SECTION 7.6

LIVESTOCK HUSBANDRY

(Revised May 2004)

EMISSION INVENTORY SOURCE CATEGORY
Miscellaneous Processes / Farming Operations

EMISSION INVENTORY CODES (CES CODES) AND DESCRIPTION

620-618-0262-0101 Livestock Husbandry – Dairy Cattle
620-618-0262-0102 Livestock Husbandry – Range Cattle
620-618-0262-0103 Livestock Husbandry – Feedlot Cattle
620-618-0262-0104 Livestock Husbandry – Poultry, Broilers
620-618-0262-0105 Livestock Husbandry – Poultry, Layers
620-618-0262-0106 Livestock Husbandry – Poultry, Turkeys
620-618-0262-0107 Livestock Husbandry – Swine
620-618-0262-0108 Livestock Husbandry – Sheep
620-618-0262-0109 Livestock Husbandry – Horses
620-618-0262-0110 Livestock Husbandry – Goats and Others

METHODS AND SOURCES

This method provides estimates of the 2000 total organic gas (TOG) and reactive organic gas (ROG) emissions produced by dairy cattle, range cattle, poultry, swine, sheep, goats, and horses. PM10 emissions from confined beef and dairy cattle operations are also estimated. The emissions from composting and land application of livestock wastes are not included in this methodology. For each category, the emissions are calculated by multiplying a per animal emission factor by the population of each animal type. The livestock emissions are provided by air district and county in Tables 1 and 2. Note that the previous version of this methodology, updated March 1989, only included the fugitive dust emission from beef cattle feedlots.

Population. Livestock emissions are assumed to be directly related to animal population. Most animal population data is based on annual sales data. For dairy cattle, range cattle, and feedlot cattle, year 2000 population was derived from the California Department of Food and Agriculture's (CDFA) summary of cattle and calves inventory of January 1, 2001[1]. The populations for other six categories are compiled by combining the 1997 Agricultural Census Data[2], developed by the United States Department of Agriculture, and the CDFA 2001 Agricultural Resources Directory. In addition, animal population was adjusted for residency time. This is needed because most livestock population data are based on annual sales data, but for emission estimates, it is important to approximate how many animals are present at a moment in time.

Due to variations in animal age, diet, housing, and waste management, animals within a single animal class have different emission potentials. To refine the emission estimates, the livestock populations were split into subcategories, which can then be assigned unique emission rates as they become available. The details of how livestock populations were estimated based on the CDFA data and census data are explained in the ARB background document of the population methodology[3]. The populations for each county are given in Table 3 and 4.

Emission Factors – ROG and TOG. Currently, there are not TOG or ROG emission factors for livestock that are based on recent or California specific test data. However, even in the absence of high quality emission factors, it is necessary to estimate livestock TOG and ROG emissions to meet regulatory requirements. The current emission estimates are intended as placeholders to help begin identifying the gross magnitudes of livestock air emissions.

To estimate the reactive portion of the total organic gas, a TOG to ROG scaling factor is needed. The current assumption is that 8% of the TOG is reactive, which is based on an undocumented livestock speciation profile published by U.S. EPA[6]. There is substantial disagreement and controversy about this assumption. Some believe that the number should be closer to 1%, similar to some other biological decomposition processes. However, limited testing at dairies in California shows ROG fractions that are both greater and less than 8%, depending on the sampling location and other conditions. The interim TOG and ROG emission factors are shown in the Table A below.

To improve the current emission factor and reactivity deficiencies, livestock emissions research is ongoing. It is anticipated that improved dairy emission rate data will be available in mid-2005, and updated poultry data in early 2005. New data will be incorporated as it becomes available. If additional information is needed regarding ongoing research efforts or specific issues regarding the current emission factors, substantial additional documentation is available through the ARB.

Table A. Livestock Subcategories and Emission Factors

Category	**Subcategory**	**Emission Factors[5,7,8]**		
		TOG (lb/head/ year)	**ROG[a]** (lb/head/ year)	**PM10** (lb/1000 head/ day)
Dairy Cattle	Dairy Cows, Dairy Bulls, Dairy Heifers, Dairy Calves	160[b]	12.8[b]	6.7[c]
Range Cattle	Beef Cows, Beef Bulls, Beef Heifers, Beef Calves, Stockers	160[b]	12.8	NA
Feedlot Cattle	Feeders	160	12.8	28.9
Swine	Swine	58	4.6	NA
Poultry	Turkey, Broilers, Layers	2.4	0.19	NA
Sheep	Sheep and Lamb	12	0.96	NA
Goats	Goats	12	0.96	NA
Horses	Horses	84	6.7	NA

[a]ROG = TOG x 8% for all sources.

[b]The same TOG and ROG emission factors are applied to all cattle subclasses.

[C]Dairy PM10 emission factor applied to producing dairy cows only because emissions from support animals are included in the factor.

Emission Factors – PM10. Livestock emission factors for PM10 are only available for cattle feedlots and dairies. The feedlot PM10 cattle emission factor is 28.9 lbs PM10/1000 head/day. This is from a study published by the University of California, Davis, during August 2001[7].

For dairy cattle, a PM10 emission factor of 6.72 lbs PM_{10}/1000 head/day for California dairies is used. This factor is derived from an emission factor of 4.4 lbs PM10/1000 lactating head/day, developed by Texas A&M[8]. To make the Texas emission factor more California specific, it was multiplied by a scaling factor. The scaling factor was based on the ratio of the California feedlot PM10 emission factor to a Texas feedlot PM10 emission factor. This ratio is 29:19, which converts to a multiplier of 1.53 and produces a dairy emission factor of 6.72 lbs PM_{10}/1000 head/day for California dairies. In addition, the dairy PM10 emission factor is only applied to the milking cows (the 'Cows' column in Table 3) because the emission factor includes the emissions from the support animals.

