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Development of an Improved Inventory of Emissions from Pleasure Craft in California

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Sincerely,

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An updated emissions inventory for California pleasure craft covers total organic gases (TOG), Nox, CO, SOx, and particulate matter (PM). A survey of over 10,000 pleasure craft owners from June 1993 to May 1994 ascertained spatial and temporal utilization of pleasure craft and collected updated consumption rates. Owners were randomly selected from Department of Motor Vehicles records, and response was near 50 percent. Annual fuel consumption is estimated for vessels by propulsion/engine combinations by region (Northern, Central, and Southern). From these, regional and county-level emissions are estimated using a model (PCEM) that includes emission estimates from DMV-registered vessels, Coast Guard-documented vessels, and rental vessels. Fuel consumption is multiplied by emission factors for each propulsion/engine type and allocated to counties with spatial allocation factors developed from the survey data. Temporal activity profiles are derived from the survey data. Results suggest that 1993-1994 NOx, TOG, and SOx pleasure craft emissions inventories be decreased from 1990 CARB inventory values by about 45, 18, and 35 percent respectively and that CO and PM inventories be increased by 3 and 100 percent respectively. These differences reflect updated emission factors and fuel consumption. An average annual fuel consumption rate of 77.5 gallons per vessel is estimated.

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Development of an Improved Inventory of Emissions from Pleasure Craft in California

Final Report

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ABSTRACT

In order to improve estimates of emissions from pleasure craft in California, the California Air Resources Board (CARB) retained the services of Systems Applications International (SAI) and Freeman, Sullivan & Company (FSC) to develop a bottom-up emissions inventory for these vessels. The objective of this study is to update the current emission inventory of total organic gases (TOG), nitrogen oxides (NO_x), carbon monoxide (CO), sulfur oxides (SO_x), and particulate matter (PM). The inventory developed during this study is based on a statewide survey of pleasure craft vessel owners that was conducted during a one-year period from June 1993 to May 1994. The survey was designed to ascertain the spatial and temporal distribution of utilization of pleasure craft in California, as well as to collect updated consumption rates for vessels.

Over 10,000 surveys were sent to randomly selected owners of motorized pleasure craft registered with the California Department of Motor Vehicles (DMV). The overall response rate from the survey was close to 50 percent. Of the surveys returned, approximately 40 percent of the vessels were used in the Peak (June–August) and Ozone (April–September) seasons, and 11 percent in the Winter season (October–March). During the winter time, owners of vessels were contacted in the Southern region only.

To generate the updated pleasure craft emissions inventory, the survey results were used to estimate the annual fuel consumption for vessels by propulsion–engine combinations on a regional basis (Northern, Central, and Southern). The annual fuel consumption per region is then used to estimate the regional and county-level emissions using an emissions model developed for this study, PCEM (Pleasure Craft Emissions Model). This model includes emission estimates from vessels registered with the DMV, vessels documented with the Coast Guard, and rental vessels. The fuel consumption is then multiplied by the appropriate emission factor for each propulsion–engine type and allocated to the county level with spatial allocation factors developed from the survey data. Temporal (seasonal, weekly, and diurnal) profiles associated with pleasure craft are provided in this report based on the survey data.

The estimates in this study suggest that 1993–1994 NO_x, TOG, and SO_x emissions inventories for this category be decreased from the values included in the 1990 CARB inventory by about 45, 18, and 85 percent, respectively, while CO and PM inventories should be increased by 3 and 100 percent respectively. These differences occur because of the use of updated emission factors and fuel consumption. An average annual fuel consumption rate of 77.5 gallons per vessel is estimated in this study.

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This report was submitted in fulfillment of contract A132-184, "Development of an Improved Inventory of Emissions from Pleasure Craft in California," by Systems Applications International, a division of ICF Kaiser International, Inc., under the sponsorship of the California Air Resources Board. Work was completed as of February 10, 1995.

Disclaimer

The statements and conclusions in this report are those of the contractor and not necessarily those of the California Air Resources Board. The mention of commercial products, their sources or their use in connection with material reported herein is not to be construed as actual or implied endorsement of such products.

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SUMMARY AND CONCLUSIONS

The California Air Resources Board (CARB) is required to inventory air pollutants emitted from stationary and mobile sources throughout California. Accurate assessment of activity levels and usage patterns is essential to developing an emission inventory for a given source category. The objective of this study is to develop an improved inventory for one of these source categories: recreational pleasure craft. For pleasure craft, that entails making an accurate assessment of the frequency of boat usage in each county, and determining the fuel consumption patterns related to such boating activity. An extensive survey was conducted to determine activity and usage for pleasure craft in California. Previous to this study, the most recent detailed account of boating activity data in California is the 1973 study titled *Boating Resources Development Planning* (DENOD, 1973). Studies conducted since then have merely projected these data from the 1973 levels using scaling factors.

Survey

The statewide survey of over 10,000 registered boat owners in California was conducted over a one-year period (June 1993 through May 1994). The purpose of the survey was to evaluate the spatial and temporal variation in utilization of pleasure craft in California. The survey targeted private owners of pleasure craft registered with the California Department of Motor Vehicles (DMV).

To account for temporal variations throughout the year and by geographical region, the survey was designed with three time periods, Winter, Ozone, and Peak; the state was divided into three regions: Northern, Southern, and Central. Independent samples of registered boat owners within these three regions were drawn for *each* of the three seasons and regions. The sample was distributed over the entire calendar year with random mailings of questionnaires every two weeks in each of the three regions. A smaller sample size was used for the less critical Winter season (October through March) with six monthly rather than biweekly mailings. Only the South region was sampled in the Winter season because of the minimal boat usage in the North and Central regions during these months. Winter usage in the Northern and Central regions was estimated based on the percent reduction in usage in the Southern region and applied to the ozone season usage in the Northern and Central regions.[1]

A total of 10,844 survey packets and reminders were sent to boat owners with an adjusted response rate of 49 percent. The Ozone and Winter mailings have adjusted response rates of 56 and 55 percent, respectively; the Peak mailing has an adjusted response rate of 46 percent. The adjusted response rates by region are 51 percent in the North and 48 percent in both the Central and South. The precision associated with the

[1] Note that even though the percent reduction in usage is equal for all three regions in the winter season, the total fuel consumption (and emissions) is much less for the Central and Northern regions compared to the Southern region.

fuel usage estimates from the survey range from about ±6 percent for the Peak and Ozone seasons to ±11 percent for the Winter season (at a 95 percent confidence level).

A study of nonresponders was conducted to determine if those that returned their questionnaires differ in any way from those who did not return a questionnaire. The study used a sample of the peak season nonresponders who had not returned a questionnaire. Of the boat owners contacted, 45 percent completed the full telephone interview about their boat usage. Analysis comparing the proportion of boat users among these nonresponders to the proportion of users among those that did respond showed no statistical differences within any of the three regions or statewide.

Emission Inventory

Pleasure craft emissions in California are estimated using an emissions model developed for this study. The model is called PCEM (Pleasure Craft Emissions Model). Features of the model include user-specified input parameters and standard reports. The user-specified input parameters include:

Fuel consumption by region and engine-propulsion type. The results of the survey are used to generate the fuel consumption quantities used by PCEM.

Emission factors by engine type. The emission factors included in the model are based on data provided by the National Marine Manufacturing Association (Morgan, 1992).

In-use adjustment factors by pollutant and engine type. The model uses the same factors as the EPA *Nonroad Engine and Vehicle Emissions Study* (EPA, 1991).

Seasonal adjustment factor to apportion annual emissions to ozone season emissions. This factor is estimated based on the survey data.

Spatial allocation factors to adjust regional population and fuel consumption to the county level. These factors are developed based on the survey data.

Vessel population by region and engine-propulsion type. The population quantities are based on the DMV and survey data.

Fuel usage adjustment factors for documented and rental vessels by engine type. To account for Coast Guard documented and rental vessels, adjustment factors are estimated based on data in the *National Recreational Boating Survey*.

PCEM generates three standard reports, including emissions by county and engine-propulsion type for an annual and ozone average day. The reports include emissions of TOG (including refueling, evaporative, and crankcase operations), NO_x, SO_x, PM, and CO. PCEM generates one other report, summarizing emissions by county and average emissions.

Table 1 summarizes the fuel consumption, number of vessels boating in a county, annual emissions (tons per year) and average emissions (pounds per 1000 gallons) by county.

TABLE 1. Annual emissions (ton/yr) and average emission factors (lb/1000 gal) by county.[1]

			Annual Emissions (Tons / year)					Average Emissions (lb./1000 gal)				
	Fuel Use 1000 gal	# of Boats *	NOx	CO	SOx	PM	TOG	NOx	CO	SOX	PM	TOG
Alameda	701.3	7308	28.8	1777.9	0.7	12.2	332.6	82.1	5070.5	2.0	34.9	948.4
Alpine	94.5	969	3.9	239.8	0.1E+00	1.6	43.6	83.3	5077.8	2.0	33.6	923.9
Amador	317.2	4139	10.1	784.7	0.3	9.0	215.6	63.6	4948.1	2.0	56.5	1359.5
Butte	538.6	7138	17.6	1347.7	0.5	13.3	332.7	65.3	5004.6	1.9	49.3	1235.5
Calaveras	982.6	14729	24.6	2386.8	1.0	35.6	816.7	50.0	4857.9	2.0	72.5	1662.2
Colusa	71.0	1166	1.4	170.1	0.7E-01	3.0	67.0	39.9	4791.1	1.9	84.3	1886.4
Contra Costa	1813.9	16614	82.6	4651.9	1.8	22.3	681.2	91.0	5129.3	2.0	24.5	751.1
Del Norte	61.3	628	2.6	160.3	0.6E-01	0.8	23.5	83.6	5231.2	1.9	24.5	767.4
El Dorado	1356.2	11791	64.0	3492.9	1.4	14.1	460.1	94.3	5150.9	2.0	20.7	678.5
Fresno	771.5	9114	27.9	1931.0	0.8	17.9	449.7	72.3	5005.7	2.0	46.4	1165.9
Glenn	54.4	1004	0.9	125.5	0.5E-01	2.5	55.5	33.7	4614.7	1.9	91.9	2040.8
Humboldt	86.0	1416	2.0	204.7	0.8E-01	3.3	74.6	45.6	4762.1	1.9	75.8	1736.4
Imperial	456.8	3723	24.4	1159.9	0.5	2.9	116.8	106.8	5078.8	2.2	12.7	511.5
Inyo	13.3	202	0.3	32.2	0.1E-01	0.5	11.2	48.7	4849.2	2.0	74.0	1691.4
Kern	824.5	7892	39.1	2075.4	0.9	10.4	314.1	95.0	5034.1	2.1	25.1	761.8
Kings	12.1	179	0.3	29.4	0.1E-01	0.4	9.9	51.4	4867.1	2.0	70.8	1631.5
Lake	2041.2	18726	92.8	5234.2	2.1	25.2	768.9	90.9	5128.6	2.0	24.7	753.4
Lassen	187.0	3189	3.9	441.3	0.2	7.5	170.8	42.1	4718.4	1.9	80.6	1826.8
Los Angeles	9350.4	107769	368.0	23248.7	9.7	197.6	5170.2	78.7	4972.8	2.1	42.3	1105.9
Madera	840.4	8442	35.6	2137.8	0.9	13.4	373.9	84.8	5088.0	2.0	31.8	889.8
Marin	1002.9	14127	28.3	2457.2	1.0	32.6	762.8	56.3	4900.0	2.0	65.0	1521.1
Mariposa	550.1	8828	11.7	1322.5	0.5	22.3	502.8	42.5	4808.5	1.9	81.2	1828.0
Mendicino	516.2	6072	18.8	1292.6	0.5	11.9	298.9	72.7	5008.0	2.0	46.0	1158.2
Merced	104.0	1932	1.3	243.9	0.1E+00	5.3	115.5	24.8	4691.1	1.9	101.9	2222.3
Modoc	0.9	17	0.3E-01	2.2	0.8E-03	0.2E-01	0.4	73.6	5107.8	1.9	38.0	1022.3
Mono	27.4	471	0.5	65.1	0.3E-01	1.2	27.5	34.5	4755.8	1.9	90.5	2005.0
Monterey	1354.8	16034	48.9	3390.1	1.4	31.5	792.1	72.2	5004.7	2.0	46.5	1169.4
Napa	1059.0	10365	45.9	2700.6	1.1	15.7	449.7	86.6	5100.0	2.0	29.7	849.2
Nevada	554.6	7910	16.4	1366.6	0.5	16.0	386.2	59.1	4928.4	1.9	57.6	1392.9
Orange	5712.4	52952	278.4	14405.6	6.1	64.2	2023.8	97.5	5043.6	2.1	22.5	708.6
Placer	2413.2	22031	110.1	6190.6	2.5	29.3	900.7	91.2	5130.6	2.0	24.3	746.5
Plumas	462.9	5956	15.7	1165.1	0.4	10.7	272.0	67.6	5033.8	1.9	46.1	1175.2
Riverside	1926.7	19093	88.8	4839.3	2.0	27.1	791.2	92.2	5023.5	2.1	28.1	821.3
Sacramento	2334.6	19436	113.1	6032.7	2.4	20.7	724.7	96.9	5168.1	2.0	17.7	620.8
San Benito	5.4	52	0.2	13.8	0.5E-02	0.7E-01	2.2	88.8	5114.4	2.0	27.2	801.2
San Bernardino	6274.5	73405	242.5	15583.7	6.5	137.3	3565.2	77.3	4967.3	2.1	43.8	1136.4
San Diego	7500.3	71457	357.5	18883.9	8.0	92.8	2827.3	95.3	5035.5	2.1	24.7	753.9
San Francisco	761.1	8731	28.4	1911.0	0.8	16.6	423.3	74.8	5021.7	2.0	43.5	1112.4
San Joaquin	3172.8	28145	147.6	8158.5	3.2	35.2	1120.0	93.1	5142.7	2.0	22.2	706.0
San Luis Obispo	705.7	9338	22.8	1735.7	0.7	20.2	496.3	[illegible]	4919.2	2.0	57.2	1406.7

Continued

[1] The fuel usage, annual emissions, and average emission factors include registered, documented, and rental vessels. The number of boats only includes registered vessels. The TOG emissions are exhaust only.

TABLE 1. Concluded.

			Annual Emissions (Tons / year)					Average Emissions (lb./1000 gal)				
	Fuel Use 1000 gal	# of Boats *	NOx	CO	SOx	PM	TOG	NOx	CO	SOX	PM	TOG
San Mateo	378.6	5516	10.0	923.4	0.4	13.1	302.3	52.9	4877.5	2.0	69.0	1596.6
Santa Barbara	227.2	3318	6.0	553.9	0.2	7.9	187.3	53.1	4876.0	2.0	69.2	1648.5
Santa Clara	733.6	5423	38.0	1911.4	0.8	3.7	174.2	103.5	5211.5	2.1	10.0	475.1
Santa Cruz	89.9	917	3.8	228.4	0.9E-01	1.5	41.1	83.7	5080.5	2.0	33.2	914.9
Shasta	1981.8	23182	74.1	5075.5	1.9	36.1	984.1	74.8	5122.0	1.9	36.4	993.1
Sierra	234.1	3741	5.0	563.2	0.2	9.4	212.7	43.0	4811.7	1.9	80.6	1817.4
Siskiyou	48.6	876	0.9	112.8	0.5E-01	2.1	48.0	36.3	4646.3	1.9	88.5	1975.6
Solano	1237.6	16395	38.5	3056.1	1.2	36.0	860.2	62.2	4938.9	2.0	58.2	1390.1
Sonoma	1304.1	12928	55.9	3321.7	1.3	20.0	566.6	85.7	5094.2	2.0	30.7	869.0
Stanislaus	299.9	4122	8.8	737.0	0.3	9.3	220.1	58.7	4915.7	2.0	62.3	1468.2
Sutter	32.4	246	1.7	84.4	0.3E-01	0.2	8.2	102.1	5202.6	2.1	11.6	505.1
Tehema	77.4	1216	1.9	186.6	0.7E-01	2.7	62.6	50.3	4819.7	1.9	69.5	1617.5
Trinity	312.7	5209	7.0	742.4	0.3	12.1	276.1	44.5	4747.9	1.9	77.4	1765.8
Tulare	665.1	5769	31.4	1713.4	0.7	6.8	224.5	94.5	5151.9	2.0	20.6	675.2
Tuolumne	2351.5	20431	110.9	6056.5	2.4	24.3	796.6	94.3	5151.2	2.0	20.7	677.6
Ventura	1387.8	13454	65.2	3490.6	1.5	18.2	543.6	93.9	5030.3	2.1	26.2	783.4
Yolo	522.5	5095	22.7	1332.9	0.5	7.7	220.4	86.9	5101.8	2.0	29.4	843.5
Yuba	798.6	9322	29.9	2045.9	0.8	14.5	395.1	74.9	5123.8	1.9	36.3	989.4
Total	69697.0	739681	2919.2	175529.5	71.5	1209.6	33095.0	83.8	5036.9	2.1	34.7	949.7

*NOTE: Number of boats does not include Rental Boats or Documented Vessels.

*NOTE: No fuel usage reported for gasoline-powered "Other" vessels in Central region. (8434 boats)

*NOTE: No fuel usage reported for diesel-powered "Other" vessels in Southern region. (399 boats)

*NOTE: No fuel usage reported for diesel-powered "Outboard" vessels in Southern region. (102 boats)

The total statewide annual fuel consumption estimated in this study, 69,697,000 gallons,is about half of that estimated by the CARB. The CARB estimate is projected from the 1973 DENOD study. The quantity estimated in this study corresponds well to that estimated in the *National Recreational Boating Survey*, which is 72,297,000 (±10.5 percent) gallons. The average fuel consumption per boat is estimated at 77 gallons per boat in the *National Recreational Boating Survey* and 77.5 gallons in this study (this average includes only the DMV data). Since the total and average fuel consumption data correspond well between these two more recent studies, it is assumed that fuel consumption was overestimated for the 1990 CARB inventory.

The notes at the end of Table 1 indicate that survey data with activity were not received for three engine-propulsion combinations: gasoline-powered "other" vessels in the Central region, diesel-powered "other" vessels in the Southern region, and diesel-powered outboards in the Southern region. For example, there are 102 diesel-powered outboards registered with the DMV in the Southern regions. Of these 102 vessels, none of the owners responded during the survey that they had used their boats during the two-week sampling period. For this reason, the activity by county associated with these boats could not be included in the inventory. Furthermore, the number of vessels associated with these three engine-propulsion combinations were not included in the county-level estimates. The three engine-propulsion combinations listed in the notes in Table 1 account for about one percent of the total vessel population.

Table 2 compares the annual emissions estimated in this study with the CARB's 1990 inventory. Differences in total emissions occur because of the updated emission factors and fuel consumption estimated in this study. The emission factors used by the CARB for the 1990 inventory are based on AP-42 factors and do not include in-use effects. Overall, NO_x, TOG, and SO_x emissions decrease by about 45, 18, and 85 percent, respectively, while CO and PM increase by about 3 and 100 percent compared to the 1990 inventory.

Based on the survey data, temporal profiles are generated for monthly, weekly, and diurnal activity. Plots of the profiles are included in Section 3 of this report.

TABLE 2. Comparison of statewide annual emission estimates between the current updated inventory and those generated in 1990 by the CARB.

Source	Fuel 1000 gal	Annual Emissions (tons per year)				
		NO_x	TOG[a]	CO	SO_x	PM
Current	69,697	2,919	34,113	175,530	72	1,210
1990 CARB	125,834	5,299	41,278	171,157	476	605

[a] Includes exhaust, evaporative, crank, and refueling.

RECOMMENDATIONS

The fuel consumption data obtained in the survey were adjusted to account for populations not included in the sample frame. These populations include rental vessels and vessels documented with the United States Coast Guard. A previous study was used to estimate fuel consumption for these populations (USCG, 1992). Better estimates of fuel consumption, as well as temporal and spatial information, could be collected for these vessels using a methodology similar to that for the DMV data and incorporated into PCEM.

For rentals, a survey could target owners of businesses that rent vessels. The rental survey could be conducted over a shorter time frame than the DMV survey, since owners of these operations may have records on fuel usage for an entire year. Ideally, this survey would be conducted during the summer when most of these businesses operate. For documented vessels, a survey similar to the DMV survey could also be conducted. This survey would require a longer time frame to account for variations in seasonal usage. However, the survey could be modified to focus on usage of larger vessels in the coastal waterways.

1 INTRODUCTION

Boating on lakes, rivers, and in coastal areas is a popular recreational sport in California. Because of the large number of California waterways available for boating activities, emissions from pleasure craft are significant. Emissions from these sources may be of particular concern to a county trying to attain air quality standards. For this reason, the California Air Resources Board (CARB) contracted with Systems Applications International (SAI) to develop an improved emission inventory for pleasure craft in California. Pleasure craft include vessels with inboard engines, outboard engines, sterndrive (also called inboard/outboard) engines, sailboats with auxiliary inboard or outboard engines, personal watercraft such as jet skis, and other noncommercial watercraft. Pleasure craft use both 2- and 4-stroke gasoline and diesel engines.

The objectives of this study included the following:

- Review methodologies currently used by the CARB and other agencies to estimate emissions of criteria pollutants from pleasure watercraft. Suggestions for changes to this methodology were to be integrated into a revised methodology used to improve the current inventory.

- Develop more accurate estimates of vessel population and usage, including spatial and temporal variations in usage patterns.

- Apply information collected in the study to develop an improved inventory of total organic gases (TOG), nitrogen oxides (NO_x), carbon monoxide (CO), sulfur oxides (SO_x), and particulate matter (PM) emissions from pleasure craft.

During its review of the methods currently used to estimate pleasure craft emissions in California, SAI was approached by the National Marine Manufacturers Association (NMMA) regarding the proposed work and its relation to recent studies conducted by the NMMA in association with the EPA and the State of Wisconsin. The NMMA suggested that the survey methodology employed in the Wisconsin study be carefully reviewed by the project team, as it could provide valuable suggestions for improving the current inventory, and it agreed to provide additional funding to this study for the survey to be expanded.

SAI and Freeman, Sullivan & Company (FSC), members of the project team that performed the survey portion of this effort, reviewed the NMMA's suggestions and integrated this information into an improved survey methodology. The expanded survey greatly modified the methodology from that originally proposed by SAI in March 1992 (e.g., survey of 500 boat marinas).

In summary, the revised approach used in this study consists of the following:

- A random mail survey was conducted of vessels registered with the California Department of Motor Vehicles (DMV). The goals of the survey were to obtain fuel consumption (gallons per vessel) and the usage patterns (e.g., where and when vessel was used) associated with the vessel. The sample size of the survey was chosen to ensure that the survey population on a regional basis was statistically representative of the entire vessel population for that region.

- Adjustments to the fuel consumption obtained in the survey were made to account for populations not included in the sample frame. These populations include rentals and vessels documented with the U.S. Coast Guard. A recent study was used to estimate fuel consumption for these populations (USCG, 1992).

- Emissions were estimated by multiplying fuel consumption by the appropriate emission factors. An emissions model, PCEM (Pleasure Craft Emissions Model), that generates county-level emissions by propulsion-engine type was developed for California's pleasure craft population.

Section 2 of this report discusses the design and results of the survey. Section 3 describes the emissions model, including development of the model inputs and resulting emissions estimates.

BACKGROUND

State Health and Safety Code Section 39607(b) requires the CARB to inventory sources of air pollution within the state and determine the kinds and quantities of air pollutants emitted. This "emission inventory" contains an itemized list of emissions data for both point and area sources of air pollution in a given region such as a county, air basin, or state. Point sources are generally defined as individual sources emitting more than 10 tons per year of any criteria pollutant (CARB, 1991). Area sources are those that individually emit relatively small quantities of air pollutants, but collectively result in significant emission levels. The CARB must take steps to ensure that this inventory is as accurate as possible for all sources of emissions.

In addition to California requirements, accurate emissions inventories are also mandated by Federal law. Two of the major requirements of Title I of the 1990 Clean Air Act Amendments (CAAA) include the preparation by states of improved emission inventories and application (for certain nonattainment areas) of photochemical grid models. Specifically, Title I specifies that a 1990 inventory of ozone precursor emissions (VOC, NO_x, and CO) be prepared for all ozone nonattainment areas. This inventory serves as the base level of emissions from which reductions will be made and from which Reasonable Further Progress (RFP) toward attainment of the requisite planned emission reductions will be tracked. The major provision of Title I is that the development of the State Implementation Plan (SIP) must be supported by the application of photochemical grid models to demonstrate attainment in serious, severe, extreme, and multistate moderate ozone nonattainment areas. For CO SIP development, the EPA is requiring

that moderate areas with 8-hour average design values greater than 12.7 ppm CO use a grid model such as the Urban Airshed Model (UAM) to simulate neighborhood-scale concentrations. When used for these purposes, the spatial and temporal allocation of the emissions in the region of interest are vital to the accuracy of the model.

Pleasure craft with diesel and gasoline engines are classified as area source categories (Category of Emission Sources (CES) codes 58602 and 58610, respectively). These represent two of approximately 200 area source categories in the CARB statewide emission inventory. Because of the large number of waterways and the popularity of boating activities in California, emissions from pleasure craft may comprise a significant portion of the total emission inventory in areas attempting to meet air quality attainment standards for pollutants such as CO and ozone.

CURRENT PLEASURE CRAFT INVENTORY

The methodology currently used by the CARB for assessing emissions from gasoline-powered pleasure craft was based on data collected from studies conducted in 1972 and 1973 for the Department of Navigation and Ocean Development (DENOD, 1972 and 1973), with some modifications based on AP-42 emission factors (EPA, 1980). In a 1980 inventory conducted for the CARB (KVB, 1980), a methodology for estimating emissions from diesel-powered vessels was developed as well. The primary elements of the current methodology are outlined below:

- The state's pleasure craft population was determined by investigating pleasure craft registration data with the DMV and the U.S. Coast Guard.
- Locations of pleasure craft boat operations were determined by dividing the state into 11 water regions, which were consolidated into general boating areas.
- Data on average boat usage and fuel consumption were extracted from the DENOD studies. These contained average values for fuel consumption and boating days, boat length, method of propulsion, and fuel type of pleasure craft.
- DMV boat registration information was extrapolated and converted into a format compatible with the DENOD studies.
- Fuel usage was spatially distributed among the waterways and coastal regions in the state by studying boating activity for lakes, rivers, and coastal regions separately. Fuel consumption was allocated as a percentage of the total fuel used for each type of waterway.
- Temporal distribution of fuel used was based upon monthly fuel sales data.
- Quality assurance measures of cross-checking data were taken by conducting telephone or personal surveys of the fuel sold and the annual boat counts on lakes and rivers and marina berths.

- Emissions were determined by calculating the fuel used with known methods of propulsion, either inboard or outboard, and fuel usage, either gasoline or diesel, and by applying the appropriate AP-42 emission factors.

- The estimated margin of error in this methodology for determining pleasure craft emissions is plus or minus 30 percent.

2 SURVEY

Accurate assessment of activity levels and usage patterns is essential to the development of an emissions inventory for a particular source category. For pleasure craft, this entails accurately determining both the frequency of boat usage in each county and the fuel consumption patterns related to such boating activity. Previous to this study, the most recent detailed account of boating activity data in California was reported in the 1973 study *Boating Resources Development Planning* (DENOD, 1973). Studies conducted since then have relied on scaling the results of the 1973 DENOD data.

One means of collecting detailed and complete information to determine activity and usage for pleasure craft is through an extensive survey, as was done for this study. A statewide survey of over 10,000 registered boat owners in California was conducted over a one-year period; the survey was jointly designed by SAI and FSC. FSC designed the questionnaire, performed the sample size calculations, and collected and processed the survey data. Before any surveys were mailed to boat owners, the CARB reviewed and approved the survey packet.

The purpose of the survey was to evaluate the spatial distribution and utilization practices of pleasure craft in California. The survey targeted private owners of pleasure craft, which include but are not limited to vessels with inboard and outboard engines, stern-drive engines (inboard/outboard), sailboats with auxiliary inboard or outboard engines, personal watercraft such as jet skis, and other noncommercial watercraft. The remainder of this section describes survey design and protocol, and, finally, the results of the survey.

SURVEY DESIGN

The design of the mail survey questionnaire, the wording of the questions, and the accompanying cover letter were tested in a focus group of boat owners in the San Francisco area in May 1993. In addition to improvements in the questionnaire wording and design, the focus group results suggested that a non-government, personalized letter explaining the purpose of collecting this information would be preferable to maximize survey response. Subsequently a new cover letter was designed and printed on FSC letterhead, addressing the concerns that the focus group raised. Each letter mailed was personalized, that is, produced with the boat owner's name appearing in the salutation. There was no specific mention of the CARB or the NMMA in the cover letter. FSC operated a toll-free number that could be called during business hours to assist boat owners with questions about the study. This number appeared in the cover letter and on the reminder postcard.

Accompanying the questionnaire in the mail was a four-color map to assist boat owners in identifying the California counties (by code number) where they used their boat. The maps were designed specifically for this study. Since all of the sample is time related, all mailings were delivered in a "business-like" envelope using first-class stamps primarily to prevent the envelope from being discarded as "bulk mail" and secondarily to ensure a rapid delivery. Appendix A provides a sample of the survey packet contents.

Survey Stratification

It is widely recognized that boat usage varies both temporally throughout the year and regionally. To account for these variations, the survey was designed with three time periods: Winter, Ozone, and Peak. The time periods are defined as:

- Winter—October through March (6 months)
- Ozone—April through September (6 months)
- Peak—June, July, and August (3 months during ozone period)

Boat usage is at a minimum during the Winter period and at a maximum during the Peak period. Peak boat utilization occurs during the Ozone period. Due to the milder weather in southern California, the Winter season is considered relatively important for southern California and less so for the rest of the state.

It is also recognized that boat usage can vary in different parts of the state. Although county-level estimates may be approximated, the available resources only allowed for estimates to be made at the larger regional levels encompassing the significant air basins. Counties were therefore aggregated into three regions as listed below.

Northern Region Counties: Butte, Del Norte, Glenn, Humboldt, Lassen, Modoc, Nevada, Plumas, Shasta, Siskiyou, Tehama, Trinity, Yuba

Central Region Counties: Alameda, Alpine, Amador, Calaveras, Colusa, Contra Costa, El Dorado, Fresno, Inyo, Kings, Lake, Madera, Marin, Mariposa, Mendocino, Merced, Mono, Monterey, Napa, Placer, Sacramento, San Benito, San Francisco, San Joaquin, San Mateo, Santa Clara, Santa Cruz, Sierra, Solano, Sonoma, Stanislaus, Sutter, Tulare, Tuolumne, Yolo

Southern Region Counties: Imperial, Kern, Los Angeles, Orange, Riverside, San Bernardino, San Diego, San Luis Obispo, Santa Barbara, Ventura

Independent samples of registered boat owners within these three regions were drawn for *each* of the three seasons and regions. Note that Sierra County was placed in the Central region rather than the Northern region. This issue is discussed further in Section 3.

Sample Frame

The sample frame used for the survey consists of the DMV database of registered vessels (as of January 1993). The DMV requires that the majority of watergoing vessels in the state be registered. While there are exceptions (vessels powered by oars or paddles, sailboats less than 8 feet in length without motors, ship's lifeboats, windsurfers, etc.), the resulting database contains the vast majority of motorized pleasure craft currently in use in the state. Access to this database was vital for the successful identification and survey of pleasure craft owners necessary for this study. Relevant data contained in the DMV database include:

- Owner name
- Address of owner, including county of residence
- Type of vessel (e.g., sailboat, motorized dinghy, motor boat) and manufacturer
- Length of vessel
- Hull construction material (fiberglass, wood, etc.)
- Engine type (inboard/outboard, inboard jet, other, etc.)
- Fuel type (diesel, gasoline, other).

The DMV "other" categories identified above represent items that could not classified in one of the DMV categories or information that was missing at the time of vessel registration.

The version of the database supplied by the DMV for this study contained over one million records, which were categorized by the DMV as *pleasure, livery (rental), dealer, manufacturer, commercial, youth group,* or *government-fee exempt*. The DMV database was culled to contain only currently registered vessels with engines that are categorized as *pleasure*, including sailboats with auxiliary engines and personal watercraft. Since the DMV database contained records for vessels that have not been registered for more than several years, only boats registered on or after November 1, 1991 were sampled (e.g., the sample frame contained vessels that were registered in 1992 or 1993; all vessel registration fees are collected once a year and are due by December 31). Table 2-1 summarizes the distribution of motorized registered boat owners in California based on the DMV database. A total of 748,597 vessels are included in the sample frame. Note that DMV reported 804,908 registered vessels in the state in December 1992; this value includes vessels both with and without engines.

The sample frame was then divided into the three geographic regions based on the county of residence of the boat owner. A unique random number was assigned to each boat owner in each region; the data records were then sorted by that number. A unique identity number, the FSCID, was attached to each record at this point. The FSCID was encoded to identify the region as well as the individual boat owner. The sample group to be mailed questionnaires was then selected from the top of each file. Records with incomplete addresses were discarded and replaced. Also extracted from the DMV database with the boat owner's name, address and county was the boat registration number, the registration date, the vessel type, propulsion type, fuel type, and the boat length. This information was merged into the data file of all returned questionnaires. The merging protocol and adjustments to the database because of missing data are discussed later in this section.

TABLE 2-1. Total sample frame counts of registered vessels based on the DMV database.[a]

Region		Fuel Type			Totals
		Diesel	Gasoline	Unknown[b]	
Northern					
Outboard		7	32,414	9,871	42,202
In/Out		16	11,433	2,685	14,134
Inboard		59	2,436	351	2,846
Jet		0	4,538	714	5,252
Other		2	504	1,390	1,896
Aux/Sail		120	381	227	728
	Total	204	51,706	15,148	67,058
Central					
Outboard		66	123,751	29,956	153,773
In/Out		144	74,216	11,734	86,094
Inboard		1,863	19,295	2,235	23,393
Jet		12	33,270	3,838	37,120
Other		104	2,601	5,729	8,434
Aux/Sail		3,327	3,977	2,514	9,818
	Total	5,516	257,110	56,006	318,632
Southern					
Outboard		89	123,447	18,608	142,144
In/Out		402	69,294	8,735	78,431
Inboard		3,151	18,866	3,009	25,026
Jet		21	90,218	4,305	94,544
Other		160	2,768	4,382	7,310
Aux/Sail		5,760	5,876	3,816	15,452
	Total	9,583	310,469	42,855	362,907
Entire State		15,303	619,285	114,009	748,597

[a] The sample frame includes only vessels categorized by the DMV as "Pleasure."
[b] Unknown = DMV category "Other." The DMV categorizes missing fuel types as "Other." Incorporation of the unknown fuel types is discussed in the next section.

Sampling Period

Since it was crucial to obtain the best possible information on boat usage including fuel consumption, it was decided to have boat owners report usage information for the previous two weeks, which includes two weekends. This time frame was recommended by the NMMA based on experience with similar studies. Respondents were asked to recall the previous two weeks starting from the time they filled out the questionnaire. They were also asked to enter the date they actually completed the questionnaire so that their two-week period could be anchored in time during the calendar year. This "two-week recall" approach was then built into the sampling strategy for the entire study.

The sample was distributed over the entire year. Sample size calculations were made for each region and season. The Ozone/Peak seasons were sampled every two weeks; that is, the calculated sample size for the Peak and Ozone seasons was divided into two-week periods and a randomly selected batch of questionnaires was mailed out every two weeks in each region. The less critical Winter season had a smaller sample size, which was randomly distributed over October through March into six monthly mail batches instead of two-week mailings. Only the South region was sampled in the Winter season because of the minimal boat usage in the North and Central regions in the winter months.

Sample Design

A stratified sample design was used for this study as described above. The boater population in California was geographically divided into Northern, Central, and Southern regions and each region sampled independently. This approach better addresses boater population differences in these three regions, particularly the relatively smaller population in the Northern region.

The sample was calculated to achieve a minimum precision within each of these geographic strata for each of the three seasons of Peak, Ozone and Winter. In calculating sample sizes, an assumption of probable boat usage (and nonuse) was made for each of the three seasons. On the recommendation of the NMMA, it was assumed that during the Peak period, 75 percent of boats are used and 25 percent are not used. During the Winter period the opposite was assumed for the Southern region: 75 percent nonuse and 25 percent boat usage. For the Ozone months that are not Peak (April, May, and September) these proportions were arbitrarily set at 50 percent users and 50 percent nonusers. These assumptions were necessary in order to calculate a coefficient of variation (c_v) for a probable sample distribution. Since a continuous variable for gallons of fuel purchased and/or used was essential to this study, it was assumed that the proportion of boat nonusers would consume zero gallons and the consumption by boat users would be normally distributed around some mean value. A value of 50 gallons was assumed as the mean value to estimate the sample size.

