



Department of Pesticide Regulation



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MEMORANDUM

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SUBJECT: REASSESSMENT OF NONSPATIAL FRACTIONS IN THE VOC INVENTORY

Problem Statement

Certain types of pesticide applications are reported to the Department of Pesticide Regulation (DPR) as “monthly summary data” with no geographic location information beyond county of application. These include commercial structural, landscape maintenance, rights-of-way, and commodity fumigations. In cases where two or more air basins, one of which may be in a nonattainment area (NAA), are present within a single county, these applications must be proportionally allocated. DPR allocates these monthly summary applications using surrogate data that are assumed to have similar geographic distributions. This memorandum documents our proposed procedure to update the surrogate data sets originally developed in the early 1990s.

Background

The surrogate data used to distribute commercial structural – landscape maintenance, rights-of-way, and commodity fumigations in the volatile organic compound (VOC) inventory was developed in the 1990s by prior DPR staff using data that are now probably 20 years old. In an effort to provide the most accurate estimated geographic distribution of VOC emissions, changes in California’s population (an increase of 9 million) and transportation infrastructure over the past 20 years needs to be reanalyzed. The updated results will be applied to recent years of the VOC inventory.



Documentation from the original calculation methods is very scarce, but one can assume that the data used at the time was from the 1990 census and the spatial data holdings of the Teale Data Center. Today we have access to the 2010 census data, county boundaries (updated in 2009), air basin, and air district boundaries (updated by Air Resource Board in 2003), and transportation and hydrologic data from the late 2000s. The term “updated” refers to corrections to linework and attribution resulting from access to higher resolution imagery, improved Global Positioning System accuracy, improved mapping techniques, etc.

For the nonspatial calculation, the state is broken up into 73 administrative areas which have unique combinations of air basin (ab), air district (ad), NAA, and county – a variable called “abadnaa.” For example, an area designated as ‘12250215’ is in airbasin 12 – “San Joaquin Valley Air Basin,” air district 25 – “San Joaquin Valley Air District,” NAA 02 – “San Joaquin Valley NAA,” and county 15 – “Kern County.” Forty-nine counties have “abadnaa” areas that are completely within one NAA, and so for nonspatial VOC inventory purposes 100 percent (%) of VOC emissions from commercial structural – landscape maintenance, rights-of-way, and commodity fumigations are attributed to those counties. Nine counties (24 individual “abadnaa” areas), however, extend over more than one NAA or air basin that is outside a NAA. They are:

Table 1. Counties that extend over more than one NAA classification

County	NAA ^A		
El Dorado	Sacramento Metro	Outside	
Kern	San Joaquin Valley	Outside	
Los Angeles	South Coast	Southeast Desert	
Placer	Sacramento Metro	Outside	
Riverside	South Coast	Southeast Desert	Outside
San Bernardino	South Coast	Southeast Desert	Outside
Solano	Sacramento Metro	Outside	
Sonoma ^B	Outside	Outside	
Sutter	Sacramento Metro	Outside	

^A “Outside” refers to that portion of a county which is not in any of California’s NAAs.

^B Sonoma County lies outside all NAAs, but contains two air basins.

Each of these “fractional abadnaa” areas are assigned a fraction of commercial structural – landscape maintenance (cslmfrac), rights-of-way (rowfrac), and commodity fumigations (cfumfrac) that reflect the estimated proportion of each category within the county. County-level monthly summary data are allocated to these multiple administrative areas within a county according to these fractions. For example – in the current calculations, San Bernardino has three “abadnaa” areas with the following fractions:

Table 2. Example of fractions assigned to “abadnaa” areas in San Bernardino County

abadnaa	ab	ad	NAA	co	cslmfrac	rowfrac	cfumfrac	index
14300536	14	30	5	36	0.755742	0.2077	1	1
15160036	15	16	0	36	0.019081	0.3651	0	2
15160336	15	16	3	36	0.225177	0.4272	0	3

In the case *cslmfrac*, approximately 75% of the monthly summary data are allocated to NAA 5 (South Coast), 23% to NAA 3 (Southeast Desert) and 2% to NAA 0 (i.e. outside any NAA, designated NAA = 0).