ASSUMPTIONS

- Population data and residence time data adequately represent average animal population values for each county
- For all livestock, 8% of the total organic gas is reactive
- All animals within a single class produce the same emissions (e.g., dairy cows, calves, and heifers each produce 160 lbs TOG/head/year)
- For cattle, the TOG emission factor is based on a chamber study performed in 1938. The study does not include the emissions from waste handling operations. For this analysis, it is assumed that the TOG emission factor for all animals includes all emission sources for each animal type including emissions directly from the animal, as well as waste handling operations.
- For cattle, the 1938 study measured methane emissions, which were later misquoted as TOG emissions. For this analysis, the measured methane emissions are assumed to equal the TOG emissions.
- It is assumed that all dairies or feedlots produce the same PM10 emissions on a per-head basis.
- For dairies, the baseline PM10 emission factor includes the effects of support stock such as calves and heifers. This is because the emissions testing included these animals within its analysis.
- For feedlots, the baseline PM10 emission factor represents the population mix at a typical feedlot.
- The method does not include emissions for animal waste composting or land application.

TEMPORAL ACTIVITY

The temporal activity is assumed to occur seven days a week and 24 hours a day. Due to insufficient temporal information, it is assumed that air emissions occur evenly throughout the year. This will be updated as new data becomes available.

Hours	Days	Weeks
24	7	52

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

COMMENTS AND RECOMMENDATIONS

This method lays the groundwork for substantially improved livestock emission estimates. The livestock categories are now split by animal type, assisting both industry and regulators in identifying the most significant livestock emission sources. Additional improvements are needed to create estimates that are more complete and more specific to animal types. To better understand dairy emissions, a multi-year research effort is underway that is coordinated by members of the regulatory community, industry, and academics. A similar effort is underway for the poultry industry.

As with any ARB area source methodology, the air districts have the flexibility to implement their own methodology, with the assumption that the district method uses information that better represents the local conditions and emission levels.

CHANGES IN METHOD AND EMISSION ESTIMATES

This is a new method. Previously, some districts estimated livestock emissions, but this was done inconsistently, and there is limited documentation regarding the methods used. New EICs (Emission Inventory Codes) were developed for each significant livestock classification, allowing emissions for each livestock classification to be individually stored in the statewide database. In addition, new statewide population estimates were developed for all livestock categories.

SUGGESTED GROWTH SURROGATES

The growth rate varies by county and by livestock and there is currently not a general surrogate to indicate the livestock growth or decline. In most cases, zero growth is assumed for livestock emissions, which is probably reasonable for most areas in the state. However, because of known dairy growth in the region, the ARB worked specifically with the San Joaquin Valley Unified Air Pollution Control District and the dairy industry to develop dairy growth profiles for the SJV counties.

There are no control assumptions applied to this category.

SAMPLE CALCULATIONS

To estimate TOG emissions from livestock husbandry in Fresno County, the following method is used:

Step 1: Population of subcategory. From Table 3 and 4, for Fresno county
Dairy cows population = 1,890,240

Step 2: Emission factor. From Table A.
Emission factor for Dairy Cows = 160 lbs TOG/head/year

Step 3: Emissions.
Emissions for Dairy Cows = Dairy cows population x Emission factor
= (1,890,240 x 160)/2000 = 151,219 tons/TOG/year

Step 4: Total Emissions. Repeat for each animal class and sum to get district total.

REFERENCES

1. California Department of Food and Agriculture, 2001 Agricultural Resource Directory. http://www.cdfa.ca.gov/card/card_new02.htm

2. United States Department of Agriculture, 1997 Agricultural Census. http://www.nass.usda.gov/census/

3. Hong Yu, Livestock Husbandry Background Document -- Livestock Population Methodology. December 2002.

4. U.S. Environmental Protection Agency, Emissions from Animal Feeding Operations (Draft). August 2001.

5. Dickson, Ronald J., Radian Corporation, Evaluation of Emissions From Selected Uninventoried Sources in the State of California, prepared for the California Air Resources Board, April 29, 1988, Section 5.0

6. U.S. EPA (1980) Volatile Organic Compound (VOC) Species Data Manual, Second Edition, EPA-450/4-80-015, July 1980

7. Sources and Sinks of PM_{10} in the San Joaquin Valley, Interim Report. Flocchini, R.G., James, T.A., et. al., August 10, 2001. Air Quality Group, Crocker Nuclear Laboratory, University of California, Davis. Table 6.1.

8. Preliminary PM10 Emission Factor for Freestall Dairies, Goodrich, L.B., Parnell, C.B., Mukhtar, S., Lacey, R.E., Shaw, B.W., Department of Biological and Agricultural Engineering, Texas A&M University, Paper presented to the 2002 ASAE Annual International Meeting, July 2002. Paper Number: 0242148

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Revisions
1/02/2003 – Population and emission tables updated to reflect reapportionment of population in South Coast and other regions with counties split by air basin or district lines.

5/5/2004 – Added PM10 estimates for dairies and feedlots.

11/15/2004 – In Sample Calculations section, corrected ROG to be TOG.

