	NOX	0.94
61060801100000	Water Heating	SAN JOAQUIN VALLEY	NOX	0.54
61060801100000	Water Heating	SOUTH COAST	NOX	0.25
61060801100000	Water Heating	YOLO-SOLANO	NOX	0.61



**Table 8: Residential Natural Gas  
Space Heating (EIC 61060601100000)  
Emissions (tons / year), 2017**

County	Air Basin	District	CO	NOX	PM	SOX	TOG
ALAMEDA	SAN FRANCISCO BAY AREA	BAY AREA	208.92	490.97	39.7	3.13	57.45
ALPINE	GREAT BASIN VALLEYS	GREAT BASIN UNIFIED	0	0	0	0	0
AMADOR	MOUNTAIN COUNTIES	AMADOR COUNTY	1.99	4.68	0.38	0.03	0.55
BUTTE	SACRAMENTO VALLEY	BUTTE COUNTY	26.42	62.1	5.02	0.4	7.27
CALAVERAS	MOUNTAIN COUNTIES	CALAVERAS COUNTY	0.41	0.97	0.08	0.01	0.11
COLUSA	SACRAMENTO VALLEY	COLUSA COUNTY	2.09	4.9	0.4	0.03	0.57
CONTRA COSTA	SAN FRANCISCO BAY AREA	BAY AREA	167.13	392.76	31.76	2.51	45.96
DEL NORTE	NORTH COAST	NORTH COAST UNIFIED	0	0	0	0	0
EL DORADO	LAKE TAHOE	EL DORADO COUNTY	3.96	9.3	0.75	0.06	1.09
EL DORADO	MOUNTAIN COUNTIES	EL DORADO COUNTY	19.37	45.52	3.68	0.29	5.33
FRESNO	SAN JOAQUIN VALLEY	SAN JOAQUIN VALLEY	103.02	236.06	19.57	5.51	32.2
GLENN	SACRAMENTO VALLEY	GLENN COUNTY	2.41	5.65	0.46	0.04	0.66
HUMBOLDT	NORTH COAST	NORTH COAST UNIFIED	19.83	46.6	3.77	0.3	5.45
IMPERIAL	SALTON SEA	IMPERIAL COUNTY	4	9.39	0.76	0.06	1.1
INYO	GREAT BASIN VALLEYS	GREAT BASIN UNIFIED	0	0	0	0	0
KERN	MOJAVE DESERT	EASTERN KERN	7.76	18.24	1.48	0.12	2.14
KERN	SAN JOAQUIN VALLEY	SAN JOAQUIN VALLEY	44.02	100.85	8.36	2.35	13.76
KINGS	SAN JOAQUIN VALLEY	SAN JOAQUIN VALLEY	8.03	18.41	1.53	0.43	2.51
LAKE	LAKE COUNTY	LAKE COUNTY	0	0	0	0	0
LASSEN	NORTHEAST PLATEAU	LASSEN COUNTY	1.25	2.94	0.24	0.02	0.34
LOS ANGELES	MOJAVE DESERT	ANTELOPE VALLEY	23.35	48.78	4.44	0.35	6.42
LOS ANGELES	SOUTH COAST	SOUTH COAST	583.19	1102.8	110.81	8.75	160.38
MADERA	SAN JOAQUIN VALLEY	SAN JOAQUIN VALLEY	7.97	18.27	1.52	0.43	2.49
MARIN	SAN FRANCISCO BAY AREA	BAY AREA	49.62	116.6	9.43	0.74	13.64
MARIPOSA	MOUNTAIN COUNTIES	MARIPOSA COUNTY	0	0	0	0	0
MENDOCINO	NORTH COAST	MENDOCINO COUNTY	5.71	13.43	1.09	0.09	1.57
MERCED	SAN JOAQUIN VALLEY	SAN JOAQUIN VALLEY	25.37	58.14	4.82	1.36	7.93
MODOC	NORTHEAST PLATEAU	MODOC COUNTY	0	0	0	0	0
MONO	GREAT BASIN VALLEYS	GREAT BASIN UNIFIED	0	0	0	0	0
MONTEREY	NORTH CENTRAL COAST	MONTEREY BAY	49.1	115.39	9.33	0.74	13.5
NAPA	SAN FRANCISCO BAY AREA	BAY AREA	20.16	47.37	3.83	0.3	5.54