A model of the three season distributions (Winter, Ozone, and Peak) for 100 theoretical boat users was developed. These data provided c_v estimates, which allowed sample size calculations to be made for different levels of precision and a 95 percent level of confidence. A 95 percent confidence level means that 95 percent of all sampled values will lie within two standard deviations of the mean value. The precision level relates to

the degree of scatter in a set of data: less scatter means the data is more precise (has a smaller precision term). The levels of precision selected were based on the available resources to conduct a mail survey using these calculated sample sizes. The maximum precision of 0.03 was set for the Peak season, followed by a precision level of 0.05 for the Ozone season and 0.20 for the Winter season (Southern region only). The formula used to calculate the sample size, n, is:

$$n = \left(\frac{z}{e}\right)^2 \times c_v^2 \qquad (2\text{-}1)$$

where

z = z-value of 1.96, representing a 95 percent confidence level,
e = set level of statistical precision for estimates of fuel consumption,
c_v = coefficient of variation, defined as the ratio of the standard deviation to mean fuel consumption.

The resulting calculations required a total sample size of 5,473 surveys to be returned. This is an optimal number given the study assumptions. The sample size per region and season, with the set precision level and the c_v used, is shown in Table 2-2. Without knowing the actual distributions or the real means and standard deviations, the results in Table 2-2 formed the basis for a reasonably large sample to be drawn for this study.

TABLE 2-2. Calculated sample sizes based on given precision and coefficients of variation (c_v).

Season	Northern Region	Central Region	Southern Region	Entire State	Precision	c_v
Winter	-	-	862	862	0.20	1.73
Ozone	1,537	1,537	1,537	4,611	0.05	1.00
Peak*	(1,436)	(1,436)	(1,436)	(4,308)	0.03	0.58
Total	1,537	1,537	2,399	5,473		

* Sample sizes shown are a subset of total ozone season sample sizes.

Sample Size

The actual size of the sample to be mailed was the minimum sample size inflated to account for a 50.5 percent response rate. This response rate was assumed based on other surveys of a similar nature (e.g., mail survey with follow-up). Assuming that approximately half of the questionnaires mailed would be returned, the calculated sample size of 5,473 was multiplied by a factor of 1.98, resulting in a mailed sample size of 10,844 initial questionnaires. This number was then distributed across the year by season, assuming two-week mailings during the Ozone/Peak seasons and monthly mailings during the Winter season. The sample mailing distribution by mailing batch and region is shown in Table 2-3.

TABLE 2-3. Number of questionnaires mailed by batch, season, and region.

Batch	Season[a]	Northern Region	Central Region	Southern Region	Total Mailing
1	O/P	500	0	500	1,000
2	O/P	0	500	500	1,000
3	O/P	666	666	500	1,832
4	O/P	666	666	500	1,832
5	O/P	666	666	500	1,832
6	O	64	64	64	192
7	O	64	64	64	192
8	W	64[b]	64[b]	64	192
9	W	64[b]	64[b]	64	192
10	W	-	-	366	366
11	W	-	-	366	366
12	W	-	-	366	366
13	W	-	-	366	366
14	W	-	-	366	366
15	O	-	-	366	366
16	O	64	64	64	192
17	O	64	64	64	192
Total		2,882	2,882	5,080	10,844

[a] O/P = Ozone / Peak Season; O = Ozone Season; W = Winter Season.
[b] These mailings were included to provide data for a complete ozone season.

Due to a short initial print run of maps and a faulty batch of mailing labels during the start-up of the survey, scheduled mailings for Batch 1 Central Region and Batch 2 North Region were missed. A very tight schedule to begin mailings to capture some part of the month of June in the start of the survey contributed to these problems. The sample in those two regions was redistributed among the remaining batches. No further mailings were missed in the remainder of the survey.

SURVEY PROTOCOL

The survey packet that was mailed to those boat owners identified in the sample frame consisted of a 9″ × 11″ addressed manila envelope containing a personalized cover letter, the survey questionnaire personalized with the respondent's boat identification number, and a postage-paid business reply mail envelope addressed to FSC in San Francisco. A two-sided color map showing the recreational waterways in California was included to improve accuracy in the identification of counties where respondents used

their boats. The Wave 1 packets were mailed to boat owners according to a predetermined schedule given in Table 2-4. One week later a reminder postcard was mailed, and two weeks after that, the Wave 2 mailing was sent out to nonresponders.

The number of packets to be mailed in each Wave 1 and reminder postcard batch was based on criteria outlined in the sample design, and the number for each region was designated to be a third of the total mailing for that batch except for Batches 1, 2, and 10 through 15, as shown in Table 2-4. The number mailed in the second wave of each batch was the Wave 1 mailing for that batch minus the returned questionnaires received prior to the Wave 2 mailing date.

TABLE 2-4. Summary of survey packet mailing schedule.

Mail Batch	Wave 1	Postcard	Wave 2
1	7/1/93	7/19/93	7/30/93
2	7/16/93	7/27/93	8/6/93
3	7/30/93	8/6/93	8/17/93
4	8/13/93	8/20/93	8/31/93
5	8/27/93	9/3/93	9/14/93
6	9/10/93	9/17/93	10/1/93
7	9/24/93	10/1/93	10/15/93
8	10/8/93	10/15/93	10/29/93
9	10/22/93	10/29/93	11/12/93
10	11/19/93	11/26/93	12/10/93
11	12/17/93	12/24/93	1/7/94
12	1/14/94	1/21/94	2/4/94
13	2/11/94	2/18/94	3/4/94
14	3/11/94	3/18/94	3/25/94
15	4/8/94	4/15/94	4/29/94
16	4/22/94	4/29/94	5/13/94
17	5/6/94	5/13/94	5/27/94

The returned surveys were stamped according to the date that they were received. The unique bar-code FSCID was then scanned by the date returned into one of two case identification files. The first file held those cases that constituted completed responses (partially or totally filled-out surveys). The second file contained scanned original survey packets that were returned because of a bad address (marked undeliverable by the post office).

A batch control system monitored the current disposition of returned cases throughout the post Peak season mailings. The control system facilitated the tracking of the number of cases returned on a given date, the batch number assigned to each date, and whether

the cases for a given batch were awaiting data entry, in process of data entry, or returned after completion of data entry. The control system was also designed to aid in locating individual questionnaires for verifying responses in the data cleaning and analysis process.

On a monthly basis, FSC ran a response program on the case identification files to generate a response status report. The response program produced counts by mail batch of all completed returned cases, and those returned due to a bad address. The counts were formatted in a report titled *ARB Survey Response Rates*. This report showed the following for each region within the batch: the Wave 1 mail date, the Wave 2 mail date, the number of sample points in each mailing, the completed cases returned, the cases returned due to a bad address, the crude response rate (including bad addresses), and the adjusted response rate (excluding bad addresses). The report also summarized for each batch the crude and adjusted response rates and the cumulative adjusted response rate.

All returned questionnaires were edited by FSC staff to eliminate any ambiguities and to pre-code certain responses before being sent for key entry. The instructions that were used for data editing are given in Appendix B. The coded batches were boxed and sent to Data Processing and Accounting Service (DPAS) in San Francisco for data entry. The batches were key-entered using a double entry system into a custom-built database structure that conformed to the survey instrument. Each key-entry pass was performed by different personnel to eliminate repetitive errors. The two data sets were compared and any discrepancies were corrected in the data set. The corrected data set and file structure were returned, along with the completed surveys to FSC. The double-key entry method results in better than 99.8 percent accuracy of the key-entered data.

The survey data set returned from the data entry house in ASCII format was converted into an SPSS (a statistical software package) data file for further quality control and verification checks. This included a check for uniqueness, that is, a routine search and purge of any duplicate records. Summary statistics (frequencies) were produced for each variable in the data set. Based on these initial frequencies, questionable cases were identified for clarification. The cases were checked against the original questionnaire pages for verification so that all answers are accurately represented in the data set.

SURVEY DATABASE

The survey database is available in electronic format in either Paradox (version 4.0) or ASCII format. Each record in the database contains pertinent DMV database data (not including the name and address of the vessel owner), "raw" and edited survey data, and several fields which were added to aid in the data analysis. The final database contains 4,427 records; several hundred records had to be removed from the database due to incomplete responses and duplications. The codes associated with each field in the database are given in Appendix C.

A screening program was developed and executed for the final data set to correct respondent skip-pattern mistakes and to assign nonresponse values where necessary. For Questions 2 and 3 of the survey, missing data were filled in with either DMV or default

data. For example, question 3 asks the respondent to fill in the vessel's propulsion type. If this response was missing in the returned survey, then the screening program assigned the propulsion type listed in the DMV database. The survey data were not compared to the DMV data for inconsistencies. Both the "raw" and "assigned" responses are given in the database for questions 2 and 3. These are identified as variables Q2_NEW and Q3_NEW (assigned responses) and Q2_ORG and Q3_ORG (raw survey data) in the database.

Assignment of Other Fields in the Database

To aid with the data analysis, the following variables that are not included in the survey instrument were assigned in the database. The database variable names are identified in parentheses.

Record Identification (FSCID). A unique code assigned to each record in the database.

Region Code (REGCODE). Assignment of this code is based on the owner's county of residence. Vessel owners located in the Southern region were assigned a REGCODE equal to 1, Central region equal to 2, and Northern region equal to 3.

Season Codes (SEASON and PEAK). Although the sample for each season was evenly divided among a number of mailing batches, the dates for which the respondent chose to report could not be controlled. The survey requested information for the two-week period prior to the date the respondent completed the questionnaire. Accordingly, the period being reported may or may not have been in the same season in which the questionnaire was mailed. Respondents who procrastinated in filling out the questionnaire might end up reporting data for the following season. To adjust for this, all survey responses with eight days or more of the fourteen-day reporting period in a different season from the mailing date were shifted forward to that season.

Two variables in the database relate to the season codes: SEASON and PEAK. The SEASON code is assigned either Ozone or Winter. To distinguish between Ozone and Peak seasons, PEAK is assigned either yes or no. Thus, if SEASON = Ozone and PEAK = no, then the vessel responded during the Ozone season in the months April, May, or September, but not during the Peak period (June–August).

Note that the sample was not mailed to Northern and Central regions in the Winter season to obtain wintertime usage, but rather to complete the ozone season sample. However, a small number of boat owners ended up reporting usage in the Winter season due to the date they filled out their questionnaires. These are identified in the database as Winter season for those two regions and probably should not be used in any Winter season analysis due to the limited number of data points.

SURVEY RESULTS

A total of 10,844 initial survey packets were sent to boat owners. At the completion of the survey period 5,636 (46 percent) were returned, 4,971 of which were mailed back by

respondents and 665 of which were not deliverable by the post office due to "incorrect" mailing addresses from the DMV database. When the 665 undeliverable cases are removed from the denominator of 10,844 mailed, the 4,971 questionnaires represent an adjusted response rate of 49 percent. The Ozone and Winter mailings have adjusted response rates of 56 and 55 percent, respectively; the Peak mailing has an adjusted response rate of 46 percent. The adjusted response rates by region are 51 percent in the North and 48 percent in both the Central and South. The response results are given in Table 2-5 for each regional season and for the overall survey. A breakdown by each mailing batch with the cumulative adjusted response rate over the entire survey year is shown in Table 2-6.

TABLE 2-5. Survey response: Overall and by season for each region.

Region	Number Mailed	Total Returned	Bad Address	Responses	Percent Response	Adjusted Percent
			Overall Survey Sample			
Northern	2,882	1,536	113	1,423	49	51
Central	2,882	1,467	174	1,293	45	48
Southern	5,080	2,633	378	2,255	44	48
Overall Total	10,844	5,636	665	4,971	46	49
			Ozone Season Sample			
Northern	256	158	13	145	57	60
Central	256	142	18	124	48	52
Southern	622	370	48	322	52	56
Ozone Total	1,134	670	79	591	52	56
			Peak Season Sample			
Northern	2,498	1,304	95	1,209	48	50
Central	2,498	1,241	140	1,101	44	47
Southern	2,500	1,127	182	945	38	41
Peak Total	7,496	3,672	417	3,255	43	46
			Winter Season Sample			
Northern*	128	74	5	69	54	56
Central*	128	84	16	68	53	61
Southern	1,958	1,136	148	988	50	55
Winter Total	2,214	1,294	169	1,125	51	55

* These mailings were included to provide data for a complete ozone season.

TABLE 2-6. Survey response rates by region and mailing batch.

		Northern Region		Central Region		Southern Region		Total			
Batch	Season*	Cases Returned	Percent Response	Cases Returned	Percent Response	Cases Returned	Percent Response	Cases Returned	Percent Response	Adjusted Response**	Cumulative Adjusted Response
1	O/P	256	51	—	—	217	43	473	47	52	52
2	O/P	—	—	234	47	111	22	345	35	38	45
3	O/P	334	50	284	43	189	38	807	44	46	45
4	O/P	268	40	242	36	196	39	706	39	41	44
5	O/P	351	53	341	51	232	46	924	50	53	46
6	O	35	55	25	39	32	50	92	48	51	46
7	O	35	55	37	58	37	58	109	57	59	46
8	W	35	55	31	48	28	44	94	49	54	47
9	W	34	53	37	58	16	25	87	45	49	47
10	W	—	—	—	—	182	50	182	50	53	47
11	W	—	—	—	—	191	52	191	52	56	47
12	W	—	—	—	—	190	52	190	52	56	48
13	W	—	—	—	—	185	51	185	51	56	48
14	W	—	—	—	—	196	54	196	54	58	48
15	O	—	—	—	—	187	51	187	51	55	49
16	O	42	66	29	45	33	52	104	54	59	49
17	O	33	52	33	52	33	52	99	52	57	49
Total		1,423	49	1,293	45	2,255	44	4,971	46	49	49

* O/P = Ozone / Peak Season; O = Ozone Season; W = Winter Season

** The adjusted response rate excludes from the denominator questionnaires returned due to a bad address.

The precision associated with the fuel usage estimates are shown in Table 2-7. These values were estimated using equation 2-1 in conjunction with the results of the survey. As can be seen from Table 2-7, the precision associated with the fuel usage estimates are about ±6 percent for the Peak and Ozone seasons and ±11 percent for the Winter season (at a 95 percent confidence level). These values are slightly higher than those originally estimated in Table 2-2 since the actual distributions were not known when the survey was designed (it was designed based on the assumptions outlined previously). Also included in the table are the number of registered vessels, estimated number of boats being used, and the actual sample size (weighted) for each region and season.

Table 2-8 summarizes the population of the raw survey data and the average engine sizes (in horsepower) by engine and propulsion type. Note that the raw survey data shown in this table have not been adjusted to the sample frame; a discussion of the adjustment factors is given in the next section.

NONRESPONSE STUDY

A study of nonrespondents was conducted to determine if those that returned their questionnaires are in any way different from those who did not return a questionnaire. This was done using a Computer Assisted Telephone Interview (CATI) survey methodology with a sample of nonrespondents. The major concern was that there would be a higher proportion of boat owners who did not use their boats among the nonresponders. The hypothesis to be tested was that there was no difference in boat usage between respondents and nonrespondents.

It was planned to interview 267 boat owners who did not return their questionnaires. This random sample would provide a plus or minus 6 percent precision on the estimate of boat usage. The study was to use a sample of the Peak season nonrespondents who had not returned a questionnaire after September 15, 1993. The total number of nonresponders per region was 1,516 cases in the Northern region, 1,559 cases in the Central region, and 1,679 cases in the Southern region. Initially 400 cases were randomly selected from each region. Using "411" directory assistance, telephone numbers were located for 251 cases in the Northern, 241 in Central, and the 201 in the Southern regions. Since the 693 numbers were not sufficient for the study, an additional 450 cases were randomly selected and 253 numbers located to yield a total of 946 telephone numbers. Estimates were made for each region based on a CATI questionnaire developed by FSC and SAI. A copy of this questionnaire is in Appendix D.

At the completion of the study, 946 numbers were called of which 73 percent resulted in contact with a household. In 648, or 78 percent, of these contacted households a boat owner was successfully located. Of these 648 boat owners, 17 percent (107) refused to be interviewed, 15 percent (100) said they had since returned the questionnaire (not yet received by FSC), 22 percent (140) did not own the boat any longer or it was the wrong boat (4 percent) and 1 percent (9) had removed the engine. Of these contacted boat owners, 292 or 45 percent completed the full telephone interview about their boat usage.

TABLE 2-7. Precision estimates for reported fuel usage per two week period by season and region.

Season/ Region	Number of Registered Boats	Percent Reported Using Boats	Sample Size (weighted)	Mean Fuel Usage[a] (gal)	Standard Deviation[a] (gal)	c_v[b]	Precision Estimate[c] (±)
Winter							
Southern	362,907	11.7	75	15.6	25.7	1.64	11
Peak							
Southern	362,907	36.8	205	25.2	45.1	1.79	7
Central	318,632	40.7	309	20.3	29.6	1.45	6
Northern	67,058	40.0	320	17.1	22.1	1.29	5
Ozone							
Southern	362,907	31.9	293	22.2	38.7	1.75	6
Central	318,632	37.7	412	20.4	32.1	1.57	5
Northern	67,058	37.5	422	16.7	20.8	1.25	5

[a] For a 2-week period.
[b] Coefficient of variation = standard deviation / mean gallons used.
[c] In percent, 95% confidence level.

TABLE 2-8. Summary of the vessel population and average engine size by propulsion and engine type from the survey database. Note that these results have not been adjusted for the sample frame as discussed in Section 3.

	2-Stroke Gasoline		4-Stroke Gasoline		Diesel		
Propulsion Type	Size (HP)	Population	Size (HP)	Population	Size (HP)	Population	Total Population
Outboard	52.5	1,951	52.3	99	—	1	2,051
Inboard/Outboard[a]	—	—	185	1,168	—	—	1,168
Inboard Propellor[b]	—	—	237	210	171	46	256
Inboard Jet[c]	—	—	303	187	—	—	187
Personal Watercraft[d]	47.3	512	—	—	—	—	512
Sailboat w/Aux	19.8	79	39.8	64	27.7	93	236
Other	40.5	14	262.5	2	—	1	17
Total	—	2,612	—	1,669	—	146	4,427

[a] Assumed that all inboard/outboards have 4-stroke gasoline engines based on discussions with manufacturers/dealers.
[b] Assumed that all gasoline-powered vessels have 4-stroke engines based on discussions with manufacturers/dealers.
[c] Assumed that all vessels have 4-stroke engines based on discussions with manufacturers/dealers.
[d] Since some respondents appear to have entered engine size in cc's, engine size was estimated for only those responses less than 200 horsepower.

A chi-square analysis comparing the proportion of boat users among these nonresponders to the proportion of users among those that did respond showed no statistical differences within any of the three regions. A weighted analysis combining the three regions for a single statewide estimate also showed no statistical difference. These comparisons are given in Table 2-9. Therefore, even though the response rate was just below 50 percent for this study, there is no reason to believe that the proportion of boat nonuse for nonrespondents differs from that of respondents.

TABLE 2-9. Comparison of peak season boat use for respondents and nonrespondents.

	Proportion Using Boat in the Peak Season	
Region	Responders (Mail Survey) n = 2,712	Nonresponders (Telephone Survey) n = 292
Southern	35.7%	39.8%
Central	39.0%	34.4%
Northern	38.3%	39.6%
Statewide (weighted)	37.5%	37.6%

3 PLEASURE CRAFT EMISSIONS INVENTORY

This section describes the development of an updated emissions inventory for pleasure craft in California. For pleasure craft registered with the DMV, a survey was conducted to assess temporal and spatial usage, as well as fuel consumption. This survey, described in Section 2, collected data for a one-year period (June 1993 through May 1994) from randomly selected registered boat owners in California. The survey results are used in this section to estimate pleasure craft emissions in California.

The emissions associated with rental vessels and Coast Guard documented vessels are estimated based on the results of previous studies. Emissions for pleasure craft in California are estimated using an emissions model developed for this study, called PCEM (Pleasure Craft Emissions Model). This section describes the development of the PCEM input data and the resulting emissions estimates. County-level emissions by engine-propulsion type are presented at the end of the section.

EMISSIONS ESTIMATION METHODOLOGY

This study focused primarily on vessels registered with the DMV, which comprise the largest portion of the population and contribute the most to the total vessel emissions. Adjustments to account for fuel consumption by vessels documented by the Coast Guard and rental vessels are also included in the inventory.

Emissions by region (Northern, Central, and Southern) were estimated for engine and propulsion types with the following equation:

$$E_{ij} = F_{ij} \times E_{f,ij} \tag{3-1}$$

where

E_{ij} = emissions (pounds per year) for engine type i and propulsion type j

F_{ij} = annual fuel consumption (thousand gallons per year) in each region for engine type i and propulsion type j

$E_{f,ij}$ = emission factor (pounds per thousand gallons) for each engine type i and propulsion type j

The distribution in fuel consumption between gasoline-powered 2-stroke and 4-stroke engines is based on the survey data, since these data were not available from the DMV database. The total fuel consumption in a region is further stratified by engine size classifications for each engine and propulsion type. For 2-strokes, the size classifications are dictated by the emission factors as described below.

Annual Fuel Consumption

The annual fuel consumption used to estimate the emissions in PCEM is estimated from the results of the survey. The survey asked respondents to quantify fuel purchased and fuel consumed (in gallons) during the previous two-week period. A two-week period was chosen for easy recall. Both questions were asked since it was not certain if some vessel owners could give a good estimate of fuel consumption in a two-week period (some boats do not have easy-to-read fuel tank gauges). The amount of fuel purchased should be simpler to quantify, since fuel is normally purchased at a gasoline station or marina where the quantity is metered. Based on the survey data, survey respondents tended to underestimate fuel consumption compared to fuel purchased by about 4½ percent. Accordingly, the fuel consumed was adjusted to reflect this underreporting of the data. Note that the fuel purchased is not a good indication of where the fuel is used or emissions are emitted, since fuel may have not been purchased in the two-week period but the boat may have been used.

The fuel consumed in a two-week period was extrapolated for vessels with similar engine–propulsion types to estimate the total annual fuel usage by region and engine–propulsion type, based on the following equation:

$$F_{ij} = \sum_{k=1}^{n_{ij}} (f_k \times T \times k \times We_k) \qquad (3\text{-}2)$$

where

f_k	=	two-week fuel consumption for vessel k with engine type i and propulsion type j;
n_{ij}	=	number of boats in the region with engine type i and propulsion type j;
T	=	number of two-week time periods in the season; and
We_k	=	weighting factor to extrapolate vessel fuel consumption to that of the entire population for boat k (defined below).

Before assignment of fuel consumption to a engine and boat type, survey responses were checked for validity. Table 3-1 summarizes the assumed valid responses for the different propulsion types.

To estimate emissions for California's vessel population, the survey's fuel consumption data collected during the survey were extrapolated to represent fuel consumption for the entire registered vessel population. A set of scaling factors, called population weight constants, were developed for each boat type, region, and season. The population weight constants were multiplied by the fuel consumption of the survey population to extrapolate the data to represent the entire registered population. For example, there are 20,000 registered vessels of boat type X. If 500 surveys were returned by the owners of boat type X, then the scaling factor, or population constant, that would be used to extrapolate the fuel consumption would equal 20,000/500 or 40. This factor would adjust the total fuel consumption for each vessel to represent 40 registered vessels. Note

TABLE 3-1. Valid engine–propulsion combinations assumed during assignment of fuel consumption.

	Engine Type		
Propulsion Type	2-Stroke	4-Stroke	Diesel
Outboard	✓	✓	✓
Inboard/Outboard		✓	
Inboard Propellor		✓	✓
Inboard Jet		✓	
Personal Watercraft	✓		
Sailboat w/Auxiliary	✓	✓	✓

that this discussion has been simplified to illustrate the methodology used to scale the survey fuel consumption. The actual extrapolation methodology is somewhat more complicated and is described below.

To extrapolate the survey population to represent the entire vessel population in California, population weight constants, *We*, were developed by fuel and propulsion classifications, as given in the DMV database. The population constant is a multiplier that is applied to each vessel in the survey; this constant varies by season and region. This results in a number that represents the population of registered pleasure craft in California for a specific propulsion and fuel type. The formula used to estimate the population constant for each region and season is:

$$We_{lj} = \left(\frac{P_{lj}}{s_{lj} \times Wp_{lj}} \right) \tag{3-3}$$

where

P_{lj} = number of registered boats of fuel type l and propulsion type j;
s_{lj} = number of respondents with boats of fuel type l and propulsion type j; and
Wp_{lj} = weighting factor that adjusts the fuel consumption to assure proportionality to the sample frame for vessels with fuel type l and propulsion type j (defined below).

For example, the parameters for estimating the weighting factor for the Northern region during the Peak season for gasoline-powered (G) outboards (O) are P_{GO} = 42,202, s_{GO} = 579 (note that this is the total number of respondents that responded to the survey, not just those that boated), and Wp_{GO} = 0.9958. The estimated population weight is equal to 73.2; this factor adjusts the survey population of one gasoline-powered outboard to represent about 73 vessels during the Peak season in the Northern region.

The weighting factor, *Wp*, was developed to adjust the survey population to that of the sample frame (DMV database). The formula used to adjust the data in a given region within each season is:

$$Wp_{lj} = \left(\frac{P_{lj}}{P_{tot}}\right) \times \left(\frac{s_{tot}}{s_{lj}}\right) . \qquad (3\text{-}4)$$

where

P_{tot}	=	total number of registered vessels;
P_{lj}	=	number of registered vessels of fuel type l and propulsion type j;
s_{tot}	=	total number of survey respondents; and
s_{lj}	=	number of survey respondents with boats of fuel type l and propulsion type j.

This weighting scheme allows fuel consumption to be estimated for each region within a season and is specific to a vessel's fuel type (gasoline or diesel) and propulsion type (outboard, inboard-outboard, inboard, jet, sailboat auxiliary, or other). The fuel and propulsion types are dictated by the DMV database categories. There are about 114,000 vessels in the database with missing or unknown fuel types. It was assumed that these vessels have the same distribution of fuel types as the known 640,000 vessels in the database based on testing the survey respondents with missing DMV fuel types. Note that if *We* is close to one, then the survey population matches that of the sample frame proportionally. For those factors greater than one, the survey population is underrepresented compared to the sample frame and the opposite is true for those factors less than one (the sample population is overrepresented compared to the sample frame). Most of the weights are close to one. The calculated weights, *We* and *Wp*, are given in Appendix E.

In the Central and Northern regions, there are no survey-based winter fuel consumption data since the survey was not conducted in these regions during the winter. To estimate the fuel consumption during this period, the data collected in the Southern region were used to estimate the decrease in boating activity that occurs in the wintertime. The decrease in fuel consumption in the South between the Ozone and Winter seasons are 50, 65, and 23 percent for 2-stroke (excluding personal watercraft), 4-stroke, and diesel engines, respectively. The difference in fuel consumption for personal watercraft was accounted for separately with a decrease in activity of about 86 percent based on the survey results. These Southern region percent reductions were applied to the Northern and Central ozone season fuel consumptions to yield an approximate wintertime fuel consumption. Since boating activity in the Southern region should be greater in the winter than in the Northern and Central regions, this assumption should yield a conservative estimate of emissions in these regions in the winter.

The annual regional fuel consumption (in gallons per year) by engine-propulsion type and region is incorporated into PCEM with a user-specified input file. The input file, presented in Appendix G, is based on the survey data and the methodology discussion

above. Total annual fuel consumption from the registered vessels is estimated at 58,001,700 gallons.

Adjustments for Rental and Documented Vessels

Since rental and documented vessels were not included in the sample frame, the fuel consumed by these vessels had to be estimated in a different manner than discussed above. The fuel consumed by these vessels is estimated by utilizing data collected for the *National Recreational Boating Survey*, sponsored jointly by the U.S. Fish and Wildlife Service and the Coast Guard (USCG, 1992). This study was conducted during 1990-1991 to ascertain the boating habits of recreational boaters. Vessel owners logged fuel usage during a three-month period and then forwarded the log sheets to the contractor collecting the data. Estimates of total fuel consumption by propulsion type and total populations were generated. This study was not designed for emissions estimation and could not be used instead of the survey. However, some of the data collected in the study are useful for extrapolating the fuel consumption of rentals and documented vessels.

Rental fuel usage is estimated utilizing data collected in the *National Recreational Boating Survey*. To quantify rental fuel, a telephone survey was conducted of 5,021 randomly selected households in the United States. The telephone survey resulted in an estimate of fuel usage for rentals of about 4 percent of the total recreational fuel usage. This percentage is applied statewide to the survey fuel consumption estimates in PCEM to account for rentals in the emission estimate. Applying the factor evenly over the fuel consumption assumes that the rental population is similar to that in the DMV database.

In addition to fuel used by rentals, an adjustment is included in PCEM for vessels documented with the Coast Guard. These vessels tend to be larger and are often used for commercial purposes. Some pleasure craft are documented with the Coast Guard and not registered with the DMV. To account for fuel used by these vessels, the population of recreational documented vessels was estimated at 93,900.[1] From that population, the relative percent of vessels with 2-stroke and other (4-stroke and diesel) engines were estimated[2]. From these percents and the total estimated population, the missing documented population was estimated for 2-stroke and other engines assuming that the outboards have 2-stroke engines and the inboards have other engines. Based on the number of estimated documented vessels and those in the DMV database, approximately 9 percent of the total 2-stroke population, excluding PWCs, and 16 percent of the 4-stroke population should consist of documented vessels. By assuming that the annual fuel consumption estimated with the survey data is proportional to the percent of the missing population, the fuel consumption estimates can be adjusted to

[1] This number is based on the total recreational boating population of 898,800 vessels given in the *National Recreational Boating Survey* and the number of registered DMV vessels (804,903) at the time of the survey. These populations include vessels without engines.

[2] Data provided by the NMMA indicates that about 35 percent of California's documented vessel population is outboards and the remainder inboards (Morgan, 1994). This includes both commercial and pleasure craft documented with the Coast Guard.

account for the missing documented vessel population by 9 and 16 percent for non-PWC 2-stroke and other (4-stroke and diesel) engines, respectively.

Total statewide fuel consumption, after the adjustments for rentals and documented vessels, is 69,696,700 gallons. This value corresponds well to that estimated in the *National Recreational Boating Survey* of 72,297,000 ($\pm$10.5 percent) gallons. However, this value is much less than that used in 1990 by the CARB of 125,934,000 gallons per year (CARB, 1991), which is based on the DENOD study projected to current levels. It should be noted that the average fuel consumption per boat is estimated at 77 gallons per boat in the *National Recreational Boating Survey* and 77.5 gallons in this study (this average includes only the DMV data).

As with the annual regional fuel consumption, the fuel adjustment factors discussed above are included in PCEM through a user-specified input file. In PCEM, these factors are applied statewide to the fuel consumption to account for documented and rental vessel fuel usage. However, the documented vessel factor is not applied to personal watercraft in PCEM, since they tend not be documented with the Coast Guard.

The annual regional fuel consumption estimates used by PCEM do not include allowances for the fuel usage for nonresident boaters or vessels that are neither registered nor documented. Exclusion of these estimates should not compromise the quality of the emission estimates, since these populations should represent only a small fraction of the total boating population in California.

Emission Factors

Emission factors for TOG, NO_x, and CO were provided by the NMMA for 2-stroke, 4-stroke, and diesel engines. Additional emission factors specifically applicable to personal watercraft were also contributed. The NMMA factors were used by the EPA in the Nonroad Engine and Vehicle Emissions Study (NEVES) and represent data from the following manufacturers: Honda, Mercury Marine, Outboard Marine Corporation, Volvo, and Yamaha (EPA, 1991). The emissions factors provided by the NMMA are shown in Appendix F. For particulate and hydrocarbon emissions associated with refueling, evaporative, and crankcase operations, the emission factors developed in NEVES are used.

Emission factors for SO_x were estimated from the sulfur content of fuel sold in California during the inventory year. For gasoline, the emission factor is based on a sulfur content of 151 ppm wt and a fuel density of 6.2 lb/gal. For vessels using diesel fuels, the emission factor is based on a sulfur content of 500 ppm wt and a fuel density of 7.1 lb/gal. The sulfur contents used to estimate the emission factors were provide by CARB staff (Grant, 1994); the fuel densities are listed in AP-42 (EPA, 1985).

Emission factors vary considerably by engine size for 2-stroke engines, and a direct relationship between horsepower and emission factors can be correlated for hydrocarbons. For this reason, the emission factors for 2-stroke engines were grouped into sizes with similar emissions and the emission factors averaged for each engine size group. Table 3-2 summarizes the emission factors (g/hp-h and lb/1000 gal) for 2-stroke

TABLE 3-2a. Summary of emission factors (g/hp-h) for 2-stroke engines by engine size category.

Engine Size Category (horsepower)	2-Stroke Emission Factors (g/hp-h)				
	TOG	NO_x	CO	PM	SO_x
< 4	287	0.7	369	7.1	0.13
4–9	254	0.8	348	7.1	0.13
10–29	135	1.6	276	7.1	0.13
30–49	120	1.0	194	7.1	0.13
50–74	115	2.0	187	7.1	0.13
75–99	106	2.0	200	7.1	0.13
100–149	115	1.0	259	7.1	0.13
150–199	106	1.2	226	7.1	0.13
≥ 200	114	1.1	210	7.1	0.13

TABLE 3-2b. Summary of emission factors (lb/1000 gal) for 2-stroke engines by engine size category. Different emission factors were used to estimate the emissions for PWC (see Table 3-3). The EPA NEVES emission factors for 2-stroke outboard engines are shown for comparison.

Engine Size Category (horsepower)	2-Stroke Engine Emission Factors (lb/1000 gal)				
	TOG	NO_x	CO	PM	SO_x
< 4	2,160	6.0	2,770	106	1.9
4–9	1,983	10.3	2,980	106	1.9
10–29	1,640	19.0	3,136	106	1.9
30–49	1,510	18.0	3,960	106	1.9
50–74	1,537	26.7	2,765	106	1.9
75–99	1,590	30.0	2,925	106	1.9
100–149	1,615	18.3	3,420	106	1.9
150–199	1,595	17.5	3,520	106	1.9
≥ 200	1,530	18.0	3,363	106	1.9
NEVES Factors	1,605	19.3	2,992	106	6.4

engines by power category. Since the emission factors provided in this report are not for an average engine size and propulsion type, they differ from the emission factors estimated by the EPA in NEVES. Since the size of the engine is known from the survey data, the factors presented in Table 3-2 are more appropriate for use in this study than the EPA NEVES factors. Appendix F provides an example calculation for estimating the average emission factors.

NMMA also provided nine sets of emission factors (TOG, NO_x, and CO) for personal watercraft (PWC). Since PWCs do not tend to vary much in engine power (about 40-70 horsepower), average emission factors were estimated as shown in Table 3-3.

TABLE 3-3a. Summary of emission factors (g/hp-h) for personal watercraft, 4-stroke, and diesel engines.

Engine Type	Propulsion Type	Emission Factors (g/hp-h)				
		TOG	NO_x	CO	PM	SO_x
2-Stroke	PWC	144	0.84	263	6.9	0.12
4-Stroke	All	9.1	5.4	151	0.07	0.08
Diesel	All	2.6	11.3	4.7	0.34	0.10

TABLE 3-3b. Summary of emission factors (lb/1000 gal) for personal watercraft (PWC), 4-stroke, and diesel engines included in PCEM (indicated in bold). The EPA NEVES emission factors are included for comparison.

Engine Type	Propulsion Type	Emission Factors (lb/1000 gal)				
		TOG	NO_x	CO	PM	SO_x
2-Stroke	**PWC**	**2,210**	**12.8**	**4,030**	**106**	**1.9**
NEVES[a]	Out	1,605	19.3	2,992	106	6.5
4-Stroke	**All**	**151**	**101**	**3,233**	**1.6**	**1.9**
NEVES	Stern/In	160	101	2,676	1.6	6.4
NEVES	Out	193	147	3,134	1.6	6.4
Diesel	**All**	**188**	**388**	**418**	**24.0**	**7.1**
NEVES	Sail/Aux	270	360	480	24.0	26.9
NEVES	Stern/In/Out	53.8	380	81.5	24.0	26.9

[a] Since the EPA did not provide emission factors for PWC, the emission factors for 2-stroke outboards are provided for comparison with the NMMA factors.