The original nonspatial data fractions were developed using 1990 Census and TIGER/Line data. TIGER/Line shapefiles are extracts of selected geographic and cartographic information from the U.S. Census Bureau’s Master Address File/Topologically Integrated Geographic Encoding and Referencing (MAF/TIGER) database (U.S. Census Bureau, 2012). The MAF/TIGER database contains geographic linear, areal, and point features such as streets, railroads, rivers, lakes, and landmarks (airports, schools, etc.). Geographic entity boundaries from the MAF/TIGER database are represented in the files, as well as the polygons that make up the legal and statistical geographic areas for which the Census Bureau tabulates data, and which can be directly linked to the Census data. Since the 1990s the populations of the counties that extend over one or more nonattainment area have increased considerably, from 10% in Los Angeles County to more than 100% in Placer County (Table 3). With increases in population come increases in housing, landscapes and transportation infrastructure and, as a result, structural, landscape and rights-of-way pesticide use.

Table 3. Changes in population from 1990 to 2010

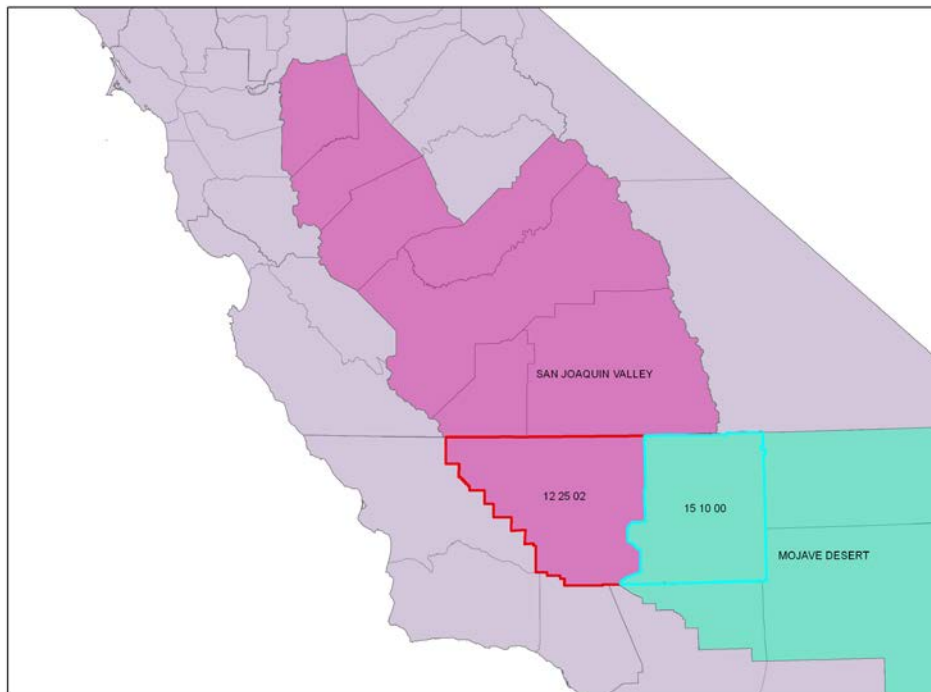
County	1990	2000	2010	1990 to 2000	2000 to 2010	% Change 1990 - 2010
Placer	172,796	248,399	348,432	75,603.0	100,033.0	101.6
Riverside	1,170,413	1,545,387	2,189,641	374,974.0	644,254.0	87.1
Kern	544,981	661,645	839,631	116,664.0	177,986.0	54.1
Sutter	64,415	78,930	94,737	14,515.0	15,807.0	47.1
El Dorado	125,995	156,299	181,058	30,304.0	24,759.0	43.7
San Bernardino	1,418,380	1,709,434	2,035,210	291,054.0	325,776.0	43.5
Sonoma	388,222	458,614	483,878	70,392.0	25,264.0	24.6
Solano	339,471	394,542	413,344	55,071.0	18,802.0	21.8
Los Angeles	8,863,052	9,519,338	9,818,605	656,286.0	299,267.0	10.8

