

San Joaquin Valley Air Pollution Control District

Open Burn Emission Factors

Approved By: _____
Seyed Sadredin,
Director of Permit Services

Date: _____

The purpose of this document is to establish open burn emission factors to be used by the District to:

- Quantify emissions from open burns, and
- Quantify emissions reductions generated by diverting biomass from open burning*.

*For any facility which has other open burn emission factors listed on their Permit to Operate, an Authority to Construct must be obtained prior to using the attached emission factors.

Background Information:

There has long been uncertainty regarding the accuracy of emission factor numbers for the open burning of biomass material. Darley¹ had originally quantified many open burn emission factors for the California Air Resources Board in the 1970's. When specific data was not available, emission factors from AP-42² have often been used to quantify emissions from open burns. In 1996 Jenkins³ presented detailed source test results of wind tunnel simulations of open burns which are more representative of specific field conditions.

The California Air Resources Board Planning and Technical Support Division has reviewed and adjusted the numbers from the sources listed above in an effort to produce the most accurate figures available, to represent typical open burning conditions⁴. The final results of the CARB comparison (August 2000 version) are presented in the table which follows.

Open Burn Emission Factors

March 2001 Version

Crop	PM ₁₀ (lbs/ton)	PM _{2.5} (lbs/ton)	NO _x (lbs/ton)	SO ₂ (lbs/ton)	VOC (lbs/ton)	CO (lbs/ton)
Row Crops						
Alfalfa	28.5	27.2	4.5	0.6	21.7	119.0
Barley	14.3	13.8	5.1	0.1	15.0	183.7
Corn	11.4	10.9	3.3	0.4	6.6	70.9
Oats	20.7	19.7	4.5	0.6	10.3	136.0
Rice	6.3	5.9	5.2	1.1	4.7	57.4
Safflower	17.7	16.9	4.5	0.6	14.8	144.0
Sorghum	17.7	16.9	4.5	0.6	5.1	77.0
Wheat	10.6	10.1	4.3	0.9	7.6	123.6
Orchard and Vine Crops						
Almond	7.0	6.7	5.9	0.1	5.2	52.2
Apple	3.9	3.7	5.2	0.1	2.3	42.0
Apricot	5.9	5.6	5.2	0.1	4.6	49.0
Avocado	20.6	19.4	5.2	0.1	18.5	116.0
Bean/Pea	13.7	13.0	5.2	0.1	18.5	116.0
Cherry	7.9	7.4	5.2	0.1	6.0	44.0
Citrus	5.9	5.6	5.2	0.1	6.8	81.0
Date Palm	9.8	9.3	5.2	0.1	3.8	56.0
Fig	6.9	6.5	5.2	0.1	6.0	57.0
Grape	4.9	4.6	5.2	0.1	3.8	51.0
Nectarine	3.9	3.7	5.2	0.1	2.3	33.0
Olive	11.8	11.1	5.2	0.1	10.3	144.0
Orchard	7.8	7.3	5.2	0.1	6.3	66.0
Peach	5.9	5.6	5.2	0.1	3.0	42.0
Pear	8.8	8.3	5.2	0.1	5.1	57.0
Prune	2.9	2.8	5.2	0.1	4.6	47.0
Walnut	4.2	4.0	4.5	0.2	4.8	67.0
Other Biomass Burning						
Grassland	15.9	15.2	4.5	0.6	10.7	114.0
Chaparral	20.1	17.3	3.5	0.1	14.4	153.7
Forest	19-30	17-27	3.5	0.1	8-21	154-312

References:

¹ Darley, E.F., *Hydrocarbon Characterization of Agricultural Waste Burning*, Darley, April 1979. Statewide Air Pollution Research Center, UC Riverside, under contract to the California Air Resources Board, #A7-068-30.

² *Compilation of Air Pollutant Emission Factors* Volume 1: Stationary Point and Area Sources, Fifth Edition, AP-42, January 1995, U.S. EPA. Table 2.5-5.

³ Jenkins, B., *Atmospheric Pollutant Emission Factors from Open Burning of Agricultural and Forest Biomass by Wind Tunnel Simulations*, April 1996, UC Davis. Tables 4.1.1 to 4.1.8.

⁴ Gaffney, P., *Emission Factors for Open Burning of Agricultural Residues*, August 2000, California Air Resources Board Planning and Technical Support Division.