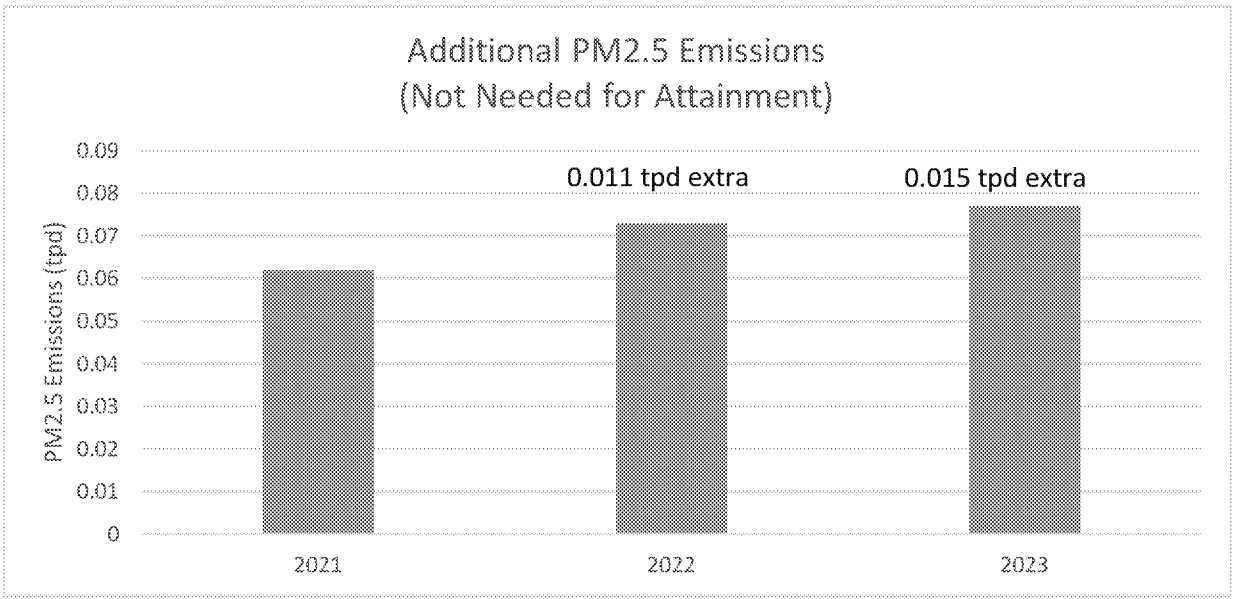
Year	Stoves	Emissions (tpd)	
		Projected	Extra
2019	350	0.045	
2020	500	0.065	
2021	600	0.077	
2021 DV	483	0.062	0
2020	500	0.065	
2021	600	0.077	
2022	600	0.077	
2022 DV	567	0.073	0.011
2021	600	0.077	
2022	600	0.077	
2023	600	0.077	
2023 DV	600	0.077	0.015

Any Year after 2023 extra will be 0.015

2021	2022	2023	2024
0.062	0.073	0.077	0.077
	0.011	0.015	0.015

5.39084E-05



Scaling factor of 27% was used to scale numbers from Plumas County to Nonattainment Area
Source of Data: 2012 ACS (https://www.census.gov/acs/www/data/data-tables-and-tools/data-profiles/20:

	Area (square meters)	Area (square miles)	Population
Plumas County			19,926
Nonattainmen	418,966,400	161.764	5,380
City of Portola	14,003,444	5.407	2,679
	3.342378768	3.342523676	49.79553903

From Gabe's email - Used in the SIP

Revised Estimate

Parameter	Fraction	Number	Data Source
County Total	100%	9,109	2012 ACS
Households i	27%	2,458	Scaling factor from EPA GIS analysis
Households u	57%	1,401	2012 ACS and District Survey
Wood used a	37%	909	2012 ACS – County Average
Wood used a	20%	492	District Survey
Breakdown by device type			
Woodstoves/	88%	1,356	District Survey
Noncertified/	53%	711	District Survey
EPA Certified	47%	642	District Survey
Fireplaces Us	9%	139	District Survey
Pellet Stoves	3%	42	District Survey
Woodstoves and Fireplace Insert PM2.5 Emissions (tons/yr)		**108**	

l2/)

