

APPENDIX C

Emission Reduction Analysis for Rule 4901

This page intentionally blank.

EMISSION REDUCTION ANALYSIS FOR PROPOSED AMENDMENTS TO RULE 4901 (WOOD BURNING FIREPLACES AND WOOD BURNING HEATERS)

SUMMARY

The proposed amendments to District Rule 4901 (Wood Burning Fireplaces and Wood Burning Heaters) would reduce thresholds for wood burning curtailments pursuant to EPA contingency measure requirements, per Section 5.7, only after certain Clean Air Act required contingency triggers occur. The triggerable contingency measures are estimated to achieve 0.69 tpd of PM_{2.5} and 0.10 tpd NO_x on an annual average basis.

EMISSION REDUCTIONS FROM PROPOSED EPISODIC TIERED CURTAILMENT CONTINGENCY MEASURES

This analysis will estimate the emissions reductions from triggerable contingency measures in the proposed amendment to District Rule 4901. Proposed contingency measures, if triggered, would lower the episodic wood burning thresholds upon certain triggers as specified in Section 5.7 of the proposed rule.

The contingency measures would be triggered upon the issuance of a final determination by EPA that the District has failed to comply with the following requirements pursuant to Clean Air Act Section 172(c)(9) or 40 CFR § 51.1014(a) for any of the PM_{2.5} NAAQS:

1. Meet any Reasonable Further Progress (RFP) requirement;
2. Meet any quantitative milestone;
3. Submit a quantitative milestone report; or
4. Attain by the applicable attainment date.

The calculation methodology in this analysis is based on the District's *2015 Area Source Emissions Inventory Methodology 610 – Residential Wood Combustion* document.¹ This analysis consists of two steps:

- **Step One:** Determine the daily emissions from wood burning devices. Registered devices are allowed to burn during level one episodic wood burning curtailment, per section 5.7 of the proposed rule, while unregistered devices are prohibited from operating under both level one and level two episodic wood burning curtailments.
- **Step Two:** Determine the emission reductions from additional episodic wood burning curtailment due to the proposed lower curtailment thresholds, using the calculated daily emissions from step one and estimated additional days of curtailment.

The following details each of these steps.

¹ SJVAPCD. *2015 Area Source Emissions Inventory Methodology 610 – Residential Wood Combustion*. Retrieved from: https://www.valleyair.org/Air_Quality_Plans/EmissionsMethods/MethodForms/Current/ResidentialWoodCombustion2016.pdf

Step One: Determine daily average emissions from registered and unregistered wood burning devices

The emissions inventory is divided into two categories, one for fireplaces and one for wood stoves. The inventory is reported as a winter average, distributing the emissions over a 180 day period. For this analysis the inventory will be distributed into emissions from registered and unregistered devices on days they are allowed to be operated. This distribution of the inventory emissions was based on a mathematical model of residential wood burning emissions, represented by the following system of 6 equations:

Equation 1
$$I_W = L_0 E_{NC} + (L_0 + f_R L_1) E_C$$

Equation 2
$$I_F = L_0 E_F$$

Equation 3
$$E_R = f_R E_C$$

Equation 4
$$E_U = E_F + E_{NC} + (1 - f_R) E_C$$

Equation 5
$$E_C = f_C E_W$$

Equation 6
$$E_{NC} = (1 - f_C) E_W$$

Where:

- E_R = the emissions per day from registered wood burning devices;
- E_U = the emissions per day from unregistered wood burning devices;
- E_F = the emissions per day from all fireplaces;
- E_W = the emissions per day from all wood stoves;
- E_C = the emissions per day from certified wood stoves eligible for registration;
- E_{NC} = the emissions per day from uncertified wood stoves;
- I_F = the winter emissions inventory from fireplaces, in tons per winter season;
- I_W = the winter emissions inventory from wood stoves, in tons per winter season;
- L_1 = the average number of days in a wood burning season a level 1 wood burning curtailment is called;
- L_0 = the average number of days in a wood burning season no wood burning curtailment is called; and
- f_C = the fraction of emissions from wood stoves that are from wood stoves that meet certification requirements making them eligible for registration per §5.9 of the proposed rule; and
- f_R = the fraction of woodstoves that are eligible for registration per §5.9 of the proposed rule that are actually registered.