NEVADA	MOUNTAIN COUNTIES	NORTHERN SIERRA	13.85	32.55	2.63	0.21	3.81
ORANGE	SOUTH COAST	SOUTH COAST	186.8	353.23	35.49	2.8	51.37
PLACER	LAKE TAHOE	PLACER COUNTY	1.85	4.35	0.35	0.03	0.51
PLACER	MOUNTAIN COUNTIES	PLACER COUNTY	4.42	10.39	0.84	0.07	1.22
PLACER	SACRAMENTO VALLEY	PLACER COUNTY	55.4	130.2	10.53	0.83	15.24
PLUMAS	MOUNTAIN COUNTIES	NORTHERN SIERRA	0	0	0	0	0
RIVERSIDE	MOJAVE DESERT	MOJAVE DESERT	1.53	3.2	0.29	0.02	0.42
RIVERSIDE	MOJAVE DESERT	SOUTH COAST	0.01	0.03	0	0	0
RIVERSIDE	SALTON SEA	SOUTH COAST	26.82	50.71	5.1	0.4	7.38
RIVERSIDE	SOUTH COAST	SOUTH COAST	109.81	207.64	20.86	1.65	30.2
SACRAMENTO	SACRAMENTO VALLEY	SACRAMENTO METRO	193.25	454.13	36.72	2.9	53.14

County	Air Basin	District	CO	NOX	PM	SOX	TOG
SAN BENITO	NORTH CENTRAL COAST	MONTEREY BAY	6.22	14.61	1.18	0.09	1.71
SAN BERNARDINO	MOJAVE DESERT	MOJAVE DESERT	31.95	75.08	6.07	0.48	8.79
SAN BERNARDINO	SOUTH COAST	SOUTH COAST	95.9	181.34	18.22	1.44	26.37
SAN DIEGO	SAN DIEGO	SAN DIEGO COUNTY	164.42	386.38	31.24	2.47	45.21
SAN FRANCISCO	SAN FRANCISCO BAY AREA	BAY AREA	128.95	303.03	24.5	1.93	35.46
SAN JOAQUIN	SAN JOAQUIN VALLEY	SAN JOAQUIN VALLEY	87.16	199.7	16.56	4.66	27.24
SAN LUIS OBISPO	SOUTH CENTRAL COAST	SAN LUIS OBISPO CO	19.44	45.68	3.69	0.29	5.35
SAN MATEO	SAN FRANCISCO BAY AREA	BAY AREA	113.16	265.92	21.5	1.7	31.12
SANTA CLARA	SAN FRANCISCO BAY AREA	BAY AREA	232.43	546.22	44.16	3.49	63.92
SANTA CRUZ	NORTH CENTRAL COAST	MONTEREY BAY	31.21	73.33	5.93	0.47	8.58
SHASTA	SACRAMENTO VALLEY	SHASTA COUNTY	18.12	42.58	3.44	0.27	4.98
SIERRA	MOUNTAIN COUNTIES	NORTHERN SIERRA	0	0	0	0	0
SISKIYOU	NORTHEAST PLATEAU	SISKIYOU COUNTY	0	0	0	0	0
SOLANO	SACRAMENTO VALLEY	YOLO-SOLANO	17.68	37.99	3.36	0.27	4.86
SOLANO	SAN FRANCISCO BAY AREA	BAY AREA	38.63	90.79	7.34	0.58	10.62
SONOMA	NORTH COAST	NORTHERN SONOMA CO	7.58	17.8	1.44	0.11	2.08
SONOMA	SAN FRANCISCO BAY AREA	BAY AREA	62.83	147.64	11.94	0.94	17.28
STANISLAUS	SAN JOAQUIN VALLEY	SAN JOAQUIN VALLEY	61.49	140.89	11.68	3.29	19.22
SUTTER	SACRAMENTO VALLEY	FEATHER RIVER	12.01	28.23	2.28	0.18	3.3
TEHAMA	SACRAMENTO VALLEY	TEHAMA COUNTY	3.85	9.04	0.73	0.06	1.06
TRINITY	NORTH COAST	NORTH COAST UNIFIED	0.02	0.05	0	0	0.01
TULARE	SAN JOAQUIN VALLEY	SAN JOAQUIN VALLEY	27.2	62.32	5.17	1.46	8.5