PROPOSED MODIFICATIONS

Changes in “ABADNAA” designations

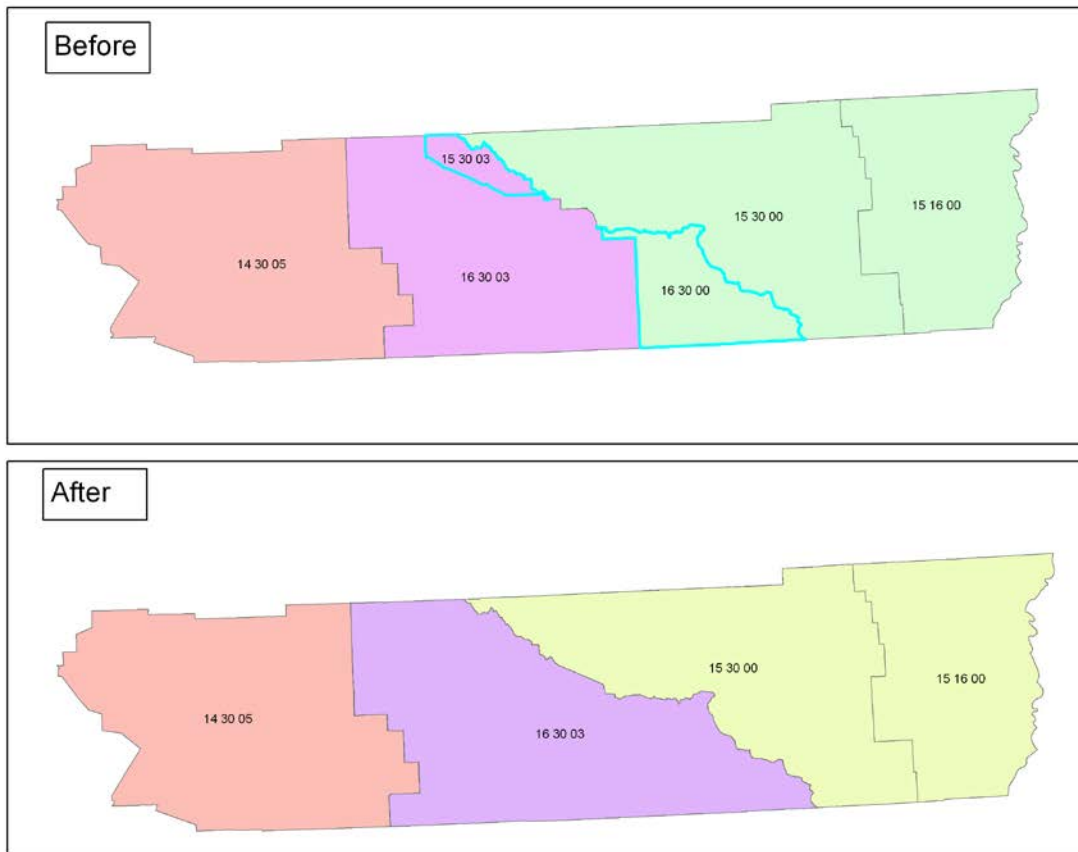
There are two areas where the historical administrative “abadnaa” designations and the revised Federal NAA boundaries used in the VOC Emissions Inventory differ.

Kern County – the “abadnaa” for the eastern portion of Kern County (15100215), which is located in the Mojave Desert Air Basin, has historically been included in NAA2, the San Joaquin Valley NAA. This area is no longer part of the San Joaquin Valley NAA (Electronic Code of Federal Regulations, 40CFR81.305), and so the “abadnaa” designation is changed to reflect this – 15100015.



abadnaa	Air Basin	Air District	NAA	CO
15100015	15 – Mojave Desert	10 – Kern	0 – Outside	15 - Kern

Riverside County - Riverside County was originally divided into six regions based on unique abadnaa designations. The realignment of the NAA boundaries to coincide with the boundary between the Mojave Desert air basin and the Salton Sea air basin now results in four unique abadnaa regions.



abadnaa	Air Basin	Air District	NAA	CO
14300533	14 - South Coast	30 - South Coast	5 - South Coast	33 - Riverside
15160033	15 - Mojave	16 - Mojave Desert	0 - Outside	33 - Riverside
15300033	15 - Mojave	30 - South Coast	0 - Outside	33 - Riverside
16300333	16 - Salton Sea	30 - South Coast	3 - Southeast Desert	33 - Riverside

Calculating the Fractions

U.S. Census data for the 2010 is a suitable surrogate data source for calculating the nonspatial data fractions because it provides consistent and detailed spatial data for all the target counties.