TABLE 1

Livestock Husbandry – 2000 Total Organic Gas Emissions

			TOG (tons/year)									
			Cattle			Poultry			Other			
Air Basin	District	County	Dairy		Feedlot	Broiler	Layer & Pullets	Turkey	Swine	Sheep	Horse	Goat
GBV	GBU	Alpine	32.9	287.1	0.0	0.0	0.0	0.0	0.0	0.0	3.7	0.0
GBV	GBU	Inyo	64.1	1,295.9	0.0	0.0	0.3	0.0	0.3	0.9	23.6	0.0
GBV	GBU	Mono	57.6	502.4	0.0	0.0	0.0	0.0	28.6	46.9	14.8	0.0
GBV Total			**154.6**	**2,085.4**	**0.0**	**0.0**	**0.4**	**0.0**	**28.9**	**47.9**	**42.1**	**0.0**
LC	LAK	Lake	57.6	502.4	0.0	0.1	7.5	0.0	3.3	6.7	23.3	1.1
LC Total			**57.6**	**502.4**	**0.0**	**0.1**	**7.5**	**0.0**	**3.3**	**6.7**	**23.3**	**1.1**
LT	ED	El Dorado	9.0	78.8	0.0	0.1	0.2	0.0	0.7	1.6	8.1	0.3
LT	PLA	Placer	44.1	163.9	0.0	0.1	0.3	13.4	0.8	2.0	10.0	0.3
LT Total			**53.1**	**242.7**	**0.0**	**0.2**	**0.5**	**13.4**	**1.4**	**3.5**	**18.1**	**0.6**
MC	AMA	Amador	737.3	2,382.7	0.0	0.1	17.3	0.0	1.2	7.0	35.3	4.1
MC	CAL	Calaveras	184.2	1,975.8	0.0	0.5	17.6	2.6	2.4	9.1	38.6	1.5
MC	ED	El Dorado	65.0	567.2	0.0	0.5	1.3	0.0	4.8	11.3	58.6	2.0
MC	MPA	Mariposa	340.7	1,499.3	0.0	1,984.5	17.5	62.8	28.6	2.3	31.8	0.9
MC	NSI	Nevada	36.2	683.8	0.0	0.1	0.8	0.0	2.3	7.6	37.0	0.9
MC	PLA	Placer	269.5	1,001.4	0.0	0.7	2.1	82.0	4.6	12.1	60.9	1.9
MC	NSI	Plumas	161.3	1,038.7	0.0	0.1	0.4	0.0	3.1	3.6	17.9	0.1
MC	NSI	Sierra	49.4	430.6	0.0	0.0	0.0	0.0	28.6	31.2	4.6	0.0
MC	TUO	Tuolumne	220.5	819.5	0.0	0.0	0.2	622.5	0.8	3.4	29.2	2.2
MC Total			**2,064.0**	**10,399.0**	**0.0**	**1,986.4**	**57.3**	**770.0**	**76.5**	**87.4**	**314.0**	**13.5**
MD	KER	Kern	0.0	566.5	254.6	0.0	0.0	0.0	0.0	93.6	14.3	0.1
MD	AV	Los Angeles	38.2	310.3	0.0	120.1	1.4	0.1	7.89	17.2	80.2	0.8
MD	MOJ	Riverside	67.8	349.7	0.0	0.0	44.7	0.0	0.2	44.4	87.7	1.0
MD	SC	Riverside	67.8	349.7	0.0	0.0	44.7	0.0	0.2	44.4	87.7	1.0
MD	MOJ	San Bernardino	415.1	2,759.6	0.0	16.9	68.9	0.6	6.6	99.9	147.2	6.4
MD Total			**588.9**	**4,335.8**	**254.6**	**136.9**	**159.7**	**0.7**	**15.0**	**299.5**	**417.1**	**9.2**
NC	NCU	Del Norte	209.0	351.0	0.0	0.0	0.2	0.0	28.6	0.6	1.4	0.0
NC	NCU	Humboldt	2,394.1	3,285.9	0.0	0.2	0.8	0.0	18.6	28.3	59.1	2.2
NC	MEN	Mendocino	413.1	1,946.9	0.0	0.3	2.8	32.9	41.9	72.3	62.7	1.5
NC	NS	Sonoma	2,470.8	1,559.7	0.0	1,814.7	551.2	115.5	14.7	81.2	105.9	5.1
NC	NCU	Trinity	3.3	396.7	0.0	0.0	0.6	0.0	1.4	1.0	11.6	0.9
NC Total			**5,490.2**	**7,540.2**	**0.0**	**1,815.2**	**555.5**	**148.5**	**105.2**	**183.3**	**240.8**	**9.7**
NCC	MBU	Monterey	2,884.8	6,235.2	0.0	0.1	3.2	0.0	11.1	10.8	66.2	4.9
NCC	MBU	San Benito	580.9	2,859.1	0.0	1,984.5	170.2	127.9	12.6	21.2	52.4	0.6
NCC	MBU	Santa Cruz	76.7	323.3	0.0	0.1	170.2	0.0	2.5	31.2	31.9	0.7
NCC Total			**3,542.4**	**9,417.6**	**0.0**	**1,984.7**	**343.6**	**127.9**	**26.2**	**63.2**	**150.5**	**6.2**
NEP	LAS	Lassen	381.6	3,698.4	0.0	0.4	0.7	28.8	8.2	13.2	58.9	0.9
NEP	MOD	Modoc	783.1	6,096.9	0.0	0.0	0.4	31.4	2.5	65.8	56.3	1.4
NEP	SIS	Siskiyou	513.3	4,846.7	0.0	0.2	1.1	0.0	47.7	23.6	72.0	0.1
NEP Total			**1,678.1**	**14,641.9**	**0.0**	**0.7**	**2.2**	**60.2**	**58.3**	**102.5**	**187.2**	**2.4**
SC	SC	Los Angeles	152.7	618.8	0.0	480.3	5.7	0.5	31.3	34.3	159.9	1.7
SC	SC	Orange	163.0	317.0	0.0	0.0	17.3	0.0	28.6	0.5	60.0	0.0
SC	SC	Riverside	13,290.8	460.3	0.0	0.6	8,759.6	0.1	47.4	58.5	115.4	1.3
SC	SC	San Bernardino	20,341.6	163.7	0.0	825.8	3,375.4	28.2	325.7	5.9	8.7	0.4
SC Total			**33,948.1**	**1,559.8**	**0.0**	**1,306.7**	**12,158.0**	**28.8**	**433.0**	**99.2**	**344.0**	**3.3**