TUOLUMNE	MOUNTAIN COUNTIES	TUOLUMNE COUNTY	0	0	0	0	0
YOLO	SACRAMENTO VALLEY	YOLO-SOLANO	24.57	52.81	4.67	0.37	6.76
YUBA	SACRAMENTO VALLEY	FEATHER RIVER	6.92	16.25	1.31	0.1	1.9

**Table 9: Residential Natural Gas  
Water Heating (EIC 61060801100000)  
Emissions (tons / year), 2017**

County	Air Basin	District	CO	NOX	PM	SOX	TOG
ALAMEDA	SAN FRANCISCO BAY AREA	BAY AREA	170.78	227.77	32.45	2.56	46.97
ALPINE	GREAT BASIN VALLEYS	GREAT BASIN UNIFIED	0	0	0	0	0
AMADOR	MOUNTAIN COUNTIES	AMADOR COUNTY	1.63	3.83	0.31	0.02	0.45
BUTTE	SACRAMENTO VALLEY	BUTTE COUNTY	21.6	50.76	4.1	0.32	5.94
CALAVERAS	MOUNTAIN COUNTIES	CALAVERAS COUNTY	0.34	0.79	0.06	0.01	0.09
COLUSA	SACRAMENTO VALLEY	COLUSA COUNTY	1.71	4.01	0.32	0.03	0.47
CONTRA COSTA	SAN FRANCISCO BAY AREA	BAY AREA	136.62	182.21	25.96	2.05	37.57
DEL NORTE	NORTH COAST	NORTH COAST UNIFIED	0	0	0	0	0
EL DORADO	LAKE TAHOE	EL DORADO COUNTY	3.24	5.64	0.61	0.05	0.89
EL DORADO	MOUNTAIN COUNTIES	EL DORADO COUNTY	15.83	27.58	3.01	0.24	4.35
FRESNO	SAN JOAQUIN VALLEY	SAN JOAQUIN VALLEY	84.22	107.16	16	4.51	26.32
GLENN	SACRAMENTO VALLEY	GLENN COUNTY	1.97	4.62	0.37	0.03	0.54
HUMBOLDT	NORTH COAST	NORTH COAST UNIFIED	16.21	38.09	3.08	0.24	4.46
IMPERIAL	SALTON SEA	IMPERIAL COUNTY	7.4	17.4	1.41	0.11	2.04
INYO	GREAT BASIN VALLEYS	GREAT BASIN UNIFIED	0	0	0	0	0
KERN	MOJAVE DESERT	EASTERN KERN	14.39	33.81	2.73	0.22	3.96
KERN	SAN JOAQUIN VALLEY	SAN JOAQUIN VALLEY	81.56	103.78	15.5	4.36	25.49
KINGS	SAN JOAQUIN VALLEY	SAN JOAQUIN VALLEY	14.89	18.94	2.83	0.8	4.65
LAKE	LAKE COUNTY	LAKE COUNTY	0	0	0	0	0
LASSEN	NORTHEAST PLATEAU	LASSEN COUNTY	1.02	2.41	0.19	0.02	0.28
LOS ANGELES	MOJAVE DESERT	ANTELOPE VALLEY	43.27	82.6	8.22	0.65	11.9
LOS ANGELES	SOUTH COAST	SOUTH COAST	1080.6	633.91	205.32	16.21	297.17
MADERA	SAN JOAQUIN VALLEY	SAN JOAQUIN VALLEY	6.52	8.29	1.24	0.35	2.04
MARIN	SAN FRANCISCO BAY AREA	BAY AREA	40.56	54.1	7.71	0.61	11.15
MARIPOSA	MOUNTAIN COUNTIES	MARIPOSA COUNTY	0	0	0	0	0
MENDOCINO	NORTH COAST	MENDOCINO COUNTY	4.67	10.98	0.89	0.07	1.28
MERCED	SAN JOAQUIN VALLEY	SAN JOAQUIN VALLEY	20.74	26.39	3.94	1.11	6.48
MODOC	NORTHEAST PLATEAU	MODOC COUNTY	0	0	0	0	0
MONO	GREAT BASIN VALLEYS	GREAT BASIN UNIFIED	0	0	0	0	0
MONTEREY	NORTH CENTRAL COAST	MONTEREY BAY	40.14	94.32	7.63	0.6	11.04