Unlike 2-stroke engines, no clear correlation exists between emission factors and engine power for 4-stroke and diesel engines. Displacement per cylinder for 4-stroke gasoline sterndrive and inboard engines varies over a relatively small range (approximately 0.7 to 1 liter) (Morgan, 1992). For this reason, simple averages have been utilized to estimate the emission factors for both 4-stroke and diesel engines. Table 3-3 summarizes the emission factors (g/hp-h and lb/1000 gal) used by PCEM for these engine types.

Refueling, evaporative, and crankcase hydrocarbon emissions were estimated based on the NEVES emission factors developed by the EPA (EPA, 1991). These factors are based on factors developed for other engines, such as lawn mowers. The NEVES factors are given in Table 3-4.

TABLE 3-4. Summary of pleasure craft crank, evaporative, and refueling emission factors (NEVES, 1991).

	TOG Emission Factors*		
Fuel and Propulsion Type	Crank lb/1000 gal	Evaporative lb/hr	Refueling lb/1000 gal
Gasoline-Powered			
Inboard	NA	0.57	11.3
Outboard	63.8	NA	19.3
In/Out	NA	0.14	11.7
Sail w/aux In	NA	0.04	19.3
Sail w/aux out	63.8	NA	19.3
Diesel-Powered			
Inboard	NA	NA	0.09
Outboard	1.1	NA	0.0
In/Out	NA	NA	0.0
Sail w/aux In	NA	NA	0.0
Sail w/aux out	5.4	NA	0.0

* N/A = not available.

The emission factors given in the previous tables were adjusted for in-use effects (or deterioration) with the adjustment factors given in Table 3-5. Note that these are the same factors that were used in NEVES (EPA, 1991).

TABLE 3-5. Adjustment factors for emission factors for in-use effects (NEVES, 1991)

	In-Use Factor		
Engine Type	TOG	NO_x	CO
2-Stroke	1.2	1.0	1.2
4-Stroke	1.5	1.0	1.3

The factors provided in Tables 3-2 through 3-5 are included in PCEM using a user-generated input file. A sample of the input file is given in Appendix G.

Spatial Allocation

Once the regional emissions are estimated in PCEM, they are allocated to the county level using allocation factors representing the proportions of fuel consumed in a county by either 2-stroke or other engines (4-stroke and diesel). Because of the variation in emission factors and activity patterns, separate factors were developed for the different engine types.

The allocation factors for each engine type are based on the survey data. For each boating day in the two-week period, the respondents listed the counties in which boating occurred, total amount of time on the water in all of these counties, and the percentage of time the engine was used during the day. From this information, fuel consumption for a two-week period is allocated to a daily usage by county and engine type (2-stroke or other). This quantity is then summed over the year by county and region and adjusted for registered county population within a region. The adjustment is necessary to account for over- or undersampling of the total number of vessels in a county. The allocation factors in a region, $A_{c,m}$, are defined for each county c and engine type m as:

$$A_{c,m} = \frac{F_{c,m} \cdot P_c/s_c}{\sum_{0}^{r=ncty} (F_{r,m} \cdot P_r/s_r)} \tag{3-5}$$

where

$ncty$	=	the number of counties in a region
F	=	annual fuel consumption by county and engine type
P	=	number of registered vessels in a county
s	=	number of survey responses in a county

After generation of the allocation factors, it was noted that several of the counties, including Kings, Inyo, and Imperial, only had activity reported in the survey for one of the two engine categories (2-stroke or "other"). If no activity was reported for a given engine type, the smallest factor estimated for the region was assigned for that county and the allocation factors were renormalized. No activity was reported for San Benito County, even though several vessel owners living in San Benito responded to the survey. The regional minimum allocation factor was assigned to this county for all boat types to be consistent with the other minimum allocation assignments.

PCEM uses the allocation factors developed from the survey data for 2-stroke and other engines (4-stroke and diesel). The data used to generate the county-level emission estimates are given in Appendix G.

Temporal Variation

For photochemical modeling purposes, adjustment of the inventory to represent ozone season emission levels is extremely important. The data collected in the survey are used to generate ozone season adjusted emissions data. The survey data were collected during the Peak, Ozone, and Winter seasons. A seasonal adjustment factor, SAF, was estimated by

$$SAF = \left(\frac{F_{ozone} \times 12 \text{ months}}{F_{annual} \times \textit{Ozone Season length}} \right) \tag{3-6}$$

where the length of the ozone season is 6 months (April–September). The SAF estimated with the survey data equals 1.64. Based on the survey data, there is little variation in the SAF by engine type. The emissions E for an average ozone day are estimated by

$$E = \frac{\textit{Annual Emissions} \times SAF}{\textit{Activity Days per Week} \times 52 \text{ weeks}} \tag{3-7}$$

For pleasure craft, activity days per week equal seven. As with the other emission-related parameters, the SAF is a variable used by PCEM that is inputted to the model through a user-specified input file. Appendix G contains the packet used by PCEM to estimate ozone-adjusted emission data. The temporal profiles are shown in Figures 3-1 through 3-4 and summarized in tables in Appendix H.

From the survey data, average monthly, weekly, and diurnal activity patterns were estimated. Figure 3-1 illustrates the monthly distribution of fuel consumption (or emissions) by region and season (Peak, Ozone, and Winter). As can be seen from the plot, there is little variation between regions with the largest activity occurring during the Peak season. During the Ozone season, the Northern and Central regions experience slightly more fuel usage than the Southern region, and the opposite effect occurs in the Winter season.

In Figure 3-2, profiles are shown of the average weekly activity for both the Winter season and the entire year. Regional variation is not given in this figure, since variation was insignificant. As can be seen from the plot, usage during the week is fairly flat with a slight increase in activity on Friday. Usage increases dramatically on Saturday, where it peaks during the Winter season (Southern region only). Average annual usage peaks on Sunday. The Peak and Ozone season profiles follow the annual profile since these seasons are about 75 percent of the total annual boating activity.

Diurnal usage averaged over the year, shown in Figure 3-3, peaks about 1 pm with little variation between regions. The profiles appear to follow a normal Gaussian distribution with an increase in activity occurring about 6 a.m. and tapering at 9 p.m. As with the weekly activity, the profiles are dominated by the Ozone and Peak season, since the majority of activity occurs during these seasons. For comparison, the Winter season diurnal usage is shown in Figure 3-4. This profile reflects activity that occurred only in the Southern region. As expected, activity begins about the same time of the day but tapers off earlier in the day, about 6 p.m., because of shorter daylight hours in the wintertime.

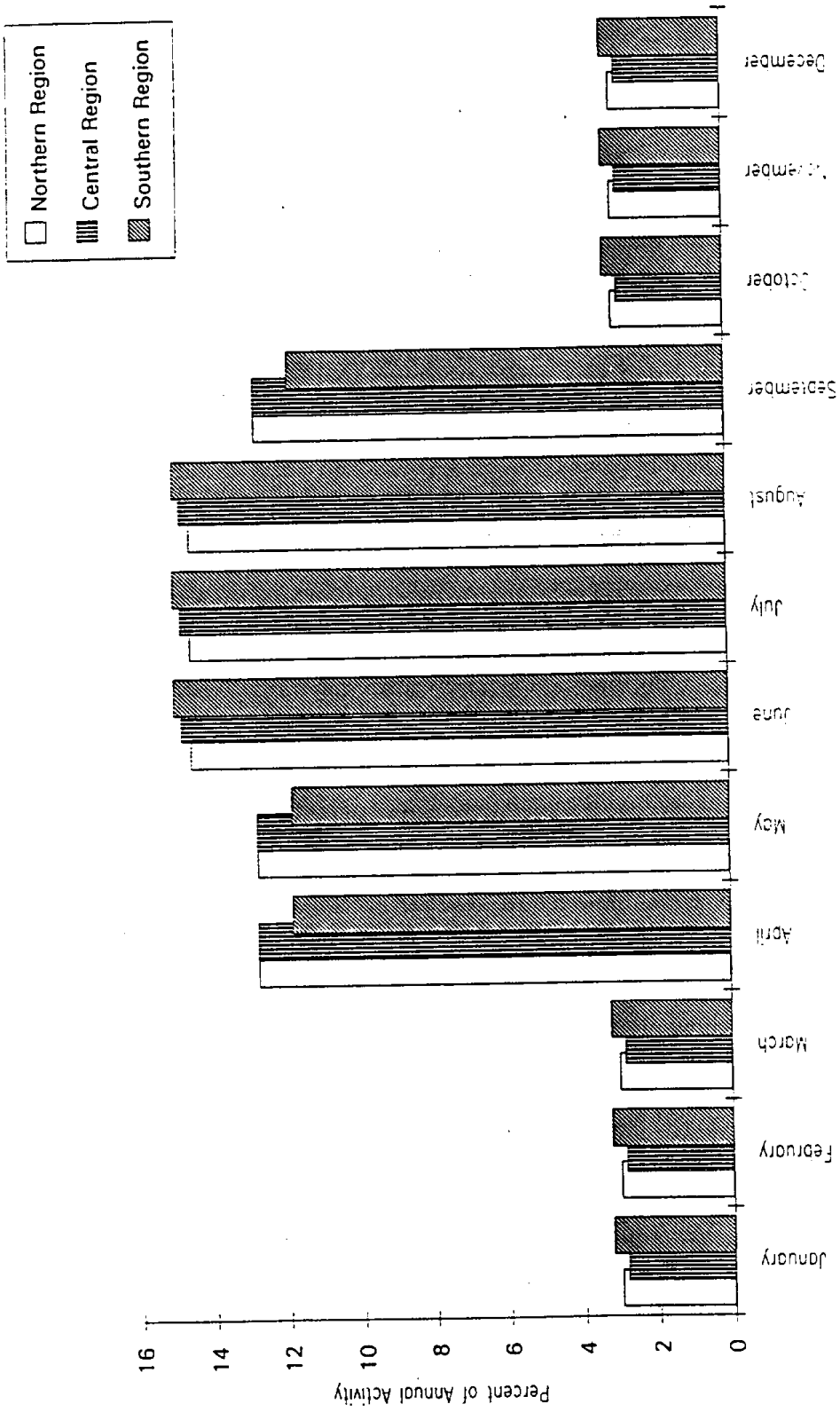

FIGURE 3-1. Monthly activity profile by region.

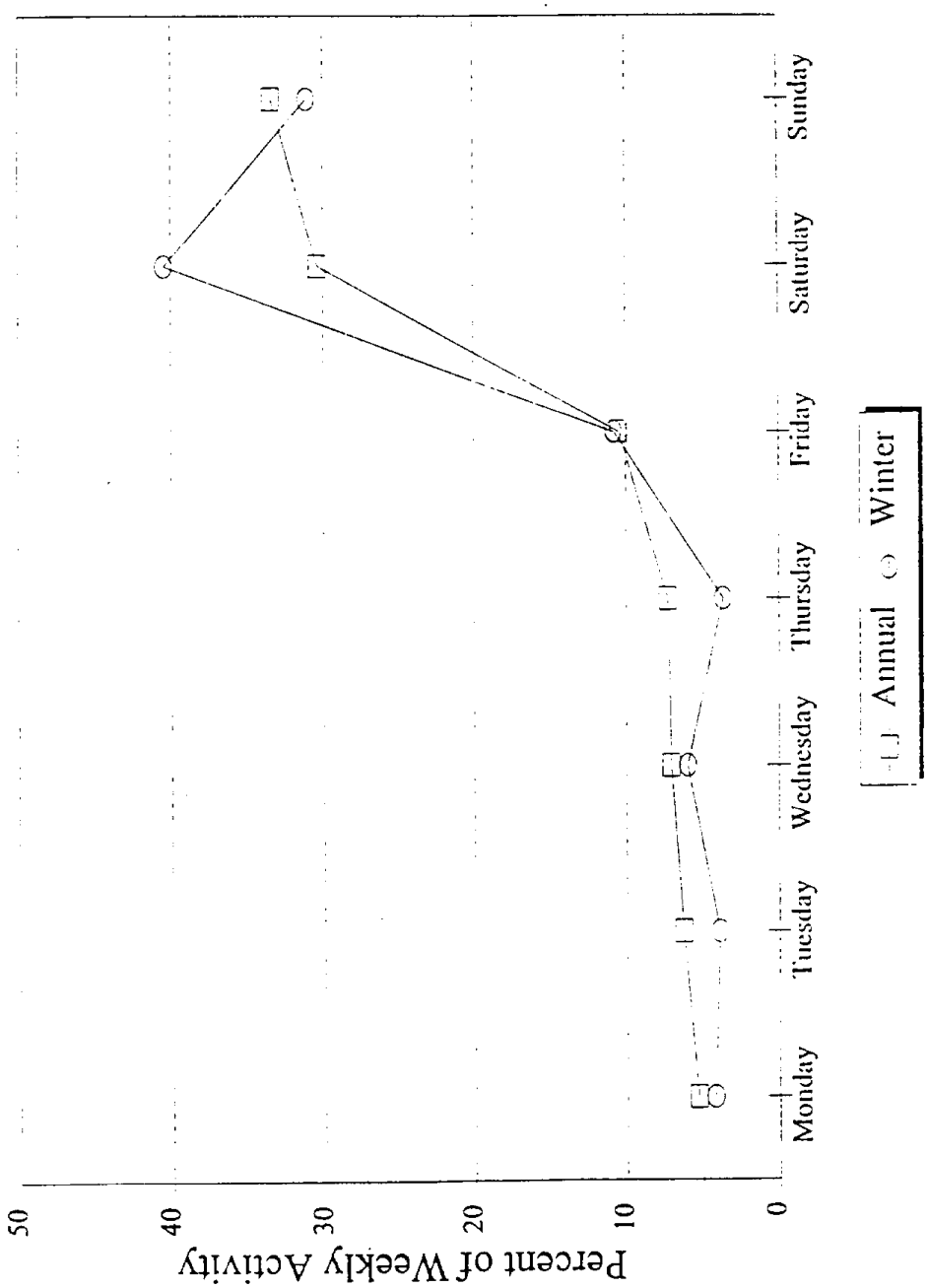

FIGURE 3-2. Average weekly activity profiles.

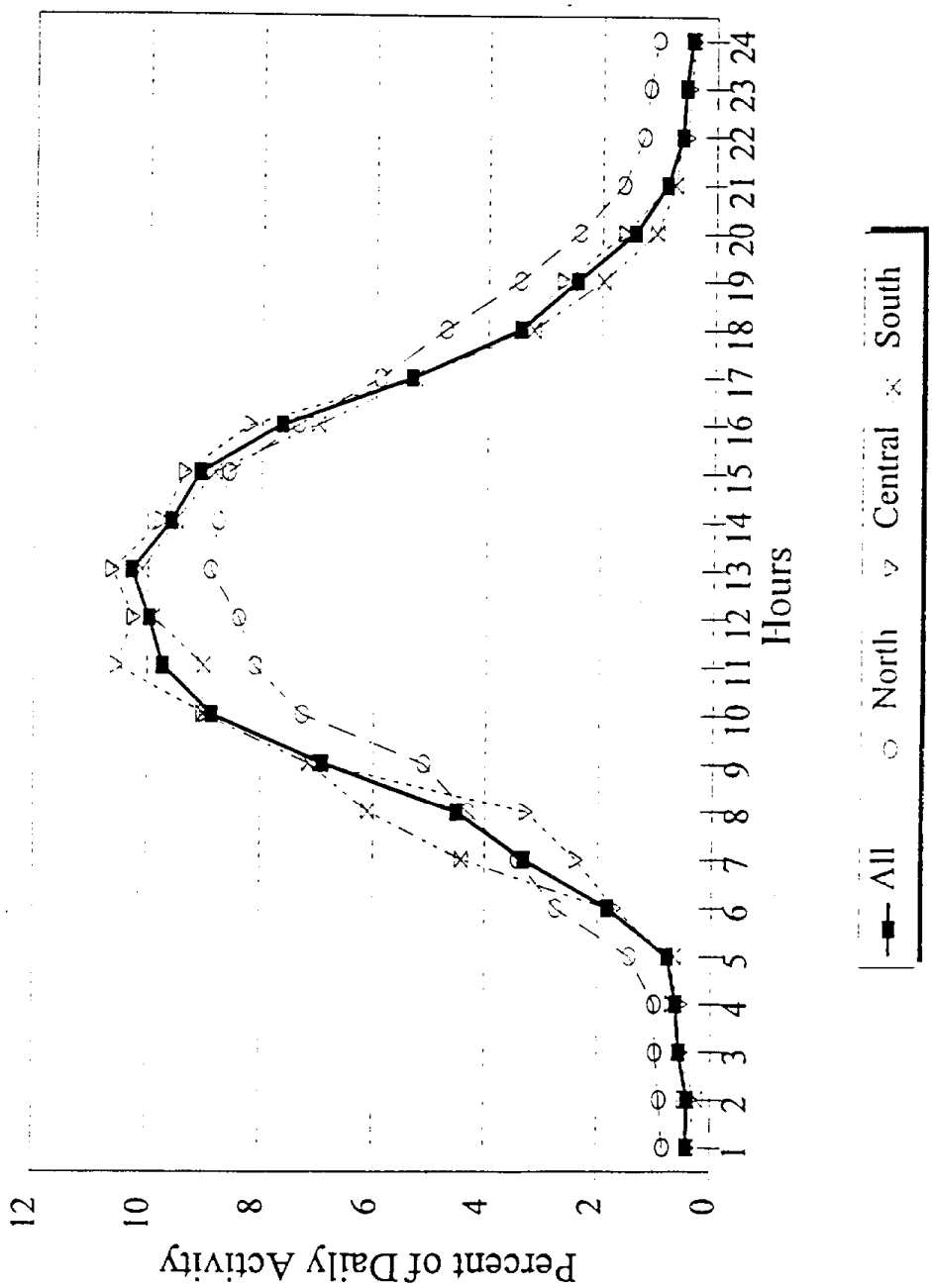

FIGURE 3-3. Annual average diurnal activity profiles.

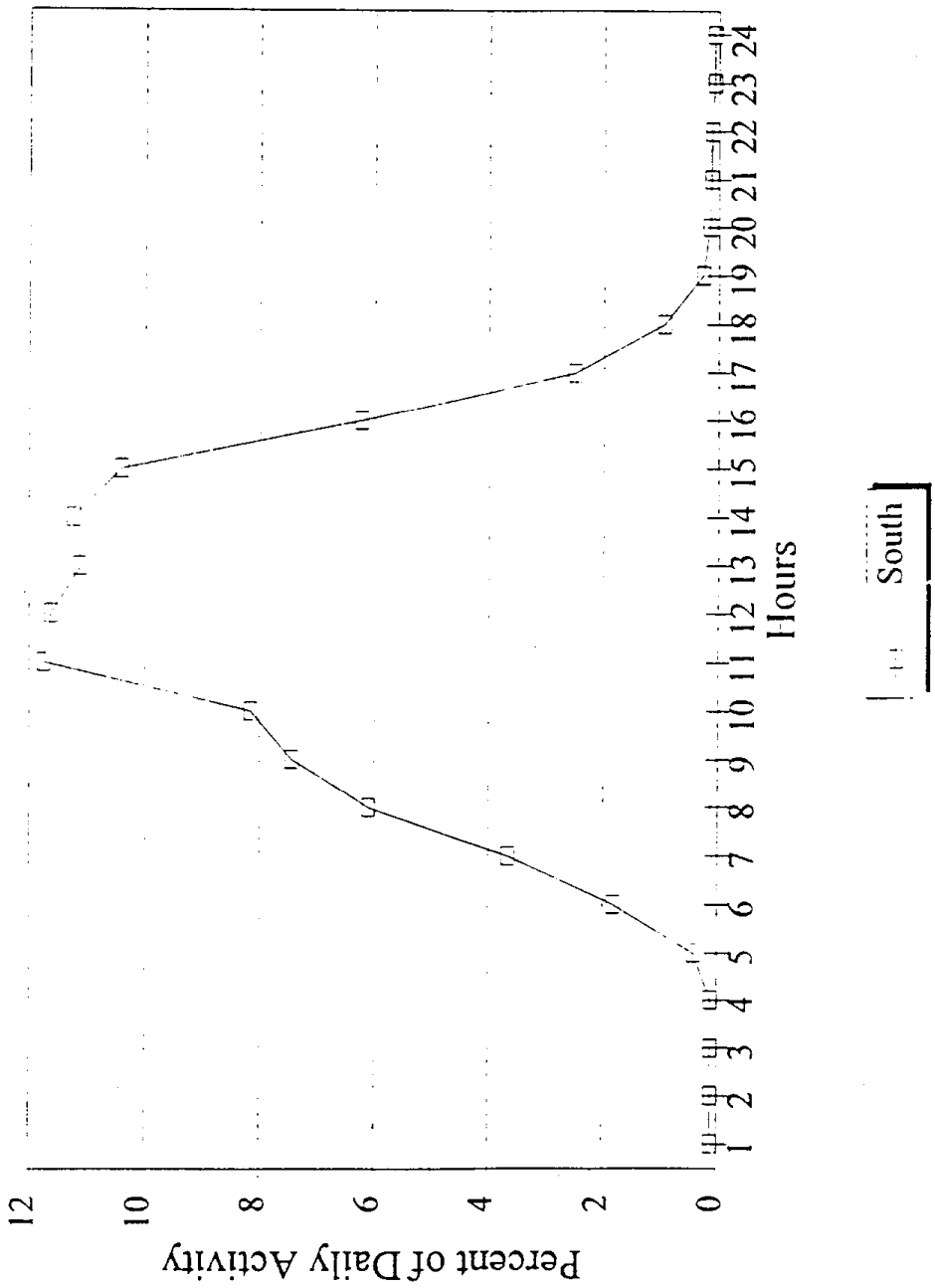

FIGURE 3-4. Winter season diurnal activity profile.

EMISSIONS INVENTORY

The following is a summary of the updated emissions inventory for pleasure craft in California. This inventory is based on the previous discussion and the emissions model PCEM. For details on the model, see Appendix G.

Tables 3-6 through 3-8 summarize the county-level emissions, which were created using the methodologies described above. These tables are standard output for PCEM. Table 3-6 shows emissions of NO_x, CO, SO_x, PM, and TOG (including exhaust, crankcase, evaporation, and refueling) for an annual average day.[3] Summaries are provided by county and engine-propulsion combinations where the code to the left of the propulsion type is for the engine type. Codes G2 and G4 represent gasoline-powered vessels with 2- and 4-stroke engines, respectively. Code D is for diesel-powered engines.

The notes at the end of the tables indicate that survey data with activity was not received for the three engine-propulsion combinations: gasoline-powered "other" vessels in the Central region, diesel-powered "other" vessels in the Southern region, and diesel-powered outboards in the Southern region. For example, there are 102 diesel-powered outboards registered with the DMV in the Southern regions. Of these 102 vessels, none of the owners of these vessels responded to the survey that they had used their boats during the two-week sampling period. For this reason, the activity by county associated with these boats could not be included in the inventory. Furthermore, the number of vessels associated with these three engine-propulsion combinations could not be included in the county-level estimates. These vessels account for about one percent of the total vessel population.

Table 3-7 summarizes emissions for an average day during the ozone season. The annual average daily emissions are adjusted with a seasonal adjustment factor as discussed above. Both of these tables also show the approximate number of boats that actually operate in the county during the year, instead of the registered population for each county. Note that these values do not include the population of documented or rental vessels.

Table 3-8 presents the emission data summarized on the county level and includes the average emissions in a county in pounds per 1000 gallons. As can be seen, the average emissions in a county can be an indication of the type of boating activity that occurs in a county. For example, the average NO_x emissions for Santa Clara are larger than for most of the other counties. This is because the population and emissions (or fuel usage) in the county are dominated by inboard/outboard vessels and the NO_x emission factor associated with 4-stroke engines is larger than that for 2-stroke engines. The TOG emissions presented in this table include exhaust emissions only.

Note that the vessel populations given in these tables do not include rentals or documented vessels. Data were not available on the population of rental vessels or

(Continued on p. 3-49)

[3] Annual average day = Annual emissions/365 days per year.

TABLE 3-6. Pleasure craft emissions (tons/average day) by county and engine-propulsion type.[1]

Annual Emissions
(Tons / Average Day)

		Fuel Use 1000 gal	# of Boats *	NOx	CO	SOx	PM	TOG Exhaust	TOG Crank	TOG Evap	TOG Refuel	TOG Total
Alameda												
Outboard	G2	0.51	3554	0.55E-02	1.20	0.49E-03	0.03	0.59	0.02	0.	0.50E-02	0.61
Auxiliary Sail	G2	0.58E-02	70	0.26E-04	0.01	0.55E-05	0.31E-03	0.85E-02	0.	0.40E-04	0.56E-04	0.86E-02
Outboard	G4	0.06	172	0.28E-02	0.15	0.53E-04	0.45E-04	0.95E-02	0.18E-02	0.	0.54E-03	0.01
Inboard/Outboard	G4	0.77	1966	0.04	2.09	0.73E-03	0.61E-03	0.13	0.	0.48E-04	0.45E-02	0.13
Inboard	G4	0.23	488	0.01	0.62	0.22E-03	0.18E-03	0.04	0.	0.19E-03	0.13E-02	0.04
Inboard Jet	G4	0.22	341	0.01	0.60	0.21E-03	0.17E-03	0.04	0.	0.	0.	0.04
Auxiliary Sail	G4	0.71E-02	56	0.36E-03	0.02	0.68E-05	0.57E-05	0.12E-02	0.23E-03	0.	0.69E-04	0.15E-02
Inboard	D	0.03	51	0.62E-02	0.67E-02	0.11E-03	0.38E-03	0.30E-02	0.	0.	0.14E-05	0.30E-02
Auxiliary Sail	D	0.01	102	0.23E-02	0.25E-02	0.43E-04	0.14E-03	0.11E-02	0.33E-04	0.	0.	0.12E-02
Personal Water Craft	G2	0.08	508	0.53E-03	0.17	0.79E-04	0.44E-02	0.09	0.	0.	0.	0.09
Total		1.92	7308	0.08	4.87	0.19E-02	0.03	0.91	0.02	0.28E-03	0.01	0.94
Alpine												
Outboard	G2	0.07	455	0.71E-03	0.15	0.63E-04	0.35E-02	0.08	0.21E-02	0.	0.64E-03	0.08
Auxiliary Sail	G2	0.74E-03	9	0.33E-05	0.15E-02	0.70E-06	0.39E-04	0.11E-02	0.	0.51E-05	0.71E-05	0.11E-02
Outboard	G4	0.77E-02	24	0.39E-03	0.02	0.73E-05	0.61E-05	0.13E-02	0.24E-03	0.	0.74E-04	0.16E-02
Inboard/Outboard	G4	0.11	270	0.53E-02	0.29	0.10E-03	0.84E-04	0.02	0.	0.65E-05	0.61E-03	0.02
Inboard	G4	0.03	67	0.16E-02	0.08	0.30E-04	0.25E-04	0.53E-02	0.	0.27E-04	0.18E-03	0.55E-02
Inboard Jet	G4	0.03	47	0.15E-02	0.08	0.28E-04	0.24E-04	0.51E-02	0.	0.	0.	0.51E-02
Auxiliary Sail	G4	0.98E-03	8	0.49E-04	0.27E-02	0.93E-06	0.78E-06	0.17E-03	0.31E-04	0.	0.94E-05	0.21E-03
Inboard	D	0.44E-02	7	0.85E-03	0.92E-03	0.16E-04	0.53E-04	0.41E-03	0.	0.	0.20E-06	0.41E-03
Auxiliary Sail	D	0.17E-02	14	0.32E-03	0.35E-03	0.59E-05	0.20E-04	0.16E-03	0.45E-05	0.	0.	0.16E-03
Personal Water Craft	G2	0.01	70	0.73E-04	0.02	0.11E-04	0.60E-03	0.01	0.	0.	0.	0.01
Total		0.26	971	0.01	0.66	0.26E-03	0.44E-02	0.12	0.24E-02	0.38E-04	0.15E-02	0.12
Amador												
Outboard	G2	0.42	2923	0.45E-02	0.99	0.40E-03	0.02	0.49	0.01	0.	0.41E-02	0.50
Auxiliary Sail	G2	0.47E-02	58	0.21E-04	0.98E-02	0.45E-05	0.25E-03	0.70E-02	0.	0.33E-04	0.46E-04	0.71E-02
Outboard	G4	0.02	54	0.89E-03	0.05	0.17E-04	0.14E-04	0.30E-02	0.56E-03	0.	0.17E-03	0.37E-02
Inboard/Outboard	G4	0.24	619	0.01	0.66	0.23E-03	0.19E-03	0.04	0.	0.15E-04	0.14E-02	0.04
Inboard	G4	0.07	154	0.36E-02	0.19	0.68E-04	0.57E-04	0.01	0.	0.61E-04	0.40E-03	0.01
Inboard Jet	G4	0.07	107	0.35E-02	0.19	0.65E-04	0.55E-04	0.01	0.	0.	0.	0.01
Auxiliary Sail	G4	0.22E-02	18	0.11E-03	0.61E-02	0.21E-05	0.18E-05	0.38E-03	0.71E-04	0.	0.22E-04	0.47E-03
Inboard	D	0.01	16	0.19E-02	0.21E-02	0.36E-04	0.12E-03	0.94E-03	0.	0.	0.45E-06	0.95E-03
Auxiliary Sail	D	0.38E-02	32	0.74E-03	0.79E-03	0.13E-04	0.46E-04	0.36E-03	0.10E-04	0.	0.	0.37E-03
Personal Water Craft	G2	0.03	160	0.17E-03	0.05	0.25E-04	0.14E-02	0.03	0.	0.	0.	0.03
Total		0.87	4141	0.03	2.15	0.86E-03	0.02	0.59	0.01	0.11E-03	0.61E-02	0.61
Butte												
Outboard	G2	0.62	4416	0.72E-02	1.40	0.59E-03	0.03	0.72	0.02	0.	0.60E-02	0.74
Other	G2	0.94E-02	209	0.13E-03	0.02	0.89E-05	0.50E-03	0.01	0.	0.	0.	0.01
Auxiliary Sail	G2	0.32E-02	40	0.20E-04	0.70E-02	0.31E-05	0.17E-03	0.44E-02	0.	0.18E-03	0.31E-04	0.46E-02
Outboard	G4	0.91E-02	207	0.46E-03	0.02	0.86E-05	0.73E-05	0.15E-02	0.29E-03	0.	0.88E-04	0.19E-02
Inboard/Outboard	G4	0.59	1418	0.03	1.61	0.56E-03	0.47E-03	0.10	0.	0.21E-03	0.34E-02	0.10
Inboard	G4	0.11	279	0.58E-02	0.31	0.11E-03	0.91E-04	0.02	0.	0.85E-03	0.65E-03	0.02
Inboard Jet	G4	0.09	349	0.45E-02	0.24	0.85E-04	0.72E-04	0.02	0.	0.	0.	0.02
Auxiliary Sail	G4	0.41E-03	19	0.20E-04	0.11E-02	0.39E-06	0.32E-06	0.69E-04	0.13E-04	0.	0.39E-05	0.86E-04
Inboard	D	0.69E-04	7	0.13E-04	0.14E-04	0.25E-06	0.83E-06	0.65E-05	0.	0.	0.31E-08	0.65E-05
Auxiliary Sail	D	0.87E-04	17	0.17E-04	0.18E-04	0.31E-06	0.10E-05	0.82E-05	0.24E-06	0.	0.	0.84E-05
Personal Water Craft	G2	0.04	178	0.25E-03	0.08	0.37E-04	0.21E-02	0.04	0.	0.	0.	0.04
Total		1.48	7139	0.05	3.69	0.14E-02	0.04	0.91	0.02	0.12E-02	0.01	0.94

[1] The fuel usage and emissions include registered, documented, and rental vessels. The number of boats only includes registered vessels.

TABLE 3-6. Continued.

Annual Emissions
(Tons / Average Day)

		Fuel Use 1000 gal	# of Boats *	NOx	CO	SOx	PM	TOG Exhaust	TOG Crank	TOG Evap	TOG Refuel	TOG Total
Calaveras												
Outboard	G2	1.75	12055	0.02	4.08	0.17E-02	0.09	2.00	0.06	0.	0.02	2.07
Auxiliary Sail	G2	0.02	238	0.87E-04	0.04	0.19E-04	0.10E-02	0.03	0.	0.14E-03	0.19E-03	0.03
Outboard	G4	0.04	114	0.19E-02	0.10	0.35E-04	0.30E-04	0.63E-02	0.12E-02	0.	0.36E-03	0.78E-02
Inboard/Outboard	G4	0.51	1300	0.03	1.38	0.48E-03	0.41E-03	0.09	0.	0.32E-04	0.30E-02	0.09
Inboard	G4	0.15	323	0.76E-02	0.41	0.14E-03	0.12E-03	0.03	0.	0.13E-03	0.85E-03	0.03
Inboard Jet	G4	0.14	226	0.73E-02	0.39	0.14E-03	0.12E-03	0.02	0.	0.	0.	0.02
Auxiliary Sail	G4	0.47E-02	37	0.24E-03	0.01	0.45E-05	0.38E-05	0.80E-03	0.15E-03	0.	0.45E-04	0.99E-03
Inboard	D	0.02	34	0.41E-02	0.44E-02	0.75E-04	0.25E-03	0.20E-02	0.	0.	0.95E-06	0.20E-02
Auxiliary Sail	D	0.80E-02	68	0.15E-02	0.17E-02	0.28E-04	0.96E-04	0.75E-03	0.22E-04	0.	0.	0.77E-03
Personal Water Craft	G2	0.05	336	0.35E-03	0.11	0.52E-04	0.29E-02	0.06	0.	0.	0.	0.06
Total		2.69	14731	0.07	6.54	0.26E-02	0.10	2.24	0.06	0.30E-03	0.02	2.32
Colusa												
Outboard	G2	0.15	1032	0.16E-02	0.35	0.14E-03	0.79E-02	0.17	0.48E-02	0.	0.14E-02	0.18
Auxiliary Sail	G2	0.17E-02	20	0.75E-05	0.35E-02	0.16E-05	0.89E-04	0.25E-02	0.	0.12E-04	0.16E-04	0.25E-02
Outboard	G4	0.17E-02	5	0.87E-04	0.47E-02	0.16E-05	0.14E-05	0.29E-03	0.55E-04	0.	0.17E-04	0.37E-03
Inboard/Outboard	G4	0.02	61	0.12E-02	0.06	0.23E-04	0.19E-04	0.40E-02	0.	0.15E-05	0.14E-03	0.42E-02
Inboard	G4	0.70E-02	15	0.35E-03	0.02	0.67E-05	0.56E-05	0.12E-02	0.	0.60E-05	0.40E-04	0.12E-02
Inboard Jet	G4	0.68E-02	11	0.34E-03	0.02	0.64E-05	0.54E-05	0.11E-02	0.	0.	0.	0.11E-02
Auxiliary Sail	G4	0.22E-03	2	0.11E-04	0.60E-03	0.21E-06	0.18E-06	0.37E-04	0.70E-05	0.	0.21E-05	0.47E-04
Inboard	D	0.99E-03	2	0.19E-03	0.21E-03	0.35E-05	0.12E-04	0.93E-04	0.	0.	0.45E-07	0.93E-04
Auxiliary Sail	D	0.37E-03	3	0.73E-04	0.78E-04	0.13E-05	0.45E-05	0.35E-04	0.10E-05	0.	0.	0.36E-04
Personal Water Craft	G2	0.26E-02	16	0.16E-04	0.52E-02	0.24E-05	0.14E-03	0.28E-02	0.	0.	0.	0.28E-02
Total		0.19	1167	0.39E-02	0.47	0.19E-03	0.82E-02	0.18	0.48E-02	0.19E-04	0.17E-02	0.19
Contra Costa												
Outboard	G2	0.81	5583	0.87E-02	1.89	0.77E-03	0.04	0.93	0.03	0.	0.78E-02	0.96
Auxiliary Sail	G2	0.91E-02	110	0.40E-04	0.02	0.86E-05	0.48E-03	0.01	0.	0.63E-04	0.87E-04	0.01
Outboard	G4	0.17	509	0.84E-02	0.45	0.16E-03	0.13E-03	0.03	0.53E-02	0.	0.16E-02	0.03
Inboard/Outboard	G4	2.27	5827	0.11	6.20	0.22E-02	0.18E-02	0.39	0.	0.14E-03	0.01	0.40
Inboard	G4	0.67	1447	0.03	1.83	0.64E-03	0.54E-03	0.11	0.	0.58E-03	0.38E-02	0.12
Inboard Jet	G4	0.65	1012	0.03	1.77	0.61E-03	0.52E-03	0.11	0.	0.	0.	0.11
Auxiliary Sail	G4	0.02	167	0.11E-02	0.06	0.20E-04	0.17E-04	0.36E-02	0.67E-03	0.	0.20E-03	0.45E-02
Inboard	D	0.09	151	0.02	0.02	0.34E-03	0.11E-02	0.89E-02	0.	0.	0.43E-05	0.89E-02
Auxiliary Sail	D	0.04	303	0.69E-02	0.75E-02	0.13E-03	0.43E-03	0.34E-02	0.97E-04	0.	0.	0.35E-02
Personal Water Craft	G2	0.25	1506	0.16E-02	0.50	0.23E-03	0.01	0.27	0.	0.	0.	0.27
Total		4.97	16615	0.23	12.75	0.51E-02	0.06	1.87	0.03	0.78E-03	0.03	1.93
Del Norte												
Outboard	G2	0.03	212	0.35E-03	0.07	0.28E-04	0.16E-02	0.03	0.95E-03	0.	0.29E-03	0.04
Other	G2	0.45E-03	10	0.64E-05	0.92E-03	0.43E-06	0.24E-04	0.51E-03	0.	0.	0.	0.51E-03
Auxiliary Sail	G2	0.16E-03	2	0.98E-06	0.34E-03	0.15E-06	0.82E-05	0.21E-03	0.	0.87E-05	0.15E-05	0.22E-03
Outboard	G4	0.15E-02	34	0.75E-04	0.41E-02	0.14E-05	0.12E-05	0.25E-03	0.47E-04	0.	0.14E-04	0.31E-03
Inboard/Outboard	G4	0.10	232	0.49E-02	0.26	0.91E-04	0.77E-04	0.02	0.	0.34E-04	0.56E-03	0.02
Inboard	G4	0.02	46	0.94E-03	0.05	0.18E-04	0.15E-04	0.32E-02	0.	0.14E-03	0.11E-03	0.34E-02
Inboard Jet	G4	0.01	57	0.74E-03	0.04	0.14E-04	0.12E-04	0.25E-02	0.	0.	0.	0.25E-02
Auxiliary Sail	G4	0.66E-04	3	0.33E-05	0.18E-03	0.63E-07	0.53E-07	0.11E-04	0.21E-05	0.	0.64E-06	0.14E-04
Inboard	D	0.11E-04	1	0.22E-05	0.24E-05	0.40E-07	0.14E-06	0.11E-05	0.	0.	0.51E-09	0.11E-05
Auxiliary Sail	D	0.14E-04	3	0.28E-05	0.30E-05	0.51E-07	0.17E-06	0.13E-05	0.39E-07	0.	0.	0.14E-05
Personal Water Craft	G2	0.64E-02	29	0.41E-04	0.01	0.61E-05	0.34E-03	0.71E-02	0.	0.	0.	0.71E-02
Total		0.17	629	0.70E-02	0.44	0.16E-03	0.21E-02	0.06	0.10E-02	0.18E-03	0.97E-03	0.07

TABLE 3-6. Continued.