			TOG (tons/year)									
			Cattle			Poultry			Other			
Air Basin	District	County	Dairy		Feedlot	Broiler	Layer & Pullets	Turkey	Swine	Sheep	Horse	Goat
SCC	SLO	San Luis Obispo	1,181.5	6,258.5	0.0	1.4	10.0	0.0	23.4	132.6	197.8	1.9
SCC	SB	Santa Barbara	1,156.4	4,043.6	0.0	0.1	187.4	0.0	4.7	64.3	221.2	0.6
SCC	VEN	Ventura	258.4	781.6	0.0	0.4	1,418.7	0.1	28.6	1.8	126.3	0.9
SCC Total			**2,596.3**	**11,083.7**	**0.0**	**1.9**	**1,616.0**	**0.2**	**56.7**	**198.7**	**545.3**	**3.3**
SD	SD	San Diego	1,189.6	1,130.4	0.0	249.4	3,289.9	0.2	36.4	6.2	342.6	3.1
SD Total			**1,189.6**	**1,130.4**	**0.0**	**249.4**	**3,289.9**	**0.2**	**36.4**	**6.2**	**342.6**	**3.1**
SF	BA	Alameda	289.6	1,790.4	0.0	398.0	0.4	0.0	2.3	7.6	81.6	1.4
SF	BA	Contra Costa	889.9	1,350.1	0.0	0.0	0.4	0.0	1.9	1.8	106.0	2.2
SF	BA	Marin	1,671.7	1,448.3	0.0	0.0	0.2	67.0	28.6	80.6	30.4	0.9
SF	BA	Napa	111.9	608.1	0.0	1,984.5	1.1	28.8	5.3	3.1	33.8	4.7
SF	BA	San Francisco	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
SF	BA	San Mateo	0.0	240.0	0.0	0.0	0.4	0.2	1.1	0.7	47.4	0.0
SF	BA	Santa Clara	191.5	1,408.5	0.0	0.1	170.3	0.0	4.6	4.4	118.2	0.8
SF	BA	Solano	268.4	618.5	0.0	0.1	0.5	0.0	1.8	172.5	29.0	0.4
SF	BA	Sonoma	1,599.7	1,009.8	0.0	1,174.9	356.8	74.8	9.5	52.6	68.6	3.3
SF Total			**5,022.6**	**8,473.8**	**0.0**	**3,557.6**	**530.1**	**170.9**	**55.2**	**323.3**	**515.0**	**13.7**
SJV	SJU	Fresno	20,762.4	2,671.4	8,566.1	14,615.3	559.7	2,255.1	175.6	211.3	159.4	13.7
SJV	SJU	Kern	9,789.5	5,098.3	2,291.2	0.1	170.3	0.1	46.2	842.2	129.1	0.8
SJV	SJU	Kings	13,448.3	551.7	0.0	2,186.8	60.5	1,154.9	28.6	31.2	25.4	5.3
SJV	SJU	Madera	5,866.8	2,110.4	1,462.8	1,048.2	1.1	942.6	8.0	61.8	97.1	0.5
SJV	SJU	Merced	25,133.8	7,586.2	0.0	1,984.5	1,680.1	1,845.2	183.8	91.2	61.6	3.9
SJV	SJU	San Joaquin	12,537.5	4,662.5	0.0	485.3	3,670.6	2.7	44.4	137.7	148.3	0.7
SJV	SJU	Stanislaus	23,248.6	6,072.9	5,318.5	14,627.3	3,628.9	1,884.8	517.8	16.0	145.5	10.0
SJV	SJU	Tulare	43,369.1	4,362.9	5,068.1	3,307.4	33.8	426.1	2,705.5	381.5	107.3	4.9
SJV Total			**154,156.1**	**33,116.2**	**22,706.7**	**38,254.8**	**9,805.0**	**8,511.4**	**3,710.0**	**1,772.9**	**873.7**	**39.8**
SS	IMP	Imperial	24,176.8	197.2	17,786.0	0.0	0.2	0.0	5.2	1,040.3	8.3	0.0
SS	SC	Riverside	135.6	478.3	0.0	0.0	89.4	0.0	0.5	60.8	119.9	1.3
SS Total			**24,312.5**	**675.5**	**17,786.0**	**0.0**	**89.5**	**0.0**	**5.7**	**1,101.0**	**128.2**	**1.3**
SV	BUT	Butte	275.2	1,244.8	0.0	0.9	2.3	0.1	159.1	14.0	48.3	0.3
SV	COL	Colusa	199.1	855.1	145.8	1,984.5	170.2	0.0	6.1	45.1	18.8	1.4
SV	GLE	Glenn	2,407.3	3,032.7	0.0	0.1	0.4	0.0	39.9	51.0	43.6	0.9
SV	PLA	Placer	127.5	473.7	0.0	0.3	1.0	38.8	2.2	5.7	28.8	0.9
SV	SAC	Sacramento	2,728.9	2,631.1	0.0	491.7	73.2	894.4	36.6	26.6	164.3	3.1
SV	SHA	Shasta	302.7	3,377.3	0.0	0.3	1.4	0.1	6.3	8.9	71.7	0.9
SV	YS	Solano	288.4	664.7	0.0	0.1	0.5	0.1	2.0	185.4	31.2	0.5
SV	FR	Sutter	187.6	532.4	0.0	0.0	0.5	2.6	6.3	96.7	21.1	0.0
SV	TEH	Tehama	1,357.8	4,962.2	0.0	0.3	1.0	31.4	10.6	40.9	89.8	0.9
SV	YS	Yolo	245.2	1,034.8	0.0	0.3	0.7	0.0	32.8	143.4	58.5	0.3
SV	FR	Yuba	1,258.6	1,621.4	0.0	1.3	0.6	0.0	16.2	6.9	32.5	0.2
SV Total			**9,378.3**	**20,430.1**	**145.8**	**2,479.9**	**251.9**	**967.6**	**318.2**	**624.5**	**608.7**	**9.2**

			Livestock TOG (tons/year)									
			Cattle			Poultry			Other			
Air Basin	District	County	Dairy		Feedlot	Broiler	Layer & Pullets	Turkey	Swine	Sheep	Horse	Goat
Grand Total			**244,232**	**125,635**	**40,893**	**51,774**	**28,867**	**10,800**	**4,930**	**4,920**	**4,751**	**116**

Fraction of Reactive Organic Gases (FROG): 0.08
Reactive Organic Gases (ROG) Emissions = TOG x FROG