Commercial structural – Landscape maintenance (cslmfrac) – Historically, surrogate data for the *cslmfrac* has been calculated using the census tract attribute for housing units (HU100), which is defined as “The total number of housing units enumerated in the specified geographic entity as determined in the 100% processing” (U.S. Census Bureau, 2011). TIGER/Line shapefiles for census tracts together with the 2010 Census Demographic Profile Summary File for California were downloaded from the U.S. Census Bureau Web site. Using GIS, the proportion of housing units in each “abadnaa” area was determined by overlaying the NAA spatial data with the census tract spatial data. Where census tracts were split by the NAA boundary, the number of housing units allocated to each portion of the census tract were divided in direct relation to the geographic area of the census tract portions. For example if one third of the census tract was inside the NAA and two thirds were outside the NAA, the number of housing units within that tract would be partitioned 1:2. The *cslmfrac* was calculated for each “abadnaa” region as the proportion of the total number of housing units in the target county.

Table 4. Comparison of the original and updated cslmfrac fractions

County	ABADNAA Code	NAA	Original cslmfrac	Updated cslmfrac	Change
El Dorado	4050009	Outside	0.344717	0.271668	-0.073
El Dorado	5050109	Sacramento Metro	0.655283	0.728332	0.073
Kern	12250215	San Joaquin Valley	0.769538	0.819606	0.050
Kern	15100015	Outside	0.230462	0.180394	-0.050
Los Angeles	14300519	South Coast	0.973283	0.9639	-0.009
Los Angeles	15350319	Southeast Desert	0.026717	0.0361	0.009
Placer	4210031	Outside	0.149582	0.079307	-0.070
Placer	5210131	Sacramento Metro	0.21005	0.102694	-0.107
Placer	9210131	Sacramento Metro	0.640368	0.818	0.178
Riverside	14300533	South Coast	0.670282	0.713128	0.043
Riverside	15160033	Outside	0.013113	0.009695	-0.003
Riverside	15300033	Outside	0.000789	0.0007	0.000
Riverside*	16300333	Southeast Desert	0.31516	0.276477	-0.038*
San Bernardino	14300536	South Coast	0.755742	0.714263	-0.041
San Bernardino	15160036	Outside	0.019081	0.019474	0.000
San Bernardino	15160336	Southeast Desert	0.225177	0.266263	0.041
Solano	9340148	Sacramento Metro	0.282209	0.299214	0.017
Solano	11240048	Outside	0.717791	0.700786	-0.017
Sonoma	7200049	Outside	0.153376	0.150324	-0.003
Sonoma	11240049	Outside	0.846624	0.849676	0.003
Sutter	9060051	Outside	0.933772	0.960346	0.027
Sutter	9060151	Sacramento Metro	0.066228	0.039654	-0.027

*'1530333' + '1630033' are included in the change calculations for '1600333'

Rights-of-way (rowfrac) – TIGER/Line shapefiles for roads, rail roads and linear hydrography were downloaded from the U.S. Census Bureau Web site. MAF/TIGER (U.S. Census Bureau, 2012) feature class codes H3020 (canal, ditch or aqueduct); R1011, R1051, and R1052 (railroad features); and S1100 (primary roads), S1200 (secondary roads), s1400 (local neighborhood roads, rural roads and city streets), S1630 (ramps), S1640 (service drive along a limited access highway), S1780 (parking lot roads) and S2000 (road medians) were selected. Using GIS, the combined length of roadways, railroads, and waterways in each administrative “abadnaa” area was calculated and proportioned into each “abadnaa” region within each county listed in Table 5. The *rowfrac* was calculated for each “abadnaa” region as the proportion of the total length of the combined features in the target county.