Households	Population Density per m2	per mile square
9,109		
2,458	1.28411E-05	33.25832695
1,055	0.000149963	388.3854263
42.92107404		

Constants & Conversions	Value	Unit	Source
PM2.5 Emission Factors			
Uncertified Stove	30.60	lb PM2.5/ton wood	AP-42, Table 1.10.-1 *
Fireplace	34.60	lb PM2.5/ton wood	AP-42, Table 1.9.-1 **
Pellet Stove	3.06	lb PM2.5/ton wood	2015 NSPS - Regulatory Impact Analysis for Residential Wood Heaters NSPS Review Table 4.3***
2015 NSPS Stove	8.76	lb PM2.5/ton wood	2015 NSPS - Regulatory Impact Analysis for Residential Wood Heaters NSPS Review Table 4.3***
Propane, Electric, or Kerosene	0.00		California Short-Lived Pollutant Reduction
Efficiency			
Uncertified Stove Efficiency	54	%	AP-42, Table 1.10-5
Certified Stove Efficiency	68	%	AP-42, Table 1.10-5
Pellet Stove Efficiency	68	%	AP-42, Table 1.10-5
Fireplace	7	%	Review of Fireplace Use and Technology, OMNI
Other Constants & Conversions			
Wood Use - Stove	4.3	cord/year	District Survey
Wood Use - Fireplace	6	cord/year	District Survey
Wood Density	1.04	ton/cord	U.S. EPA Burnwise Emission Calculator
Average Burn Rate	1.5	kg/hour	Gary Blais Personal Communications
Emission Rate Scaling Factor	1.5		
Conversion from lb to ton	2000		
Conversion from g/kg to lb/ton	2		

* https://www3.epa.gov/ttnchie1/ap42/ch01/final/c01s10.pdf
**https://www3.epa.gov/ttnchie1/ap42/ch01/final/c01s09.pdf
***https://www3.epa.gov/ttnecas1/docs/ria/wood-heaters_ria_final-nsps-revision_2015-02.pdf
**** https://www.arb.ca.gov/cc/shortlived/meetings/03142017/final_slcp_report.pdf
*****http://www.omni-test.com/publications/firepl.pdf

Additional reductions needed for attainment

Old Device	New Device	Emission Rate	New Device EF (lb/ton)	Number of Devices	Emissions (ton/year) Before	After	Difference	Emission Reductions (tpd)
Uncertified	Wood (by 1	2.80	5.6	60	4.1053	0.5966	3.5087	0.0096
Uncertified	Wood	2.00	4	119	8.1422	0.8452	7.2970	0.0200
Uncertified	Non-wood	0.00	0	5	0.3421	0.0000	0.3421	0.0009
Total				184	12.5896	1.4418	11.1477	0.0305

Scenarios

1. Assuming that curtailment program will prompt 100% of households operating uncertified stove or fireplace after the attainment date to change-out their device.

Old Device	New Device	Emission Rate	New Device EF (lb/ton)	Number of Devices	Emissions (ton/year) Before	After	Difference	Emission Reductions (tpd)
Uncertified	wood	2	4	34	2.3263	0.2415	2.0848	0.0057
Fireplace	wood	2	4	54	5.8294	0.3835	5.4459	0.0149
Total					8.1557	0.6250	7.5307	0.0206

2. Assuming that curtailment program will prompt 25% of households operating uncertified stove or fireplace after the attainment date to change-out their device.

Old Device	New Device	Emission Rate	New Device EF (lb/ton)	Number of Devices	Emissions (ton/year) Before	After	Difference	Emission Reductions (tpd)
Uncertified	wood	2	4	8	0.5474	0.0568	0.4906	0.0013
Fireplace	wood	2	4	13	1.4034	0.0923	1.3110	0.0036
Total					1.9507	0.1492	1.8016	0.0049

3. Assuming that curtailment program will prompt 50% of households operating uncertified stove or fireplace after the attainment date to change-out their device.