Equation 1 calculates the emissions for a year from wood stoves (I_W). It is represented by the sum of two contributors, essentially the emissions from uncertified wood stoves plus the emissions from certified wood stoves. Where the emissions from uncertified wood stoves is the number of days no curtailments are called (L_0) times the emissions per day from uncertified wood stoves (E_{NC}) that are not eligible for registration. The emissions from certified wood stoves is the sum of the number of days no curtailments are called (L_0) and the number of days level one curtailments are called (L_1) scaled by the fraction of certified devices that are actually registered (f_R) multiplied by the emissions per day from certified wood stoves (E_C).

Equation 2 calculates the emissions for a year from fireplaces (I_F). It is simply the number of days no curtailments are called (L_0) times the emissions per day from fireplaces (E_F)

Equation 3 calculates the emissions per day from registered wood stoves (E_R). It is the fraction of certified wood stoves that are actually registered (f_R) times the emissions per day from certified wood stoves (E_C)

Equation 4 calculates the emissions per day from unregistered wood burning devices (E_U). It is the sum of three terms: the emissions per day from fireplaces (E_F), the emissions per day from uncertified wood stoves (E_{NC}), and the emissions per day from certified wood stoves that are not registered. The last term is calculated by multiplying the fraction of certified wood stoves that are unregistered by the emissions per day from certified wood stoves (E_C). Where the fraction of fraction of certified wood stoves that are unregistered is just one minus the fraction of certified wood stoves that are actually registered ($1 - f_R$)

Equation 5 calculates the emissions per day from certified wood stoves (E_C) as the fraction of wood stove emissions that are from certified wood stoves (f_C) times the daily emissions from wood stoves (E_W).

Equation 6 calculates the emissions per day from uncertified wood stoves (E_{NC}) as the fraction of wood stove emissions that are from uncertified wood stoves ($1 - f_C$) times the daily emissions from wood stoves (E_W).

In these equations L_0 , L_1 , I_F , I_W , f_R , and f_C can all be found from observed ambient particulate levels (L_0 and L_1), the emissions inventory (I_F and I_W), and the emissions inventory methodology (f_R and f_C), with further details below. The remaining six emissions per day variables (E_R , E_U , E_F , E_W , E_{NC} , E_C) can be determined from this system of six equations. Using a variety of methods, this system of equations can be used to solve for the daily emissions from registered wood burning devices (E_R), see Equation 7 below, and unregistered wood burning devices (E_U), see Equation 8 below, on days in which they are allowed to operate.

Equation 7
$$E_R = \frac{f_R f_C I_W}{L_0 + f_R f_C L_1}$$

Equation 8
$$E_U = \frac{I_F}{L_0} + \frac{(1 - f_R f_C) I_W}{L_0 + f_R f_C L_1}$$

The derivation of these are left as an exercise for the reader.

Determine the Annual Emissions Affected by Wood Burning Curtailments

This analysis uses the same emissions inventory for residential wood burning as the District's 2018 *PM2.5 Plan* (CEPAM version 1.05)². This inventory provides emissions

² CEPAM: 2016 SIP Baseline Emission Projections v. 1.05 – Winter Average

for residential wood burning from fireplaces and wood stoves and also provides annual and winter season daily averages. For the purposes of this evaluation, the winter season daily average emissions, representative of the 180 days between November and April, will be used as a starting point, as shown by the table below. The emissions inventory used in this analysis for the two EICs affected are static in future years, so this analysis holds any future year for any plan commitments based on the CEPAM version 1.05 inventory. For the purpose of this analysis the 2020 inventory is used, but any year after or including 2017 would yield the same results. Table C-1 below is this emissions inventory.