Annual Emissions
(Tons / Average Day)

		Fuel Use 1000 gal	# of Boats *	NOx	CO	SOx	PM	TOG Exhaust	TOG Crank	TOG Evap	TOG Refuel	TOG Total
El Dorado												
Outboard	G2	0.46	3180	0.49E-02	1.08	0.44E-03	0.02	0.53	0.01	0.	0.44E-02	0.55
Auxiliary Sail	G2	0.52E-02	63	0.23E-04	0.01	0.49E-05	0.27E-03	0.75E-02	0.	0.36E-04	0.50E-04	0.77E-02
Outboard	G4	0.13	398	0.65E-02	0.35	0.12E-03	0.10E-03	0.02	0.41E-02	0.	0.12E-02	0.03
Inboard/Outboard	G4	1.78	4562	0.09	4.85	0.17E-02	0.14E-02	0.30	0.	0.11E-03	0.01	0.31
Inboard	G4	0.53	1132	0.03	1.44	0.50E-03	0.42E-03	0.09	0.	0.45E-03	0.30E-02	0.09
Inboard Jet	G4	0.51	792	0.03	1.38	0.48E-03	0.41E-03	0.09	0.	0.	0.	0.09
Auxiliary Sail	G4	0.02	131	0.83E-03	0.05	0.16E-04	0.13E-04	0.28E-02	0.53E-03	0.	0.16E-03	0.35E-02
Inboard	D	0.07	118	0.01	0.02	0.26E-03	0.89E-03	0.70E-02	0.	0.	0.33E-05	0.70E-02
Auxiliary Sail	D	0.03	237	0.54E-02	0.59E-02	0.99E-04	0.34E-03	0.26E-02	0.76E-04	0.	0.	0.27E-02
Personal Water Craft	G2	0.19	1179	0.12E-02	0.39	0.18E-03	0.01	0.21	0.	0.	0.	0.21
Total		3.72	11792	0.18	9.57	0.38E-02	0.04	1.26	0.02	0.60E-03	0.02	1.30
Fresno												
Outboard	G2	0.81	5602	0.87E-02	1.90	0.77E-03	0.04	0.93	0.03	0.	0.78E-02	0.96
Auxiliary Sail	G2	0.91E-02	111	0.41E-04	0.02	0.86E-05	0.48E-03	0.01	0.	0.63E-04	0.88E-04	0.01
Outboard	G4	0.05	158	0.26E-02	0.14	0.49E-04	0.41E-04	0.88E-02	0.16E-02	0.	0.50E-03	0.01
Inboard/Outboard	G4	0.71	1815	0.04	1.93	0.67E-03	0.57E-03	0.12	0.	0.44E-04	0.41E-02	0.12
Inboard	G4	0.21	451	0.01	0.57	0.20E-03	0.17E-03	0.04	0.	0.18E-03	0.12E-02	0.04
Inboard Jet	G4	0.20	315	0.01	0.55	0.19E-03	0.16E-03	0.03	0.	0.	0.	0.03
Auxiliary Sail	G4	0.66E-02	52	0.33E-03	0.02	0.62E-05	0.53E-05	0.11E-02	0.21E-03	0.	0.63E-04	0.14E-02
Inboard	D	0.03	47	0.57E-02	0.62E-02	0.10E-03	0.35E-03	0.28E-02	0.	0.	0.13E-05	0.28E-02
Auxiliary Sail	D	0.01	94	0.22E-02	0.23E-02	0.40E-04	0.13E-03	0.10E-02	0.30E-04	0.	0.	0.11E-02
Personal Water Craft	G2	0.08	469	0.49E-03	0.15	0.73E-04	0.41E-02	0.08	0.	0.	0.	0.08
Total		2.11	9114	0.08	5.29	0.21E-02	0.05	1.23	0.03	0.29E-03	0.01	1.27
Glenn												
Outboard	G2	0.13	890	0.15E-02	0.28	0.12E-03	0.66E-02	0.14	0.40E-02	0.	0.12E-02	0.15
Other	G2	0.19E-02	42	0.27E-04	0.39E-02	0.18E-05	0.10E-03	0.21E-02	0.	0.	0.	0.21E-02
Auxiliary Sail	G2	0.65E-03	8	0.41E-05	0.14E-02	0.62E-06	0.35E-04	0.89E-03	0.	0.37E-04	0.63E-05	0.93E-03
Outboard	G4	0.23E-03	5	0.11E-04	0.62E-03	0.22E-06	0.18E-06	0.39E-04	0.73E-05	0.	0.22E-05	0.48E-04
Inboard/Outboard	G4	0.01	36	0.74E-03	0.04	0.14E-04	0.12E-04	0.25E-02	0.	0.52E-05	0.86E-04	0.26E-02
Inboard	G4	0.29E-02	7	0.14E-03	0.78E-02	0.27E-05	0.23E-05	0.49E-03	0.	0.21E-04	0.16E-04	0.52E-03
Inboard Jet	G4	0.22E-02	9	0.11E-03	0.61E-02	0.21E-05	0.18E-05	0.38E-03	0.	0.	0.	0.38E-03
Auxiliary Sail	G4	0.10E-04	1	0.51E-06	0.28E-04	0.97E-08	0.81E-08	0.17E-05	0.32E-06	0.	0.98E-07	0.21E-05
Inboard	D	0.17E-05	1	0.34E-06	0.36E-06	0.61E-08	0.21E-07	0.16E-06	0.	0.	0.78E-10	0.16E-06
Auxiliary Sail	D	0.22E-05	1	0.42E-06	0.46E-06	0.78E-08	0.26E-07	0.21E-06	0.59E-08	0.	0.	0.21E-06
Personal Water Craft	G2	0.98E-03	4	0.63E-05	0.20E-02	0.93E-06	0.52E-04	0.11E-02	0.	0.	0.	0.11E-02
Total		0.15	1004	0.25E-02	0.34	0.14E-03	0.69E-02	0.15	0.40E-02	0.63E-04	0.13E-02	0.16
Humboldt												
Outboard	G2	0.16	1142	0.19E-02	0.36	0.15E-03	0.85E-02	0.19	0.51E-02	0.	0.16E-02	0.19
Other	G2	0.24E-02	54	0.34E-04	0.50E-02	0.23E-05	0.13E-03	0.27E-02	0.	0.	0.	0.27E-02
Auxiliary Sail	G2	0.84E-03	10	0.53E-05	0.18E-02	0.80E-06	0.44E-04	0.11E-02	0.	0.47E-04	0.81E-05	0.12E-02
Outboard	G4	0.77E-03	18	0.39E-04	0.21E-02	0.73E-06	0.62E-06	0.13E-03	0.25E-04	0.	0.74E-05	0.16E-03
Inboard/Outboard	G4	0.05	121	0.25E-02	0.14	0.47E-04	0.40E-04	0.85E-02	0.	0.18E-04	0.29E-03	0.88E-02
Inboard	G4	0.97E-02	24	0.49E-03	0.03	0.92E-05	0.78E-05	0.17E-02	0.	0.72E-04	0.55E-04	0.18E-02
Inboard Jet	G4	0.76E-02	30	0.38E-03	0.02	0.72E-05	0.61E-05	0.13E-02	0.	0.	0.	0.13E-02
Auxiliary Sail	G4	0.34E-04	2	0.17E-05	0.94E-04	0.33E-07	0.28E-07	0.59E-05	0.11E-05	0.	0.33E-06	0.73E-05
Inboard	D	0.59E-05	1	0.11E-05	0.12E-05	0.21E-07	0.70E-07	0.55E-06	0.	0.	0.26E-09	0.55E-06
Auxiliary Sail	D	0.74E-05	1	0.14E-05	0.16E-05	0.26E-07	0.89E-07	0.70E-06	0.20E-07	0.	0.	0.72E-06
Personal Water Craft	G2	0.33E-02	15	0.21E-04	0.67E-02	0.32E-05	0.18E-03	0.37E-02	0.	0.	0.	0.37E-02
Total		0.24	1418	0.54E-02	0.56	0.22E-03	0.89E-02	0.20	0.52E-02	0.14E-03	0.19E-02	0.21

TABLE 3-6. Continued.

Annual Emissions
(Tons / Average Day)

		Fuel Use 1000 gal	# of Boats *	NOx	CO	SOx	PM	TOG Exhaust	TOG Crank	TOG Evap	TOG Refuel	TOG Total
Imperial												
Outboard	G2	0.28E-02	18	0.25E-04	0.66E-02	0.26E-05	0.15E-03	0.33E-02	0.88E-04	0.	0.27E-04	0.34E-02
Other	G2	0.17E-04	1	0.16E-06	0.50E-04	0.17E-07	0.92E-06	0.19E-04	0.	0.	0.	0.19E-04
Auxiliary Sail	G2	0.28E-04	1	0.24E-06	0.64E-04	0.27E-07	0.15E-05	0.35E-04	0.	0.29E-06	0.27E-06	0.35E-04
Outboard	G4	0.42E-03	119	0.21E-04	0.12E-02	0.40E-06	0.34E-06	0.72E-04	0.14E-04	0.	0.41E-05	0.90E-04
Inboard/Outboard	G4	0.65	1337	0.03	1.79	0.62E-03	0.52E-03	0.11	0.	0.36E-04	0.38E-02	0.11
Inboard	G4	0.30	368	0.01	0.81	0.28E-03	0.24E-03	0.05	0.	0.15E-03	0.17E-02	0.05
Inboard Jet	G4	0.11	483	0.55E-02	0.30	0.10E-03	0.87E-04	0.02	0.	0.	0.	0.02
Auxiliary Sail	G4	0.01	59	0.52E-03	0.03	0.98E-05	0.83E-05	0.18E-02	0.33E-03	0.	0.10E-03	0.22E-02
Inboard	D	0.03	69	0.64E-02	0.69E-02	0.12E-03	0.40E-03	0.31E-02	0.	0.	0.15E-05	0.31E-02
Auxiliary Sail	D	0.03	131	0.56E-02	0.60E-02	0.10E-03	0.35E-03	0.27E-02	0.78E-04	0.	0.	0.28E-02
Personal Water Craft	G2	0.12	1138	0.75E-03	0.24	0.11E-03	0.62E-02	0.13	0.	0.	0.	0.13
Total		1.25	3724	0.07	3.18	0.13E-02	0.79E-02	0.32	0.51E-03	0.18E-03	0.56E-02	0.33
Inyo												
Outboard	G2	0.02	167	0.26E-03	0.06	0.23E-04	0.13E-02	0.03	0.77E-03	0.	0.23E-03	0.03
Auxiliary Sail	G2	0.27E-03	3	0.12E-05	0.56E-03	0.26E-06	0.14E-04	0.40E-03	0.	0.19E-05	0.26E-05	0.40E-03
Outboard	G4	0.48E-03	1	0.24E-04	0.13E-02	0.45E-06	0.38E-06	0.81E-04	0.15E-04	0.	0.46E-05	0.10E-03
Inboard/Outboard	G4	0.65E-02	17	0.33E-03	0.02	0.62E-05	0.52E-05	0.11E-02	0.	0.41E-06	0.38E-04	0.11E-02
Inboard	G4	0.19E-02	4	0.97E-04	0.53E-02	0.18E-05	0.15E-05	0.33E-03	0.	0.17E-05	0.11E-04	0.34E-03
Inboard Jet	G4	0.19E-02	3	0.94E-04	0.51E-02	0.18E-05	0.15E-05	0.32E-03	0.	0.	0.	0.32E-03
Auxiliary Sail	G4	0.61E-04	1	0.31E-05	0.17E-03	0.58E-07	0.49E-07	0.10E-04	0.19E-05	0.	0.59E-06	0.13E-04
Inboard	D	0.27E-03	1	0.53E-04	0.57E-04	0.97E-06	0.33E-05	0.26E-04	0.	0.	0.12E-07	0.26E-04
Auxiliary Sail	D	0.10E-03	1	0.20E-04	0.22E-04	0.37E-06	0.12E-05	0.97E-05	0.28E-06	0.	0.	0.99E-05
Personal Water Craft	G2	0.71E-03	4	0.45E-05	0.14E-02	0.67E-06	0.38E-04	0.78E-03	0.	0.	0.	0.78E-03
Total		0.04	202	0.89E-03	0.09	0.36E-04	0.13E-02	0.03	0.79E-03	0.39E-05	0.29E-03	0.03
Kern												
Outboard	G2	0.30	1937	0.27E-02	0.71	0.29E-03	0.02	0.36	0.96E-02	0.	0.29E-02	0.37
Other	G2	0.19E-02	99	0.17E-04	0.54E-02	0.18E-05	0.10E-03	0.21E-02	0.	0.	0.	0.21E-02
Auxiliary Sail	G2	0.31E-02	63	0.26E-04	0.70E-02	0.29E-05	0.16E-03	0.38E-02	0.	0.32E-04	0.30E-04	0.38E-02
Outboard	G4	0.66E-03	186	0.34E-04	0.18E-02	0.63E-06	0.53E-06	0.11E-03	0.21E-04	0.	0.64E-05	0.14E-03
Inboard/Outboard	G4	1.02	2092	0.05	2.79	0.97E-03	0.82E-03	0.17	0.	0.56E-04	0.60E-02	0.18
Inboard	G4	0.46	575	0.02	1.27	0.44E-03	0.37E-03	0.08	0.	0.23E-03	0.26E-02	0.08
Inboard Jet	G4	0.17	755	0.86E-02	0.47	0.16E-03	0.14E-03	0.03	0.	0.	0.	0.03
Auxiliary Sail	G4	0.02	92	0.81E-03	0.04	0.15E-04	0.13E-04	0.27E-02	0.51E-03	0.	0.16E-03	0.34E-02
Inboard	D	0.05	108	0.01	0.01	0.18E-03	0.62E-03	0.49E-02	0.	0.	0.23E-05	0.49E-02
Auxiliary Sail	D	0.05	205	0.88E-02	0.94E-02	0.16E-03	0.54E-03	0.42E-02	0.12E-03	0.	0.	0.44E-02
Personal Water Craft	G2	0.18	1781	0.12E-02	0.37	0.17E-03	0.97E-02	0.20	0.	0.	0.	0.20
Total		2.26	7893	0.11	5.69	0.24E-02	0.03	0.86	0.01	0.31E-03	0.01	0.88
Kings												
Outboard	G2	0.02	145	0.22E-03	0.05	0.20E-04	0.11E-02	0.02	0.67E-03	0.	0.20E-03	0.02
Auxiliary Sail	G2	0.23E-03	3	0.10E-05	0.49E-03	0.22E-06	0.12E-04	0.34E-03	0.	0.16E-05	0.23E-05	0.35E-03
Outboard	G4	0.48E-03	1	0.24E-04	0.13E-02	0.45E-06	0.38E-06	0.81E-04	0.15E-04	0.	0.46E-05	0.10E-03
Inboard/Outboard	G4	0.65E-02	17	0.33E-03	0.02	0.62E-05	0.52E-05	0.11E-02	0.	0.41E-06	0.38E-04	0.11E-02
Inboard	G4	0.19E-02	4	0.97E-04	0.53E-02	0.18E-05	0.15E-05	0.33E-03	0.	0.17E-05	0.11E-04	0.34E-03
Inboard Jet	G4	0.19E-02	3	0.94E-04	0.51E-02	0.18E-05	0.15E-05	0.32E-03	0.	0.	0.	0.32E-03
Auxiliary Sail	G4	0.61E-04	1	0.31E-05	0.17E-03	0.58E-07	0.49E-07	0.10E-04	0.19E-05	0.	0.59E-06	0.13E-04
Inboard	D	0.27E-03	1	0.53E-04	0.57E-04	0.97E-06	0.33E-05	0.26E-04	0.	0.	0.12E-07	0.26E-04
Auxiliary Sail	D	0.10E-03	1	0.20E-04	0.22E-04	0.37E-06	0.12E-05	0.97E-05	0.28E-06	0.	0.	0.99E-05
Personal Water Craft	G2	0.71E-03	4	0.45E-05	0.14E-02	0.67E-06	0.38E-04	0.78E-03	0.	0.	0.	0.78E-03
Total		0.03	180	0.85E-03	0.08	0.32E-04	0.12E-02	0.03	0.69E-03	0.37E-05	0.26E-03	0.03

TABLE 3-6. Continued.

Annual Emissions
(Tons / Average Day)

		Fuel Use 1000 gal	# of Boats *	NOx	CO	SOx	PM	TOG Exhaust	TOG Crank	TOG Evap	TOG Refuel	TOG Total
Lake												
Outboard	G2	0.92	6329	0.98E-02	2.14	0.87E-03	0.05	1.05	0.03	0.	0.88E-02	1.09
Auxiliary Sail	G2	0.01	125	0.46E-04	0.02	0.98E-05	0.54E-03	0.02	0.	0.71E-04	0.99E-04	0.02
Outboard	G4	0.19	572	0.94E-02	0.51	0.18E-03	0.15E-03	0.03	0.59E-02	0.	0.18E-02	0.04
Inboard/Outboard	G4	2.55	6548	0.13	6.97	0.24E-02	0.20E-02	0.43	0.	0.16E-03	0.01	0.45
Inboard	G4	0.75	1626	0.04	2.06	0.72E-03	0.60E-03	0.13	0.	0.65E-03	0.43E-02	0.13
Inboard Jet	G4	0.73	1137	0.04	1.99	0.69E-03	0.58E-03	0.12	0.	0.	0.	0.12
Auxiliary Sail	G4	0.02	187	0.12E-02	0.06	0.23E-04	0.19E-04	0.40E-02	0.76E-03	0.	0.23E-03	0.50E-02
Inboard	D	0.11	170	0.02	0.02	0.38E-03	0.13E-02	0.10E-01	0.	0.	0.48E-05	0.01
Auxiliary Sail	D	0.04	341	0.78E-02	0.84E-02	0.14E-03	0.48E-03	0.38E-02	0.11E-03	0.	0.	0.39E-02
Personal Water Craft	G2	0.28	1692	0.18E-02	0.56	0.26E-03	0.01	0.31	0.	0.	0.	0.31
Total		5.59	18727	0.25	14.34	0.57E-02	0.07	2.11	0.04	0.88E-03	0.03	2.17
Lassen												
Outboard	G2	0.37	2655	0.44E-02	0.84	0.36E-03	0.02	0.43	0.01	0.	0.36E-02	0.45
Other	G2	0.57E-02	125	0.80E-04	0.01	0.54E-05	0.30E-03	0.64E-02	0.	0.	0.	0.64E-02
Auxiliary Sail	G2	0.19E-02	24	0.12E-04	0.42E-02	0.18E-05	0.10E-03	0.27E-02	0.	0.11E-03	0.19E-04	0.28E-02
Outboard	G4	0.14E-02	32	0.71E-04	0.39E-02	0.13E-05	0.11E-05	0.24E-03	0.45E-04	0.	0.14E-04	0.30E-03
Inboard/Outboard	G4	0.09	221	0.46E-02	0.25	0.87E-04	0.73E-04	0.02	0.	0.33E-04	0.54E-03	0.02
Inboard	G4	0.02	43	0.90E-03	0.05	0.17E-04	0.14E-04	0.30E-02	0.	0.13E-03	0.10E-03	0.33E-02
Inboard Jet	G4	0.01	54	0.70E-03	0.04	0.13E-04	0.11E-04	0.24E-02	0.	0.	0.	0.24E-02
Auxiliary Sail	G4	0.63E-04	3	0.32E-05	0.17E-03	0.60E-07	0.50E-07	0.11E-04	0.20E-05	0.	0.61E-06	0.13E-04
Inboard	D	0.11E-04	1	0.21E-05	0.22E-05	0.38E-07	0.13E-06	0.10E-05	0.	0.	0.48E-09	0.10E-05
Auxiliary Sail	D	0.14E-04	3	0.26E-05	0.28E-05	0.48E-07	0.16E-06	0.13E-05	0.37E-07	0.	0.	0.13E-05
Personal Water Craft	G2	0.61E-02	28	0.39E-04	0.01	0.58E-05	0.32E-03	0.67E-02	0.	0.	0.	0.67E-02
Total		0.51	3189	0.01	1.21	0.49E-03	0.02	0.47	0.01	0.27E-03	0.43E-02	0.48
Los Angeles												
Outboard	G2	8.02	51661	0.07	19.02	0.76E-02	0.43	9.58	0.26	0.	0.08	9.91
Other	G2	0.05	2643	0.45E-03	0.14	0.48E-04	0.27E-02	0.05	0.	0.	0.	0.05
Auxiliary Sail	G2	0.08	1671	0.69E-03	0.19	0.78E-04	0.44E-02	0.10	0.	0.84E-03	0.79E-03	0.10
Outboard	G4	0.59E-02	1662	0.30E-03	0.02	0.56E-05	0.47E-05	0.10E-02	0.19E-03	0.	0.57E-04	0.13E-02
Inboard/Outboard	G4	9.14	18697	0.46	24.97	0.87E-02	0.73E-02	1.55	0.	0.50E-03	0.05	1.61
Inboard	G4	4.15	5142	0.21	11.33	0.39E-02	0.33E-02	0.70	0.	0.20E-02	0.02	0.73
Inboard Jet	G4	1.52	6749	0.08	4.16	0.14E-02	0.12E-02	0.26	0.	0.	0.	0.26
Auxiliary Sail	G4	0.14	823	0.73E-02	0.39	0.14E-03	0.12E-03	0.02	0.46E-02	0.	0.14E-02	0.03
Inboard	D	0.46	967	0.09	0.10	0.16E-02	0.55E-02	0.04	0.	0.	0.21E-04	0.04
Auxiliary Sail	D	0.40	1834	0.08	0.08	0.14E-02	0.48E-02	0.04	0.11E-02	0.	0.	0.04
Personal Water Craft	G2	1.63	15920	0.01	3.29	0.16E-02	0.09	1.81	0.	0.	0.	1.81
Total		25.62	107769	1.01	63.70	0.03	0.54	14.17	0.26	0.34E-02	0.16	14.59
Madera												
Outboard	G2	0.54	3762	0.58E-02	1.27	0.52E-03	0.03	0.62	0.02	0.	0.53E-02	0.65
Auxiliary Sail	G2	0.61E-02	74	0.27E-04	0.01	0.58E-05	0.32E-03	0.90E-02	0.	0.42E-04	0.59E-04	0.91E-02
Outboard	G4	0.07	215	0.35E-02	0.19	0.66E-04	0.56E-04	0.01	0.22E-02	0.	0.67E-03	0.01
Inboard/Outboard	G4	0.96	2458	0.05	2.62	0.91E-03	0.77E-03	0.16	0.	0.60E-04	0.56E-02	0.17
Inboard	G4	0.28	610	0.01	0.77	0.27E-03	0.23E-03	0.05	0.	0.24E-03	0.16E-02	0.05
Inboard Jet	G4	0.27	427	0.01	0.75	0.26E-03	0.22E-03	0.05	0.	0.	0.	0.05
Auxiliary Sail	G4	0.89E-02	70	0.45E-03	0.02	0.85E-05	0.71E-05	0.15E-02	0.28E-03	0.	0.86E-04	0.19E-02
Inboard	D	0.04	64	0.77E-02	0.83E-02	0.14E-03	0.48E-03	0.38E-02	0.	0.	0.18E-05	0.38E-02
Auxiliary Sail	D	0.02	128	0.29E-02	0.32E-02	0.54E-04	0.18E-03	0.14E-02	0.41E-04	0.	0.	0.15E-02
Personal Water Craft	G2	0.10	635	0.67E-03	0.21	0.99E-04	0.55E-02	0.11	0.	0.	0.	0.11
Total		2.30	8443	0.10	5.86	0.23E-02	0.04	1.02	0.02	0.34E-03	0.01	1.06

TABLE 3-6. Continued.

Annual Emissions
(Tons / Average Day)

		Fuel Use 1000 gal	# of Boats *	NOx	CO	SOx	PM	TOG Exhaust	TOG Crank	TOG Evap	TOG Refuel	TOG Total
Marin												
Outboard	G2	1.58	10876	0.02	3.68	0.15E-02	0.08	1.81	0.05	0.	0.02	1.87
Auxiliary Sail	G2	0.02	215	0.79E-04	0.04	0.17E-04	0.94E-03	0.03	0.	0.12E-03	0.17E-03	0.03
Outboard	G4	0.05	142	0.23E-02	0.13	0.44E-04	0.37E-04	0.78E-02	0.15E-02	0.	0.44E-03	0.97E-02
Inboard/Outboard	G4	0.63	1620	0.03	1.72	0.60E-03	0.50E-03	0.11	0.	0.39E-04	0.37E-02	0.11
Inboard	G4	0.19	402	0.94E-02	0.51	0.18E-03	0.15E-03	0.03	0.	0.16E-03	0.11E-02	0.03
Inboard Jet	G4	0.18	281	0.91E-02	0.49	0.17E-03	0.14E-03	0.03	0.	0.	0.	0.03
Auxiliary Sail	G4	0.59E-02	46	0.30E-03	0.02	0.56E-05	0.47E-05	0.10E-02	0.19E-03	0.	0.57E-04	0.12E-02
Inboard	D	0.03	42	0.51E-02	0.55E-02	0.93E-04	0.32E-03	0.25E-02	0.	0.	0.12E-05	0.25E-02
Auxiliary Sail	D	0.99E-02	84	0.19E-02	0.21E-02	0.35E-04	0.12E-03	0.94E-03	0.27E-04	0.	0.	0.96E-03
Personal Water Craft	G2	0.07	419	0.44E-03	0.14	0.65E-04	0.36E-02	0.08	0.	0.	0.	0.08
Total		2.75	14127	0.08	6.73	0.27E-02	0.09	2.09	0.05	0.32E-03	0.02	2.16
Mariposa												
Outboard	G2	1.11	7668	0.01	2.60	0.11E-02	0.06	1.27	0.04	0.	0.01	1.32
Auxiliary Sail	G2	0.01	151	0.55E-04	0.03	0.12E-04	0.66E-03	0.02	0.	0.86E-04	0.12E-03	0.02
Outboard	G4	0.02	47	0.77E-03	0.04	0.15E-04	0.12E-04	0.26E-02	0.49E-03	0.	0.15E-03	0.32E-02
Inboard/Outboard	G4	0.21	539	0.01	0.57	0.20E-03	0.17E-03	0.04	0.	0.13E-04	0.12E-02	0.04
Inboard	G4	0.06	134	0.31E-02	0.17	0.59E-04	0.50E-04	0.01	0.	0.53E-04	0.35E-03	0.01
Inboard Jet	G4	0.06	93	0.30E-02	0.16	0.57E-04	0.48E-04	0.01	0.	0.	0.	0.01
Auxiliary Sail	G4	0.19E-02	15	0.98E-04	0.53E-02	0.19E-05	0.16E-05	0.33E-03	0.62E-04	0.	0.19E-04	0.41E-03
Inboard	D	0.87E-02	14	0.17E-02	0.18E-02	0.31E-04	0.10E-03	0.82E-03	0.	0.	0.39E-06	0.82E-03
Auxiliary Sail	D	0.33E-02	28	0.64E-03	0.69E-03	0.12E-04	0.40E-04	0.31E-03	0.89E-05	0.	0.	0.32E-03
Personal Water Craft	G2	0.02	139	0.15E-03	0.05	0.22E-04	0.12E-02	0.03	0.	0.	0.	0.03
Total		1.51	8828	0.03	3.62	0.15E-02	0.06	1.38	0.04	0.15E-03	0.01	1.43
Mendicino												
Outboard	G2	0.54	3709	0.57E-02	1.26	0.51E-03	0.03	0.62	0.02	0.	0.52E-02	0.64
Auxiliary Sail	G2	0.60E-02	73	0.27E-04	0.01	0.57E-05	0.32E-03	0.88E-02	0.	0.42E-04	0.58E-04	0.89E-02
Outboard	G4	0.03	107	0.18E-02	0.09	0.33E-04	0.28E-04	0.59E-02	0.11E-02	0.	0.33E-03	0.73E-02
Inboard/Outboard	G4	0.48	1222	0.02	1.30	0.45E-03	0.38E-03	0.08	0.	0.30E-04	0.28E-02	0.08
Inboard	G4	0.14	304	0.71E-02	0.38	0.13E-03	0.11E-03	0.02	0.	0.12E-03	0.80E-03	0.02
Inboard Jet	G4	0.14	212	0.69E-02	0.37	0.13E-03	0.11E-03	0.02	0.	0.	0.	0.02
Auxiliary Sail	G4	0.44E-02	35	0.22E-03	0.01	0.42E-05	0.35E-05	0.75E-03	0.14E-03	0.	0.43E-04	0.94E-03
Inboard	D	0.02	32	0.39E-02	0.41E-02	0.70E-04	0.24E-03	0.19E-02	0.	0.	0.89E-06	0.19E-02
Auxiliary Sail	D	0.75E-02	64	0.15E-02	0.16E-02	0.27E-04	0.90E-04	0.71E-03	0.20E-04	0.	0.	0.73E-03
Personal Water Craft	G2	0.05	316	0.33E-03	0.10	0.49E-04	0.27E-02	0.06	0.	0.	0.	0.06
Total		1.41	6074	0.05	3.54	0.14E-02	0.03	0.82	0.02	0.19E-03	0.92E-02	0.85
Merced												
Outboard	G2	0.27	1863	0.29E-02	0.63	0.26E-03	0.01	0.31	0.86E-02	0.	0.26E-02	0.32
Auxiliary Sail	G2	0.30E-02	37	0.13E-04	0.63E-02	0.29E-05	0.16E-03	0.44E-02	0.	0.21E-04	0.29E-04	0.45E-02
Outboard	G4	0.48E-03	1	0.24E-04	0.13E-02	0.45E-06	0.38E-06	0.81E-04	0.15E-04	0.	0.46E-05	0.10E-03
Inboard/Outboard	G4	0.65E-02	17	0.33E-03	0.02	0.62E-05	0.52E-05	0.11E-02	0.	0.41E-06	0.38E-04	0.11E-02
Inboard	G4	0.19E-02	4	0.97E-04	0.53E-02	0.18E-05	0.15E-05	0.33E-03	0.	0.17E-05	0.11E-04	0.34E-03
Inboard Jet	G4	0.19E-02	3	0.94E-04	0.51E-02	0.18E-05	0.15E-05	0.32E-03	0.	0.	0.	0.32E-03
Auxiliary Sail	G4	0.61E-04	1	0.31E-05	0.17E-03	0.58E-07	0.49E-07	0.10E-04	0.19E-05	0.	0.59E-06	0.13E-04
Inboard	D	0.27E-03	1	0.53E-04	0.57E-04	0.97E-06	0.33E-05	0.26E-04	0.	0.	0.12E-07	0.26E-04
Auxiliary Sail	D	0.10E-03	1	0.20E-04	0.22E-04	0.37E-06	0.12E-05	0.97E-05	0.28E-06	0.	0.	0.99E-05
Personal Water Craft	G2	0.71E-03	4	0.45E-05	0.14E-02	0.67E-06	0.38E-04	0.78E-03	0.	0.	0.	0.78E-03
Total		0.28	1932	0.35E-02	0.67	0.27E-03	0.01	0.32	0.86E-02	0.23E-04	0.27E-02	0.33

TABLE 3-6. Continued.