NAPA	SAN FRANCISCO BAY AREA	BAY AREA	16.48	21.98	3.13	0.25	4.53
NEVADA	MOUNTAIN COUNTIES	NORTHERN SIERRA	11.32	26.61	2.15	0.17	3.11
ORANGE	SOUTH COAST	SOUTH COAST	346.13	203.04	65.76	5.19	95.18
PLACER	LAKE TAHOE	PLACER COUNTY	1.51	2.63	0.29	0.02	0.42
PLACER	MOUNTAIN COUNTIES	PLACER COUNTY	3.61	6.28	0.69	0.05	0.99
PLACER	SACRAMENTO VALLEY	PLACER COUNTY	45.29	78.66	8.61	0.68	12.45
PLUMAS	MOUNTAIN COUNTIES	NORTHERN SIERRA	0	0	0	0	0
RIVERSIDE	MOJAVE DESERT	MOJAVE DESERT	2.84	5.43	0.54	0.04	0.78
RIVERSIDE	MOJAVE DESERT	SOUTH COAST	0.03	0.02	0	0	0.01
RIVERSIDE	SALTON SEA	SOUTH COAST	49.7	29.15	9.44	0.75	13.67
RIVERSIDE	SOUTH COAST	SOUTH COAST	203.47	119.36	38.66	3.05	55.95
SACRAMENTO	SACRAMENTO VALLEY	SACRAMENTO METRO	157.97	126.08	30.01	2.37	43.44

County	Air Basin	District	CO	NOX	PM	SOX	TOG
SAN BENITO	NORTH CENTRAL COAST	MONTEREY BAY	5.08	11.95	0.97	0.08	1.4
SAN BERNARDINO	MOJAVE DESERT	MOJAVE DESERT	59.2	139.12	11.25	0.89	16.28
SAN BERNARDINO	SOUTH COAST	SOUTH COAST	177.7	104.24	33.76	2.67	48.87
SAN DIEGO	SAN DIEGO	SAN DIEGO COUNTY	272.22	600.05	51.72	4.08	74.86
SAN FRANCISCO	SAN FRANCISCO BAY AREA	BAY AREA	105.41	140.58	20.03	1.58	28.99
SAN JOAQUIN	SAN JOAQUIN VALLEY	SAN JOAQUIN VALLEY	71.25	90.65	13.54	3.81	22.26
SAN LUIS OBISPO	SOUTH CENTRAL COAST	SAN LUIS OBISPO CO	36.02	84.65	6.84	0.54	9.91
SAN MATEO	SAN FRANCISCO BAY AREA	BAY AREA	92.5	123.37	17.57	1.39	25.44
SANTA CLARA	SAN FRANCISCO BAY AREA	BAY AREA	190	253.41	36.1	2.85	52.25
SANTA CRUZ	NORTH CENTRAL COAST	MONTEREY BAY	25.51	59.95	4.85	0.38	7.02
SHASTA	SACRAMENTO VALLEY	SHASTA COUNTY	14.81	34.8	2.81	0.22	4.07
SIERRA	MOUNTAIN COUNTIES	NORTHERN SIERRA	0	0	0	0	0
SISKIYOU	NORTHEAST PLATEAU	SISKIYOU COUNTY	0	0	0	0	0
SOLANO	SACRAMENTO VALLEY	YOLO-SOLANO	14.45	20.87	2.75	0.22	3.97
SOLANO	SAN FRANCISCO BAY AREA	BAY AREA	31.58	42.12	6	0.47	8.68
SONOMA	NORTH COAST	NORTHERN SONOMA CO	6.19	14.55	1.18	0.09	1.7
SONOMA	SAN FRANCISCO BAY AREA	BAY AREA	51.36	68.5	9.76	0.77	14.12
STANISLAUS	SAN JOAQUIN VALLEY	SAN JOAQUIN VALLEY	50.27	63.96	9.55	2.69	15.71
SUTTER	SACRAMENTO VALLEY	FEATHER RIVER	9.82	23.07	1.87	0.15	2.7
TEHAMA	SACRAMENTO VALLEY	TEHAMA COUNTY	3.15	7.39	0.6	0.05	0.87
TRINITY	NORTH COAST	NORTH COAST UNIFIED	0.02	0.04	0	0	0
TULARE	SAN JOAQUIN VALLEY	SAN JOAQUIN VALLEY	50.39	64.12	9.57	2.7	15.75