TABLE 2

Livestock Husbandry – 2000 PM10 Emissions

Air Basin	District	County	PM10 (tons/year)	Feedlot
GBV	GBU	Alpine	0.0	0.0
GBV	GBU	Inyo	0.0	0.0
GBV	GBU	Mono	0.0	0.0
GBV Total			0.0	0.0
LC	LAK	Lake	0.0	0.0
LC Total			0.0	0.0
LT	ED	El Dorado	0.0	0.0
LT	PLA	Placer	0.0	0.0
LT Total			0.0	0.0
MC	AMA	Amador	0.0	0.0
MC	CAL	Calaveras	0.0	0.0
MC	ED	El Dorado	0.0	0.0
MC	MPA	Mariposa	0.0	0.0
MC	NSI	Nevada	0.0	0.0
MC	PLA	Placer	0.0	0.0
MC	NSI	Plumas	0.0	0.0
MC	NSI	Sierra	0.0	0.0
MC	TUO	Tuolumne	0.0	0.0
MC Total			0.0	0.0
MD	KER	Kern	0.0	16.8
MD	AV	Los Angeles	0.0	0.0
MD	MOJ	Riverside	0.7	0.0
MD	SC	Riverside	0.7	0.0
MD	MOJ	San Bernardino	4.2	0.0
MD Total			5.7	16.8
NC	NCU	Del Norte	0.0	0.0
NC	NCU	Humboldt	20.2	0.0
NC	MEN	Mendocino	0.0	0.0
NC	NS	Sonoma	23.8	0.0
NC	NCU	Trinity	0.0	0.0
NC Total			44.1	0.0
NCC	MBU	Monterey	3.7	0.0
NCC	MBU	San Benito	0.0	0.0
NCC	MBU	Santa Cruz	0.0	0.0
NCC Total			3.7	0.0
NEP	LAS	Lassen	0.0	0.0
NEP	MOD	Modoc	0.0	0.0
NEP	SIS	Siskiyou	0.0	0.0
NEP Total			0.0	0.0
SC	SC	Los Angeles	0.0	0.0
SC	SC	Orange	0.0	0.0
SC	SC	Riverside	145.4	0.0
SC	SC	San Bernardino	205.5	0.0
SC Total			350.9	0.0
SCC	SLO	San Luis Obispo	0.0	0.0
SCC	SB	Santa Barbara	3.7	0.0
SCC	VEN	Ventura	0.0	0.0
SCC Total			3.7	0.0

Air Basin	District	County	PM10 (tons/year)	Feedlot
SD	SD	San Diego	9.8	0.0
SD Total			9.8	0.0
SF	BA	Alameda	0.0	0.0
SF	BA	Contra Costa	3.7	0.0
SF	BA	Marin	14.7	0.0
SF	BA	Napa	0.0	0.0
SF	BA	San Francisco	0.0	0.0
SF	BA	San Mateo	0.0	0.0
SF	BA	Santa Clara	0.0	0.0
SF	BA	Solano	0.9	0.0
SF	BA	Sonoma	15.4	0.0
SF Total			34.7	0.0
SJV	SJU	Fresno	109.1	564.2
SJV	SJU	Kern	76.0	150.9
SJV	SJU	Kings	159.4	0.0
SJV	SJU	Madera	46.6	96.3
SJV	SJU	Merced	245.3	0.0
SJV	SJU	San Joaquin	117.7	0.0
SJV	SJU	Stanislaus	192.5	350.3
SJV	SJU	Tulare	439.1	333.8
SJV Total			1385.8	1495.5
SS	IMP	Imperial	0.0	1171.4
SS	SC	Riverside	1.5	0.0
SS Total			1.5	1171.4
SV	BUT	Butte	1.2	0.0
SV	COL	Colusa	0.0	9.6
SV	GLE	Glenn	20.2	0.0
SV	PLA	Placer	0.0	0.0
SV	SAC	Sacramento	22.1	0.0
SV	SHA	Shasta	0.0	0.0
SV	YS	Solano	1.0	0.0
SV	FR	Sutter	0.0	0.0
SV	TEH	Tehama	6.1	0.0
SV	YS	Yolo	0.0	0.0
SV	FR	Yuba	3.7	0.0
SV Total			54.3	9.6

Grand Total	1894.2	2693.2

PM10 = TSP x 0.4818

TABLE 3

Population Summary of Dairy Cattle, Range Cattle, and Feedlot Cattle for Year 2000