Annual Emissions
(Tons / Average Day)

		Fuel Use 1000 gal	# of Boats *	NOx	CO	SOx	PM	TOG Exhaust	TOG Crank	TOG Evap	TOG Refuel	TOG Total
Modoc												
Outboard	G2	0.75E-03	5	0.87E-05	0.17E-02	0.71E-06	0.40E-04	0.86E-03	0.24E-04	0.	0.72E-05	0.89E-03
Other	G2	0.11E-04	1	0.16E-06	0.23E-04	0.11E-07	0.60E-06	0.13E-04	0.	0.	0.	0.13E-04
Auxiliary Sail	G2	0.39E-05	1	0.24E-07	0.84E-05	0.37E-08	0.21E-06	0.53E-05	0.	0.22E-06	0.38E-07	0.56E-05
Outboard	G4	0.18E-04	1	0.90E-06	0.48E-04	0.17E-07	0.14E-07	0.30E-05	0.57E-06	0.	0.17E-06	0.38E-05
Inboard/Outboard	G4	0.11E-02	3	0.58E-04	0.31E-02	0.11E-05	0.92E-06	0.20E-03	0.	0.41E-06	0.67E-05	0.20E-03
Inboard	G4	0.22E-03	1	0.11E-04	0.61E-03	0.21E-06	0.18E-06	0.38E-04	0.	0.17E-05	0.13E-05	0.41E-04
Inboard Jet	G4	0.17E-03	1	0.88E-05	0.48E-03	0.17E-06	0.14E-06	0.30E-04	0.	0.	0.	0.30E-04
Auxiliary Sail	G4	0.79E-06	1	0.40E-07	0.22E-05	0.75E-09	0.63E-09	0.13E-06	0.25E-07	0.	0.76E-08	0.17E-06
Inboard	D	0.13E-06	1	0.26E-07	0.28E-07	0.48E-09	0.16E-08	0.13E-07	0.	0.	0.61E-11	0.13E-07
Auxiliary Sail	D	0.17E-06	1	0.33E-07	0.36E-07	0.61E-09	0.20E-08	0.16E-07	0.46E-09	0.	0.	0.17E-07
Personal Water Craft	G2	0.76E-04	1	0.49E-06	0.15E-03	0.72E-07	0.40E-05	0.84E-04	0.	0.	0.	0.84E-04
Total		0.24E-02	17	0.88E-04	0.61E-02	0.23E-05	0.46E-04	0.12E-02	0.24E-04	0.23E-05	0.15E-04	0.13E-02
Mono												
Outboard	G2	0.06	431	0.67E-03	0.15	0.59E-04	0.33E-02	0.07	0.20E-02	0.	0.60E-03	0.07
Auxiliary Sail	G2	0.70E-03	9	0.31E-05	0.14E-02	0.66E-06	0.37E-04	0.10E-02	0.	0.49E-05	0.67E-05	0.10E-02
Outboard	G4	0.48E-03	1	0.24E-04	0.13E-02	0.45E-06	0.38E-06	0.81E-04	0.15E-04	0.	0.46E-05	0.10E-03
Inboard/Outboard	G4	0.65E-02	17	0.33E-03	0.02	0.62E-05	0.52E-05	0.11E-02	0.	0.41E-06	0.38E-04	0.11E-02
Inboard	G4	0.19E-02	4	0.97E-04	0.53E-02	0.18E-05	0.15E-05	0.33E-03	0.	0.17E-05	0.11E-04	0.34E-03
Inboard Jet	G4	0.19E-02	3	0.94E-04	0.51E-02	0.18E-05	0.15E-05	0.32E-03	0.	0.	0.	0.32E-03
Auxiliary Sail	G4	0.61E-04	1	0.31E-05	0.17E-03	0.58E-07	0.49E-07	0.10E-04	0.19E-05	0.	0.59E-06	0.13E-04
Inboard	D	0.27E-03	1	0.53E-04	0.57E-04	0.97E-06	0.33E-05	0.26E-04	0.	0.	0.12E-07	0.26E-04
Auxiliary Sail	D	0.10E-03	1	0.20E-04	0.22E-04	0.37E-06	0.12E-05	0.97E-05	0.28E-06	0.	0.	0.99E-05
Personal Water Craft	G2	0.71E-03	4	0.45E-05	0.14E-02	0.67E-06	0.38E-04	0.78E-03	0.	0.	0.	0.78E-03
Total		0.08	472	0.13E-02	0.18	0.72E-04	0.34E-02	0.08	0.20E-02	0.69E-05	0.66E-03	0.08
Monterey												
Outboard	G2	1.43	9885	0.02	3.35	0.14E-02	0.08	1.64	0.05	0.	0.01	1.70
Auxiliary Sail	G2	0.02	195	0.72E-04	0.03	0.15E-04	0.85E-03	0.02	0.	0.11E-03	0.15E-03	0.02
Outboard	G4	0.09	277	0.46E-02	0.25	0.86E-04	0.72E-04	0.02	0.29E-02	0.	0.87E-03	0.02
Inboard/Outboard	G4	1.24	3177	0.06	3.38	0.12E-02	0.99E-03	0.21	0.	0.77E-04	0.72E-02	0.22
Inboard	G4	0.37	789	0.02	1.00	0.35E-03	0.29E-03	0.06	0.	0.31E-03	0.21E-02	0.06
Inboard Jet	G4	0.35	552	0.02	0.96	0.34E-03	0.28E-03	0.06	0.	0.	0.	0.06
Auxiliary Sail	G4	0.01	91	0.58E-03	0.03	0.11E-04	0.92E-05	0.20E-02	0.37E-03	0.	0.11E-03	0.24E-02
Inboard	D	0.05	82	0.01	0.01	0.18E-03	0.62E-03	0.49E-02	0.	0.	0.23E-05	0.49E-02
Auxiliary Sail	D	0.02	165	0.38E-02	0.41E-02	0.69E-04	0.23E-03	0.18E-02	0.53E-04	0.	0.	0.19E-02
Personal Water Craft	G2	0.13	821	0.86E-03	0.27	0.13E-03	0.71E-02	0.15	0.	0.	0.	0.15
Total		3.71	16034	0.13	9.29	0.37E-02	0.09	2.17	0.05	0.50E-03	0.02	2.24
Napa												
Outboard	G2	0.62	4307	0.67E-02	1.46	0.59E-03	0.03	0.72	0.02	0.	0.60E-02	0.74
Auxiliary Sail	G2	0.70E-02	85	0.31E-04	0.01	0.66E-05	0.37E-03	0.01	0.	0.49E-04	0.67E-04	0.01
Outboard	G4	0.09	278	0.46E-02	0.25	0.86E-04	0.72E-04	0.02	0.29E-02	0.	0.87E-03	0.02
Inboard/Outboard	G4	1.24	3187	0.06	3.39	0.12E-02	0.99E-03	0.21	0.	0.77E-04	0.73E-02	0.22
Inboard	G4	0.37	791	0.02	1.00	0.35E-03	0.29E-03	0.06	0.	0.31E-03	0.21E-02	0.06
Inboard Jet	G4	0.35	553	0.02	0.97	0.34E-03	0.28E-03	0.06	0.	0.	0.	0.06
Auxiliary Sail	G4	0.01	91	0.58E-03	0.03	0.11E-04	0.92E-05	0.20E-02	0.37E-03	0.	0.11E-03	0.24E-02
Inboard	D	0.05	83	0.01	0.01	0.18E-03	0.62E-03	0.49E-02	0.	0.	0.23E-05	0.49E-02
Auxiliary Sail	D	0.02	166	0.38E-02	0.41E-02	0.69E-04	0.23E-03	0.18E-02	0.53E-04	0.	0.	0.19E-02
Personal Water Craft	G2	0.13	823	0.86E-03	0.27	0.13E-03	0.71E-02	0.15	0.	0.	0.	0.15
Total		2.90	10364	0.13	7.40	0.29E-02	0.04	1.23	0.02	0.44E-03	0.02	1.27

TABLE 3-6. Continued.

Annual Emissions
(Tons / Average Day)

		Fuel Use 1000 gal	# of Boats *	NOx	CO	SOx	PM	TOG Exhaust	TOG Crank	TOG Evap	TOG Refuel	TOG Total
Nevada												
Outboard	G2	0.77	5432	0.89E-02	1.72	0.73E-03	0.04	0.88	0.02	0.	0.74E-02	0.91
Other	G2	0.01	257	0.16E-03	0.02	0.11E-04	0.61E-03	0.01	0.	0.	0.	0.01
Auxiliary Sail	G2	0.40E-02	50	0.25E-04	0.87E-02	0.38E-05	0.21E-03	0.54E-02	0.	0.22E-03	0.38E-04	0.57E-02
Outboard	G4	0.80E-02	181	0.40E-03	0.02	0.76E-05	0.64E-05	0.14E-02	0.25E-03	0.	0.77E-04	0.17E-02
Inboard/Outboard	G4	0.52	1246	0.03	1.41	0.49E-03	0.41E-03	0.09	0.	0.18E-03	0.30E-02	0.09
Inboard	G4	0.10	245	0.51E-02	0.27	0.95E-04	0.80E-04	0.02	0.	0.75E-03	0.57E-03	0.02
Inboard Jet	G4	0.08	307	0.40E-02	0.21	0.75E-04	0.63E-04	0.01	0.	0.	0.	0.01
Auxiliary Sail	G4	0.36E-03	17	0.18E-04	0.97E-03	0.34E-06	0.28E-06	0.61E-04	0.11E-04	0.	0.34E-05	0.75E-04
Inboard	D	0.61E-04	6	0.12E-04	0.13E-04	0.22E-06	0.73E-06	0.57E-05	0.	0.	0.27E-08	0.57E-05
Auxiliary Sail	D	0.77E-04	15	0.15E-04	0.16E-04	0.27E-06	0.92E-06	0.72E-05	0.21E-06	0.	0.	0.74E-05
Personal Water Craft	G2	0.03	156	0.22E-03	0.07	0.33E-04	0.18E-02	0.04	0.	0.	0.	0.04
Total		1.52	7912	0.04	3.74	0.14E-02	0.04	1.06	0.02	0.12E-02	0.01	1.10
Orange												
Outboard	G2	1.65	10613	0.02	3.91	0.16E-02	0.09	1.97	0.05	0.	0.02	2.04
Other	G2	0.01	543	0.93E-04	0.03	0.99E-05	0.55E-03	0.01	0.	0.	0.	0.01
Auxiliary Sail	G2	0.02	343	0.14E-03	0.04	0.16E-04	0.89E-03	0.02	0.	0.17E-03	0.16E-03	0.02
Outboard	G4	0.47E-02	1330	0.24E-03	0.01	0.45E-05	0.38E-05	0.81E-03	0.15E-03	0.	0.46E-04	0.10E-02
Inboard/Outboard	G4	7.31	14964	0.37	19.98	0.69E-02	0.59E-02	1.24	0.	0.40E-03	0.04	1.29
Inboard	G4	3.32	4115	0.17	9.07	0.32E-02	0.27E-02	0.56	0.	0.16E-02	0.02	0.58
Inboard Jet	G4	1.22	5401	0.06	3.33	0.12E-02	0.98E-03	0.21	0.	0.	0.	0.21
Auxiliary Sail	G4	0.12	659	0.58E-02	0.32	0.11E-03	0.92E-04	0.02	0.37E-02	0.	0.11E-02	0.02
Inboard	D	0.37	774	0.07	0.08	0.13E-02	0.44E-02	0.03	0.	0.	0.17E-04	0.03
Auxiliary Sail	D	0.32	1468	0.06	0.07	0.11E-02	0.39E-02	0.03	0.87E-03	0.	0.	0.03
Personal Water Craft	G2	1.31	12742	0.84E-02	2.64	0.12E-02	0.07	1.45	0.	0.	0.	1.45
Total		15.65	52952	0.76	39.47	0.02	0.18	5.54	0.06	0.22E-02	0.08	5.68
Placer												
Outboard	G2	1.06	7314	0.01	2.48	0.10E-02	0.06	1.21	0.03	0.	0.01	1.26
Auxiliary Sail	G2	0.01	144	0.53E-04	0.02	0.11E-04	0.63E-03	0.02	0.	0.82E-04	0.11E-03	0.02
Outboard	G4	0.22	679	0.01	0.60	0.21E-03	0.18E-03	0.04	0.70E-02	0.	0.21E-02	0.05
Inboard/Outboard	G4	3.03	7776	0.15	8.27	0.29E-02	0.24E-02	0.51	0.	0.19E-03	0.02	0.53
Inboard	G4	0.90	1931	0.05	2.45	0.85E-03	0.72E-03	0.15	0.	0.77E-03	0.51E-02	0.16
Inboard Jet	G4	0.86	1350	0.04	2.36	0.82E-03	0.69E-03	0.15	0.	0.	0.	0.15
Auxiliary Sail	G4	0.03	223	0.14E-02	0.08	0.27E-04	0.23E-04	0.48E-02	0.90E-03	0.	0.27E-03	0.60E-02
Inboard	D	0.13	202	0.02	0.03	0.45E-03	0.15E-02	0.01	0.	0.	0.57E-05	0.01
Auxiliary Sail	D	0.05	405	0.93E-02	0.10E-01	0.17E-03	0.57E-03	0.45E-02	0.13E-03	0.	0.	0.46E-02
Personal Water Craft	G2	0.33	2009	0.21E-02	0.66	0.31E-03	0.02	0.36	0.	0.	0.	0.36
Total		6.61	22033	0.30	16.96	0.67E-02	0.08	2.47	0.04	0.10E-02	0.04	2.55
Plumas												
Outboard	G2	0.49	3513	0.58E-02	1.11	0.47E-03	0.03	0.57	0.02	0.	0.48E-02	0.59
Other	G2	0.75E-02	166	0.11E-03	0.02	0.71E-05	0.40E-03	0.84E-02	0.	0.	0.	0.84E-02
Auxiliary Sail	G2	0.26E-02	32	0.16E-04	0.56E-02	0.24E-05	0.14E-03	0.35E-02	0.	0.14E-03	0.25E-04	0.37E-02
Outboard	G4	0.82E-02	188	0.42E-03	0.02	0.78E-05	0.66E-05	0.14E-02	0.26E-03	0.	0.80E-04	0.17E-02
Inboard/Outboard	G4	0.53	1287	0.03	1.46	0.51E-03	0.43E-03	0.09	0.	0.19E-03	0.31E-02	0.09
Inboard	G4	0.10	253	0.52E-02	0.28	0.99E-04	0.83E-04	0.02	0.	0.77E-03	0.59E-03	0.02
Inboard Jet	G4	0.08	317	0.41E-02	0.22	0.77E-04	0.65E-04	0.01	0.	0.	0.	0.01
Auxiliary Sail	G4	0.37E-03	17	0.19E-04	0.10E-02	0.35E-06	0.29E-06	0.63E-04	0.12E-04	0.	0.36E-05	0.78E-04
Inboard	D	0.63E-04	6	0.12E-04	0.13E-04	0.22E-06	0.75E-06	0.59E-05	0.	0.	0.28E-08	0.59E-05
Auxiliary Sail	D	0.79E-04	16	0.15E-04	0.17E-04	0.28E-06	0.95E-06	0.75E-05	0.21E-06	0.	0.	0.77E-05
Personal Water Craft	G2	0.04	161	0.23E-03	0.07	0.34E-04	0.19E-02	0.04	0.	0.	0.	0.04
Total		1.27	5956	0.04	3.19	0.12E-02	0.03	0.75	0.02	0.11E-02	0.86E-02	0.77

TABLE 3-6. Continued.

Annual Emissions
(Tons / Average Day)

		Fuel Use 1000 gal	# of Boats *	NOx	CO	SOx	PM	TOG Exhaust	TOG Crank	TOG Evap	TOG Refuel	TOG Total
Riverside												
Outboard	G2	0.87	5585	0.79E-02	2.06	0.82E-03	0.05	1.04	0.03	0.	0.84E-02	1.07
Other	G2	0.55E-02	286	0.49E-04	0.02	0.52E-05	0.29E-03	0.59E-02	0.	0.	0.	0.59E-02
Auxiliary Sail	G2	0.89E-02	181	0.74E-04	0.02	0.84E-05	0.47E-03	0.01	0.	0.91E-04	0.86E-04	0.01
Outboard	G4	0.15E-02	418	0.75E-04	0.41E-02	0.14E-05	0.12E-05	0.25E-03	0.48E-04	0.	0.14E-04	0.32E-03
Inboard/Outboard	G4	2.30	4708	0.12	6.29	0.22E-02	0.18E-02	0.39	0.	0.13E-03	0.01	0.40
Inboard	G4	1.04	1295	0.05	2.85	0.99E-03	0.84E-03	0.18	0.	0.51E-03	0.59E-02	0.18
Inboard Jet	G4	0.38	1699	0.02	1.05	0.36E-03	0.31E-03	0.07	0.	0.	0.	0.07
Auxiliary Sail	G4	0.04	207	0.18E-02	0.10	0.35E-04	0.29E-04	0.62E-02	0.12E-02	0.	0.35E-03	0.77E-02
Inboard	D	0.12	244	0.02	0.02	0.41E-03	0.14E-02	0.01	0.	0.	0.52E-05	0.01
Auxiliary Sail	D	0.10	462	0.02	0.02	0.36E-03	0.12E-02	0.96E-02	0.27E-03	0.	0.	0.98E-02
Personal Water Craft	G2	0.41	4009	0.26E-02	0.83	0.39E-03	0.02	0.45	0.	0.	0.	0.45
Total		5.28	19094	0.24	13.26	0.56E-02	0.07	2.17	0.03	0.73E-03	0.03	2.23
Sacramento												
Outboard	G2	0.60	4116	0.64E-02	1.39	0.57E-03	0.03	0.68	0.02	0.	0.58E-02	0.71
Auxiliary Sail	G2	0.67E-02	81	0.30E-04	0.01	0.63E-05	0.35E-03	0.98E-02	0.	0.46E-04	0.64E-04	0.99E-02
Outboard	G4	0.23	710	0.01	0.63	0.22E-03	0.18E-03	0.04	0.74E-02	0.	0.22E-02	0.05
Inboard/Outboard	G4	3.17	8131	0.16	8.65	0.30E-02	0.25E-02	0.54	0.	0.20E-03	0.02	0.56
Inboard	G4	0.94	2019	0.05	2.56	0.89E-03	0.75E-03	0.16	0.	0.80E-03	0.53E-02	0.17
Inboard Jet	G4	0.90	1412	0.05	2.47	0.86E-03	0.72E-03	0.15	0.	0.	0.	0.15
Auxiliary Sail	G4	0.03	233	0.15E-02	0.08	0.28E-04	0.24E-04	0.50E-02	0.94E-03	0.	0.28E-03	0.62E-02
Inboard	D	0.13	211	0.03	0.03	0.47E-03	0.16E-02	0.01	0.	0.	0.59E-05	0.01
Auxiliary Sail	D	0.05	423	0.97E-02	0.01	0.18E-03	0.60E-03	0.47E-02	0.13E-03	0.	0.	0.48E-02
Personal Water Craft	G2	0.34	2101	0.22E-02	0.69	0.33E-03	0.02	0.38	0.	0.	0.	0.38
Total		6.40	19437	0.31	16.53	0.65E-02	0.06	1.99	0.03	0.10E-02	0.03	2.05
San Benito												
Outboard	G2	0.28E-02	19	0.30E-04	0.65E-02	0.27E-05	0.15E-03	0.32E-02	0.89E-04	0.	0.27E-04	0.33E-02
Auxiliary Sail	G2	0.31E-04	1	0.14E-06	0.65E-04	0.30E-07	0.17E-05	0.46E-04	0.	0.22E-06	0.30E-06	0.47E-04
Outboard	G4	0.48E-03	1	0.24E-04	0.13E-02	0.45E-06	0.38E-06	0.81E-04	0.15E-04	0.	0.46E-05	0.10E-03
Inboard/Outboard	G4	0.65E-02	17	0.33E-03	0.02	0.62E-05	0.52E-05	0.11E-02	0.	0.41E-06	0.38E-04	0.11E-02
Inboard	G4	0.19E-02	4	0.97E-04	0.53E-02	0.18E-05	0.15E-05	0.33E-03	0.	0.17E-05	0.11E-04	0.34E-03
Inboard Jet	G4	0.19E-02	3	0.94E-04	0.51E-02	0.18E-05	0.15E-05	0.32E-03	0.	0.	0.	0.32E-03
Auxiliary Sail	G4	0.61E-04	1	0.31E-05	0.17E-03	0.58E-07	0.49E-07	0.10E-04	0.19E-05	0.	0.59E-06	0.13E-04
Inboard	D	0.27E-03	1	0.53E-04	0.57E-04	0.97E-06	0.33E-05	0.26E-04	0.	0.	0.12E-07	0.26E-04
Auxiliary Sail	D	0.10E-03	1	0.20E-04	0.22E-04	0.37E-06	0.12E-05	0.97E-05	0.28E-06	0.	0.	0.99E-05
Personal Water Craft	G2	0.71E-03	4	0.45E-05	0.14E-02	0.67E-06	0.38E-04	0.78E-03	0.	0.	0.	0.78E-03
Total		0.01	52	0.66E-03	0.04	0.15E-04	0.20E-03	0.59E-02	0.11E-03	0.23E-05	0.82E-04	0.61E-02
San Bernardino												
Outboard	G2	5.66	36435	0.05	13.41	0.54E-02	0.30	6.76	0.18	0.	0.05	6.99
Other	G2	0.04	1864	0.32E-03	0.10	0.34E-04	0.19E-02	0.04	0.	0.	0.	0.04
Auxiliary Sail	G2	0.06	1178	0.49E-03	0.13	0.55E-04	0.31E-02	0.07	0.	0.59E-03	0.56E-03	0.07
Outboard	G4	0.39E-02	1089	0.20E-03	0.01	0.37E-05	0.31E-05	0.66E-03	0.12E-03	0.	0.38E-04	0.82E-03
Inboard/Outboard	G4	5.99	12248	0.30	16.35	0.57E-02	0.48E-02	1.02	0.	0.33E-03	0.04	1.05
Inboard	G4	2.72	3368	0.14	7.42	0.26E-02	0.22E-02	0.46	0.	0.13E-02	0.02	0.48
Inboard Jet	G4	1.00	4421	0.05	2.73	0.95E-03	0.80E-03	0.17	0.	0.	0.	0.17
Auxiliary Sail	G4	0.09	539	0.48E-02	0.26	0.90E-04	0.76E-04	0.02	0.30E-02	0.	0.91E-03	0.02
Inboard	D	0.30	634	0.06	0.06	0.11E-02	0.36E-02	0.03	0.	0.	0.14E-04	0.03
Auxiliary Sail	D	0.26	1201	0.05	0.06	0.94E-03	0.32E-02	0.02	0.71E-03	0.	0.	0.03
Personal Water Craft	G2	1.07	10429	0.69E-02	2.16	0.10E-02	0.06	1.18	0.	0.	0.	1.18
Total		17.19	73406	0.66	42.70	0.02	0.38	9.77	0.18	0.23E-02	0.11	10.06

TABLE 3-6. Continued.

Annual Emissions
(Tons / Average Day)

		Fuel Use 1000 gal	# of Boats *	NOx	CO	SOx	PM	TOG Exhaust	TOG Crank	TOG Evap	TOG Refuel	TOG Total
San Diego												
Outboard	G2	2.65	17075	0.02	6.29	0.25E-02	0.14	3.17	0.08	0.	0.03	3.28
Other	G2	0.02	873	0.15E-03	0.05	0.16E-04	0.88E-03	0.02	0.	0.	0.	0.02
Auxiliary Sail	G2	0.03	552	0.23E-03	0.06	0.26E-04	0.14E-02	0.03	0.	0.28E-03	0.26E-03	0.03
Outboard	G4	0.61E-02	1699	0.31E-03	0.02	0.58E-05	0.49E-05	0.10E-02	0.19E-03	0.	0.59E-04	0.13E-02
Inboard/Outboard	G4	9.34	19117	0.47	25.53	0.89E-02	0.75E-02	1.59	0.	0.51E-03	0.05	1.64
Inboard	G4	4.24	5257	0.21	11.59	0.40E-02	0.34E-02	0.72	0.	0.21E-02	0.02	0.75
Inboard Jet	G4	1.56	6900	0.08	4.26	0.15E-02	0.12E-02	0.26	0.	0.	0.	0.26
Auxiliary Sail	G4	0.15	842	0.74E-02	0.40	0.14E-03	0.12E-03	0.03	0.47E-02	0.	0.14E-02	0.03
Inboard	D	0.47	989	0.09	0.10	0.17E-02	0.57E-02	0.04	0.	0.	0.21E-04	0.04
Auxiliary Sail	D	0.41	1875	0.08	0.09	0.15E-02	0.50E-02	0.04	0.11E-02	0.	0.	0.04
Personal Water Craft	G2	1.67	16278	0.01	3.37	0.16E-02	0.09	1.85	0.	0.	0.	1.85
Total		20.55	71457	0.98	51.74	0.02	0.25	7.75	0.09	0.29E-02	0.11	7.95
San Francisco												
Outboard	G2	0.74	5116	0.79E-02	1.73	0.70E-03	0.04	0.85	0.02	0.	0.72E-02	0.88
Auxiliary Sail	G2	0.83E-02	101	0.37E-04	0.02	0.79E-05	0.44E-03	0.01	0.	0.58E-04	0.80E-04	0.01
Outboard	G4	0.05	164	0.27E-02	0.15	0.51E-04	0.43E-04	0.90E-02	0.17E-02	0.	0.51E-03	0.01
Inboard/Outboard	G4	0.73	1875	0.04	1.99	0.69E-03	0.58E-03	0.12	0.	0.45E-04	0.43E-02	0.13
Inboard	G4	0.22	465	0.01	0.59	0.21E-03	0.17E-03	0.04	0.	0.19E-03	0.12E-02	0.04
Inboard Jet	G4	0.21	325	0.01	0.57	0.20E-03	0.17E-03	0.04	0.	0.	0.	0.04
Auxiliary Sail	G4	0.68E-02	54	0.34E-03	0.02	0.64E-05	0.54E-05	0.12E-02	0.22E-03	0.	0.65E-04	0.14E-02
Inboard	D	0.03	49	0.59E-02	0.64E-02	0.11E-03	0.37E-03	0.29E-02	0.	0.	0.14E-05	0.29E-02
Auxiliary Sail	D	0.01	98	0.22E-02	0.24E-02	0.41E-04	0.14E-03	0.11E-02	0.31E-04	0.	0.	0.11E-02
Personal Water Craft	G2	0.08	484	0.51E-03	0.16	0.75E-04	0.42E-02	0.09	0.	0.	0.	0.09
Total		2.09	8731	0.08	5.24	0.21E-02	0.05	1.16	0.03	0.29E-03	0.01	1.20
San Joaquin												
Outboard	G2	1.21	8320	0.01	2.82	0.11E-02	0.06	1.38	0.04	0.	0.01	1.43
Auxiliary Sail	G2	0.01	164	0.60E-04	0.03	0.13E-04	0.72E-03	0.02	0.	0.94E-04	0.13E-03	0.02
Outboard	G4	0.30	916	0.02	0.81	0.28E-03	0.24E-03	0.05	0.95E-02	0.	0.29E-02	0.06
Inboard/Outboard	G4	4.09	10490	0.21	11.16	0.39E-02	0.33E-02	0.69	0.	0.25E-03	0.02	0.72
Inboard	G4	1.21	2604	0.06	3.30	0.11E-02	0.97E-03	0.21	0.	0.10E-02	0.68E-02	0.21
Inboard Jet	G4	1.17	1821	0.06	3.18	0.11E-02	0.93E-03	0.20	0.	0.	0.	0.20
Auxiliary Sail	G4	0.04	300	0.19E-02	0.10	0.36E-04	0.30E-04	0.65E-02	0.12E-02	0.	0.37E-03	0.80E-02
Inboard	D	0.17	272	0.03	0.04	0.60E-03	0.20E-02	0.02	0.	0.	0.77E-05	0.02
Auxiliary Sail	D	0.06	546	0.01	0.01	0.23E-03	0.77E-03	0.61E-02	0.17E-03	0.	0.	0.62E-02
Personal Water Craft	G2	0.44	2711	0.28E-02	0.89	0.42E-03	0.02	0.49	0.	0.	0.	0.49
Total		8.69	28144	0.40	22.35	0.89E-02	0.10	3.07	0.05	0.14E-02	0.05	3.16
San Luis Obispo												
Outboard	G2	0.91	5858	0.83E-02	2.16	0.86E-03	0.05	1.09	0.03	0.	0.88E-02	1.12
Other	G2	0.57E-02	300	0.52E-04	0.02	0.54E-05	0.30E-03	0.62E-02	0.	0.	0.	0.62E-02
Auxiliary Sail	G2	0.93E-02	189	0.78E-04	0.02	0.88E-05	0.49E-03	0.01	0.	0.95E-04	0.90E-04	0.01
Outboard	G4	0.34E-03	96	0.17E-04	0.94E-03	0.33E-06	0.27E-06	0.58E-04	0.11E-04	0.	0.33E-05	0.72E-04
Inboard/Outboard	G4	0.53	1080	0.03	1.44	0.50E-03	0.42E-03	0.09	0.	0.29E-04	0.31E-02	0.09
Inboard	G4	0.24	297	0.01	0.65	0.23E-03	0.19E-03	0.04	0.	0.12E-03	0.14E-02	0.04
Inboard Jet	G4	0.09	390	0.44E-02	0.24	0.84E-04	0.70E-04	0.01	0.	0.	0.	0.01
Auxiliary Sail	G4	0.83E-02	48	0.42E-03	0.02	0.79E-05	0.67E-05	0.14E-02	0.27E-03	0.	0.80E-04	0.18E-02
Inboard	D	0.03	56	0.52E-02	0.56E-02	0.95E-04	0.32E-03	0.25E-02	0.	0.	0.12E-05	0.25E-02
Auxiliary Sail	D	0.02	106	0.45E-02	0.49E-02	0.83E-04	0.28E-03	0.22E-02	0.63E-04	0.	0.	0.23E-02
Personal Water Craft	G2	0.09	920	0.60E-03	0.19	0.90E-04	0.50E-02	0.10	0.	0.	0.	0.10
Total		1.93	9340	0.06	4.76	0.20E-02	0.06	1.36	0.03	0.24E-03	0.01	1.40

TABLE 3-6. Continued.

Annual Emissions
(Tons / Average Day)

		Fuel Use 1000 gal	# of Boats *	NOx	CO	SOx	PM	TOG Exhaust	TOG Crank	TOG Evap	TOG Refuel	TOG Total
San Mateo												
Outboard	G2	0.64	4394	0.68E-02	1.49	0.60E-03	0.03	0.73	0.02	0.	0.61E-02	0.76
Auxiliary Sail	G2	0.71E-02	87	0.32E-04	0.01	0.68E-05	0.38E-03	0.01	0.	0.50E-04	0.69E-04	0.01
Outboard	G4	0.02	48	0.79E-03	0.04	0.15E-04	0.13E-04	0.27E-02	0.50E-03	0.	0.15E-03	0.33E-02
Inboard/Outboard	G4	0.22	552	0.01	0.59	0.20E-03	0.17E-03	0.04	0.	0.13E-04	0.13E-02	0.04
Inboard	G4	0.06	137	0.32E-02	0.17	0.60E-04	0.51E-04	0.01	0.	0.55E-04	0.36E-03	0.01
Inboard Jet	G4	0.06	96	0.31E-02	0.17	0.58E-04	0.49E-04	0.01	0.	0.	0.	0.01
Auxiliary Sail	G4	0.20E-02	16	0.10E-03	0.55E-02	0.19E-05	0.16E-05	0.34E-03	0.64E-04	0.	0.19E-04	0.42E-03
Inboard	D	0.90E-02	14	0.17E-02	0.19E-02	0.32E-04	0.11E-03	0.84E-03	0.	0.	0.40E-06	0.84E-03
Auxiliary Sail	D	0.34E-02	29	0.66E-03	0.71E-03	0.12E-04	0.41E-04	0.32E-03	0.92E-05	0.	0.	0.33E-03
Personal Water Craft	G2	0.02	143	0.15E-03	0.05	0.22E-04	0.12E-02	0.03	0.	0.	0.	0.03
Total		1.04	5516	0.03	2.53	0.10E-02	0.04	0.83	0.02	0.12E-03	0.80E-02	0.86
Santa Barbara												
Outboard	G2	0.37	2393	0.34E-02	0.88	0.35E-03	0.02	0.44	0.01	0.	0.36E-02	0.46
Other	G2	0.23E-02	122	0.21E-04	0.67E-02	0.22E-05	0.12E-03	0.25E-02	0.	0.	0.	0.25E-02
Auxiliary Sail	G2	0.38E-02	77	0.32E-04	0.86E-02	0.36E-05	0.20E-03	0.46E-02	0.	0.39E-04	0.37E-04	0.47E-02
Outboard	G4	0.83E-04	23	0.42E-05	0.23E-03	0.79E-07	0.67E-07	0.14E-04	0.27E-05	0.	0.80E-06	0.18E-04
Inboard/Outboard	G4	0.13	262	0.65E-02	0.35	0.12E-03	0.10E-03	0.02	0.	0.70E-05	0.75E-03	0.02
Inboard	G4	0.06	72	0.29E-02	0.16	0.55E-04	0.46E-04	0.99E-02	0.	0.28E-04	0.33E-03	0.01
Inboard Jet	G4	0.02	95	0.11E-02	0.06	0.20E-04	0.17E-04	0.36E-02	0.	0.	0.	0.36E-02
Auxiliary Sail	G4	0.20E-02	12	0.10E-03	0.55E-02	0.19E-05	0.16E-05	0.34E-03	0.64E-04	0.	0.19E-04	0.43E-03
Inboard	D	0.65E-02	14	0.13E-02	0.14E-02	0.23E-04	0.78E-04	0.61E-03	0.	0.	0.29E-06	0.61E-03
Auxiliary Sail	D	0.57E-02	26	0.11E-02	0.12E-02	0.20E-04	0.68E-04	0.53E-03	0.15E-04	0.	0.	0.55E-03
Personal Water Craft	G2	0.02	223	0.15E-03	0.05	0.22E-04	0.12E-02	0.03	0.	0.	0.	0.03
Total		0.62	3319	0.02	1.52	0.62E-03	0.02	0.51	0.01	0.74E-04	0.47E-02	0.53
Santa Clara												
Outboard	G2	0.03	215	0.33E-03	0.07	0.30E-04	0.16E-02	0.04	0.99E-03	0.	0.30E-03	0.04
Auxiliary Sail	G2	0.35E-03	4	0.16E-05	0.72E-03	0.33E-06	0.18E-04	0.51E-03	0.	0.24E-05	0.34E-05	0.52E-03
Outboard	G4	0.08	242	0.40E-02	0.22	0.75E-04	0.63E-04	0.01	0.25E-02	0.	0.76E-03	0.02
Inboard/Outboard	G4	1.08	2777	0.05	2.95	0.10E-02	0.87E-03	0.18	0.	0.67E-04	0.63E-02	0.19
Inboard	G4	0.32	689	0.02	0.87	0.30E-03	0.26E-03	0.05	0.	0.27E-03	0.18E-02	0.06
Inboard Jet	G4	0.31	482	0.02	0.84	0.29E-03	0.25E-03	0.05	0.	0.	0.	0.05
Auxiliary Sail	G4	0.01	79	0.51E-03	0.03	0.95E-05	0.80E-05	0.17E-02	0.32E-03	0.	0.97E-04	0.21E-02
Inboard	D	0.05	72	0.87E-02	0.94E-02	0.16E-03	0.54E-03	0.42E-02	0.	0.	0.20E-05	0.42E-02
Auxiliary Sail	D	0.02	145	0.33E-02	0.36E-02	0.61E-04	0.20E-03	0.16E-02	0.46E-04	0.	0.	0.16E-02
Personal Water Craft	G2	0.12	717	0.75E-03	0.24	0.11E-03	0.62E-02	0.13	0.	0.	0.	0.13
Total		2.01	5422	0.10	5.24	0.21E-02	0.01	0.48	0.39E-02	0.34E-03	0.93E-02	0.49
Santa Cruz												
Outboard	G2	0.06	425	0.66E-03	0.14	0.59E-04	0.33E-02	0.07	0.20E-02	0.	0.59E-03	0.07
Auxiliary Sail	G2	0.69E-03	8	0.31E-05	0.14E-02	0.66E-06	0.37E-04	0.10E-02	0.	0.48E-05	0.67E-05	0.10E-02
Outboard	G4	0.73E-02	23	0.37E-03	0.02	0.70E-05	0.59E-05	0.12E-02	0.23E-03	0.	0.71E-04	0.16E-02
Inboard/Outboard	G4	0.10	258	0.51E-02	0.27	0.96E-04	0.80E-04	0.02	0.	0.63E-05	0.59E-03	0.02
Inboard	G4	0.03	64	0.15E-02	0.08	0.28E-04	0.24E-04	0.51E-02	0.	0.25E-04	0.17E-03	0.52E-02
Inboard Jet	G4	0.03	45	0.14E-02	0.08	0.27E-04	0.23E-04	0.49E-02	0.	0.	0.	0.49E-02
Auxiliary Sail	G4	0.94E-03	7	0.47E-04	0.26E-02	0.89E-06	0.75E-06	0.16E-03	0.30E-04	0.	0.90E-05	0.20E-03
Inboard	D	0.42E-02	7	0.81E-03	0.88E-03	0.15E-04	0.50E-04	0.39E-03	0.	0.	0.19E-06	0.39E-03
Auxiliary Sail	D	0.16E-02	13	0.31E-03	0.33E-03	0.56E-05	0.19E-04	0.15E-03	0.43E-05	0.	0.	0.15E-03
Personal Water Craft	G2	0.01	67	0.70E-04	0.02	0.10E-04	0.58E-03	0.01	0.	0.	0.	0.01
Total		0.25	917	0.01	0.63	0.25E-03	0.41E-02	0.11	0.22E-02	0.37E-04	0.14E-02	0.12

TABLE 3-6. Continued.