TUOLUMNE	MOUNTAIN COUNTIES	TUOLUMNE COUNTY	0	0	0	0	0
YOLO	SACRAMENTO VALLEY	YOLO-SOLANO	20.09	29.02	3.82	0.3	5.52
YUBA	SACRAMENTO VALLEY	FEATHER RIVER	5.65	13.28	1.07	0.08	1.55

**Table 10: Residential Natural Gas  
Cooking (EIC 61061001100000)  
Emissions (tons / year), 2017**

County	Air Basin	District	CO	NOX	PM	SOX	TOG
ALAMEDA	SAN FRANCISCO BAY AREA	BAY AREA	18.55	43.6	3.52	0.28	5.1
ALPINE	GREAT BASIN VALLEYS	GREAT BASIN UNIFIED	0	0	0	0	0
AMADOR	MOUNTAIN COUNTIES	AMADOR COUNTY	0.18	0.42	0.03	0	0.05
BUTTE	SACRAMENTO VALLEY	BUTTE COUNTY	2.35	5.51	0.45	0.04	0.65
CALAVERAS	MOUNTAIN COUNTIES	CALAVERAS COUNTY	0.04	0.09	0.01	0	0.01
COLUSA	SACRAMENTO VALLEY	COLUSA COUNTY	0.19	0.44	0.04	0	0.05
CONTRA COSTA	SAN FRANCISCO BAY AREA	BAY AREA	14.84	34.88	2.82	0.22	4.08
DEL NORTE	NORTH COAST	NORTH COAST UNIFIED	0	0	0	0	0
EL DORADO	LAKE TAHOE	EL DORADO COUNTY	0.35	0.83	0.07	0.01	0.1
EL DORADO	MOUNTAIN COUNTIES	EL DORADO COUNTY	1.72	4.04	0.33	0.03	0.47
FRESNO	SAN JOAQUIN VALLEY	SAN JOAQUIN VALLEY	9.15	21.5	1.74	0.49	2.86
GLENN	SACRAMENTO VALLEY	GLENN COUNTY	0.21	0.5	0.04	0	0.06
HUMBOLDT	NORTH COAST	NORTH COAST UNIFIED	1.76	4.14	0.33	0.03	0.48
IMPERIAL	SALTON SEA	IMPERIAL COUNTY	1.29	3.02	0.24	0.02	0.35
INYO	GREAT BASIN VALLEYS	GREAT BASIN UNIFIED	0	0	0	0	0
KERN	MOJAVE DESERT	EASTERN KERN	2.5	5.87	0.47	0.04	0.69
KERN	SAN JOAQUIN VALLEY	SAN JOAQUIN VALLEY	14.17	33.29	2.69	0.76	4.43
KINGS	SAN JOAQUIN VALLEY	SAN JOAQUIN VALLEY	2.59	6.08	0.49	0.14	0.81
LAKE	LAKE COUNTY	LAKE COUNTY	0	0	0	0	0
LASSEN	NORTHEAST PLATEAU	LASSEN COUNTY	0.11	0.26	0.02	0	0.03
LOS ANGELES	MOJAVE DESERT	ANTELOPE VALLEY	7.52	17.66	1.43	0.11	2.07
LOS ANGELES	SOUTH COAST	SOUTH COAST	187.7	441.09	35.66	2.82	51.62
MADERA	SAN JOAQUIN VALLEY	SAN JOAQUIN VALLEY	0.71	1.66	0.13	0.04	0.22
MARIN	SAN FRANCISCO BAY AREA	BAY AREA	4.41	10.35	0.84	0.07	1.21
MARIPOSA	MOUNTAIN COUNTIES	MARIPOSA COUNTY	0	0	0	0	0
MENDOCINO	NORTH COAST	MENDOCINO COUNTY	0.51	1.19	0.1	0.01	0.14
MERCED	SAN JOAQUIN VALLEY	SAN JOAQUIN VALLEY	2.25	5.29	0.43	0.12	0.7
MODOC	NORTHEAST PLATEAU	MODOC COUNTY	0	0	0	0	0
MONO	GREAT BASIN VALLEYS	GREAT BASIN UNIFIED	0	0	0	0	0
MONTEREY	NORTH CENTRAL COAST	MONTEREY BAY	4.36	10.25	0.83	0.07	1.2
NAPA	SAN FRANCISCO BAY AREA	BAY AREA	1.79	4.21	0.34	0.03	0.49