Table C-1 2020 Winter Season Wood Burning Emissions Inventory (tpd)

County	PM2.5		NOx	
	Wood Stoves	Fireplaces	Wood Stoves	Fireplaces
Fresno	0.7215	0.5937	0.1210	0.0680
Kern (SJV)	0.3905	0.4209	0.0762	0.0509
Kings	0.0566	0.0832	0.0141	0.0092
Madera	0.1280	0.0844	0.0183	0.0089
Merced	0.3373	0.1968	0.0458	0.0224
San Joaquin	0.4019	0.5827	0.0878	0.0683
Stanislaus	0.4167	0.4549	0.0778	0.0535
Tulare	0.3611	0.2616	0.0610	0.0321

The winter season includes the months of November through April (180 days). However, the wood burning season consists of the months of November through February (120 days). Because there is little to no residential wood burning activities during the months of March and April, all emissions are assumed to be limited to the wood burning season months of November through February.

To determine the annual emissions from fireplaces (I_F) and the annual emissions from wood stoves (I_W) used in this analysis the daily winter average emissions from Table C-1 must be multiplied by the 180 days in the winter season. Furthermore, wood burning stoves and fireplaces used in homes without natural gas service are exempted from wood burning curtailments in Rule 4901. As a result the emissions that can be affected by curtailments is reduced to only those homes with natural gas service. Table C-2 lists the percentage of homes with both wood burning devices and natural gas service.

Table C-2 Natural Gas Service Rate

County	With Natural Gas Service
Fresno	92.96%
Kern (SJV)	95.31%
Kings	94.58%
Madera	48.79%
Merced	96.90%
San Joaquin	96.67%
Stanislaus	94.96%
Tulare	94.47%

One further reduction to accurately assess the emissions reductions is by considering the compliance rate of Valley residents who obey the curtailment requirements. The actual compliance rate is likely much higher, but for the purposes of being conservative in our analysis the District has used an 80% compliance rate. Table C-3 contains the total annual emissions, in tons per year (tpy), from homes with piped natural gas service. It is calculated by multiplying the inventory (in Table C-1) by the percentage of homes with natural gas service (Table C-2), the assumed compliance rate (80%), and 180 days in the winter season.

Table C-3 Annual Emissions from Homes with Natural Gas Service (tpy)

County	PM2.5		NOx	
	Wood Stoves (I _w)	Fireplaces (I _f)	Wood Stoves (I _w)	Fireplaces (I _f)
Fresno	96.58	79.47	16.20	9.10
Kern (SJV)	53.59	57.77	10.46	6.99
Kings	7.71	11.33	1.92	1.25
Madera	8.99	5.93	1.29	0.63
Merced	47.07	27.46	6.39	3.13
San Joaquin	55.95	81.11	12.22	9.51
Stanislaus	56.98	62.20	10.64	7.32
Tulare	49.12	35.59	8.30	4.37

Determine the usage of each category of wood stove

Equation 5 and Equation 6 rely on the fraction of wood stove emissions that come from certified wood stoves (f_c). Dividing the daily emissions for wood stoves into emissions from certified and uncertified devices will require looking closer at the wood stove category. The methodology used to determine the emissions inventory in Table C-1 above uses five categories of wood stoves: pellet-fueled, compressed wood logs, conventional, EPA Phase II (non-catalytic), and EPA Phase II (catalytic).

In order to distribute the emissions from the wood stove category, this analysis will rely on the latest fuel usage data for wood stoves in the *2015 Area Source Emissions Inventory Methodology 610 – Residential Wood Combustion*.³ Table A-12 of that methodology includes baseline data for fuel use as well as emission factors from each type of wood stove. Data in Table C-4 and Table C-5 below are from this source.