Annual Emissions
(Tons / Average Day)

		Fuel Use 1000 gal	# of Boats *	NOx	CO	SOx	PM	TOG Exhaust	TOG Crank	TOG Evap	TOG Refuel	TOG Total
Shasta												
Outboard	G2	1.60	11380	0.02	3.60	0.15E-02	0.08	1.85	0.05	0.	0.02	1.91
Other	G2	0.02	537	0.34E-03	0.05	0.23E-04	0.13E-02	0.03	0.	0.	0.	0.03
Auxiliary Sail	G2	0.83E-02	104	0.53E-04	0.02	0.79E-05	0.44E-03	0.01	0.	0.47E-03	0.81E-04	0.01
Outboard	G4	0.04	932	0.21E-02	0.11	0.39E-04	0.33E-04	0.70E-02	0.13E-02	0.	0.40E-03	0.87E-02
Inboard/Outboard	G4	2.65	6399	0.13	7.25	0.25E-02	0.21E-02	0.45	0.	0.94E-03	0.02	0.47
Inboard	G4	0.52	1258	0.03	1.41	0.49E-03	0.41E-03	0.09	0.	0.38E-02	0.29E-02	0.09
Inboard Jet	G4	0.40	1575	0.02	1.10	0.38E-03	0.32E-03	0.07	0.	0.	0.	0.07
Auxiliary Sail	G4	0.18E-02	85	0.92E-04	0.50E-02	0.17E-05	0.15E-05	0.31E-03	0.58E-04	0.	0.18E-04	0.39E-03
Inboard	D	0.31E-03	30	0.60E-04	0.65E-04	0.11E-05	0.37E-05	0.29E-04	0.	0.	0.14E-07	0.29E-04
Auxiliary Sail	D	0.39E-03	79	0.76E-04	0.82E-04	0.14E-05	0.47E-05	0.37E-04	0.11E-05	0.	0.	0.38E-04
Personal Water Craft	G2	0.18	803	0.11E-02	0.36	0.17E-03	0.93E-02	0.19	0.	0.	0.	0.19
Total		5.43	23182	0.20	13.91	0.52E-02	0.10	2.70	0.05	0.53E-02	0.03	2.79
Sierra												
Outboard	G2	0.47	3238	0.50E-02	1.10	0.45E-03	0.02	0.54	0.01	0.	0.45E-02	0.56
Auxiliary Sail	G2	0.53E-02	64	0.23E-04	0.01	0.50E-05	0.28E-03	0.77E-02	0.	0.36E-04	0.51E-04	0.78E-02
Outboard	G4	0.67E-02	20	0.34E-03	0.02	0.63E-05	0.53E-05	0.11E-02	0.21E-03	0.	0.64E-04	0.14E-02
Inboard/Outboard	G4	0.09	234	0.46E-02	0.25	0.87E-04	0.73E-04	0.02	0.	0.57E-05	0.53E-03	0.02
Inboard	G4	0.03	58	0.14E-02	0.07	0.26E-04	0.22E-04	0.46E-02	0.	0.23E-04	0.15E-03	0.48E-02
Inboard Jet	G4	0.03	41	0.13E-02	0.07	0.25E-04	0.21E-04	0.44E-02	0.	0.	0.	0.44E-02
Auxiliary Sail	G4	0.85E-03	7	0.43E-04	0.23E-02	0.81E-06	0.68E-06	0.14E-03	0.27E-04	0.	0.82E-05	0.18E-03
Inboard	D	0.38E-02	6	0.74E-03	0.80E-03	0.14E-04	0.46E-04	0.36E-03	0.	0.	0.17E-06	0.36E-03
Auxiliary Sail	D	0.14E-02	12	0.28E-03	0.30E-03	0.51E-05	0.17E-04	0.14E-03	0.39E-05	0.	0.	0.14E-03
Personal Water Craft	G2	0.99E-02	61	0.63E-04	0.02	0.94E-05	0.53E-03	0.01	0.	0.	0.	0.01
Total		0.64	3741	0.01	1.54	0.62E-03	0.03	0.58	0.02	0.65E-04	0.53E-02	0.60
Siskiyou												
Outboard	G2	0.11	762	0.12E-02	0.24	0.10E-03	0.57E-02	0.12	0.34E-02	0.	0.10E-02	0.13
Other	G2	0.16E-02	36	0.23E-04	0.33E-02	0.15E-05	0.86E-04	0.18E-02	0.	0.	0.	0.18E-02
Auxiliary Sail	G2	0.56E-03	7	0.35E-05	0.12E-02	0.53E-06	0.30E-04	0.76E-03	0.	0.31E-04	0.54E-05	0.80E-03
Outboard	G4	0.25E-03	6	0.13E-04	0.69E-03	0.24E-06	0.20E-06	0.43E-04	0.81E-05	0.	0.24E-05	0.54E-04
Inboard/Outboard	G4	0.02	40	0.83E-03	0.04	0.16E-04	0.13E-04	0.28E-02	0.	0.58E-05	0.96E-04	0.29E-02
Inboard	G4	0.32E-02	8	0.16E-03	0.87E-02	0.30E-05	0.25E-05	0.54E-03	0.	0.24E-04	0.18E-04	0.58E-03
Inboard Jet	G4	0.25E-02	10	0.13E-03	0.68E-02	0.24E-05	0.20E-05	0.42E-03	0.	0.	0.	0.42E-03
Auxiliary Sail	G4	0.11E-04	1	0.57E-06	0.31E-04	0.11E-07	0.90E-08	0.19E-05	0.36E-06	0.	0.11E-06	0.24E-05
Inboard	D	0.19E-05	1	0.37E-06	0.40E-06	0.68E-08	0.23E-07	0.18E-06	0.	0.	0.87E-10	0.18E-06
Auxiliary Sail	D	0.24E-05	1	0.47E-06	0.51E-06	0.86E-08	0.29E-07	0.23E-06	0.66E-08	0.	0.	0.24E-06
Personal Water Craft	G2	0.11E-02	5	0.70E-05	0.22E-02	0.10E-05	0.58E-04	0.12E-02	0.	0.	0.	0.12E-02
Total		0.13	877	0.24E-02	0.31	0.13E-03	0.59E-02	0.13	0.34E-02	0.61E-04	0.12E-02	0.14
Solano												
Outboard	G2	1.71	11786	0.02	3.99	0.16E-02	0.09	1.96	0.05	0.	0.02	2.03
Auxiliary Sail	G2	0.02	233	0.85E-04	0.04	0.18E-04	0.10E-02	0.03	0.	0.13E-03	0.18E-03	0.03
Outboard	G4	0.07	204	0.33E-02	0.18	0.63E-04	0.53E-04	0.01	0.21E-02	0.	0.64E-03	0.01
Inboard/Outboard	G4	0.91	2335	0.05	2.48	0.86E-03	0.73E-03	0.15	0.	0.57E-04	0.53E-02	0.16
Inboard	G4	0.27	580	0.01	0.73	0.26E-03	0.22E-03	0.05	0.	0.23E-03	0.15E-02	0.05
Inboard Jet	G4	0.26	405	0.01	0.71	0.25E-03	0.21E-03	0.04	0.	0.	0.	0.04
Auxiliary Sail	G4	0.85E-02	67	0.43E-03	0.02	0.80E-05	0.68E-05	0.14E-02	0.27E-03	0.	0.82E-04	0.18E-02
Inboard	D	0.04	61	0.74E-02	0.79E-02	0.13E-03	0.46E-03	0.36E-02	0.	0.	0.17E-05	0.36E-02
Auxiliary Sail	D	0.01	122	0.28E-02	0.30E-02	0.51E-04	0.17E-03	0.13E-02	0.39E-04	0.	0.	0.14E-02
Personal Water Craft	G2	0.10	603	0.63E-03	0.20	0.94E-04	0.52E-02	0.11	0.	0.	0.	0.11
Total		3.39	16396	0.11	8.37	0.34E-02	0.10	2.36	0.06	0.42E-03	0.02	2.44

TABLE 3-6. Continued.

Annual Emissions
(Tons / Average Day)

		Fuel Use 1000 gal	# of Boats *	NOx	CO	SOx	PM	TOG Exhaust	TOG Crank	TOG Evap	TOG Refuel	TOG Total
Sonoma												
Outboard	G2	0.81	5564	0.86E-02	1.88	0.77E-03	0.04	0.92	0.03	0.	0.78E-02	0.96
Auxiliary Sail	G2	0.90E-02	110	0.40E-04	0.02	0.86E-05	0.48E-03	0.01	0.	0.63E-04	0.87E-04	0.01
Outboard	G4	0.11	338	0.56E-02	0.30	0.10E-03	0.88E-04	0.02	0.35E-02	0.	0.11E-02	0.02
Inboard/Outboard	G4	1.51	3871	0.08	4.12	0.14E-02	0.12E-02	0.26	0.	0.94E-04	0.88E-02	0.27
Inboard	G4	0.45	961	0.02	1.22	0.42E-03	0.36E-03	0.08	0.	0.38E-03	0.25E-02	0.08
Inboard Jet	G4	0.43	672	0.02	1.17	0.41E-03	0.34E-03	0.07	0.	0.	0.	0.07
Auxiliary Sail	G4	0.01	111	0.71E-03	0.04	0.13E-04	0.11E-04	0.24E-02	0.45E-03	0.	0.14E-03	0.30E-02
Inboard	D	0.06	100	0.01	0.01	0.22E-03	0.75E-03	0.59E-02	0.	0.	0.28E-05	0.59E-02
Auxiliary Sail	D	0.02	201	0.46E-02	0.50E-02	0.84E-04	0.29E-03	0.22E-02	0.64E-04	0.	0.	0.23E-02
Personal Water Craft	G2	0.16	1000	0.10E-02	0.33	0.16E-03	0.87E-02	0.18	0.	0.	0.	0.18
Total		3.57	12928	0.15	9.10	0.36E-02	0.05	1.55	0.03	0.54E-03	0.02	1.60
Stanislaus												
Outboard	G2	0.45	3092	0.48E-02	1.05	0.43E-03	0.02	0.51	0.01	0.	0.43E-02	0.53
Auxiliary Sail	G2	0.50E-02	61	0.22E-04	0.01	0.48E-05	0.27E-03	0.74E-02	0.	0.35E-04	0.48E-04	0.75E-02
Outboard	G4	0.01	45	0.74E-03	0.04	0.14E-04	0.12E-04	0.25E-02	0.47E-03	0.	0.14E-03	0.31E-02
Inboard/Outboard	G4	0.20	517	0.01	0.55	0.19E-03	0.16E-03	0.03	0.	0.13E-04	0.12E-02	0.04
Inboard	G4	0.06	128	0.30E-02	0.16	0.57E-04	0.48E-04	0.01	0.	0.51E-04	0.34E-03	0.01
Inboard Jet	G4	0.06	90	0.29E-02	0.16	0.55E-04	0.46E-04	0.98E-02	0.	0.	0.	0.98E-02
Auxiliary Sail	G4	0.19E-02	15	0.95E-04	0.51E-02	0.18E-05	0.15E-05	0.32E-03	0.60E-04	0.	0.18E-04	0.40E-03
Inboard	D	0.84E-02	13	0.16E-02	0.18E-02	0.30E-04	0.10E-03	0.79E-03	0.	0.	0.38E-06	0.79E-03
Auxiliary Sail	D	0.32E-02	27	0.62E-03	0.66E-03	0.11E-04	0.38E-04	0.30E-03	0.86E-05	0.	0.	0.31E-03
Personal Water Craft	G2	0.02	134	0.14E-03	0.04	0.21E-04	0.12E-02	0.02	0.	0.	0.	0.02
Total		0.82	4122	0.02	2.02	0.81E-03	0.03	0.60	0.01	0.98E-04	0.60E-02	0.62
Sutter												
Outboard	G2	0.28E-02	19	0.30E-04	0.65E-02	0.27E-05	0.15E-03	0.32E-02	0.89E-04	0.	0.27E-04	0.33E-02
Auxiliary Sail	G2	0.31E-04	1	0.14E-06	0.65E-04	0.30E-07	0.17E-05	0.46E-04	0.	0.22E-06	0.30E-06	0.47E-04
Outboard	G4	0.34E-02	11	0.17E-03	0.94E-02	0.33E-05	0.27E-05	0.58E-03	0.11E-03	0.	0.33E-04	0.72E-03
Inboard/Outboard	G4	0.05	121	0.24E-02	0.13	0.45E-04	0.38E-04	0.80E-02	0.	0.29E-05	0.28E-03	0.83E-02
Inboard	G4	0.01	30	0.70E-03	0.04	0.13E-04	0.11E-04	0.24E-02	0.	0.12E-04	0.79E-04	0.25E-02
Inboard Jet	G4	0.01	21	0.68E-03	0.04	0.13E-04	0.11E-04	0.23E-02	0.	0.	0.	0.23E-02
Auxiliary Sail	G4	0.44E-03	3	0.22E-04	0.12E-02	0.42E-06	0.35E-06	0.74E-04	0.14E-04	0.	0.42E-05	0.92E-04
Inboard	D	0.20E-02	3	0.38E-03	0.41E-03	0.70E-05	0.24E-04	0.18E-03	0.	0.	0.88E-07	0.18E-03
Auxiliary Sail	D	0.74E-03	6	0.14E-03	0.15E-03	0.26E-05	0.89E-05	0.70E-04	0.20E-05	0.	0.	0.72E-04
Personal Water Craft	G2	0.51E-02	31	0.33E-04	0.01	0.49E-05	0.27E-03	0.56E-02	0.	0.	0.	0.56E-02
Total		0.09	246	0.45E-02	0.23	0.91E-04	0.52E-03	0.02	0.21E-03	0.15E-04	0.42E-03	0.02
Tehema												
Outboard	G2	0.13	935	0.15E-02	0.30	0.13E-03	0.70E-02	0.15	0.42E-02	0.	0.13E-02	0.16
Other	G2	0.20E-02	44	0.28E-04	0.41E-02	0.19E-05	0.11E-03	0.22E-02	0.	0.	0.	0.22E-02
Auxiliary Sail	G2	0.69E-03	9	0.43E-05	0.15E-02	0.65E-06	0.36E-04	0.93E-03	0.	0.38E-04	0.66E-05	0.98E-03
Outboard	G4	0.84E-03	19	0.42E-04	0.23E-02	0.80E-06	0.67E-06	0.14E-03	0.27E-04	0.	0.81E-05	0.18E-03
Inboard/Outboard	G4	0.05	131	0.27E-02	0.15	0.52E-04	0.44E-04	0.92E-02	0.	0.19E-04	0.32E-03	0.96E-02
Inboard	G4	0.01	26	0.53E-03	0.03	0.10E-04	0.85E-05	0.18E-02	0.	0.79E-04	0.60E-04	0.19E-02
Inboard Jet	G4	0.83E-02	32	0.42E-03	0.02	0.79E-05	0.66E-05	0.14E-02	0.	0.	0.	0.14E-02
Auxiliary Sail	G4	0.38E-04	2	0.19E-05	0.10E-03	0.36E-07	0.30E-07	0.64E-05	0.12E-05	0.	0.36E-06	0.79E-05
Inboard	D	0.64E-05	1	0.12E-05	0.13E-05	0.23E-07	0.77E-07	0.60E-06	0.	0.	0.29E-09	0.60E-06
Auxiliary Sail	D	0.81E-05	2	0.16E-05	0.17E-05	0.29E-07	0.97E-07	0.76E-06	0.22E-07	0.	0.	0.78E-06
Personal Water Craft	G2	0.36E-02	16	0.23E-04	0.73E-02	0.34E-05	0.19E-03	0.40E-02	0.	0.	0.	0.40E-02
Total		0.21	1217	0.53E-02	0.51	0.20E-03	0.74E-02	0.17	0.42E-02	0.14E-03	0.17E-02	0.18

TABLE 3-6. Continued.

Annual Emissions
(Tons / Average Day)

		Fuel Use 1000 gal	# of Boats *	NOx	CO	SOx	PM	TOG Exhaust	TOG Crank	TOG Evap	TOG Refuel	TOG Total
Trinity												
Outboard	G2	0.60	4245	0.70E-02	1.34	0.57E-03	0.03	0.69	0.02	0.	0.58E-02	0.71
Other	G2	0.90E-02	201	0.13E-03	0.02	0.86E-05	0.48E-03	0.01	0.	0.	0.	0.01
Auxiliary Sail	G2	0.31E-02	39	0.20E-04	0.68E-02	0.30E-05	0.17E-03	0.42E-02	0.	0.17E-03	0.30E-04	0.44E-02
Outboard	G4	0.27E-02	61	0.13E-03	0.73E-02	0.25E-05	0.21E-05	0.45E-03	0.85E-04	0.	0.26E-04	0.56E-03
Inboard/Outboard	G4	0.17	416	0.87E-02	0.47	0.16E-03	0.14E-03	0.03	0.	0.61E-04	0.10E-02	0.03
Inboard	G4	0.03	82	0.17E-02	0.09	0.32E-04	0.27E-04	0.57E-02	0.	0.25E-03	0.19E-03	0.61E-02
Inboard Jet	G4	0.03	102	0.13E-02	0.07	0.25E-04	0.21E-04	0.45E-02	0.	0.	0.	0.45E-02
Auxiliary Sail	G4	0.12E-03	6	0.60E-05	0.32E-03	0.11E-06	0.95E-07	0.20E-04	0.38E-05	0.	0.11E-05	0.25E-04
Inboard	D	0.20E-04	2	0.39E-05	0.42E-05	0.72E-07	0.24E-06	0.19E-05	0.	0.	0.91E-09	0.19E-05
Auxiliary Sail	D	0.26E-04	5	0.50E-05	0.54E-05	0.91E-07	0.31E-06	0.24E-05	0.69E-07	0.	0.	0.25E-05
Personal Water Craft	G2	0.01	52	0.73E-04	0.02	0.11E-04	0.61E-03	0.01	0.	0.	0.	0.01
Total		0.86	5211	0.02	2.03	0.81E-03	0.03	0.76	0.02	0.49E-03	0.70E-02	0.78
Tulare												
Outboard	G2	0.22	1537	0.24E-02	0.52	0.21E-03	0.01	0.26	0.71E-02	0.	0.21E-02	0.26
Auxiliary Sail	G2	0.25E-02	30	0.11E-04	0.52E-02	0.24E-05	0.13E-03	0.37E-02	0.	0.17E-04	0.24E-04	0.37E-02
Outboard	G4	0.06	196	0.32E-02	0.17	0.60E-04	0.51E-04	0.01	0.20E-02	0.	0.61E-03	0.01
Inboard/Outboard	G4	0.87	2242	0.04	2.39	0.83E-03	0.70E-03	0.15	0.	0.54E-04	0.51E-02	0.15
Inboard	G4	0.26	557	0.01	0.71	0.25E-03	0.21E-03	0.04	0.	0.22E-03	0.15E-02	0.05
Inboard Jet	G4	0.25	389	0.01	0.68	0.24E-03	0.20E-03	0.04	0.	0.	0.	0.04
Auxiliary Sail	G4	0.81E-02	64	0.41E-03	0.02	0.77E-05	0.65E-05	0.14E-02	0.26E-03	0.	0.78E-04	0.17E-02
Inboard	D	0.04	58	0.71E-02	0.76E-02	0.13E-03	0.44E-03	0.34E-02	0.	0.	0.16E-05	0.34E-02
Auxiliary Sail	D	0.01	117	0.27E-02	0.29E-02	0.49E-04	0.17E-03	0.13E-02	0.37E-04	0.	0.	0.13E-02
Personal Water Craft	G2	0.09	579	0.61E-03	0.19	0.90E-04	0.50E-02	0.10	0.	0.	0.	0.10
Total		1.82	5769	0.09	4.69	0.19E-02	0.02	0.62	0.94E-02	0.29E-03	0.94E-02	0.63
Tuolumne												
Outboard	G2	0.80	5492	0.85E-02	1.86	0.76E-03	0.04	0.91	0.03	0.	0.77E-02	0.95
Auxiliary Sail	G2	0.89E-02	108	0.40E-04	0.02	0.85E-05	0.47E-03	0.01	0.	0.62E-04	0.86E-04	0.01
Outboard	G4	0.22	691	0.01	0.61	0.21E-03	0.18E-03	0.04	0.72E-02	0.	0.22E-02	0.05
Inboard/Outboard	G4	3.08	7913	0.16	8.42	0.29E-02	0.25E-02	0.52	0.	0.19E-03	0.02	0.54
Inboard	G4	0.91	1965	0.05	2.49	0.87E-03	0.73E-03	0.15	0.	0.78E-03	0.52E-02	0.16
Inboard Jet	G4	0.88	1374	0.04	2.40	0.84E-03	0.70E-03	0.15	0.	0.	0.	0.15
Auxiliary Sail	G4	0.03	226	0.14E-02	0.08	0.27E-04	0.23E-04	0.49E-02	0.91E-03	0.	0.28E-03	0.61E-02
Inboard	D	0.13	205	0.02	0.03	0.46E-03	0.15E-02	0.01	0.	0.	0.58E-05	0.01
Auxiliary Sail	D	0.05	412	0.94E-02	0.01	0.17E-03	0.58E-03	0.46E-02	0.13E-03	0.	0.	0.47E-02
Personal Water Craft	G2	0.33	2045	0.21E-02	0.67	0.32E-03	0.02	0.37	0.	0.	0.	0.37
Total		6.44	20431	0.30	16.59	0.66E-02	0.07	2.18	0.03	0.10E-02	0.03	2.25
Ventura												
Outboard	G2	0.55	3537	0.50E-02	1.30	0.52E-03	0.03	0.66	0.02	0.	0.53E-02	0.68
Other	G2	0.35E-02	181	0.31E-04	0.99E-02	0.33E-05	0.18E-03	0.38E-02	0.	0.	0.	0.38E-02
Auxiliary Sail	G2	0.56E-02	114	0.47E-04	0.01	0.53E-05	0.30E-03	0.69E-02	0.	0.58E-04	0.54E-04	0.70E-02
Outboard	G4	0.11E-02	309	0.56E-04	0.30E-02	0.10E-05	0.88E-06	0.19E-03	0.35E-04	0.	0.11E-04	0.23E-03
Inboard/Outboard	G4	1.70	3474	0.09	4.64	0.16E-02	0.14E-02	0.29	0.	0.93E-04	0.99E-02	0.30
Inboard	G4	0.77	955	0.04	2.11	0.73E-03	0.62E-03	0.13	0.	0.38E-03	0.44E-02	0.14
Inboard Jet	G4	0.28	1254	0.01	0.77	0.27E-03	0.23E-03	0.05	0.	0.	0.	0.05
Auxiliary Sail	G4	0.03	153	0.14E-02	0.07	0.25E-04	0.21E-04	0.46E-02	0.85E-03	0.	0.26E-03	0.57E-02
Inboard	D	0.09	180	0.02	0.02	0.30E-03	0.10E-02	0.81E-02	0.	0.	0.39E-05	0.81E-02
Auxiliary Sail	D	0.08	341	0.01	0.02	0.27E-03	0.90E-03	0.71E-02	0.20E-03	0.	0.	0.73E-02
Personal Water Craft	G2	0.30	2958	0.19E-02	0.61	0.29E-03	0.02	0.34	0.	0.	0.	0.34
Total		3.80	13456	0.18	9.56	0.40E-02	0.05	1.49	0.02	0.53E-03	0.02	1.53

TABLE 3-6. Concluded.

Annual Emissions
(Tons / Average Day)

		Fuel Use 1000 gal	# of Boats *	NOx	CO	SOx	PM	TOG Exhaust	TOG Crank	TOG Evap	TOG Refuel	TOG Total
Yolo												
Outboard	G2	0.30	2095	0.32E-02	0.71	0.29E-03	0.02	0.35	0.97E-02	0.	0.29E-02	0.36
Auxiliary Sail	G2	0.34E-02	41	0.15E-04	0.70E-02	0.32E-05	0.18E-03	0.50E-02	0.	0.24E-04	0.33E-04	0.51E-02
Outboard	G4	0.04	138	0.23E-02	0.12	0.43E-04	0.36E-04	0.76E-02	0.14E-02	0.	0.43E-03	0.95E-02
Inboard/Outboard	G4	0.61	1579	0.03	1.68	0.58E-03	0.49E-03	0.10	0.	0.38E-04	0.36E-02	0.11
Inboard	G4	0.18	392	0.92E-02	0.50	0.17E-03	0.15E-03	0.03	0.	0.16E-03	0.10E-02	0.03
Inboard Jet	G4	0.18	274	0.89E-02	0.48	0.17E-03	0.14E-03	0.03	0.	0.	0.	0.03
Auxiliary Sail	G4	0.57E-02	45	0.29E-03	0.02	0.54E-05	0.46E-05	0.97E-03	0.18E-03	0.	0.55E-04	0.12E-02
Inboard	D	0.03	41	0.50E-02	0.54E-02	0.91E-04	0.31E-03	0.24E-02	0.	0.	0.12E-05	0.24E-02
Auxiliary Sail	D	0.97E-02	82	0.19E-02	0.20E-02	0.34E-04	0.12E-03	0.91E-03	0.26E-04	0.	0.	0.94E-03
Personal Water Craft	G2	0.07	408	0.43E-03	0.13	0.63E-04	0.35E-02	0.07	0.	0.	0.	0.07
Total		1.43	5095	0.06	3.65	0.15E-02	0.02	0.60	0.01	0.22E-03	0.81E-02	0.62
Yuba												
Outboard	G2	0.64	4556	0.75E-02	1.44	0.61E-03	0.03	0.74	0.02	0.	0.62E-02	0.77
Other	G2	0.97E-02	215	0.14E-03	0.02	0.92E-05	0.51E-03	0.01	0.	0.	0.	0.01
Auxiliary Sail	G2	0.33E-02	42	0.21E-04	0.73E-02	0.32E-05	0.18E-03	0.46E-02	0.	0.19E-03	0.32E-04	0.48E-02
Outboard	G4	0.02	377	0.84E-03	0.05	0.16E-04	0.13E-04	0.28E-02	0.53E-03	0.	0.16E-03	0.35E-02
Inboard/Outboard	G4	1.07	2586	0.05	2.93	0.10E-02	0.86E-03	0.18	0.	0.38E-03	0.63E-02	0.19
Inboard	G4	0.21	508	0.01	0.57	0.20E-03	0.17E-03	0.04	0.	0.16E-02	0.12E-02	0.04
Inboard Jet	G4	0.16	636	0.82E-02	0.45	0.16E-03	0.13E-03	0.03	0.	0.	0.	0.03
Auxiliary Sail	G4	0.74E-03	34	0.37E-04	0.20E-02	0.70E-06	0.59E-06	0.13E-03	0.24E-04	0.	0.71E-05	0.16E-03
Inboard	D	0.13E-03	12	0.24E-04	0.26E-04	0.45E-06	0.15E-05	0.12E-04	0.	0.	0.57E-08	0.12E-04
Auxiliary Sail	D	0.16E-03	32	0.31E-04	0.33E-04	0.57E-06	0.19E-05	0.15E-04	0.43E-06	0.	0.	0.15E-04
Personal Water Craft	G2	0.07	324	0.46E-03	0.14	0.68E-04	0.38E-02	0.08	0.	0.	0.	0.08
Total		2.19	9322	0.08	5.61	0.21E-02	0.04	1.08	0.02	0.21E-02	0.01	1.12
Total		190.95	739685	8.00	480.90	0.20	3.31	90.67	1.64	0.04	1.11	93.46

*NOTE: Number of boats does not include Rental Boats or Documented Vessels.

*NOTE: No fuel usage reported for gasoline-powered "Other" vessels in Central region. (8434 boats)

*NOTE: No fuel usage reported for diesel-powered "Other" vessels in Southern region. (399 boats)

*NOTE: No fuel usage reported for diesel-powered "Outboard" vessels in Southern region. (102 boats)

TABLE 3-7. Pleasure craft emissions (tons/average ozone day) by county and engine-propulsion type.[1]

Ozone Season Emissions
(Tons / Average Day)

		Fuel Use 1000 gal	# of Boats *	NOx	CO	SOx	PM	TOG Exhaust	TOG Crank	TOG Evap	TOG Refuel	TOG Total
Alameda												
Outboard	G2	0.84	3554	0.90E-02	1.97	0.80E-03	0.04	0.97	0.03	0.	0.81E-02	1.00
Auxiliary Sail	G2	0.95E-02	70	0.42E-04	0.02	0.90E-05	0.50E-03	0.01	0.	0.66E-04	0.91E-04	0.01
Outboard	G4	0.09	172	0.46E-02	0.25	0.87E-04	0.73E-04	0.02	0.29E-02	0.	0.88E-03	0.02
Inboard/Outboard	G4	1.26	1966	0.06	3.43	0.12E-02	0.10E-02	0.21	0.	0.78E-04	0.73E-02	0.22
Inboard	G4	0.37	488	0.02	1.01	0.35E-03	0.30E-03	0.06	0.	0.32E-03	0.21E-02	0.07
Inboard Jet	G4	0.36	341	0.02	0.98	0.34E-03	0.29E-03	0.06	0.	0.	0.	0.06
Auxiliary Sail	G4	0.01	56	0.59E-03	0.03	0.11E-04	0.93E-05	0.20E-02	0.37E-03	0.	0.11E-03	0.25E-02
Inboard	D	0.05	51	0.01	0.01	0.19E-03	0.63E-03	0.49E-02	0.	0.	0.24E-05	0.49E-02
Auxiliary Sail	D	0.02	102	0.38E-02	0.41E-02	0.70E-04	0.24E-03	0.19E-02	0.53E-04	0.	0.	0.19E-02
Personal Water Craft	G2	0.14	508	0.87E-03	0.27	0.13E-03	0.72E-02	0.15	0.	0.	0.	0.15
Total		3.15	7308	0.13	7.99	0.32E-02	0.06	1.49	0.03	0.46E-03	0.02	1.54
Alpine												
Outboard	G2	0.11	455	0.12E-02	0.25	0.10E-03	0.57E-02	0.12	0.35E-02	0.	0.10E-02	0.13
Auxiliary Sail	G2	0.12E-02	9	0.54E-05	0.25E-02	0.12E-05	0.64E-04	0.18E-02	0.	0.84E-05	0.12E-04	0.18E-02
Outboard	G4	0.01	24	0.63E-03	0.03	0.12E-04	0.10E-04	0.21E-02	0.40E-03	0.	0.12E-03	0.27E-02
Inboard/Outboard	G4	0.17	270	0.87E-02	0.47	0.16E-03	0.14E-03	0.03	0.	0.11E-04	0.10E-02	0.03
Inboard	G4	0.05	67	0.26E-02	0.14	0.48E-04	0.41E-04	0.87E-02	0.	0.44E-04	0.29E-03	0.90E-02
Inboard Jet	G4	0.05	47	0.25E-02	0.13	0.47E-04	0.39E-04	0.83E-02	0.	0.	0.	0.83E-02
Auxiliary Sail	G4	0.16E-02	8	0.81E-04	0.44E-02	0.15E-05	0.13E-05	0.27E-03	0.51E-04	0.	0.15E-04	0.34E-03
Inboard	D	0.72E-02	7	0.14E-02	0.15E-02	0.25E-04	0.86E-04	0.68E-03	0.	0.	0.32E-06	0.68E-03
Auxiliary Sail	D	0.27E-02	14	0.53E-03	0.57E-03	0.96E-05	0.33E-04	0.26E-03	0.73E-05	0.	0.	0.26E-03
Personal Water Craft	G2	0.02	70	0.12E-03	0.04	0.18E-04	0.99E-03	0.02	0.	0.	0.	0.02
Total		0.42	971	0.02	1.08	0.43E-03	0.71E-02	0.20	0.39E-02	0.63E-04	0.25E-02	0.20
Amador												
Outboard	G2	0.69	2923	0.74E-02	1.62	0.66E-03	0.04	0.80	0.02	0.	0.67E-02	0.82
Auxiliary Sail	G2	0.78E-02	58	0.35E-04	0.02	0.74E-05	0.41E-03	0.01	0.	0.54E-04	0.75E-04	0.01
Outboard	G4	0.03	54	0.15E-02	0.08	0.27E-04	0.23E-04	0.49E-02	0.92E-03	0.	0.28E-03	0.61E-02
Inboard/Outboard	G4	0.40	619	0.02	1.08	0.38E-03	0.32E-03	0.07	0.	0.25E-04	0.23E-02	0.07
Inboard	G4	0.12	154	0.59E-02	0.32	0.11E-03	0.94E-04	0.02	0.	0.10E-03	0.66E-03	0.02
Inboard Jet	G4	0.11	107	0.57E-02	0.31	0.11E-03	0.90E-04	0.02	0.	0.	0.	0.02
Auxiliary Sail	G4	0.37E-02	18	0.19E-03	0.01	0.35E-05	0.29E-05	0.62E-03	0.12E-03	0.	0.35E-04	0.78E-03
Inboard	D	0.02	16	0.32E-02	0.34E-02	0.59E-04	0.20E-03	0.15E-02	0.	0.	0.74E-06	0.15E-02
Auxiliary Sail	D	0.62E-02	32	0.12E-02	0.13E-02	0.22E-04	0.75E-04	0.59E-03	0.17E-04	0.	0.	0.60E-03
Personal Water Craft	G2	0.04	160	0.27E-03	0.09	0.41E-04	0.23E-02	0.05	0.	0.	0.	0.05
Total		1.43	4141	0.05	3.53	0.14E-02	0.04	0.97	0.02	0.18E-03	0.01	1.00
Butte												
Outboard	G2	1.02	4416	0.01	2.29	0.97E-03	0.05	1.18	0.03	0.	0.98E-02	1.22
Other	G2	0.02	209	0.22E-03	0.03	0.15E-04	0.82E-03	0.02	0.	0.	0.	0.02
Auxiliary Sail	G2	0.53E-02	40	0.33E-04	0.01	0.50E-05	0.28E-03	0.72E-02	0.	0.30E-03	0.51E-04	0.76E-02
Outboard	G4	0.01	207	0.75E-03	0.04	0.14E-04	0.12E-04	0.25E-02	0.48E-03	0.	0.14E-03	0.31E-02
Inboard/Outboard	G4	0.96	1418	0.05	2.63	0.92E-03	0.77E-03	0.16	0.	0.34E-03	0.56E-02	0.17
Inboard	G4	0.19	279	0.95E-02	0.51	0.18E-03	0.15E-03	0.03	0.	0.14E-02	0.11E-02	0.03
Inboard Jet	G4	0.15	349	0.74E-02	0.40	0.14E-03	0.12E-03	0.02	0.	0.	0.	0.02
Auxiliary Sail	G4	0.67E-03	19	0.34E-04	0.18E-02	0.63E-06	0.53E-06	0.11E-03	0.21E-04	0.	0.64E-05	0.14E-03
Inboard	D	0.11E-03	7	0.22E-04	0.24E-04	0.40E-06	0.14E-05	0.11E-04	0.	0.	0.51E-08	0.11E-04
Auxiliary Sail	D	0.14E-03	17	0.28E-04	0.30E-04	0.51E-06	0.17E-05	0.13E-04	0.39E-06	0.	0.	0.14E-04
Personal Water Craft	G2	0.06	178	0.41E-03	0.13	0.61E-04	0.34E-02	0.07	0.	0.	0.	0.07
Total		2.42	7139	0.08	6.06	0.23E-02	0.06	1.49	0.03	0.20E-02	0.02	1.55

[1] The fuel usage and emissions include registered, documented, and rental vessels. The number of boats only includes registered vessels.

TABLE 3-7. Continued.