Old Device	New Device	Emission Rate	New Device EF (lb/ton)	Number of Devices	Emissions (ton/year) Before	After	Difference	Emission Reductions (tpd)
Uncertified	wood	2	4	17	1.1632	0.1207	1.0424	0.0029
Fireplace	wood	2	4	27	2.9147	0.1918	2.7229	0.0075
Total					4.0779	0.3125	3.7654	0.0103

4. Assuming that curtailment program will prompt 3% of households operating uncertified stove or fireplace after the attainment date in Zone 2 to change-out their device.

Old Device	New Device	Emission Rate	New Device EF (lb/ton)	Number of Devices	Emissions (ton/year) Before	After	Difference	Emission Reductions (tpd)
Uncertified	wood	2	4	7	0.4790	0.0497	0.4292	0.0012
Fireplace	wood	2	4	2	0.2159	0.0142	0.2017	0.0006
Total					0.6949	0.0639	0.6309	0.0017

Estimating Percent of NA Households Residing in the City
(2013-2017 Survey)

Category	Nonattainment Area	City of Portola	Percent in City
Households	2458	1,055	43

Estimating Number of Devices Subject to Ordinance

	Nonattainment Area		City of Portola		Zone 2	
Status	Uncertified Stoves	Fireplaces	Uncertified	Fireplaces	Uncertified Stoves	Fireplaces
Operating before Change-out Program	711	139	305	60	406	79
Replaced through 12/31/2018	269	12	161	6	108	6
Additional needed for attainment*	184	0	110	0	74	0
Total needed for attainment	453	12	271	6	182	6
Remaining in operation after the attainment date	258	127	34	54	224	73

* Assume the same ratio of change-outs between Zone 1 and Zone 2 as before 12/31/2018 (161 to 108)

Estimating Benefits of Contingency

Category	Stove	Fireplace before	Total
Emission Factor (lb PM2.5/ton of wood)	30.6	34.6	
Wood use annual (cords)	4.3	6	
Wood density (ton/cord)	1.04	1.04	
Conversion from lb to ton	2000	2000	
Number of Devices	34	54	88
Emissions (tpy)	2.32924	5.79274	8.12197
Emissions (tpd)	0.00638	0.01587	0.02225
100% compliance on 31% of days	0.00198	0.00492	0.00690

Estimating Benefits of Contingency 2022
Assume 50% of households will comply with curtailment

Category	Stove	Fireplace before	Total
Emission Factor (lb PM2.5/ton of wood)	30.6	34.6	
Wood use annual (cords)	4.3	6	
Wood density (ton/cord)	1.04	1.04	
Conversion from lb to ton	2000	2000	
Number of Devices	34	54	88
Emissions (tpy)	2.3292	5.7927	8.1220
Emissions (tpd)	0.0064	0.0159	0.0223
50% compliance on 31% of days	0.0010	0.0025	0.0034

Estimating Benefits of Contingency 2023
Assume 50% compliance rate and 25% of households changing out their devices

Category	Stove	Fireplace before	Total
Emission Factor (lb PM2.5/ton of wood)	30.6	34.6	
Wood use annual (cords)	4.3	6	
Wood density (ton/cord)	1.04	1.04	
Conversion from lb to ton	2000	2000	
Number of Devices	34	54	88
Emissions (tpy)	2.3292	5.7927	8.1220
Emissions (tpd)	0.0064	0.0159	0.0223
50% compliance on 31% of days	0.0010	0.0025	0.0034
25% of Households changing devices	0.0013	0.0036	0.0049
Total Contingency	0.0023	0.0061	0.0084

Estimating Benefits of Contingency 2023
Assume 25% compliance rate and 25% of households changing out their devices