³ SJVAPCD. *2015 Area Source Emissions Inventory Methodology 610- Residential Wood Combustion*. October 18, 2016. Retrieved from: https://www.valleyair.org/Air_Quality_Plans/EmissionsMethods/MethodForms/Current/ResidentialWoodCombustion2016.pdf

Table C-4 All Wood Stoves – Fuel Use (tons/year)

County	Conventional	Phase II, Non-Catalytic	Phase II, Catalytic	Pellets	Compressed Wood Logs
Fresno	6,404	4,522	1,010	5,700	0
Kern (SJV)	3,758	2,101	268	3,932	0
Kings	504	306	39	773	0
Madera	822	1,032	394	877	0
Merced	3,122	1,823	301	1,923	0
San Joaquin	3,514	2,285	397	5,542	0
Stanislaus	4,158	2,421	397	4,429	0
Tulare	3,420	2,166	398	2,480	0

Table C-5 PM2.5 Emission Factors (lb/ton-fuel-burned)

Pollutant	Conventional	Phase II, Non-Catalytic	Phase II, Catalytic	Pellets	Compressed Wood Logs
PM2.5	29.5	14.1	19.6	2.9	25
NOx	2.6	2.28	2	3.8	2.8

Distributing the emissions into each of these categories will allow the emissions to be regrouped into emissions from certified wood stoves and uncertified wood burning devices later in this analysis.

Determine the portion of emissions from each category of wood stove

To calculate the percentage of wood burning stove emissions of a given pollutant in each county by device type, the emissions from each device type is divided by the total emissions of that pollutant from all device types, as shown by the following formula:

Equation 9
$$f_D = \frac{F_D \times EF_D}{\sum_{i=Device\ Types} (F_i \times EF_i)} \times 100\%$$

Where:

- f_D = Percentage of emissions for a given device type D;
- F_D = Fuel Use for a given device type D; and
- EF_D = Emissions factor for a given device type D.

Example: Calculating the percentage of PM2.5 wood stove emissions for conventional wood stoves in Fresno County

$$f_D = \frac{6,404 \text{ tons/year} \times 29.5 \text{ lbs/ton}}{(6,404 \text{ tons/year} \times 29.5 \text{ lbs/ton}) + (4,522 \text{ tons/year} \times 14.1 \text{ lbs/ton}) + \dots} \times 100\%$$

$$= \frac{188,913 \text{ lbs/year}}{288,992.61 \text{ lbs/year}} \times 100\% = 65.4\%$$

This calculation is completed for PM2.5 for each device type and for each county to create Table C-6 below, and for NOx to create Table C-7 below.

Table C-6 Ratio of Contribution to County Wood Stove PM2.5 Inventory

County	Conventional	Phase II, Non-Catalytic	Phase II, Catalytic	Pellets	Compressed Wood Logs
Fresno	65.4%	22.1%	6.8%	5.7%	0.0%
Kern (SJV)	70.5%	18.9%	3.3%	7.3%	0.0%
Kings	67.0%	19.4%	3.5%	10.1%	0.0%
Madera	49.4%	29.7%	15.7%	5.2%	0.0%
Merced	71.2%	19.9%	4.6%	4.3%	0.0%
San Joaquin	64.9%	20.2%	4.9%	10.1%	0.0%
Stanislaus	69.1%	19.2%	4.4%	7.2%	0.0%
Tulare	68.9%	20.9%	5.3%	4.9%	0.0%

Table C-7 Ratio of Contribution to County Wood Stove NOx Inventory

County	Conventional	Phase II, Non-Catalytic	Phase II, Catalytic	Pellets	Compressed Wood Logs
Fresno	32.88%	20.36%	3.99%	42.77%	0.00%
Kern (SJV)	32.53%	15.95%	1.78%	49.74%	0.00%
Kings	26.09%	13.89%	1.55%	58.47%	0.00%
Madera	24.82%	27.33%	9.15%	38.70%	0.00%
Merced	40.22%	20.59%	2.98%	36.21%	0.00%
San Joaquin	25.24%	14.39%	2.19%	58.18%	0.00%
Stanislaus	31.84%	16.26%	2.34%	49.57%	0.00%
Tulare	36.97%	20.53%	3.31%	39.18%	0.00%

Determine the portion of emissions from certified and uncertified wood stoves

The 5 categories in Table C-6 and Table C-7 need to be combined into certified and uncertified categories, to account for the two-tiered curtailment requirement in the rule.