Ozone Season Emissions
(Tons / Average Day)

		Fuel Use 1000 gal	# of Boats *	NOx	CO	SOx	PM	TOG Exhaust	TOG Crank	TOG Evap	TOG Refuel	TOG Total
Calaveras												
Outboard	G2	2.86	12055	0.03	6.69	0.27E-02	0.15	3.28	0.09	0.	0.03	3.40
Auxiliary Sail	G2	0.03	238	0.14E-03	0.07	0.30E-04	0.17E-02	0.05	0.	0.22E-03	0.31E-03	0.05
Outboard	G4	0.06	114	0.31E-02	0.17	0.58E-04	0.48E-04	0.01	0.19E-02	0.	0.58E-03	0.01
Inboard/Outboard	G4	0.83	1300	0.04	2.27	0.79E-03	0.66E-03	0.14	0.	0.52E-04	0.49E-02	0.15
Inboard	G4	0.25	323	0.01	0.67	0.23E-03	0.20E-03	0.04	0.	0.21E-03	0.14E-02	0.04
Inboard Jet	G4	0.24	226	0.01	0.65	0.22E-03	0.19E-03	0.04	0.	0.	0.	0.04
Auxiliary Sail	G4	0.77E-02	37	0.39E-03	0.02	0.73E-05	0.62E-05	0.13E-02	0.25E-03	0.	0.74E-04	0.16E-02
Inboard	D	0.03	34	0.67E-02	0.72E-02	0.12E-03	0.42E-03	0.33E-02	0.	0.	0.16E-05	0.33E-02
Auxiliary Sail	D	0.01	68	0.25E-02	0.27E-02	0.46E-04	0.16E-03	0.12E-02	0.35E-04	0.	0.	0.13E-02
Personal Water Craft	G2	0.09	336	0.58E-03	0.18	0.86E-04	0.48E-02	0.10	0.	0.	0.	0.10
Total		4.42	14731	0.11	10.72	0.43E-02	0.16	3.67	0.09	0.48E-03	0.03	3.80
Colusa												
Outboard	G2	0.25	1032	0.26E-02	0.57	0.23E-03	0.01	0.28	0.78E-02	0.	0.24E-02	0.29
Auxiliary Sail	G2	0.27E-02	20	0.12E-04	0.57E-02	0.26E-05	0.15E-03	0.40E-02	0.	0.19E-04	0.26E-04	0.41E-02
Outboard	G4	0.28E-02	5	0.14E-03	0.78E-02	0.27E-05	0.23E-05	0.48E-03	0.91E-04	0.	0.27E-04	0.60E-03
Inboard/Outboard	G4	0.04	61	0.20E-02	0.11	0.37E-04	0.31E-04	0.66E-02	0.	0.24E-05	0.23E-03	0.68E-02
Inboard	G4	0.01	15	0.58E-03	0.03	0.11E-04	0.92E-05	0.20E-02	0.	0.99E-05	0.65E-04	0.20E-02
Inboard Jet	G4	0.01	11	0.56E-03	0.03	0.11E-04	0.89E-05	0.19E-02	0.	0.	0.	0.19E-02
Auxiliary Sail	G4	0.36E-03	2	0.18E-04	0.99E-03	0.34E-06	0.29E-06	0.61E-04	0.12E-04	0.	0.35E-05	0.76E-04
Inboard	D	0.16E-02	2	0.31E-03	0.34E-03	0.58E-05	0.19E-04	0.15E-03	0.	0.	0.73E-07	0.15E-03
Auxiliary Sail	D	0.61E-03	3	0.12E-03	0.13E-03	0.22E-05	0.74E-05	0.58E-04	0.17E-05	0.	0.	0.59E-04
Personal Water Craft	G2	0.42E-02	16	0.27E-04	0.85E-02	0.40E-05	0.22E-03	0.47E-02	0.	0.	0.	0.47E-02
Total		0.32	1167	0.64E-02	0.76	0.31E-03	0.01	0.30	0.79E-02	0.31E-04	0.27E-02	0.31
Contra Costa												
Outboard	G2	1.33	5583	0.01	3.10	0.13E-02	0.07	1.52	0.04	0.	0.01	1.58
Auxiliary Sail	G2	0.01	110	0.66E-04	0.03	0.14E-04	0.79E-03	0.02	0.	0.10E-03	0.14E-03	0.02
Outboard	G4	0.27	509	0.01	0.74	0.26E-03	0.22E-03	0.05	0.87E-02	0.	0.26E-02	0.06
Inboard/Outboard	G4	3.72	5827	0.19	10.17	0.35E-02	0.30E-02	0.63	0.	0.23E-03	0.02	0.65
Inboard	G4	1.10	1447	0.06	3.01	0.10E-02	0.88E-03	0.19	0.	0.94E-03	0.62E-02	0.19
Inboard Jet	G4	1.06	1012	0.05	2.90	0.10E-02	0.85E-03	0.18	0.	0.	0.	0.18
Auxiliary Sail	G4	0.03	167	0.17E-02	0.09	0.33E-04	0.28E-04	0.59E-02	0.11E-02	0.	0.33E-03	0.73E-02
Inboard	D	0.16	151	0.03	0.03	0.55E-03	0.19E-02	0.01	0.	0.	0.70E-05	0.01
Auxiliary Sail	D	0.06	303	0.01	0.01	0.21E-03	0.70E-03	0.55E-02	0.16E-03	0.	0.	0.57E-02
Personal Water Craft	G2	0.40	1506	0.26E-02	0.81	0.38E-03	0.02	0.45	0.	0.	0.	0.45
Total		8.15	16615	0.37	20.90	0.83E-02	0.10	3.06	0.05	0.13E-02	0.04	3.16
Del Norte												
Outboard	G2	0.05	212	0.57E-03	0.11	0.46E-04	0.26E-02	0.06	0.16E-02	0.	0.47E-03	0.06
Other	G2	0.74E-03	10	0.10E-04	0.15E-02	0.70E-06	0.39E-04	0.83E-03	0.	0.	0.	0.83E-03
Auxiliary Sail	G2	0.25E-03	2	0.16E-05	0.55E-03	0.24E-06	0.14E-04	0.35E-03	0.	0.14E-04	0.25E-05	0.36E-03
Outboard	G4	0.24E-02	34	0.12E-03	0.67E-02	0.23E-05	0.19E-05	0.41E-03	0.78E-04	0.	0.24E-04	0.52E-03
Inboard/Outboard	G4	0.16	232	0.80E-02	0.43	0.15E-03	0.13E-03	0.03	0.	0.56E-04	0.92E-03	0.03
Inboard	G4	0.03	46	0.15E-02	0.08	0.29E-04	0.25E-04	0.52E-02	0.	0.23E-03	0.17E-03	0.56E-02
Inboard Jet	G4	0.02	57	0.12E-02	0.07	0.23E-04	0.19E-04	0.41E-02	0.	0.	0.	0.41E-02
Auxiliary Sail	G4	0.11E-03	3	0.55E-05	0.30E-03	0.10E-06	0.87E-07	0.18E-04	0.35E-05	0.	0.10E-05	0.23E-04
Inboard	D	0.19E-04	1	0.36E-05	0.39E-05	0.66E-07	0.22E-06	0.17E-05	0.	0.	0.83E-09	0.17E-05
Auxiliary Sail	D	0.23E-04	3	0.45E-05	0.49E-05	0.83E-07	0.28E-06	0.22E-05	0.63E-07	0.	0.	0.23E-05
Personal Water Craft	G2	0.01	29	0.67E-04	0.02	0.10E-04	0.56E-03	0.01	0.	0.	0.	0.01
Total		0.28	629	0.01	0.72	0.26E-03	0.34E-02	0.11	0.16E-02	0.30E-03	0.16E-02	0.11

TABLE 3-7. Continued.

Ozone Season Emissions
(Tons / Average Day)

		Fuel Use 1000 gal	# of Boats *	NOx	CO	SOx	PM	TOG Exhaust	TOG Crank	TOG Evap	TOG Refuel	TOG Total
El Dorado												
Outboard	G2	0.76	3180	0.81E-02	1.77	0.72E-03	0.04	0.87	0.02	0.	0.73E-02	0.90
Auxiliary Sail	G2	0.85E-02	63	0.38E-04	0.02	0.80E-05	0.45E-03	0.01	0.	0.59E-04	0.82E-04	0.01
Outboard	G4	0.21	398	0.01	0.58	0.20E-03	0.17E-03	0.04	0.68E-02	0.	0.20E-02	0.04
Inboard/Outboard	G4	2.91	4562	0.15	7.96	0.28E-02	0.23E-02	0.49	0.	0.18E-03	0.02	0.51
Inboard	G4	0.86	1132	0.04	2.35	0.82E-03	0.69E-03	0.15	0.	0.74E-03	0.49E-02	0.15
Inboard Jet	G4	0.83	792	0.04	2.27	0.79E-03	0.66E-03	0.14	0.	0.	0.	0.14
Auxiliary Sail	G4	0.03	131	0.14E-02	0.07	0.26E-04	0.22E-04	0.46E-02	0.86E-03	0.	0.26E-03	0.57E-02
Inboard	D	0.12	118	0.02	0.03	0.43E-03	0.15E-02	0.01	0.	0.	0.55E-05	0.01
Auxiliary Sail	D	0.05	237	0.89E-02	0.96E-02	0.16E-03	0.55E-03	0.43E-02	0.12E-03	0.	0.	0.44E-02
Personal Water Craft	G2	0.32	1179	0.20E-02	0.64	0.30E-03	0.02	0.35	0.	0.	0.	0.35
Total		6.09	11792	0.29	15.69	0.62E-02	0.06	2.07	0.03	0.98E-03	0.03	2.13
Fresno												
Outboard	G2	1.33	5602	0.01	3.11	0.13E-02	0.07	1.53	0.04	0.	0.01	1.58
Auxiliary Sail	G2	0.01	111	0.66E-04	0.03	0.14E-04	0.79E-03	0.02	0.	0.10E-03	0.14E-03	0.02
Outboard	G4	0.08	158	0.43E-02	0.23	0.80E-04	0.68E-04	0.01	0.27E-02	0.	0.82E-03	0.02
Inboard/Outboard	G4	1.16	1815	0.06	3.17	0.11E-02	0.93E-03	0.20	0.	0.72E-04	0.68E-02	0.20
Inboard	G4	0.34	451	0.02	0.94	0.33E-03	0.27E-03	0.06	0.	0.29E-03	0.19E-02	0.06
Inboard Jet	G4	0.33	315	0.02	0.90	0.31E-03	0.26E-03	0.06	0.	0.	0.	0.06
Auxiliary Sail	G4	0.01	52	0.54E-03	0.03	0.10E-04	0.86E-05	0.18E-02	0.34E-03	0.	0.10E-03	0.23E-02
Inboard	D	0.05	47	0.94E-02	0.01	0.17E-03	0.58E-03	0.45E-02	0.	0.	0.22E-05	0.45E-02
Auxiliary Sail	D	0.02	94	0.35E-02	0.38E-02	0.65E-04	0.22E-03	0.17E-02	0.49E-04	0.	0.	0.18E-02
Personal Water Craft	G2	0.13	469	0.81E-03	0.25	0.12E-03	0.67E-02	0.14	0.	0.	0.	0.14
Total		3.47	9114	0.13	8.68	0.35E-02	0.08	2.02	0.05	0.47E-03	0.02	2.09
Glenn												
Outboard	G2	0.21	890	0.24E-02	0.46	0.20E-03	0.01	0.24	0.66E-02	0.	0.20E-02	0.25
Other	G2	0.31E-02	42	0.44E-04	0.64E-02	0.30E-05	0.16E-03	0.35E-02	0.	0.	0.	0.35E-02
Auxiliary Sail	G2	0.11E-02	8	0.67E-05	0.23E-02	0.10E-05	0.57E-04	0.15E-02	0.	0.60E-04	0.10E-04	0.15E-02
Outboard	G4	0.37E-03	5	0.19E-04	0.10E-02	0.35E-06	0.30E-06	0.63E-04	0.12E-04	0.	0.36E-05	0.79E-04
Inboard/Outboard	G4	0.02	36	0.12E-02	0.07	0.23E-04	0.19E-04	0.41E-02	0.	0.86E-05	0.14E-03	0.43E-02
Inboard	G4	0.47E-02	7	0.24E-03	0.01	0.45E-05	0.38E-05	0.80E-03	0.	0.35E-04	0.27E-04	0.86E-03
Inboard Jet	G4	0.37E-02	9	0.19E-03	0.01	0.35E-05	0.29E-05	0.63E-03	0.	0.	0.	0.63E-03
Auxiliary Sail	G4	0.17E-04	1	0.84E-06	0.46E-04	0.16E-07	0.13E-07	0.28E-05	0.53E-06	0.	0.16E-06	0.35E-05
Inboard	D	0.28E-05	1	0.55E-06	0.59E-06	0.10E-07	0.34E-07	0.27E-06	0.	0.	0.13E-09	0.27E-06
Auxiliary Sail	D	0.36E-05	1	0.70E-06	0.75E-06	0.13E-07	0.43E-07	0.34E-06	0.97E-08	0.	0.	0.35E-06
Personal Water Craft	G2	0.16E-02	4	0.10E-04	0.32E-02	0.15E-05	0.85E-04	0.18E-02	0.	0.	0.	0.18E-02
Total		0.24	1004	0.41E-02	0.56	0.23E-03	0.01	0.25	0.66E-02	0.10E-03	0.22E-02	0.26
Humboldt												
Outboard	G2	0.26	1142	0.31E-02	0.59	0.25E-03	0.01	0.30	0.84E-02	0.	0.25E-02	0.32
Other	G2	0.40E-02	54	0.56E-04	0.82E-02	0.38E-05	0.21E-03	0.45E-02	0.	0.	0.	0.45E-02
Auxiliary Sail	G2	0.14E-02	10	0.87E-05	0.30E-02	0.13E-05	0.73E-04	0.19E-02	0.	0.77E-04	0.13E-04	0.20E-02
Outboard	G4	0.13E-02	18	0.64E-04	0.35E-02	0.12E-05	0.10E-05	0.22E-03	0.40E-04	0.	0.12E-04	0.27E-03
Inboard/Outboard	G4	0.08	121	0.41E-02	0.22	0.78E-04	0.66E-04	0.01	0.	0.29E-04	0.48E-03	0.01
Inboard	G4	0.02	24	0.80E-03	0.04	0.15E-04	0.13E-04	0.27E-02	0.	0.12E-03	0.90E-04	0.29E-02
Inboard Jet	G4	0.01	30	0.63E-03	0.03	0.12E-04	0.10E-04	0.21E-02	0.	0.	0.	0.21E-02
Auxiliary Sail	G4	0.57E-04	2	0.29E-05	0.15E-03	0.54E-07	0.45E-07	0.96E-05	0.18E-05	0.	0.55E-06	0.12E-04
Inboard	D	0.96E-05	1	0.19E-05	0.20E-05	0.34E-07	0.12E-06	0.90E-06	0.	0.	0.43E-09	0.90E-06
Auxiliary Sail	D	0.12E-04	1	0.24E-05	0.25E-05	0.43E-07	0.15E-06	0.11E-05	0.33E-07	0.	0.	0.12E-05
Personal Water Craft	G2	0.54E-02	15	0.35E-04	0.01	0.52E-05	0.29E-03	0.60E-02	0.	0.	0.	0.60E-02

TABLE 3-7. Continued.

Ozone Season Emissions
(Tons / Average Day)

		Fuel Use 1000 gal	# of Boats *	NOx	CO	SOx	PM	TOG Exhaust	TOG Crank	TOG Evap	TOG Refuel	TOG Total
Total		0.39	1418	0.88E-02	0.92	0.37E-03	0.01	0.34	0.85E-02	0.22E-03	0.31E-02	0.35
Imperial												
Outboard	G2	0.45E-02	18	0.41E-04	0.01	0.43E-05	0.24E-03	0.54E-02	0.14E-03	0.	0.44E-04	0.56E-02
Other	G2	0.29E-04	1	0.26E-06	0.81E-04	0.27E-07	0.15E-05	0.31E-04	0.	0.	0.	0.31E-04
Auxiliary Sail	G2	0.47E-04	1	0.39E-06	0.11E-03	0.44E-07	0.25E-05	0.57E-04	0.	0.48E-06	0.45E-06	0.58E-04
Outboard	G4	0.70E-03	119	0.35E-04	0.19E-02	0.66E-06	0.56E-06	0.12E-03	0.22E-04	0.	0.67E-05	0.15E-03
Inboard/Outboard	G4	1.07	1337	0.05	2.93	0.10E-02	0.86E-03	0.18	0.	0.59E-04	0.63E-02	0.19
Inboard	G4	0.49	368	0.02	1.33	0.46E-03	0.39E-03	0.08	0.	0.24E-03	0.27E-02	0.09
Inboard Jet	G4	0.18	483	0.90E-02	0.49	0.17E-03	0.14E-03	0.03	0.	0.	0.	0.03
Auxiliary Sail	G4	0.02	59	0.85E-03	0.05	0.16E-04	0.14E-04	0.29E-02	0.54E-03	0.	0.16E-03	0.36E-02
Inboard	D	0.05	69	0.01	0.01	0.19E-03	0.65E-03	0.51E-02	0.	0.	0.24E-05	0.51E-02
Auxiliary Sail	D	0.05	131	0.92E-02	0.99E-02	0.17E-03	0.57E-03	0.45E-02	0.13E-03	0.	0.	0.46E-02
Personal Water Craft	G2	0.19	1138	0.12E-02	0.39	0.18E-03	0.01	0.21	0.	0.	0.	0.21
Total		2.05	3724	0.11	5.21	0.22E-02	0.01	0.52	0.83E-03	0.30E-03	0.92E-02	0.54
Inyo												
Outboard	G2	0.04	167	0.42E-03	0.09	0.38E-04	0.21E-02	0.05	0.13E-02	0.	0.38E-03	0.05
Auxiliary Sail	G2	0.44E-03	3	0.20E-05	0.92E-03	0.42E-06	0.24E-04	0.65E-03	0.	0.31E-05	0.43E-05	0.66E-03
Outboard	G4	0.78E-03	1	0.39E-04	0.21E-02	0.74E-06	0.62E-06	0.13E-03	0.25E-04	0.	0.75E-05	0.16E-03
Inboard/Outboard	G4	0.01	17	0.54E-03	0.03	0.10E-04	0.86E-05	0.18E-02	0.	0.67E-06	0.63E-04	0.19E-02
Inboard	G4	0.32E-02	4	0.16E-03	0.86E-02	0.30E-05	0.25E-05	0.54E-03	0.	0.27E-05	0.18E-04	0.56E-03
Inboard Jet	G4	0.31E-02	3	0.15E-03	0.83E-02	0.29E-05	0.24E-05	0.52E-03	0.	0.	0.	0.52E-03
Auxiliary Sail	G4	0.99E-04	1	0.50E-05	0.27E-03	0.95E-07	0.80E-07	0.17E-04	0.32E-05	0.	0.96E-06	0.21E-04
Inboard	D	0.45E-03	1	0.87E-04	0.93E-04	0.16E-05	0.54E-05	0.42E-04	0.	0.	0.20E-07	0.42E-04
Auxiliary Sail	D	0.17E-03	1	0.33E-04	0.35E-04	0.60E-06	0.20E-05	0.16E-04	0.46E-06	0.	0.	0.16E-04
Personal Water Craft	G2	0.12E-02	4	0.74E-05	0.23E-02	0.11E-05	0.62E-04	0.13E-02	0.	0.	0.	0.13E-02
Total		0.06	202	0.15E-02	0.14	0.58E-04	0.22E-02	0.05	0.13E-02	0.65E-05	0.48E-03	0.05
Kern												
Outboard	G2	0.49	1937	0.45E-02	1.17	0.47E-03	0.03	0.59	0.02	0.	0.48E-02	0.61
Other	G2	0.31E-02	99	0.28E-04	0.88E-02	0.29E-05	0.16E-03	0.34E-02	0.	0.	0.	0.34E-02
Auxiliary Sail	G2	0.51E-02	63	0.42E-04	0.01	0.48E-05	0.27E-03	0.62E-02	0.	0.52E-04	0.49E-04	0.63E-02
Outboard	G4	0.11E-02	186	0.55E-04	0.30E-02	0.10E-05	0.87E-06	0.18E-03	0.35E-04	0.	0.11E-04	0.23E-03
Inboard/Outboard	G4	1.68	2092	0.08	4.58	0.16E-02	0.13E-02	0.28	0.	0.92E-04	0.98E-02	0.29
Inboard	G4	0.76	575	0.04	2.08	0.72E-03	0.61E-03	0.13	0.	0.37E-03	0.43E-02	0.13
Inboard Jet	G4	0.28	755	0.01	0.76	0.27E-03	0.22E-03	0.05	0.	0.	0.	0.05
Auxiliary Sail	G4	0.03	92	0.13E-02	0.07	0.25E-04	0.21E-04	0.45E-02	0.84E-03	0.	0.26E-03	0.56E-02
Inboard	D	0.08	108	0.02	0.02	0.30E-03	0.10E-02	0.80E-02	0.	0.	0.38E-05	0.80E-02
Auxiliary Sail	D	0.07	205	0.01	0.02	0.26E-03	0.89E-03	0.70E-02	0.20E-03	0.	0.	0.72E-02
Personal Water Craft	G2	0.30	1781	0.19E-02	0.60	0.28E-03	0.02	0.33	0.	0.	0.	0.33
Total		3.70	7893	0.18	9.33	0.39E-02	0.05	1.41	0.02	0.52E-03	0.02	1.45
Kings												
Outboard	G2	0.03	145	0.37E-03	0.08	0.33E-04	0.18E-02	0.04	0.11E-02	0.	0.33E-03	0.04
Auxiliary Sail	G2	0.38E-03	3	0.17E-05	0.80E-03	0.37E-06	0.20E-04	0.57E-03	0.	0.27E-05	0.37E-05	0.57E-03
Outboard	G4	0.78E-03	1	0.39E-04	0.21E-02	0.74E-06	0.62E-06	0.13E-03	0.25E-04	0.	0.75E-05	0.16E-03
Inboard/Outboard	G4	0.01	17	0.54E-03	0.03	0.10E-04	0.86E-05	0.18E-02	0.	0.67E-06	0.63E-04	0.19E-02
Inboard	G4	0.32E-02	4	0.16E-03	0.86E-02	0.30E-05	0.25E-05	0.54E-03	0.	0.27E-05	0.18E-04	0.56E-03
Inboard Jet	G4	0.31E-02	3	0.15E-03	0.83E-02	0.29E-05	0.24E-05	0.52E-03	0.	0.	0.	0.52E-03
Auxiliary Sail	G4	0.99E-04	1	0.50E-05	0.27E-03	0.95E-07	0.80E-07	0.17E-04	0.32E-05	0.	0.96E-06	0.21E-04
Inboard	D	0.45E-03	1	0.87E-04	0.93E-04	0.16E-05	0.54E-05	0.42E-04	0.	0.	0.20E-07	0.42E-04
Auxiliary Sail	D	0.17E-03	1	0.33E-04	0.35E-04	0.60E-06	0.20E-05	0.16E-04	0.46E-06	0.	0.	0.16E-04

TABLE 3-7. Continued.

Ozone Season Emissions
(Tons / Average Day)

		Fuel Use 1000 gal	# of Boats *	NOx	CO	SOx	PM	TOG Exhaust	TOG Crank	TOG Evap	TOG Refuel	TOG Total
Personal Water Craft	G2	0.12E-02	4	0.74E-05	0.23E-02	0.11E-05	0.62E-04	0.13E-02	0.	0.	0.	0.13E-02
Total		0.05	180	0.14E-02	0.13	0.53E-04	0.19E-02	0.04	0.11E-02	0.60E-05	0.42E-03	0.05
Lake												
Outboard	G2	1.50	6329	0.02	3.51	0.14E-02	0.08	1.72	0.05	0.	0.01	1.79
Auxiliary Sail	G2	0.02	125	0.75E-04	0.03	0.16E-04	0.89E-03	0.02	0.	0.12E-03	0.16E-03	0.03
Outboard	G4	0.30	572	0.02	0.83	0.29E-03	0.24E-03	0.05	0.97E-02	0.	0.29E-02	0.06
Inboard/Outboard	G4	4.18	6548	0.21	11.43	0.40E-02	0.33E-02	0.71	0.	0.26E-03	0.02	0.74
Inboard	G4	1.24	1626	0.06	3.38	0.12E-02	0.99E-03	0.21	0.	0.11E-02	0.70E-02	0.22
Inboard Jet	G4	1.19	1137	0.06	3.26	0.11E-02	0.95E-03	0.20	0.	0.	0.	0.20
Auxiliary Sail	G4	0.04	187	0.20E-02	0.11	0.37E-04	0.31E-04	0.66E-02	0.12E-02	0.	0.38E-03	0.82E-02
Inboard	D	0.17	170	0.03	0.04	0.62E-03	0.21E-02	0.02	0.	0.	0.78E-05	0.02
Auxiliary Sail	D	0.07	341	0.01	0.01	0.23E-03	0.79E-03	0.62E-02	0.18E-03	0.	0.	0.64E-02
Personal Water Craft	G2	0.45	1692	0.29E-02	0.92	0.43E-03	0.02	0.50	0.	0.	0.	0.50
Total		9.17	18727	0.42	23.52	0.93E-02	0.11	3.45	0.06	0.14E-02	0.05	3.56
Lassen												
Outboard	G2	0.61	2655	0.71E-02	1.38	0.58E-03	0.03	0.71	0.02	0.	0.59E-02	0.73
Other	G2	0.93E-02	125	0.13E-03	0.02	0.88E-05	0.49E-03	0.01	0.	0.	0.	0.01
Auxiliary Sail	G2	0.32E-02	24	0.20E-04	0.69E-02	0.30E-05	0.17E-03	0.44E-02	0.	0.18E-03	0.31E-04	0.46E-02
Outboard	G4	0.23E-02	32	0.12E-03	0.63E-02	0.22E-05	0.19E-05	0.39E-03	0.74E-04	0.	0.22E-04	0.49E-03
Inboard/Outboard	G4	0.15	221	0.76E-02	0.41	0.14E-03	0.12E-03	0.03	0.	0.53E-04	0.88E-03	0.03
Inboard	G4	0.03	43	0.15E-02	0.08	0.28E-04	0.23E-04	0.50E-02	0.	0.22E-03	0.16E-03	0.53E-02
Inboard Jet	G4	0.02	54	0.12E-02	0.06	0.22E-04	0.18E-04	0.39E-02	0.	0.	0.	0.39E-02
Auxiliary Sail	G4	0.10E-03	3	0.52E-05	0.28E-03	0.98E-07	0.83E-07	0.18E-04	0.33E-05	0.	0.10E-05	0.22E-04
Inboard	D	0.18E-04	1	0.34E-05	0.37E-05	0.63E-07	0.21E-06	0.17E-05	0.	0.	0.79E-09	0.17E-05
Auxiliary Sail	D	0.22E-04	3	0.43E-05	0.47E-05	0.79E-07	0.27E-06	0.21E-05	0.60E-07	0.	0.	0.22E-05
Personal Water Craft	G2	0.10E-01	28	0.64E-04	0.02	0.95E-05	0.53E-03	0.01	0.	0.	0.	0.01
Total		0.84	3189	0.02	1.98	0.80E-03	0.03	0.77	0.02	0.45E-03	0.70E-02	0.79
Los Angeles												
Outboard	G2	13.16	51661	0.12	31.19	0.01	0.70	15.71	0.42	0.	0.13	16.26
Other	G2	0.08	2643	0.74E-03	0.24	0.79E-04	0.44E-02	0.09	0.	0.	0.	0.09
Auxiliary Sail	G2	0.13	1671	0.11E-02	0.31	0.13E-03	0.71E-02	0.16	0.	0.14E-02	0.13E-02	0.17
Outboard	G4	0.97E-02	1662	0.49E-03	0.03	0.92E-05	0.78E-05	0.17E-02	0.31E-03	0.	0.94E-04	0.21E-02
Inboard/Outboard	G4	14.99	18697	0.76	40.95	0.01	0.01	2.55	0.	0.82E-03	0.09	2.63
Inboard	G4	6.80	5142	0.34	18.59	0.65E-02	0.54E-02	1.16	0.	0.33E-02	0.04	1.20
Inboard Jet	G4	2.50	6749	0.13	6.83	0.24E-02	0.20E-02	0.42	0.	0.	0.	0.42
Auxiliary Sail	G4	0.24	823	0.01	0.65	0.22E-03	0.19E-03	0.04	0.75E-02	0.	0.23E-02	0.05
Inboard	D	0.76	967	0.15	0.16	0.27E-02	0.91E-02	0.07	0.	0.	0.34E-04	0.07
Auxiliary Sail	D	0.66	1834	0.13	0.14	0.24E-02	0.79E-02	0.06	0.18E-02	0.	0.	0.06
Personal Water Craft	G2	2.68	15920	0.02	5.40	0.25E-02	0.14	2.96	0.	0.	0.	2.96
Total		42.01	107769	1.65	104.46	0.04	0.89	23.23	0.43	0.55E-02	0.26	23.92
Madera												
Outboard	G2	0.89	3762	0.96E-02	2.09	0.85E-03	0.05	1.02	0.03	0.	0.86E-02	1.06
Auxiliary Sail	G2	0.01	74	0.45E-04	0.02	0.95E-05	0.53E-03	0.01	0.	0.70E-04	0.97E-04	0.01
Outboard	G4	0.11	215	0.58E-02	0.31	0.11E-03	0.92E-04	0.02	0.37E-02	0.	0.11E-02	0.02
Inboard/Outboard	G4	1.57	2458	0.08	4.29	0.15E-02	0.13E-02	0.27	0.	0.98E-04	0.92E-02	0.28
Inboard	G4	0.46	610	0.02	1.27	0.44E-03	0.37E-03	0.08	0.	0.40E-03	0.26E-02	0.08
Inboard Jet	G4	0.45	427	0.02	1.22	0.43E-03	0.36E-03	0.08	0.	0.	0.	0.08
Auxiliary Sail	G4	0.01	70	0.74E-03	0.04	0.14E-04	0.12E-04	0.25E-02	0.47E-03	0.	0.14E-03	0.31E-02
Inboard	D	0.07	64	0.01	0.01	0.23E-03	0.79E-03	0.62E-02	0.	0.	0.29E-05	0.62E-02

TABLE 3-7. Continued.

Ozone Season Emissions
(Tons / Average Day)

		Fuel Use 1000 gal	# of Boats *	NOx	CO	SOx	PM	Exhaust	Crank	TOG Evap	Refuel	Total
Auxiliary Sail	D	0.02	128	0.48E-02	0.52E-02	0.88E-04	0.30E-03	0.23E-02	0.67E-04	0.	0.	0.24E-02
Personal Water Craft	G2	0.17	635	0.11E-02	0.34	0.16E-03	0.90E-02	0.19	0.	0.	0.	0.19
Total		3.78	8443	0.16	9.61	0.38E-02	0.06	1.68	0.03	0.57E-03	0.02	1.73
Marin												
Outboard	G2	2.58	10876	0.03	6.04	0.25E-02	0.14	2.96	0.08	0.	0.02	3.07
Auxiliary Sail	G2	0.03	215	0.13E-03	0.06	0.27E-04	0.15E-02	0.04	0.	0.20E-03	0.28E-03	0.04
Outboard	G4	0.08	142	0.38E-02	0.21	0.72E-04	0.60E-04	0.01	0.24E-02	0.	0.73E-03	0.02
Inboard/Outboard	G4	1.04	1620	0.05	2.83	0.98E-03	0.83E-03	0.18	0.	0.64E-04	0.61E-02	0.18
Inboard	G4	0.31	402	0.02	0.84	0.29E-03	0.24E-03	0.05	0.	0.26E-03	0.17E-02	0.05
Inboard Jet	G4	0.30	281	0.01	0.81	0.28E-03	0.24E-03	0.05	0.	0.	0.	0.05
Auxiliary Sail	G4	0.96E-02	46	0.49E-03	0.03	0.91E-05	0.77E-05	0.16E-02	0.31E-03	0.	0.93E-04	0.20E-02
Inboard	D	0.04	42	0.84E-02	0.90E-02	0.15E-03	0.52E-03	0.41E-02	0.	0.	0.19E-05	0.41E-02
Auxiliary Sail	D	0.02	84	0.32E-02	0.34E-02	0.58E-04	0.20E-03	0.15E-02	0.44E-04	0.	0.	0.16E-02
Personal Water Craft	G2	0.11	419	0.72E-03	0.23	0.11E-03	0.60E-02	0.12	0.	0.	0.	0.12
Total		4.51	14127	0.13	11.04	0.44E-02	0.15	3.43	0.09	0.53E-03	0.03	3.55
Mariposa												
Outboard	G2	1.82	7668	0.02	4.26	0.17E-02	0.10	2.09	0.06	0.	0.02	2.16
Auxiliary Sail	G2	0.02	151	0.91E-04	0.04	0.19E-04	0.11E-02	0.03	0.	0.14E-03	0.20E-03	0.03
Outboard	G4	0.03	47	0.13E-02	0.07	0.24E-04	0.20E-04	0.43E-02	0.80E-03	0.	0.24E-03	0.53E-02
Inboard/Outboard	G4	0.34	539	0.02	0.94	0.33E-03	0.28E-03	0.06	0.	0.21E-04	0.20E-02	0.06
Inboard	G4	0.10	134	0.51E-02	0.28	0.97E-04	0.81E-04	0.02	0.	0.87E-04	0.57E-03	0.02
Inboard Jet	G4	0.10	93	0.50E-02	0.27	0.93E-04	0.78E-04	0.02	0.	0.	0.	0.02
Auxiliary Sail	G4	0.32E-02	15	0.16E-03	0.87E-02	0.30E-05	0.26E-05	0.54E-03	0.10E-03	0.	0.31E-04	0.68E-03
Inboard	D	0.01	14	0.28E-02	0.30E-02	0.51E-04	0.17E-03	0.13E-02	0.	0.	0.65E-06	0.13E-02
Auxiliary Sail	D	0.54E-02	28	0.11E-02	0.11E-02	0.19E-04	0.65E-04	0.51E-03	0.15E-04	0.	0.	0.52E-03
Personal Water Craft	G2	0.04	139	0.24E-03	0.08	0.35E-04	0.20E-02	0.04	0.	0.	0.	0.04
Total		2.47	8828	0.05	5.94	0.24E-02	0.10	2.26	0.06	0.25E-03	0.02	2.34
Mendicino												
Outboard	G2	0.88	3709	0.94E-02	2.06	0.84E-03	0.05	1.01	0.03	0.	0.85E-02	1.05
Auxiliary Sail	G2	0.99E-02	73	0.44E-04	0.02	0.94E-05	0.52E-03	0.01	0.	0.69E-04	0.95E-04	0.01
Outboard	G4	0.06	107	0.29E-02	0.16	0.54E-04	0.46E-04	0.97E-02	0.18E-02	0.	0.55E-03	0.01
Inboard/Outboard	G4	0.78	1222	0.04	2.13	0.74E-03	0.62E-03	0.13	0.	0.49E-04	0.46E-02	0.14
Inboard	G4	0.23	304	0.01	0.63	0.22E-03	0.18E-03	0.04	0.	0.20E-03	0.13E-02	0.04
Inboard Jet	G4	0.22	212	0.01	0.61	0.21E-03	0.18E-03	0.04	0.	0.	0.	0.04
Auxiliary Sail	G4	0.73E-02	35	0.37E-03	0.02	0.69E-05	0.58E-05	0.12E-02	0.23E-03	0.	0.70E-04	0.15E-02
Inboard	D	0.03	32	0.63E-02	0.68E-02	0.12E-03	0.39E-03	0.31E-02	0.	0.	0.15E-05	0.31E-02
Auxiliary Sail	D	0.01	64	0.24E-02	0.26E-02	0.44E-04	0.15E-03	0.12E-02	0.33E-04	0.	0.	0.12E-02
Personal Water Craft	G2	0.08	316	0.54E-03	0.17	0.81E-04	0.45E-02	0.09	0.	0.	0.	0.09
Total		2.32	6074	0.08	5.81	0.23E-02	0.05	1.34	0.03	0.32E-03	0.02	1.39
Merced												
Outboard	G2	0.44	1863	0.47E-02	1.03	0.42E-03	0.02	0.51	0.01	0.	0.43E-02	0.53
Auxiliary Sail	G2	0.50E-02	37	0.22E-04	0.01	0.47E-05	0.26E-03	0.73E-02	0.	0.34E-04	0.48E-04	0.74E-02
Outboard	G4	0.78E-03	1	0.39E-04	0.21E-02	0.74E-06	0.62E-06	0.13E-03	0.25E-04	0.	0.75E-05	0.16E-03
Inboard/Outboard	G4	0.01	17	0.54E-03	0.03	0.10E-04	0.86E-05	0.18E-02	0.	0.67E-06	0.63E-04	0.19E-02
Inboard	G4	0.32E-02	4	0.16E-03	0.86E-02	0.30E-05	0.25E-05	0.54E-03	0.	0.27E-05	0.18E-04	0.56E-03
Inboard Jet	G4	0.31E-02	3	0.15E-03	0.83E-02	0.29E-05	0.24E-05	0.52E-03	0.	0.	0.	0.52E-03
Auxiliary Sail	G4	0.99E-04	1	0.50E-05	0.27E-03	0.95E-07	0.80E-07	0.17E-04	0.32E-05	0.	0.96E-06	0.21E-04
Inboard	D	0.45E-03	1	0.87E-04	0.93E-04	0.16E-05	0.54E-05	0.42E-04	0.	0.	0.20E-07	0.42E-04
Auxiliary Sail	D	0.17E-03	1	0.33E-04	0.35E-04	0.60E-06	0.20E-05	0.16E-04	0.46E-06	0.	0.	0.16E-04

TABLE 3-7. Continued.