NEVADA	MOUNTAIN COUNTIES	NORTHERN SIERRA	1.23	2.89	0.23	0.02	0.34
ORANGE	SOUTH COAST	SOUTH COAST	60.12	141.28	11.42	0.9	16.53
PLACER	LAKE TAHOE	PLACER COUNTY	0.16	0.39	0.03	0	0.05
PLACER	MOUNTAIN COUNTIES	PLACER COUNTY	0.39	0.92	0.07	0.01	0.11
PLACER	SACRAMENTO VALLEY	PLACER COUNTY	4.92	11.56	0.93	0.07	1.35
PLUMAS	MOUNTAIN COUNTIES	NORTHERN SIERRA	0	0	0	0	0
RIVERSIDE	MOJAVE DESERT	MOJAVE DESERT	0.49	1.16	0.09	0.01	0.14
RIVERSIDE	MOJAVE DESERT	SOUTH COAST	0	0.01	0	0	0
RIVERSIDE	SALTON SEA	SOUTH COAST	8.63	20.28	1.64	0.13	2.37
RIVERSIDE	SOUTH COAST	SOUTH COAST	35.34	83.05	6.71	0.53	9.72
SACRAMENTO	SACRAMENTO VALLEY	SACRAMENTO METRO	17.16	40.33	3.26	0.26	4.72

County	Air Basin	District	CO	NOX	PM	SOX	TOG
SAN BENITO	NORTH CENTRAL COAST	MONTEREY BAY	0.55	1.3	0.1	0.01	0.15
SAN BERNARDINO	MOJAVE DESERT	MOJAVE DESERT	10.28	24.16	1.95	0.15	2.83
SAN BERNARDINO	SOUTH COAST	SOUTH COAST	30.87	72.53	5.86	0.46	8.49
SAN DIEGO	SAN DIEGO	SAN DIEGO COUNTY	41.87	98.39	7.95	0.63	11.51
SAN FRANCISCO	SAN FRANCISCO BAY AREA	BAY AREA	11.45	26.91	2.18	0.17	3.15
SAN JOAQUIN	SAN JOAQUIN VALLEY	SAN JOAQUIN VALLEY	7.74	18.19	1.47	0.41	2.42
SAN LUIS OBISPO	SOUTH CENTRAL COAST	SAN LUIS OBISPO CO	6.26	14.7	1.19	0.09	1.72
SAN MATEO	SAN FRANCISCO BAY AREA	BAY AREA	10.05	23.61	1.91	0.15	2.76
SANTA CLARA	SAN FRANCISCO BAY AREA	BAY AREA	20.64	48.5	3.92	0.31	5.68
SANTA CRUZ	NORTH CENTRAL COAST	MONTEREY BAY	2.77	6.51	0.53	0.04	0.76
SHASTA	SACRAMENTO VALLEY	SHASTA COUNTY	1.61	3.78	0.31	0.02	0.44
SIERRA	MOUNTAIN COUNTIES	NORTHERN SIERRA	0	0	0	0	0
SISKIYOU	NORTHEAST PLATEAU	SISKIYOU COUNTY	0	0	0	0	0
SOLANO	SACRAMENTO VALLEY	YOLO-SOLANO	1.57	3.69	0.3	0.02	0.43
SOLANO	SAN FRANCISCO BAY AREA	BAY AREA	3.43	8.06	0.65	0.05	0.94
SONOMA	NORTH COAST	NORTHERN SONOMA CO	0.67	1.58	0.13	0.01	0.18
SONOMA	SAN FRANCISCO BAY AREA	BAY AREA	5.58	13.11	1.06	0.08	1.53
STANISLAUS	SAN JOAQUIN VALLEY	SAN JOAQUIN VALLEY	5.46	12.83	1.04	0.29	1.71
SUTTER	SACRAMENTO VALLEY	FEATHER RIVER	1.07	2.51	0.2	0.02	0.29
TEHAMA	SACRAMENTO VALLEY	TEHAMA COUNTY	0.34	0.8	0.06	0.01	0.09
TRINITY	NORTH COAST	NORTH COAST UNIFIED	0	0	0	0	0
TULARE	SAN JOAQUIN VALLEY	SAN JOAQUIN VALLEY	8.75	20.57	1.66	0.47	2.74
TUOLUMNE	MOUNTAIN COUNTIES	TUOLUMNE COUNTY	0	0	0	0	0
YOLO	SACRAMENTO VALLEY	YOLO-SOLANO	2.18	5.13	0.41	0.03	0.6