The device types that are certified include EPA Phase II (Non-Catalytic), EPA Phase II (Catalytic), and pellet stoves. Conventional wood stoves and the compressed wood log category are uncertified.

Calculating the percentage of the wood burning stove inventory for each county that is uncertified is accomplished by summing the percentage contributions by county for each device type that is uncertified. Similarly, the percentage of the wood stove emissions from certified devices is calculated by summing the percentage from each certified device type.

Equation 10

$$f_{NC} = f_{Conventional} + f_{Compressed\ Wood\ Logs}$$

Equation 11

$$f_C = f_{Phase\ II, Non-catalytic} + f_{Phase\ II, Catalytic} + f_{Pellet}$$

Where:

- f_U = Percentage of emissions from uncertified wood stoves;
- f_C = Percentage of emissions from certified wood stoves; and
- $f_{Device\ Type}$ = Percentage of emissions from that device type.

Example: Calculating the percentage of wood burning emissions due to certified devices Fresno County.

$$f_C = 22.1\% + 6.8\% + 5.7\% = 34.6\%$$

This calculation is completed for both uncertified and certified in each county to generate Table C-8 below.

Table C-8 Baseline Wood Stove Contributions

County	PM2.5		NOx	
	Uncertified	Certified (f_C)	Uncertified	Certified (f_C)
Fresno	65.37%	34.63%	32.88%	67.12%
Kern (SJV)	70.55%	29.45%	32.53%	67.47%
Kings	67.01%	32.99%	26.09%	73.91%
Madera	49.42%	50.58%	24.82%	75.18%
Merced	71.24%	28.75%	40.22%	59.78%
San Joaquin	64.90%	35.10%	25.24%	74.76%
Stanislaus	69.14%	30.87%	31.84%	68.17%
Tulare	68.90%	31.10%	36.97%	63.02%

Note that only f_C is used in Equation 5 and Equation 6, as f_U will always be $(1 - f_C)$.

To determine the fraction of devices that are actually registered (f_R), the number of wood stoves registered is divided by the number of certified wood stoves in the Valley. As of March 20, 2023 there were 1,011 wood burning devices registered with the District. Once again referencing the *2015 Area Source Emissions Inventory Methodology 610 – Residential Wood Combustion*.⁴ Table A-5 shows a total of 16,922 homes in the valley with wood stoves in use, and Table A-6 shows the 35.2% of wood stoves are certified. 1,011 registered wood stoves divided by 35.2% of 16,922 wood stoves yields 16.97% of certified stoves are registered. So, f_R is 16.97%.

The final information necessary to determine the daily emissions will be the average number of days curtailments were called in the baseline inventory. Specifically, the

⁴ SJVAPCD. *2015 Area Source Emissions Inventory Methodology 610- Residential Wood Combustion*. October 18, 2016. Retrieved from: https://www.valleyair.org/Air_Quality_Plans/EmissionsMethods/MethodForms/Current/ResidentialWoodCombustion2016.pdf

average number of days a level one curtailment is called (L_1) and the average number of days no curtailment is called (L_0).

The CEPAM version 1.05 used in this analysis was prepared prior to the 2019 amendment to District Rule 4901, so the lowered thresholds in that rule were not in effect at the time that inventory was developed. So for this step of the calculations the analysis should be based on the curtailment thresholds in effect prior to that amendment.

To calculate the average number of curtailment days the observed PM2.5 levels from the 2019-2020, 2020-2021, and 2021-2022 wood burning curtailment seasons (November to February) were used. The average number of level 1 days (L_1) represent the number of days the observed PM2.5 levels were between the level 1 and level 2 thresholds inclusive, divided by the number of days PM2.5 observations occurred, times 120 the number of full days in a season. In a few cases some monitoring stations had maintenance preventing the observations, this calculation was done to estimate the average over a 120 day season. Table C-9 shows the thresholds and number of curtailment days observed.