Table 5. Comparison of the original and updated rowfrac fractions

County	ABADNAA Code	NAA	Original rowfrac	Updated rowfrac	Change
El Dorado	4050009	Outside	0.0669	0.091866	0.025
El Dorado	5050109	Sacramento Metro	0.9331	0.908134	-0.025
Kern	12250215	San Joaquin Valley	0.744	0.564564	-0.179
Kern	15100015	Outside	0.256	0.435436	0.179
Los Angeles	14300519	South Coast	0.7151	0.840942	0.126
Los Angeles	15350319	Southeast Desert	0.2849	0.159058	-0.126
Placer	4210031	Outside	0.0184	0.045243	0.027
Placer	5210131	Sacramento Metro	0.442	0.456398	0.014
Placer	9210131	Sacramento Metro	0.5396	0.498359	-0.041
Riverside	14300533	South Coast	0.3829	0.598162	0.215
Riverside	15160033	Outside	0.2415	0.088632	-0.153
Riverside	15300033	Outside	0.0832	0.054773	-0.028
Riverside	16300333	Southeast Desert	0.263	0.258433	-0.025
San Bernardino	14300536	South Coast	0.2077	0.223278	0.016
San Bernardino	15160036	Outside	0.3651	0.260853	-0.104
San Bernardino	15160336	Southeast Desert	0.4272	0.515869	0.089
Solano	9340148	Sacramento Metro	0.6446	0.525406	-0.119
Solano	11240048	Outside	0.3554	0.474594	0.119
Sonoma	7200049	Outside	0.5522	0.445727	-0.106
Sonoma	11240049	Outside	0.4478	0.554273	0.106
Sutter	9060051	Outside	0.6425	0.728163	0.086
Sutter	9060151	Sacramento Metro	0.3575	0.271837	-0.086

*'1530333' + '1630033' are included in the change calculations for '1600333'

Commodity fumigations (cfumfrac) – Each County Agricultural Commissioner of the target counties was provided with a map showing the location of the “abadnaa” regions, and asked to estimate the proportions of commodity fumigations within each of these regions based on local knowledge.

Table 6. Comparison of the original and updated cfumfrac fractions

County	ABADNAA Code	NAA	Original cfumfrac	Updated cfumfrac	Change
El Dorado	4050009	Outside	0	0	0
El Dorado	5050109	Sacramento Metro	1	1	0
Kern	12250215	San Joaquin Valley	1	1	0
Kern	15100015	Outside	0	0	0
Los Angeles	14300519	South Coast	1	1	0
Los Angeles	15350319	Southeast Desert	0	0	0
Placer	4210031	Outside	0	0	0
Placer	5210131	Sacramento Metro	0	0.1	0.1
Placer	9210131	Sacramento Metro	1	0.9	-0.1
Riverside	14300533	South Coast	0.4	0.25	-0.15
Riverside	15160033	Outside	0.2	0.25	0.05
Riverside	15300033	Outside	0	0	0
Riverside	16300333	Southeast Desert	0.4	0.5	0.1
San Bernardino	14300536	South Coast	1	1	0
San Bernardino	15160036	Outside	0	0	0
San Bernardino	15160336	Southeast Desert	0	0	0
Solano	9340148	Sacramento Metro	0.35	1	0.65
Solano	11240048	Outside	0.65	0	-0.65
Sonoma	7200049	Outside	0	0	0
Sonoma	11240049	Outside	1	1	0
Sutter	9060051	Outside	1	0.8	-0.2
Sutter	9060151	Sacramento Metro	0	0.2	0.2

Conclusion

This re-evaluation is now complete and these changes will be implemented in the 2011 VOC Inventory.

Citations

U.S. Census Bureau, 2012. TECHNICAL DOCUMENTATION: 2010 TIGER/Line Shapefiles Technical Documentation/prepared by the U.S. Census Bureau, 2012. Available at: <http://www.census.gov/geo/www/tiger/tgrshp2010/TGRSHP10SF1.pdf>.

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