YUBA	SACRAMENTO VALLEY	FEATHER RIVER	0.61	1.44	0.12	0.01	0.17

**Table 11: Residential Natural Gas****Other (EIC 61099501100000)****Emissions (tons / year), 2017**

County	Air Basin	District	CO	NOX	PM	SOX	TOG
ALAMEDA	SAN FRANCISCO BAY AREA	BAY AREA	16.77	39.4	3.19	0.25	4.61
ALPINE	GREAT BASIN VALLEYS	GREAT BASIN UNIFIED	0	0	0	0	0
AMADOR	MOUNTAIN COUNTIES	AMADOR COUNTY	0.16	0.38	0.03	0	0.04
BUTTE	SACRAMENTO VALLEY	BUTTE COUNTY	2.12	4.98	0.4	0.03	0.58
CALAVERAS	MOUNTAIN COUNTIES	CALAVERAS COUNTY	0.03	0.08	0.01	0	0.01
COLUSA	SACRAMENTO VALLEY	COLUSA COUNTY	0.17	0.39	0.03	0	0.05
CONTRA COSTA	SAN FRANCISCO BAY AREA	BAY AREA	13.41	31.52	2.55	0.2	3.69
DEL NORTE	NORTH COAST	NORTH COAST UNIFIED	0	0	0	0	0
EL DORADO	LAKE TAHOE	EL DORADO COUNTY	0.32	0.75	0.06	0	0.09
EL DORADO	MOUNTAIN COUNTIES	EL DORADO COUNTY	1.55	3.65	0.3	0.02	0.43
FRESNO	SAN JOAQUIN VALLEY	SAN JOAQUIN VALLEY	8.27	19.43	1.57	0.44	2.58
GLENN	SACRAMENTO VALLEY	GLENN COUNTY	0.19	0.45	0.04	0	0.05
HUMBOLDT	NORTH COAST	NORTH COAST UNIFIED	1.59	3.74	0.3	0.02	0.44
IMPERIAL	SALTON SEA	IMPERIAL COUNTY	1.51	3.55	0.29	0.02	0.41
INYO	GREAT BASIN VALLEYS	GREAT BASIN UNIFIED	0	0	0	0	0
KERN	MOJAVE DESERT	EASTERN KERN	2.93	6.89	0.56	0.04	0.81
KERN	SAN JOAQUIN VALLEY	SAN JOAQUIN VALLEY	16.62	39.06	3.16	0.89	5.19
KINGS	SAN JOAQUIN VALLEY	SAN JOAQUIN VALLEY	3.03	7.13	0.58	0.16	0.95
LAKE	LAKE COUNTY	LAKE COUNTY	0	0	0	0	0
LASSEN	NORTHEAST PLATEAU	LASSEN COUNTY	0.1	0.24	0.02	0	0.03
LOS ANGELES	MOJAVE DESERT	ANTELOPE VALLEY	8.82	20.72	1.68	0.13	2.42
LOS ANGELES	SOUTH COAST	SOUTH COAST	220.22	517.53	41.84	3.3	60.56
MADERA	SAN JOAQUIN VALLEY	SAN JOAQUIN VALLEY	0.64	1.5	0.12	0.03	0.2
MARIN	SAN FRANCISCO BAY AREA	BAY AREA	3.98	9.36	0.76	0.06	1.1
MARIPOSA	MOUNTAIN COUNTIES	MARIPOSA COUNTY	0	0	0	0	0
MENDOCINO	NORTH COAST	MENDOCINO COUNTY	0.46	1.08	0.09	0.01	0.13
MERCED	SAN JOAQUIN VALLEY	SAN JOAQUIN VALLEY	2.04	4.79	0.39	0.11	0.64
MODOC	NORTHEAST PLATEAU	MODOC COUNTY	0	0	0	0	0
MONO	GREAT BASIN VALLEYS	GREAT BASIN UNIFIED	0	0	0	0	0
MONTEREY	NORTH CENTRAL COAST	MONTEREY BAY	3.94	9.26	0.75	0.06	1.08
NAPA	SAN FRANCISCO BAY AREA	BAY AREA	1.62	3.8	0.31	0.02	0.44
NEVADA	MOUNTAIN COUNTIES	NORTHERN SIERRA	1.11	2.61	0.21	0.02	0.31
ORANGE	SOUTH COAST	SOUTH COAST	70.54	165.77	13.4	1.06	19.4