			Dairy Cattle						Range Cattle							
		ID #	Cows	Bulls	Pregnant Heifers		Calves	Total	Beef Cows		Beef Heifers	Beef Calves	Stockers	Beef Total	Feedlot	Total All
GBV	Alpine	2	0	0	0	138	274	411	2,000	90	359	837	303	3,589	0	4,000
GBV	Inyo	14	0	0	0	268	533	801	9,500	428	1,705	3,976	590	16,199	0	17,000
GBV	Mono	26	0	0	0	241	479	720	3,500	158	628	1,465	529	6,280	0	7,000
GBV	**Total**		0	0	0	647	1,286	1,932	15,000	676	2,692	6,277	1,422	26,068	0	28,000
LC	Lake	17	0	0	0	241	479	720	3,500	158	628	1,465	529	6,280	0	7,000
LC	**Total**		0	0	0	241	479	720	3,500	158	628	1,465	529	6,280	0	7,000
LT	El Dorado	9	0	0	0	38	75	113	549	25	99	230	83	985	0	1,098
LT	Placer	31	0	0	0	184	367	551	1,000	45	179	418	406	2,049	0	2,600
LT	**Total**		0	0	0	222	442	664	1,549	70	278	648	489	3,034	0	3,698
MC	Amador	3	0	0	0	3,084	6,133	9,217	14,000	631	2,513	5,859	6,780	29,783	0	39,000
MC	Calaveras	5	0	0	0	771	1,532	2,303	14,000	631	2,513	5,859	1,694	24,697	0	27,000
MC	El Dorado	9	0	0	0	272	541	813	3,951	178	709	1,653	598	7,089	0	7,902
MC	Mariposa	22	0	0	0	1,425	2,833	4,258	9,500	428	1,705	3,976	3,133	18,742	0	23,000
MC	Nevada	29	0	0	0	151	301	452	5,000	225	897	2,092	333	8,548	0	9,000
MC	Placer	31	0	0	0	1,127	2,241	3,369	6,110	276	1,097	2,557	2,478	12,517	0	15,886
MC	Plumas	32	0	0	0	674	1,341	2,016	7,000	316	1,256	2,929	1,483	12,984	0	15,000
MC	Sierra	46	0	0	0	206	410	617	3,000	135	538	1,255	454	5,383	0	6,000
MC	Tuolumne	55	0	0	0	922	1,834	2,757	5,000	225	897	2,092	2,028	10,243	0	13,000
MC	**Total**		0	0	0	8,633	17,167	25,800	67,561	3,047	12,126	28,273	18,980	129,988	0	155,788
MD	Kern	15	0	0	0	0	0	0	4,300	194	772	1,799	16	7,081	3,182	10,263
MD	Los Angeles	19	0	0	0	160	318	477	2,004	90	360	839	586	3,879	0	4,356
MD	Riverside	33	605	14	151	26	52	848	1,174	53	211	491	2,442	4,371	0	5,219
MD	Riverside	33	605	14	151	26	52	848	1,174	53	211	491	2,442	4,371	0	5,219
MD	San Bernardino	36	3,420	77	855	280	557	5,189	3,304	149	593	1,383	29,066	34,495	0	39,684
MD	**Total**		4,630	104	1,158	492	978	7,362	11,957	539	2,146	5,004	34,552	54,197	3,182	64,741
NC	Del Norte	8	0	0	0	874	1,739	2,613	1,500	68	269	628	1,922	4,387	0	7,000
NC	Humboldt	12	16,500	372	4,125	2,988	5,942	29,926	21,000	947	3,769	8,788	6,569	41,074	0	71,000
NC	Mendocino	23	0	0	0	1,728	3,436	5,163	12,500	564	2,244	5,231	3,798	24,337	0	29,500
NC	Sonoma	49	19,424	438	4,856	2,063	4,103	30,884	9,105	411	1,634	3,810	4,536	19,497	0	50,381
NC	Trinity	53	0	0	0	14	27	41	3,000	135	538	1,255	30	4,959	0	5,000
NC	**Total**		35,924	810	8,981	7,667	15,246	68,628	47,105	2,124	8,455	19,713	16,856	94,253	0	162,881
NCC	Monterey	27	3,000	68	750	10,789	21,453	36,060	33,000	1,488	5,923	13,810	23,719	77,940	0	114,000
NCC	San Benito	35	0	0	0	2,430	4,832	7,261	18,500	834	3,321	7,742	5,342	35,739	0	43,000
NCC	Santa Cruz	44	0	0	0	321	638	959	2,000	94	373	869	705	4,041	0	5,000
NCC	**Total**		3,000	68	750	13,539	26,923	44,280	53,500	2,416	9,616	22,421	29,766	117,720	0	162,000
NEP	Lassen	18	0	0	0	1,596	3,174	4,771	26,000	1,172	4,667	10,881	3,510	46,229	0	51,000
NEP	Modoc	25	0	0	0	3,276	6,514	9,789	42,000	1,894	7,538	17,576	7,202	76,211	0	86,000
NEP	Siskiyou	47	0	0	0	2,147	4,269	6,416	34,000	1,533	6,103	14,229	4,720	60,584	0	67,000
NEP	**Total**		0	0	0	7,019	13,957	20,976	102,000	4,600	18,308	42,686	15,431	183,024	0	204,000
SC	Los Angeles	19	0	0	0	639	1,270	1,909	3,996	180	717	1,672	1,169	7,735	0	9,644
SC	Orange	30	0	0	0	682	1,355	2,037	1,500	68	269	628	1,498	3,963	0	6,000
SC	Riverside	33	118,580	2,674	29,645	5,098	10,138	166,135	1,546	70	277	647	3,214	5,753	0	171,888
SC	San Bernardino	36	167,580	3,779	41,895	13,725	27,292	254,270	196	9	35	82	1,724	2,046	0	256,316
SC	**Total**		286,160	6,452	71,540	20,143	40,055	424,351	7,238	326	1,299	3,029	7,606	19,498	0	443,848
SCC	San Luis Obispo	40	0	0	0	4,942	9,827	14,769	41,000	1,849	7,359	17,158	10,865	78,231	0	93,000
SCC	Santa Barbara	42	3,000	68	750	3,559	7,078	14,455	26,000	1,172	4,667	10,881	7,825	50,545	0	65,000
SCC	Ventura	56	0	0	0	1,081	2,149	3,230	4,500	203	808	1,883	2,376	9,770	0	13,000
SCC	**Total**		3,000	68	750	9,582	19,054	32,454	71,500	3,224	12,833	29,922	21,067	138,546	0	171,000
SD	San Diego	37	8,000	180	2,000	1,569	3,120	14,870	6,500	293	1,167	2,720	3,450	14,130	0	29,000
SD	**Total**		8,000	180	2,000	1,569	3,120	14,870	6,500	293	1,167	2,720	3,450	14,130	0	29,000
SF	Alameda	1	0	0	0	1,211	2,409	3,620	12,000	541	2,154	5,022	2,663	22,380	0	26,000