Category	Stove	Fireplace before	Total
Emission Factor (lb PM2.5/ton of wood)	30.6	34.6	
Wood use annual (cords)	4.3	6	
Wood density (ton/cord)	1.04	1.04	
Conversion from lb to ton	2000	2000	
Number of Devices	34	54	88
Emissions (tpy)	2.3292	5.7927	8.1220
Emissions (tpd)	0.0064	0.0159	0.0223
25% compliance on 31% of days	0.0005	0.0012	0.0017
25% of Households changing devices	0.0013	0.0036	0.0049
Total Contingency	0.0018	0.0048	0.0067

Other Benefits 0.0001

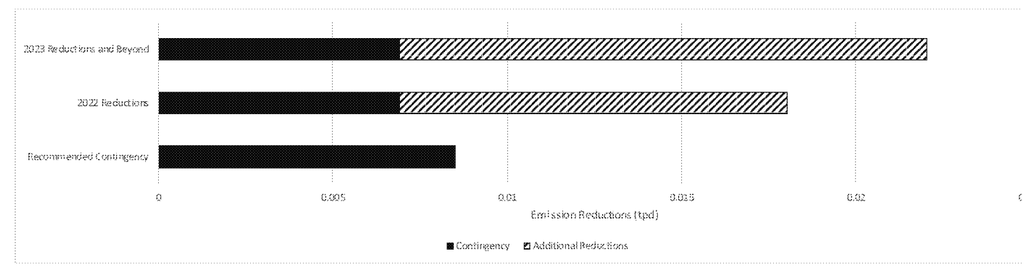
Measure	**2022**	2023 and Beyond
Modified Ordinance	0.0069	0.0069
Full Benefit of Change-out Program	0.011	0.015
CARB Mobile Program	0.0001	0.0001
Prohibiting Open Burning	4.29211E-05	4.29211E-05
Total	0.0180	0.0220

Compare to One Year of Progress	Contingency	Additional Reductions	Total
Recommended Contingency	0.0085		
2022 Reductions	0.0069	0.0111	0.01804
2023 Reductions and Beyond	0.00690	0.0151	0.0220

Estimating Benefits of Voluntary Woodburning Curtailment outside of Zone 1
Assume 3% of households will comply with curtailment

Category	Stove	Fireplace before	Total
Emission Factor (lb PM2.5/ton of wood)	30.6	34.6	
Wood use annual (cords)	4.3	6	
Wood density (ton/cord)	1.04	1.04	
Conversion from lb to ton	2000	2000	
Number of Devices	224	73	297
Emissions (tpy)	15.3235	7.9172	23.2407
Emissions (tpd)	0.0420	0.0217	0.0637
3% compliance on 31% of days	0.0004	0.0002	0.0006

Compare the additional emission reductions to suggested contingency



SiteName	Year	Count 1
Portola-Gulling Street	2013	5
Portola-Gulling Street	2014	17
Portola-Gulling Street	2015	15
Portola-Gulling Street	2016	33
Portola-Gulling Street	2017	33
Portola-Gulling Street	2018	36
	2014-2016	37
	2015-2017	65
	2016-2018	102

Count 1 - Days in Jan, Feb, Nov, Dec with PM2.5 between 20 ug/m3 and 30 ug/m3
Count 2 - Days in March, April, Sept, and Oct with PM2.5 >20 ug/m3
Total - Total number of obs in a year

SiteName	Year	Total Days
Portola-Gulling Street	2014	363
Portola-Gulling Street	2015	356
Portola-Gulling Street	2016	352
Portola-Gulling Street	2017	364
Portola-Gulling Street	2018	355
	2014-2016	719
	2015-2017	1071
	2016-2018	1071

Days>20 represents a count of days during the curtailment months
(Sept-April) with PM2.5 concentrations above 20 ug/m3.

Count 2	Subject to Ordinance	Total	Percent of Total
25	30	122	
46	63	363	
31	46	356	
20	53	352	
29	62	364	
23	59	355	
102	139	841	17
97	162	1071	15
72	174	1071	16

Days>20	Percent of Total
152	
128	
116	
111	
106	
280	39
396	37
333	31