Table C-9 Inventory Baseline Average Curtailment Days

County	Level 1 Threshold $\mu\text{g}/\text{m}^3$	Level 2 Threshold $\mu\text{g}/\text{m}^3$	Level 1 Days (L_1)	Level 2 Days	Days with No Curtailment (L_0)
Fresno	20	65	64.49	0	55.51
Kern (SJV)	20	65	59.50	0	60.50
Kings	20	65	64.49	0	55.51
Madera	20	65	33.95	0	86.05
Merced	20	65	32.09	0	87.91
San Joaquin	20	65	47.87	0	72.13
Stanislaus	20	65	53.52	0	66.48
Tulare	20	65	52.77	0	67.23

Using the data collected above for I_w , I_F , f_C , f_D , L_0 , and L_1 with Equation 7 and Equation 8, the daily emissions for certified and uncertified wood burning devices is calculated. The results are in Table C-10.

Table C-10 Average Daily Residential Wood Burning Emissions by County

County	PM2.5		NOx	
	E _R	E _U	E _R	E _U
Fresno	0.095728	2.964559	0.029361	0.392302
Kern (SJV)	0.042202	1.756955	0.017795	0.253134
Kings	0.007302	0.327216	0.003787	0.048920
Madera	0.008675	0.161290	0.001821	0.019773
Merced	0.025670	0.812758	0.007112	0.098585
San Joaquin	0.044454	1.826224	0.019827	0.268275
Stanislaus	0.043091	1.714939	0.016940	0.239578
Tulare	0.037032	1.193903	0.012183	0.166713

Step Two: Determine Emission Reductions from Additional Curtailment Days

To calculate the potential emission reductions from lower curtailment thresholds, this analysis will determine the increase in number of Level One and Level Two curtailment days. The additional days for each curtailment level are multiplied by the appropriate daily emissions in Table C-10. Since the proposed contingency strategy includes four triggers, this calculation will compare the first trigger to the baseline, then each further trigger to the trigger before it.

Table C-11 Current Baseline Average Curtailment Days

County	Current Level 1 Threshold µg/m ³	Current Level 2 Threshold µg/m ³	Level 1 Days	Level 2 Days	Days with No Curtailment
Fresno	12	35	73.13	19.28	27.59
Kern (SJV)	12	35	74.87	20.72	24.41
Kings	20	65	64.49	0	55.51
Madera	12	35	67.90	3.70	48.4
Merced	20	65	32.09	0	87.91
San Joaquin	20	65	47.87	0	72.13
Stanislaus	20	65	53.52	0	66.48
Tulare	20	65	52.77	0	67.23

The average number of level one and level two curtailments expected to be called for each contingency threshold are shown in Table C-12 Average Level One and Level Two Curtailments by Proposed Contingency Trigger (Days)

County	First Trigger		Second Trigger	
	Level One (12 µg/m ³)	Level Two (35 µg/m ³)	Level One (11 µg/m ³)	Level Two (35 µg/m ³)
Fresno	73.13	19.28	76.79	19.28
Kern (SJV)	74.87	20.72	78.22	20.72
Kings	70.14	22.60	73.46	22.60
Madera	67.90	3.70	72.61	3.70
Merced	69.86	2.34	74.54	2.34
San Joaquin	77.78	5.65	80.44	5.65
Stanislaus	79.45	8.31	82.77	8.31
Tulare	75.29	14.79	80.67	14.79

. The threshold values are shown as [level one threshold]/[level two threshold] in table headers. Since Fresno, Kern, and Madera counties are already subject to the lower thresholds, there is no information to show for those counties in the higher threshold columns.