			Dairy Cattle						Range Cattle							Total All
		ID #	Cows	Bulls	Pregnant Heifers		Calves	Total	Beef Cows		Beef Heifers	Beef Calves	Stockers	Beef Total	Feedlot	
SF	Contra Costa	7	3,000	68	750	2,445	4,861	11,124	7,000	316	1,256	2,929	5,375	16,876	0	28,000
SF	Marin	21	12,000	271	3,000	1,882	3,743	20,896	8,500	383	1,526	3,557	4,138	18,104	0	39,000
SF	Napa	28	0	0	0	468	931	1,399	4,000	180	718	1,674	1,029	7,601	0	9,000
SF	San Francisco	38	0	0	0	0	0	0	0	0	0	0	0	0	0	0
SF	San Mateo	41	0	0	0	0	0	0	2,000	70	279	651	0	3,000	0	3,000
SF	Santa Clara	43	0	0	0	801	1,593	2,394	9,500	445	1,771	4,129	1,761	17,606	0	20,000
SF	Solano	48	723	16	181	815	1,620	3,355	3,615	163	649	1,513	1,791	7,731	0	11,086
SF	Sonoma	49	12,576	284	3,144	1,336	2,657	19,996	5,895	266	1,058	2,467	2,937	12,623	0	32,619
SF	**Total**		28,299	638	7,075	8,958	17,813	62,783	52,510	2,364	9,411	21,942	19,694	105,922	0	168,705
SJV	Fresno	10	89,000	2,007	22,250	48,945	97,329	259,530	20,000	902	3,590	8,370	531	33,393	107,077	400,000
SJV	Kern	15	62,000	1,398	15,500	14,546	28,925	122,368	38,700	1,745	6,946	16,195	142	63,729	28,639	214,737
SJV	Kings	16	130,000	2,931	32,500	894	1,779	168,104	3,000	135	538	1,255	1,966	6,896	0	175,000
SJV	Madera	20	38,000	857	9,500	8,358	16,620	73,335	16,000	722	2,872	6,696	91	26,380	18,285	118,000
SJV	Merced	24	200,000	4,510	50,000	19,964	39,699	314,173	31,000	1,398	5,564	12,973	43,892	94,827	0	409,000
SJV	San Joaquin	39	96,000	2,165	24,000	11,562	22,992	156,719	20,000	902	3,590	8,370	25,420	58,281	0	215,000
SJV	Stanislaus	50	157,000	3,540	39,250	30,389	60,429	290,608	46,000	2,074	8,256	19,250	330	75,911	66,481	433,000
SJV	Tulare	54	358,000	8,072	89,500	28,958	57,584	542,113	33,000	1,488	5,923	13,810	314	54,536	63,351	660,000
SJV	**Total**		1,130,000	25,479	282,500	163,616	325,356	1,926,951	207,700	9,366	37,279	86,920	72,687	413,953	283,833	2,624,737
SS	Imperial	13	0	0	0	101,123	201,087	302,210	1,500	68	269	628	0	2,465	222,325	527,000
SS	Riverside	33	1,210	27	303	52	103	1,695	1,606	72	288	672	3,340	5,979	0	7,674
SS	**Total**		1,210	27	303	101,175	201,191	303,906	3,106	140	557	1,300	3,340	8,443	222,325	534,674
SV	Butte	4	1,000	23	250	725	1,442	3,440	8,500	383	1,526	3,557	1,594	15,560	0	19,000
SV	Colusa	6	0	0	0	833	1,656	2,489	6,500	293	1,167	2,720	9	10,689	1,822	15,000
SV	Glenn	11	16,500	372	4,125	3,043	6,051	30,091	19,000	857	3,410	7,951	6,690	37,909	0	68,000
SV	Placer	31	0	0	0	533	1,060	1,593	2,890	130	519	1,209	1,172	5,921	0	7,514
SV	Sacramento	34	18,000	406	4,500	3,749	7,456	34,111	15,000	676	2,692	6,277	8,243	32,889	0	67,000
SV	Shasta	45	0	0	0	1,266	2,517	3,783	24,000	1,082	4,308	10,044	2,783	42,217	0	46,000
SV	Solano	48	777	18	194	876	1,741	3,606	3,885	175	697	1,626	1,925	8,308	0	11,914
SV	Sutter	51	0	0	0	785	1,561	2,345	3,000	135	538	1,255	1,725	6,655	0	9,000
SV	Tehama	52	5,000	113	1,250	3,550	7,060	16,973	33,000	1,488	5,923	13,810	7,806	62,027	0	79,000
SV	Yolo	57	0	0	0	1,026	2,040	3,065	6,500	293	1,167	2,720	2,255	12,935	0	16,000
SV	Yuba	58	3,000	68	750	3,987	7,928	15,733	7,000	316	1,256	2,929	8,766	20,267	0	36,000
SV	**Total**		44,277	998	11,069	20,373	40,512	117,229	129,275	5,830	23,203	54,100	42,969	255,377	1,822	374,428

	Dairy Cattle						Range Cattle							Total All
Grand Total	Cows	Bulls	Pregnant Heifers	Young Heifers	Calves	Total	Beef Cows	Beef Bulls	Beef Heifers	Beef Calves	Stockers	Beef Total	Feedlot	
	1,544,500	**34,825**	**386,125**	**363,875**	**723,579**	**3,052,905**	**780,000**	**35,175**	**140,000**	**326,421**	**288,838**	**1,570,433**	**511,163**	**5,134,500**