PLACER	LAKE TAHOE	PLACER COUNTY	0.15	0.35	0.03	0	0.04
PLACER	MOUNTAIN COUNTIES	PLACER COUNTY	0.35	0.83	0.07	0.01	0.1
PLACER	SACRAMENTO VALLEY	PLACER COUNTY	4.45	10.45	0.84	0.07	1.22
PLUMAS	MOUNTAIN COUNTIES	NORTHERN SIERRA	0	0	0	0	0
RIVERSIDE	MOJAVE DESERT	MOJAVE DESERT	0.58	1.36	0.11	0.01	0.16
RIVERSIDE	MOJAVE DESERT	SOUTH COAST	0.01	0.01	0	0	0
RIVERSIDE	SALTON SEA	SOUTH COAST	10.13	23.8	1.92	0.15	2.79
RIVERSIDE	SOUTH COAST	SOUTH COAST	41.47	97.44	7.88	0.62	11.4
SACRAMENTO	SACRAMENTO VALLEY	SACRAMENTO METRO	15.51	36.45	2.95	0.23	4.26

County	Air Basin	District	CO	NOX	PM	SOX	TOG
SAN BENITO	NORTH CENTRAL COAST	MONTEREY BAY	0.5	1.17	0.09	0.01	0.14
SAN BERNARDINO	MOJAVE DESERT	MOJAVE DESERT	12.06	28.35	2.29	0.18	3.32
SAN BERNARDINO	SOUTH COAST	SOUTH COAST	36.21	85.1	6.88	0.54	9.96
SAN DIEGO	SAN DIEGO	SAN DIEGO COUNTY	48.13	113.12	9.15	0.72	13.24
SAN FRANCISCO	SAN FRANCISCO BAY AREA	BAY AREA	10.35	24.32	1.97	0.16	2.85
SAN JOAQUIN	SAN JOAQUIN VALLEY	SAN JOAQUIN VALLEY	6.99	16.44	1.33	0.37	2.19
SAN LUIS OBISPO	SOUTH CENTRAL COAST	SAN LUIS OBISPO CO	7.34	17.25	1.39	0.11	2.02
SAN MATEO	SAN FRANCISCO BAY AREA	BAY AREA	9.08	21.34	1.73	0.14	2.5
SANTA CLARA	SAN FRANCISCO BAY AREA	BAY AREA	18.65	43.84	3.54	0.28	5.13
SANTA CRUZ	NORTH CENTRAL COAST	MONTEREY BAY	2.5	5.89	0.48	0.04	0.69
SHASTA	SACRAMENTO VALLEY	SHASTA COUNTY	1.45	3.42	0.28	0.02	0.4
SIERRA	MOUNTAIN COUNTIES	NORTHERN SIERRA	0	0	0	0	0
SISKIYOU	NORTHEAST PLATEAU	SISKIYOU COUNTY	0	0	0	0	0
SOLANO	SACRAMENTO VALLEY	YOLO-SOLANO	1.42	3.33	0.27	0.02	0.39
SOLANO	SAN FRANCISCO BAY AREA	BAY AREA	3.1	7.29	0.59	0.05	0.85
SONOMA	NORTH COAST	NORTHERN SONOMA CO	0.61	1.43	0.12	0.01	0.17
SONOMA	SAN FRANCISCO BAY AREA	BAY AREA	5.04	11.85	0.96	0.08	1.39
STANISLAUS	SAN JOAQUIN VALLEY	SAN JOAQUIN VALLEY	4.93	11.6	0.94	0.26	1.54
SUTTER	SACRAMENTO VALLEY	FEATHER RIVER	0.96	2.27	0.18	0.01	0.27
TEHAMA	SACRAMENTO VALLEY	TEHAMA COUNTY	0.31	0.73	0.06	0	0.08
TRINITY	NORTH COAST	NORTH COAST UNIFIED	0	0	0	0	0
TULARE	SAN JOAQUIN VALLEY	SAN JOAQUIN VALLEY	10.27	24.13	1.95	0.55	3.21
TUOLUMNE	MOUNTAIN COUNTIES	TUOLUMNE COUNTY	0	0	0	0	0
YOLO	SACRAMENTO VALLEY	YOLO-SOLANO	1.97	4.63	0.37	0.03	0.54
YUBA	SACRAMENTO VALLEY	FEATHER RIVER	0.55	1.3	0.11	0.01	0.15



**Figure 2: Utility Area Assignment**