Table C-12 Average Level One and Level Two Curtailments by Proposed Contingency Trigger (Days)

County	First Trigger		Second Trigger	
	Level One (12 µg/m ³)	Level Two (35 µg/m ³)	Level One (11 µg/m ³)	Level Two (35 µg/m ³)
Fresno	73.13	19.28	76.79	19.28
Kern (SJV)	74.87	20.72	78.22	20.72
Kings	70.14	22.60	73.46	22.60
Madera	67.90	3.70	72.61	3.70
Merced	69.86	2.34	74.54	2.34
San Joaquin	77.78	5.65	80.44	5.65
Stanislaus	79.45	8.31	82.77	8.31
Tulare	75.29	14.79	80.67	14.79

To determine the emissions reductions for each triggered contingency threshold, the number of curtailments is compared to the previous threshold. Table C-13 shows the additional curtailment days that would occur compared to the previous trigger.

Table C-13 Additional Level One and Level Two Curtailments by Proposed Contingency Trigger (Days)

County	First Trigger		Second Trigger	
	Level One (12 µg/m ³)	Level Two (35 µg/m ³)	Level One (11 µg/m ³)	Level Two (35 µg/m ³)
Fresno	0.00	0.00	3.66	-
Kern (SJV)	0.00	0.00	3.35	-
Kings	5.65	22.60	3.32	-
Madera	0.00	0.00	4.71	-
Merced	37.77	2.34	4.68	-
San Joaquin	29.91	5.65	2.66	-
Stanislaus	25.93	8.31	3.32	-
Tulare	22.52	14.79	5.38	-

Finally, to calculate the emissions reduction from each of the contingency triggers simply multiply the additional number of days for a given curtailment level, by the daily emissions of the equipment that would be curtailed at that level. Specifically, the emissions from uncertified wood burning devices (E_U) on Level One days, and the emissions from both the uncertified and certified wood burning devices ($E_U + E_R$) on Level Two days. This is shown in Equation 12.

Equation 12
$$R = E_U A_1 + (E_U + E_R) A_2$$

Where:

- R = the emissions reduction from additional curtailment days;
- E_U = the emissions per day from uncertified units, per Equation 8;
- E_R = the emissions per day from certified units, per Equation 7;
- A_1 = the additional Level One curtailment days; and
- A_2 = the additional Level Two curtailment days.

Completing this calculation for each triggered contingency threshold for both PM2.5 and NOx results in the emissions reduction shown **Error! Reference source not found.** in Table C-14.

Table C-14 Annual PM2.5 and NOx Emission Reductions by Proposed Contingency Trigger (tons/year)

County	Contingency Thresholds			
	12/35 $\mu\text{g}/\text{m}^3$		11/35 $\mu\text{g}/\text{m}^3$	
	PM2.5	NOx	PM2.5	NOx
Fresno	0.0000	0.0000	10.8503	1.4358
Kern (SJV)	0.0000	0.0000	5.8858	0.848
Kings	9.4089	1.4676	1.0864	0.1624
Madera	0.0000	0.0000	0.7597	0.0931
Merced	32.6598	3.9709	3.8037	0.4614
San Joaquin	65.1917	9.6519	4.8578	0.7136
Stanislaus	59.0776	8.3439	5.6936	0.7954
Tulare	45.0922	6.4002	6.4232	0.8969

The emissions reductions presented above are the total annual reductions. To convert to a tons per day annual average, divide by 365.

Table C-15 Annual Average Emission Reductions by Proposed Contingency Trigger (tons/day)

County	Contingency Thresholds			
	12/35 $\mu\text{g}/\text{m}^3$		11/35 $\mu\text{g}/\text{m}^3$	
	PM2.5	NOx	PM2.5	NOx
Fresno	0.0000	0.0000	0.0297	0.0039
Kern (SJV)	0.0000	0.0000	0.0161	0.0023
Kings	0.0258	0.0040	0.0030	0.0004
Madera	0.0000	0.0000	0.0021	0.0003
Merced	0.0895	0.0109	0.0104	0.0013
San Joaquin	0.1786	0.0264	0.0133	0.0020
Stanislaus	0.1619	0.0229	0.0156	0.0022
Tulare	0.1235	0.0175	0.0176	0.0025
Total	0.5793	0.0817	0.1078	0.0148

In total the triggerable contingency measures are estimated to achieve 0.69 tpd of PM2.5 and 0.10 tpd NOx on an annual average basis.