TABLE 4

Population Summary of Swine, Poultry, Sheep, Goats, and Horses for 2000

			Poultry							
AB	County	ID #		Layer & Pullets	Turkey	Total Poultry	Swine	Sheep	Horse	Goat
GBV	Alpine	2	0	0	0	0	0	0	89	0
GBV	Inyo	14	0	287	0	287	10	154	562	0
GBV	Mono	26	0	28	0	28	987	7,824	352	0
GBV Total			0	315	0	315	997	7,978	1,003	0
LC	Lake	17	89	6,243	35	6,367	113	1,123	554	184
LC Total		0	89	6,243	35	6,367	113	1,123	554	184
LT	El Dorado	9	55	150	5	210	23	261	194	46
LT	Placer	31	91	289	11,190	11,570	26	329	237	53
LT Total			147	439	11,195	11,780	49	590	431	99
MC	Amador	3	98	14,417	0	14,516	42	1,162	841	677
MC	Calaveras	5	407	14,686	2,204	17,297	83	1,521	920	243
MC	El Dorado	9	398	1,076	35	1,510	165	1,879	1,396	328
MC	Mariposa	22	1,653,743	14,602	52,336	1,720,681	987	380	756	146
MC	Nevada	29	69	691	28	789	81	1,268	880	146
MC	Placer	31	557	1,766	68,373	70,695	159	2,012	1,451	324
MC	Plumas	32	66	341	11	418	107	593	427	9
MC	Sierra	46	0	23	0	23	987	5,197	110	0
MC	Tuolumne	55	19	168	518,717	518,903	26	558	696	374
MC Total			1,655,358	47,770	641,704	2,344,832	2,639	14,569	7,477	2,247
MD	Kern	15	0	0	0	0	0	15,597	342	15
MD	Los Angeles	19	100,065	1,193	99	101,357	270	2,869	1,909	140
MD	Riverside	33	5	74,486	1	74,492	17	14,806	4,175	317
MD	San Bernardino	36	14,045	57,405	480	71,929	229	16,647	3,505	1,065
MD Total			114,115	133,084	580	247,779	516	49,919	9,931	1,536
NC	Del Norte	8	0	152	0	152	987	100	33	0
NC	Humboldt	12	165	681	21	866	641	4,714	1,408	374
NC	Mendocino	23	272	2,304	27,429	30,005	1,446	12,042	1,494	253
NC	Sonoma	49	1,512,250	459,300	96,242	2,067,792	506	13,531	2,521	846
NC	Trinity	53	0	477	23	500	47	164	276	146
NC Total			1,512,687	462,913	123,716	2,099,316	3,627	30,551	5,732	1,618
NCC	Monterey	27	92	2,637	34	2,763	384	1,796	1,576	818
NCC	San Benito	35	1,653,743	141,856	106,568	1,902,167	434	3,537	1,247	94
NCC	Santa Cruz	44	83	141,856	8	141,947	85	5,197	760	121
NCC Total		0	1,653,918	286,349	106,610	2,046,877	903	10,529	3,583	1,033
NEP	Lassen	18	313	612	23,988	24,912	281	2,204	1,403	146
NEP	Modoc	25	34	319	26,162	26,515	85	10,961	1,340	228
NEP	Siskiyou	47	198	910	7	1,115	1,645	3,925	1,714	21
NEP Total			545	1,840	50,156	52,542	2,011	17,089	4,457	395
SC	Los Angeles	19	400,259	4,772	398	405,429	1,079	5,721	3,807	279
SC	Orange	30	0	14,388	0	14,388	987	86	1,429	0
SC	Riverside	33	491	7,299,653	109	7,300,253	1,634	9,744	2,748	209
SC	San Bernardino	36	688,208	2,812,826	23,500	3,524,534	11,230	988	208	63
SC Total			1,088,957	10,131,639	24,007	11,244,604	14,930	16,538	8,191	551

			Poultry							
AB	County	ID #		Layer & Pullets	Turkey	Total Poultry	Swine	Sheep	Horse	Goat
SCC	San Luis Obispo	40	1,134	8,298	29	9,462	808	22,101	4,710	312
SCC	Santa Barbara	42	107	156,131	34	156,271	161	10,720	5,266	97
SCC	Ventura	56	313	1,182,263	115	1,182,691	987	303	3,008	146
SCC Total		0	1,554	1,346,692	178	1,348,424	1,956	33,125	12,984	555
SD	San Diego	37	207,859	2,741,611	133	2,949,603	1,257	1,035	8,158	509
SD Total			207,859	2,741,611	133	2,949,603	1,257	1,035	8,158	509
SF	Alameda	1	331,655	318	8	331,981	80	1,268	1,943	228
SF	Contra Costa	7	24	343	0	366	65	299	2,523	374
SF	Marin	21	0	170	55,862	56,032	987	13,435	723	146
SF	Napa	28	1,653,743	920	24,034	1,678,697	184	520	805	782
SF	San Francisco	38	0	0	0	0	0	0	0	0
SF	San Mateo	41	0	353	169	522	38	109	1,129	0
SF	Santa Clara	43	113	141,897	23	142,034	157	742	2,815	136
SF	Solano	48	54	376	40	471	63	28,750	691	70
SF	Sonoma	49	979,101	297,372	62,312	1,338,785	327	8,761	1,633	547
SF Total			2,964,690	441,750	142,448	3,548,888	1,902	53,883	12,261	2,283
SJV	Fresno	10	12,179,422	466,446	1,879,251	14,525,118	6,055	35,210	3,795	2,290
SJV	Kern	15	93	141,926	120	142,139	1,593	140,370	3,074	131
SJV	Kings	16	1,822,301	50,456	962,397	2,835,154	987	5,197	604	877
SJV	Madera	20	873,471	885	785,475	1,659,831	277	10,302	2,313	82
SJV	Merced	24	1,653,743	1,400,055	1,537,664	4,591,461	6,337	15,201	1,467	654
SJV	San Joaquin	39	404,378	3,058,868	2,216	3,465,462	1,532	22,950	3,530	111
SJV	Stanislaus	50	12,189,388	3,024,069	1,570,665	16,784,122	17,855	2,669	3,464	1,670
SJV	Tulare	54	2,756,185	28,141	355,086	3,139,412	93,293	63,581	2,555	819
SJV Total			31,878,980	8,170,846	7,092,873	47,142,699	127,929	295,479	20,802	6,634
SS	Imperial	13	0	128	0	128	180	173,377	198	0
SS	Riverside	33	5	74,486	1	74,492	17	10,125	2,855	217
SS Total			5	74,614	1	74,620	196	183,502	3,053	217
SV	Butte	4	778	1,929	43	2,750	5,487	2,331	1,150	54
SV	Colusa	6	1,653,743	141,856	6	1,795,604	210	7,513	448	228
SV	Glenn	11	55	361	40	455	1,376	8,496	1,039	145
SV	Placer	31	264	835	32,340	33,439	75	952	686	153
SV	Sacramento	34	409,736	61,013	745,367	1,216,115	1,262	4,433	3,913	519
SV	Shasta	45	279	1,189	99	1,568	219	1,482	1,708	146
SV	Solano	48	58	404	43	506	68	30,898	742	76
SV	Sutter	51	26	436	2,204	2,666	216	16,114	503	0
SV	Tehama	52	287	846	26,162	27,295	367	6,821	2,138	146
SV	Yolo	57	210	552	37	798	1,133	23,898	1,392	46
SV	Yuba	58	1,116	475	21	1,613	560	1,150	773	25
SV Total			2,066,550	209,895	806,363	3,082,809	10,973	104,088	14,492	1,537

	Poultry							
Grand Totals		Layer & Pullets	Turkey	Total Poultry	Swine	Sheep	Horse	Goat
	43,145,455	24,056,000	9,000,000	76,201,455	170,000	820,000	113,110	19,397