Ozone Season Emissions
(Tons / Average Day)

		Fuel Use 1000 gal	# of Boats *	NOx	CO	SOx	PM	TOG Exhaust	TOG Crank	TOG Evap	TOG Refuel	TOG Total
Personal Water Craft	G2	0.12E-02	4	0.74E-05	0.23E-02	0.11E-05	0.62E-04	0.13E-02	0.	0.	0.	0.13E-02
Total		0.47	1932	0.58E-02	1.10	0.45E-03	0.02	0.52	0.01	0.38E-04	0.44E-02	0.54
Modoc												
Outboard	G2	0.12E-02	5	0.14E-04	0.28E-02	0.12E-05	0.65E-04	0.14E-02	0.39E-04	0.	0.12E-04	0.15E-02
Other	G2	0.18E-04	1	0.26E-06	0.38E-04	0.18E-07	0.98E-06	0.21E-04	0.	0.	0.	0.21E-04
Auxiliary Sail	G2	0.64E-05	1	0.40E-07	0.14E-04	0.61E-08	0.34E-06	0.87E-05	0.	0.36E-06	0.62E-07	0.91E-05
Outboard	G4	0.29E-04	1	0.15E-05	0.80E-04	0.28E-07	0.23E-07	0.49E-05	0.93E-06	0.	0.28E-06	0.62E-05
Inboard/Outboard	G4	0.19E-02	3	0.95E-04	0.51E-02	0.18E-05	0.15E-05	0.32E-03	0.	0.67E-06	0.11E-04	0.33E-03
Inboard	G4	0.37E-03	1	0.19E-04	0.10E-02	0.35E-06	0.29E-06	0.62E-04	0.	0.27E-05	0.21E-05	0.67E-04
Inboard Jet	G4	0.29E-03	1	0.14E-04	0.78E-03	0.27E-06	0.23E-06	0.49E-04	0.	0.	0.	0.49E-04
Auxiliary Sail	G4	0.13E-05	1	0.66E-07	0.35E-05	0.12E-08	0.10E-08	0.22E-06	0.41E-07	0.	0.13E-07	0.27E-06
Inboard	D	0.22E-06	1	0.43E-07	0.46E-07	0.79E-09	0.27E-08	0.21E-07	0.	0.	0.10E-10	0.21E-07
Auxiliary Sail	D	0.28E-06	1	0.54E-07	0.58E-07	0.99E-09	0.34E-08	0.26E-07	0.76E-09	0.	0.	0.27E-07
Personal Water Craft	G2	0.13E-03	1	0.80E-06	0.25E-03	0.12E-06	0.66E-05	0.14E-03	0.	0.	0.	0.14E-03
Total		0.39E-02	17	0.15E-03	0.01	0.37E-05	0.75E-04	0.20E-02	0.40E-04	0.38E-05	0.25E-04	0.21E-02
Mono												
Outboard	G2	0.10	431	0.11E-02	0.24	0.97E-04	0.54E-02	0.12	0.33E-02	0.	0.99E-03	0.12
Auxiliary Sail	G2	0.11E-02	9	0.51E-05	0.24E-02	0.11E-05	0.61E-04	0.17E-02	0.	0.80E-05	0.11E-04	0.17E-02
Outboard	G4	0.78E-03	1	0.39E-04	0.21E-02	0.74E-06	0.62E-06	0.13E-03	0.25E-04	0.	0.75E-05	0.16E-03
Inboard/Outboard	G4	0.01	17	0.54E-03	0.03	0.10E-04	0.86E-05	0.18E-02	0.	0.67E-06	0.63E-04	0.19E-02
Inboard	G4	0.32E-02	4	0.16E-03	0.86E-02	0.30E-05	0.25E-05	0.54E-03	0.	0.27E-05	0.18E-04	0.56E-03
Inboard Jet	G4	0.31E-02	3	0.15E-03	0.83E-02	0.29E-05	0.24E-05	0.52E-03	0.	0.	0.	0.52E-03
Auxiliary Sail	G4	0.99E-04	1	0.50E-05	0.27E-03	0.95E-07	0.80E-07	0.17E-04	0.32E-05	0.	0.96E-06	0.21E-04
Inboard	D	0.45E-03	1	0.87E-04	0.93E-04	0.16E-05	0.54E-05	0.42E-04	0.	0.	0.20E-07	0.42E-04
Auxiliary Sail	D	0.17E-03	1	0.33E-04	0.35E-04	0.60E-06	0.20E-05	0.16E-04	0.46E-06	0.	0.	0.16E-04
Personal Water Craft	G2	0.12E-02	4	0.74E-05	0.23E-02	0.11E-05	0.62E-04	0.13E-02	0.	0.	0.	0.13E-02
Total		0.12	472	0.21E-02	0.29	0.12E-03	0.56E-02	0.12	0.33E-02	0.11E-04	0.11E-02	0.13
Monterey												
Outboard	G2	2.35	9885	0.03	5.49	0.22E-02	0.12	2.69	0.07	0.	0.02	2.79
Auxiliary Sail	G2	0.03	195	0.12E-03	0.05	0.25E-04	0.14E-02	0.04	0.	0.18E-03	0.25E-03	0.04
Outboard	G4	0.15	277	0.75E-02	0.40	0.14E-03	0.12E-03	0.03	0.47E-02	0.	0.14E-02	0.03
Inboard/Outboard	G4	2.03	3177	0.10	5.54	0.19E-02	0.16E-02	0.34	0.	0.13E-03	0.01	0.36
Inboard	G4	0.60	789	0.03	1.64	0.57E-03	0.48E-03	0.10	0.	0.51E-03	0.34E-02	0.11
Inboard Jet	G4	0.58	552	0.03	1.58	0.55E-03	0.46E-03	0.10	0.	0.	0.	0.10
Auxiliary Sail	G4	0.02	91	0.95E-03	0.05	0.18E-04	0.15E-04	0.32E-02	0.60E-03	0.	0.18E-03	0.40E-02
Inboard	D	0.08	82	0.02	0.02	0.30E-03	0.10E-02	0.80E-02	0.	0.	0.38E-05	0.80E-02
Auxiliary Sail	D	0.03	165	0.62E-02	0.67E-02	0.11E-03	0.38E-03	0.30E-02	0.86E-04	0.	0.	0.31E-02
Personal Water Craft	G2	0.22	821	0.14E-02	0.44	0.21E-03	0.01	0.24	0.	0.	0.	0.24
Total		6.09	16034	0.22	15.23	0.61E-02	0.14	3.56	0.08	0.82E-03	0.04	3.68
Napa												
Outboard	G2	1.02	4307	0.01	2.39	0.97E-03	0.05	1.17	0.03	0.	0.99E-02	1.22
Auxiliary Sail	G2	0.01	85	0.51E-04	0.02	0.11E-04	0.61E-03	0.02	0.	0.80E-04	0.11E-03	0.02
Outboard	G4	0.15	278	0.75E-02	0.41	0.14E-03	0.12E-03	0.03	0.47E-02	0.	0.14E-02	0.03
Inboard/Outboard	G4	2.04	3187	0.10	5.56	0.19E-02	0.16E-02	0.35	0.	0.13E-03	0.01	0.36
Inboard	G4	0.60	791	0.03	1.64	0.57E-03	0.48E-03	0.10	0.	0.52E-03	0.34E-02	0.11
Inboard Jet	G4	0.58	553	0.03	1.59	0.55E-03	0.46E-03	0.10	0.	0.	0.	0.10
Auxiliary Sail	G4	0.02	91	0.96E-03	0.05	0.18E-04	0.15E-04	0.32E-02	0.60E-03	0.	0.18E-03	0.40E-02
Inboard	D	0.08	83	0.02	0.02	0.30E-03	0.10E-02	0.80E-02	0.	0.	0.38E-05	0.80E-02
Auxiliary Sail	D	0.03	166	0.62E-02	0.67E-02	0.11E-03	0.39E-03	0.30E-02	0.87E-04	0.	0.	0.31E-02

TABLE 3-7. Continued.

Ozone Season Emissions
(Tons / Average Day)

		Fuel Use 1000 gal	# of Boats *	NOx	CO	SOx	PM	TOG Exhaust	TOG Crank	TOG Evap	TOG Refuel	TOG Total
Personal Water Craft	G2	0.22	823	0.14E-02	0.45	0.21E-03	0.01	0.24	0.	0.	0.	0.24
Total		4.76	10364	0.21	12.13	0.48E-02	0.07	2.02	0.04	0.72E-03	0.03	2.09
Nevada												
Outboard	G2	1.26	5432	0.01	2.82	0.12E-02	0.07	1.45	0.04	0.	0.01	1.50
Other	G2	0.02	257	0.27E-03	0.04	0.18E-04	0.10E-02	0.02	0.	0.	0.	0.02
Auxiliary Sail	G2	0.65E-02	50	0.41E-04	0.01	0.62E-05	0.35E-03	0.89E-02	0.	0.37E-03	0.63E-04	0.93E-02
Outboard	G4	0.01	181	0.66E-03	0.04	0.12E-04	0.10E-04	0.22E-02	0.42E-03	0.	0.13E-03	0.28E-02
Inboard/Outboard	G4	0.85	1246	0.04	2.31	0.80E-03	0.68E-03	0.14	0.	0.30E-03	0.50E-02	0.15
Inboard	G4	0.16	245	0.83E-02	0.45	0.16E-03	0.13E-03	0.03	0.	0.12E-02	0.93E-03	0.03
Inboard Jet	G4	0.13	307	0.65E-02	0.35	0.12E-03	0.10E-03	0.02	0.	0.	0.	0.02
Auxiliary Sail	G4	0.58E-03	17	0.30E-04	0.16E-02	0.55E-06	0.47E-06	0.99E-04	0.19E-04	0.	0.56E-05	0.12E-03
Inboard	D	0.99E-04	6	0.19E-04	0.21E-04	0.35E-06	0.12E-05	0.93E-05	0.	0.	0.45E-08	0.94E-05
Auxiliary Sail	D	0.13E-03	15	0.24E-04	0.26E-04	0.45E-06	0.15E-05	0.12E-04	0.34E-06	0.	0.	0.12E-04
Personal Water Craft	G2	0.06	156	0.36E-03	0.11	0.53E-04	0.30E-02	0.06	0.	0.	0.	0.06
Total		2.49	7912	0.07	6.14	0.24E-02	0.07	1.74	0.04	0.19E-02	0.02	1.80
Orange												
Outboard	G2	2.70	10613	0.02	6.41	0.26E-02	0.14	3.23	0.09	0.	0.03	3.34
Other	G2	0.02	543	0.15E-03	0.05	0.16E-04	0.90E-03	0.02	0.	0.	0.	0.02
Auxiliary Sail	G2	0.03	343	0.23E-03	0.06	0.26E-04	0.15E-02	0.03	0.	0.28E-03	0.27E-03	0.03
Outboard	G4	0.78E-02	1330	0.39E-03	0.02	0.74E-05	0.62E-05	0.13E-02	0.25E-03	0.	0.75E-04	0.16E-02
Inboard/Outboard	G4	12.00	14964	0.61	32.77	0.01	0.96E-02	2.04	0.	0.66E-03	0.07	2.11
Inboard	G4	5.44	4115	0.27	14.88	0.52E-02	0.44E-02	0.92	0.	0.27E-02	0.03	0.96
Inboard Jet	G4	2.00	5401	0.10	5.46	0.19E-02	0.16E-02	0.34	0.	0.	0.	0.34
Auxiliary Sail	G4	0.19	659	0.96E-02	0.52	0.18E-03	0.15E-03	0.03	0.60E-02	0.	0.18E-02	0.04
Inboard	D	0.61	774	0.12	0.13	0.22E-02	0.73E-02	0.06	0.	0.	0.27E-04	0.06
Auxiliary Sail	D	0.53	1468	0.10	0.11	0.19E-02	0.64E-02	0.05	0.14E-02	0.	0.	0.05
Personal Water Craft	G2	2.14	12742	0.01	4.32	0.20E-02	0.11	2.37	0.	0.	0.	2.37
Total		25.67	52952	1.25	64.73	0.03	0.29	9.09	0.09	0.36E-02	0.13	9.32
Placer												
Outboard	G2	1.74	7314	0.02	4.06	0.17E-02	0.09	1.99	0.06	0.	0.02	2.06
Auxiliary Sail	G2	0.02	144	0.87E-04	0.04	0.18E-04	0.10E-02	0.03	0.	0.14E-03	0.19E-03	0.03
Outboard	G4	0.36	679	0.02	0.99	0.34E-03	0.29E-03	0.06	0.01	0.	0.35E-02	0.08
Inboard/Outboard	G4	4.97	7776	0.25	13.57	0.47E-02	0.40E-02	0.84	0.	0.31E-03	0.03	0.87
Inboard	G4	1.47	1931	0.07	4.01	0.14E-02	0.12E-02	0.25	0.	0.13E-02	0.83E-02	0.26
Inboard Jet	G4	1.42	1350	0.07	3.87	0.13E-02	0.11E-02	0.24	0.	0.	0.	0.24
Auxiliary Sail	G4	0.05	223	0.23E-02	0.13	0.44E-04	0.37E-04	0.78E-02	0.15E-02	0.	0.45E-03	0.98E-02
Inboard	D	0.21	202	0.04	0.04	0.74E-03	0.25E-02	0.02	0.	0.	0.93E-05	0.02
Auxiliary Sail	D	0.08	405	0.02	0.02	0.28E-03	0.94E-03	0.74E-02	0.21E-03	0.	0.	0.76E-02
Personal Water Craft	G2	0.54	2009	0.35E-02	1.09	0.51E-03	0.03	0.60	0.	0.	0.	0.60
Total		10.84	22033	0.49	27.82	0.01	0.13	4.05	0.07	0.17E-02	0.06	4.18
Plumas												
Outboard	G2	0.81	3513	0.94E-02	1.82	0.77E-03	0.04	0.94	0.03	0.	0.78E-02	0.97
Other	G2	0.01	166	0.17E-03	0.03	0.12E-04	0.65E-03	0.01	0.	0.	0.	0.01
Auxiliary Sail	G2	0.42E-02	32	0.27E-04	0.92E-02	0.40E-05	0.22E-03	0.58E-02	0.	0.24E-03	0.41E-04	0.60E-02
Outboard	G4	0.01	188	0.68E-03	0.04	0.13E-04	0.11E-04	0.23E-02	0.43E-03	0.	0.13E-03	0.29E-02
Inboard/Outboard	G4	0.88	1287	0.04	2.39	0.83E-03	0.70E-03	0.15	0.	0.31E-03	0.51E-02	0.15
Inboard	G4	0.17	253	0.86E-02	0.47	0.16E-03	0.14E-03	0.03	0.	0.13E-02	0.96E-03	0.03
Inboard Jet	G4	0.13	317	0.67E-02	0.36	0.13E-03	0.11E-03	0.02	0.	0.	0.	0.02
Auxiliary Sail	G4	0.60E-03	17	0.30E-04	0.16E-02	0.57E-06	0.48E-06	0.10E-03	0.19E-04	0.	0.58E-05	0.13E-03

TABLE 3-7. Continued.

Ozone Season Emissions
(Tons / Average Day)

		Fuel Use 1000 gal	# of Boats *	NOx	CO	SOx	PM	TOG Exhaust	TOG Crank	TOG Evap	TOG Refuel	TOG Total
Inboard	D	0.10E-03	6	0.20E-04	0.21E-04	0.36E-06	0.12E-05	0.97E-05	0.	0.	0.46E-08	0.97E-05
Auxiliary Sail	D	0.13E-03	16	0.25E-04	0.27E-04	0.46E-06	0.16E-05	0.12E-04	0.35E-06	0.	0.	0.13E-04
Personal Water Craft	G2	0.06	161	0.37E-03	0.12	0.55E-04	0.31E-02	0.06	0.	0.	0.	0.06
Total		2.08	5956	0.07	5.24	0.20E-02	0.05	1.22	0.03	0.18E-02	0.01	1.26
Riverside												
Outboard	G2	1.42	5585	0.01	3.37	0.14E-02	0.08	1.70	0.05	0.	0.01	1.76
Other	G2	0.89E-02	286	0.81E-04	0.03	0.85E-05	0.47E-03	0.97E-02	0.	0.	0.	0.97E-02
Auxiliary Sail	G2	0.01	181	0.12E-03	0.03	0.14E-04	0.77E-03	0.02	0.	0.15E-03	0.14E-03	0.02
Outboard	G4	0.25E-02	418	0.12E-03	0.67E-02	0.23E-05	0.20E-05	0.42E-03	0.78E-04	0.	0.24E-04	0.52E-03
Inboard/Outboard	G4	3.77	4708	0.19	10.31	0.36E-02	0.30E-02	0.64	0.	0.21E-03	0.02	0.66
Inboard	G4	1.71	1295	0.09	4.68	0.16E-02	0.14E-02	0.29	0.	0.84E-03	0.97E-02	0.30
Inboard Jet	G4	0.63	1699	0.03	1.72	0.60E-03	0.50E-03	0.11	0.	0.	0.	0.11
Auxiliary Sail	G4	0.06	207	0.30E-02	0.16	0.57E-04	0.48E-04	0.01	0.19E-02	0.	0.57E-03	0.01
Inboard	D	0.19	244	0.04	0.04	0.68E-03	0.23E-02	0.02	0.	0.	0.86E-05	0.02
Auxiliary Sail	D	0.17	462	0.03	0.03	0.59E-03	0.20E-02	0.02	0.45E-03	0.	0.	0.02
Personal Water Craft	G2	0.67	4009	0.43E-02	1.36	0.64E-03	0.04	0.75	0.	0.	0.	0.75
Total		8.66	19094	0.40	21.74	0.92E-02	0.12	3.55	0.05	0.12E-02	0.05	3.65
Sacramento												
Outboard	G2	0.98	4116	0.01	2.29	0.93E-03	0.05	1.12	0.03	0.	0.94E-02	1.16
Auxiliary Sail	G2	0.01	81	0.49E-04	0.02	0.10E-04	0.58E-03	0.02	0.	0.76E-04	0.11E-03	0.02
Outboard	G4	0.38	710	0.02	1.03	0.36E-03	0.30E-03	0.06	0.01	0.	0.37E-02	0.08
Inboard/Outboard	G4	5.19	8131	0.26	14.19	0.49E-02	0.42E-02	0.88	0.	0.32E-03	0.03	0.91
Inboard	G4	1.54	2019	0.08	4.20	0.15E-02	0.12E-02	0.26	0.	0.13E-02	0.87E-02	0.27
Inboard Jet	G4	1.48	1412	0.07	4.05	0.14E-02	0.12E-02	0.25	0.	0.	0.	0.25
Auxiliary Sail	G4	0.05	233	0.24E-02	0.13	0.46E-04	0.39E-04	0.82E-02	0.15E-02	0.	0.47E-03	0.01
Inboard	D	0.22	211	0.04	0.05	0.77E-03	0.26E-02	0.02	0.	0.	0.97E-05	0.02
Auxiliary Sail	D	0.08	423	0.02	0.02	0.29E-03	0.98E-03	0.77E-02	0.22E-03	0.	0.	0.79E-02
Personal Water Craft	G2	0.56	2101	0.36E-02	1.14	0.54E-03	0.03	0.62	0.	0.	0.	0.62
Total		10.49	19437	0.51	27.11	0.01	0.09	3.26	0.05	0.17E-02	0.05	3.36
San Benito												
Outboard	G2	0.46E-02	19	0.49E-04	0.01	0.44E-05	0.24E-03	0.53E-02	0.15E-03	0.	0.44E-04	0.54E-02
Auxiliary Sail	G2	0.51E-04	1	0.23E-06	0.11E-03	0.49E-07	0.27E-05	0.76E-04	0.	0.36E-06	0.50E-06	0.76E-04
Outboard	G4	0.78E-03	1	0.39E-04	0.21E-02	0.74E-06	0.62E-06	0.13E-03	0.25E-04	0.	0.75E-05	0.16E-03
Inboard/Outboard	G4	0.01	17	0.54E-03	0.03	0.10E-04	0.86E-05	0.18E-02	0.	0.67E-06	0.63E-04	0.19E-02
Inboard	G4	0.32E-02	4	0.16E-03	0.86E-02	0.30E-05	0.25E-05	0.54E-03	0.	0.27E-05	0.18E-04	0.56E-03
Inboard Jet	G4	0.31E-02	3	0.15E-03	0.83E-02	0.29E-05	0.24E-05	0.52E-03	0.	0.	0.	0.52E-03
Auxiliary Sail	G4	0.99E-04	1	0.50E-05	0.27E-03	0.95E-07	0.80E-07	0.17E-04	0.32E-05	0.	0.96E-06	0.21E-04
Inboard	D	0.45E-03	1	0.87E-04	0.93E-04	0.16E-05	0.54E-05	0.42E-04	0.	0.	0.20E-07	0.42E-04
Auxiliary Sail	D	0.17E-03	1	0.33E-04	0.35E-04	0.60E-06	0.20E-05	0.16E-04	0.46E-06	0.	0.	0.16E-04
Personal Water Craft	G2	0.12E-02	4	0.74E-05	0.23E-02	0.11E-05	0.62E-04	0.13E-02	0.	0.	0.	0.13E-02
Total		0.02	52	0.11E-02	0.06	0.25E-04	0.33E-03	0.97E-02	0.17E-03	0.37E-05	0.13E-03	0.01
San Bernardino												
Outboard	G2	9.28	36435	0.08	22.00	0.88E-02	0.49	11.08	0.30	0.	0.09	11.47
Other	G2	0.06	1864	0.53E-03	0.17	0.55E-04	0.31E-02	0.06	0.	0.	0.	0.06
Auxiliary Sail	G2	0.10	1178	0.80E-03	0.22	0.90E-04	0.50E-02	0.12	0.	0.97E-03	0.92E-03	0.12
Outboard	G4	0.64E-02	1089	0.32E-03	0.02	0.61E-05	0.51E-05	0.11E-02	0.20E-03	0.	0.62E-04	0.13E-02
Inboard/Outboard	G4	9.82	12248	0.50	26.82	0.93E-02	0.79E-02	1.67	0.	0.54E-03	0.06	1.73
Inboard	G4	4.46	3368	0.23	12.17	0.42E-02	0.36E-02	0.76	0.	0.22E-02	0.03	0.78
Inboard Jet	G4	1.64	4421	0.08	4.47	0.16E-02	0.13E-02	0.28	0.	0.	0.	0.28

TABLE 3-7. Continued.

Ozone Season Emissions
(Tons / Average Day)

		Fuel Use 1000 gal	# of Boats *	NOx	CO	SOx	PM	TOG Exhaust	TOG Crank	TOG Evap	TOG Refuel	TOG Total
Auxiliary Sail	G4	0.15	539	0.78E-02	0.42	0.15E-03	0.12E-03	0.03	0.49E-02	0.	0.15E-02	0.03
Inboard	D	0.50	634	0.10	0.10	0.18E-02	0.59E-02	0.05	0.	0.	0.22E-04	0.05
Auxiliary Sail	D	0.43	1201	0.08	0.09	0.15E-02	0.52E-02	0.04	0.12E-02	0.	0.	0.04
Personal Water Craft	G2	1.76	10429	0.01	3.54	0.17E-02	0.09	1.94	0.	0.	0.	1.94
Total		28.19	73406	1.09	70.02	0.03	0.62	16.02	0.30	0.37E-02	0.17	16.50
San Diego												
Outboard	G2	4.35	17075	0.04	10.31	0.41E-02	0.23	5.19	0.14	0.	0.04	5.37
Other	G2	0.03	873	0.25E-03	0.08	0.26E-04	0.15E-02	0.03	0.	0.	0.	0.03
Auxiliary Sail	G2	0.04	552	0.37E-03	0.10	0.42E-04	0.24E-02	0.05	0.	0.46E-03	0.43E-03	0.06
Outboard	G4	0.10E-01	1699	0.50E-03	0.03	0.95E-05	0.80E-05	0.17E-02	0.32E-03	0.	0.96E-04	0.21E-02
Inboard/Outboard	G4	15.32	19117	0.77	41.87	0.01	0.01	2.60	0.	0.84E-03	0.09	2.69
Inboard	G4	6.96	5257	0.35	19.00	0.66E-02	0.56E-02	1.18	0.	0.34E-02	0.04	1.22
Inboard Jet	G4	2.56	6900	0.13	6.98	0.24E-02	0.20E-02	0.43	0.	0.	0.	0.43
Auxiliary Sail	G4	0.24	842	0.01	0.66	0.23E-03	0.19E-03	0.04	0.77E-02	0.	0.23E-02	0.05
Inboard	D	0.77	989	0.15	0.16	0.27E-02	0.93E-02	0.07	0.	0.	0.35E-04	0.07
Auxiliary Sail	D	0.68	1875	0.13	0.14	0.24E-02	0.81E-02	0.06	0.18E-02	0.	0.	0.07
Personal Water Craft	G2	2.74	16278	0.02	5.52	0.26E-02	0.15	3.03	0.	0.	0.	3.03
Total		33.70	71457	1.61	84.85	0.04	0.42	12.70	0.15	0.47E-02	0.17	13.03
San Francisco												
Outboard	G2	1.22	5116	0.01	2.84	0.12E-02	0.06	1.39	0.04	0.	0.01	1.44
Auxiliary Sail	G2	0.01	101	0.61E-04	0.03	0.13E-04	0.72E-03	0.02	0.	0.95E-04	0.13E-03	0.02
Outboard	G4	0.09	164	0.44E-02	0.24	0.83E-04	0.70E-04	0.01	0.28E-02	0.	0.84E-03	0.02
Inboard/Outboard	G4	1.20	1875	0.06	3.27	0.11E-02	0.96E-03	0.20	0.	0.75E-04	0.70E-02	0.21
Inboard	G4	0.35	465	0.02	0.97	0.34E-03	0.28E-03	0.06	0.	0.30E-03	0.20E-02	0.06
Inboard Jet	G4	0.34	325	0.02	0.93	0.32E-03	0.27E-03	0.06	0.	0.	0.	0.06
Auxiliary Sail	G4	0.01	54	0.56E-03	0.03	0.11E-04	0.89E-05	0.19E-02	0.36E-03	0.	0.11E-03	0.24E-02
Inboard	D	0.05	49	0.97E-02	0.01	0.18E-03	0.60E-03	0.47E-02	0.	0.	0.22E-05	0.47E-02
Auxiliary Sail	D	0.02	98	0.37E-02	0.39E-02	0.67E-04	0.23E-03	0.18E-02	0.51E-04	0.	0.	0.18E-02
Personal Water Craft	G2	0.13	484	0.83E-03	0.26	0.12E-03	0.69E-02	0.14	0.	0.	0.	0.14
Total		3.42	8731	0.13	8.59	0.34E-02	0.07	1.90	0.04	0.47E-03	0.02	1.97
San Joaquin												
Outboard	G2	1.98	8320	0.02	4.62	0.19E-02	0.10	2.27	0.06	0.	0.02	2.35
Auxiliary Sail	G2	0.02	164	0.99E-04	0.05	0.21E-04	0.12E-02	0.03	0.	0.15E-03	0.21E-03	0.03
Outboard	G4	0.49	916	0.02	1.33	0.46E-03	0.39E-03	0.08	0.02	0.	0.47E-02	0.10
Inboard/Outboard	G4	6.70	10490	0.34	18.31	0.64E-02	0.54E-02	1.14	0.	0.42E-03	0.04	1.18
Inboard	G4	1.98	2604	0.10	5.41	0.19E-02	0.16E-02	0.34	0.	0.17E-02	0.01	0.35
Inboard Jet	G4	1.91	1821	0.10	5.22	0.18E-02	0.15E-02	0.32	0.	0.	0.	0.32
Auxiliary Sail	G4	0.06	300	0.31E-02	0.17	0.59E-04	0.50E-04	0.01	0.20E-02	0.	0.60E-03	0.01
Inboard	D	0.28	272	0.05	0.06	0.99E-03	0.34E-02	0.03	0.	0.	0.13E-04	0.03
Auxiliary Sail	D	0.11	546	0.02	0.02	0.38E-03	0.13E-02	0.99E-02	0.29E-03	0.	0.	0.01
Personal Water Craft	G2	0.73	2711	0.47E-02	1.47	0.69E-03	0.04	0.80	0.	0.	0.	0.80
Total		14.26	28144	0.66	36.66	0.01	0.16	5.03	0.08	0.23E-02	0.08	5.19
San Luis Obispo												
Outboard	G2	1.49	5858	0.01	3.54	0.14E-02	0.08	1.78	0.05	0.	0.01	1.84
Other	G2	0.94E-02	300	0.84E-04	0.03	0.89E-05	0.50E-03	0.01	0.	0.	0.	0.01
Auxiliary Sail	G2	0.02	189	0.13E-03	0.03	0.15E-04	0.81E-03	0.02	0.	0.16E-03	0.15E-03	0.02
Outboard	G4	0.56E-03	96	0.28E-04	0.15E-02	0.53E-06	0.45E-06	0.95E-04	0.18E-04	0.	0.54E-05	0.12E-03
Inboard/Outboard	G4	0.87	1080	0.04	2.36	0.82E-03	0.69E-03	0.15	0.	0.47E-04	0.51E-02	0.15
Inboard	G4	0.39	297	0.02	1.07	0.37E-03	0.31E-03	0.07	0.	0.19E-03	0.22E-02	0.07

TABLE 3-7. Continued.

Ozone Season Emissions
(Tons / Average Day)

		Fuel Use 1000 gal	# of Boats *	NOx	CO	SOx	PM	TOG Exhaust	TOG Crank	TOG Evap	TOG Refuel	TOG Total
Inboard Jet	G4	0.14	390	0.73E-02	0.39	0.14E-03	0.12E-03	0.02	0.	0.	0.	0.02
Auxiliary Sail	G4	0.01	48	0.69E-03	0.04	0.13E-04	0.11E-04	0.23E-02	0.44E-03	0.	0.13E-03	0.29E-02
Inboard	D	0.04	56	0.85E-02	0.91E-02	0.16E-03	0.52E-03	0.41E-02	0.	0.	0.20E-05	0.41E-02
Auxiliary Sail	D	0.04	106	0.74E-02	0.80E-02	0.14E-03	0.46E-03	0.36E-02	0.10E-03	0.	0.	0.37E-02
Personal Water Craft	G2	0.15	920	0.99E-03	0.31	0.15E-03	0.82E-02	0.17	0.	0.	0.	0.17
Total		3.17	9340	0.10	7.80	0.32E-02	0.09	2.23	0.05	0.40E-03	0.02	2.30
San Mateo												
Outboard	G2	1.04	4394	0.01	2.44	0.99E-03	0.06	1.20	0.03	0.	0.01	1.24
Auxiliary Sail	G2	0.01	87	0.52E-04	0.02	0.11E-04	0.62E-03	0.02	0.	0.81E-04	0.11E-03	0.02
Outboard	G4	0.03	48	0.13E-02	0.07	0.24E-04	0.21E-04	0.44E-02	0.82E-03	0.	0.25E-03	0.54E-02
Inboard/Outboard	G4	0.35	552	0.02	0.96	0.34E-03	0.28E-03	0.06	0.	0.22E-04	0.21E-02	0.06
Inboard	G4	0.10	137	0.53E-02	0.29	0.99E-04	0.83E-04	0.02	0.	0.89E-04	0.59E-03	0.02
Inboard Jet	G4	0.10	96	0.51E-02	0.27	0.96E-04	0.81E-04	0.02	0.	0.	0.	0.02
Auxiliary Sail	G4	0.33E-02	16	0.17E-03	0.90E-02	0.31E-05	0.26E-05	0.56E-03	0.10E-03	0.	0.32E-04	0.69E-03
Inboard	D	0.01	14	0.29E-02	0.31E-02	0.52E-04	0.18E-03	0.14E-02	0.	0.	0.66E-06	0.14E-02
Auxiliary Sail	D	0.56E-02	29	0.11E-02	0.12E-02	0.20E-04	0.67E-04	0.52E-03	0.15E-04	0.	0.	0.54E-03
Personal Water Craft	G2	0.04	143	0.25E-03	0.08	0.36E-04	0.20E-02	0.04	0.	0.	0.	0.04
Total		1.70	5516	0.05	4.15	0.17E-02	0.06	1.36	0.03	0.19E-03	0.01	1.41
Santa Barbara												
Outboard	G2	0.61	2393	0.56E-02	1.44	0.58E-03	0.03	0.73	0.02	0.	0.59E-02	0.75
Other	G2	0.38E-02	122	0.35E-04	0.01	0.36E-05	0.20E-03	0.42E-02	0.	0.	0.	0.42E-02
Auxiliary Sail	G2	0.62E-02	77	0.52E-04	0.01	0.59E-05	0.33E-03	0.76E-02	0.	0.64E-04	0.60E-04	0.77E-02
Outboard	G4	0.14E-03	23	0.69E-05	0.37E-03	0.13E-06	0.11E-06	0.23E-04	0.43E-05	0.	0.13E-05	0.29E-04
Inboard/Outboard	G4	0.21	262	0.01	0.57	0.20E-03	0.17E-03	0.04	0.	0.11E-04	0.12E-02	0.04
Inboard	G4	0.10	72	0.48E-02	0.26	0.91E-04	0.76E-04	0.02	0.	0.47E-04	0.54E-03	0.02
Inboard Jet	G4	0.04	95	0.18E-02	0.10	0.33E-04	0.28E-04	0.59E-02	0.	0.	0.	0.59E-02
Auxiliary Sail	G4	0.33E-02	12	0.17E-03	0.91E-02	0.31E-05	0.27E-05	0.56E-03	0.11E-03	0.	0.32E-04	0.70E-03
Inboard	D	0.01	14	0.21E-02	0.22E-02	0.38E-04	0.13E-03	0.10E-02	0.	0.	0.48E-06	0.10E-02
Auxiliary Sail	D	0.93E-02	26	0.18E-02	0.19E-02	0.33E-04	0.11E-03	0.87E-03	0.25E-04	0.	0.	0.90E-03
Personal Water Craft	G2	0.04	223	0.24E-03	0.08	0.36E-04	0.20E-02	0.04	0.	0.	0.	0.04
Total		1.02	3319	0.03	2.49	0.10E-02	0.04	0.84	0.02	0.12E-03	0.77E-02	0.87
Santa Clara												
Outboard	G2	0.05	215	0.55E-03	0.12	0.48E-04	0.27E-02	0.06	0.16E-02	0.	0.49E-03	0.06
Auxiliary Sail	G2	0.57E-03	4	0.25E-05	0.12E-02	0.54E-06	0.30E-04	0.84E-03	0.	0.40E-05	0.55E-05	0.85E-03
Outboard	G4	0.13	242	0.65E-02	0.35	0.12E-03	0.10E-03	0.02	0.41E-02	0.	0.12E-02	0.03
Inboard/Outboard	G4	1.77	2777	0.09	4.85	0.17E-02	0.14E-02	0.30	0.	0.11E-03	0.01	0.31
Inboard	G4	0.52	689	0.03	1.43	0.50E-03	0.42E-03	0.09	0.	0.45E-03	0.30E-02	0.09
Inboard Jet	G4	0.51	482	0.03	1.38	0.48E-03	0.40E-03	0.09	0.	0.	0.	0.09
Auxiliary Sail	G4	0.02	79	0.83E-03	0.05	0.16E-04	0.13E-04	0.28E-02	0.53E-03	0.	0.16E-03	0.35E-02
Inboard	D	0.07	72	0.01	0.02	0.26E-03	0.89E-03	0.70E-02	0.	0.	0.33E-05	0.70E-02
Auxiliary Sail	D	0.03	145	0.54E-02	0.58E-02	0.99E-04	0.34E-03	0.26E-02	0.75E-04	0.	0.	0.27E-02
Personal Water Craft	G2	0.19	717	0.12E-02	0.39	0.18E-03	0.01	0.21	0.	0.	0.	0.21
Total		3.30	5422	0.17	8.59	0.34E-02	0.02	0.78	0.64E-02	0.56E-03	0.02	0.81
Santa Cruz												
Outboard	G2	0.10	425	0.11E-02	0.24	0.96E-04	0.54E-02	0.12	0.32E-02	0.	0.97E-03	0.12
Auxiliary Sail	G2	0.11E-02	8	0.50E-05	0.23E-02	0.11E-05	0.60E-04	0.17E-02	0.	0.79E-05	0.11E-04	0.17E-02
Outboard	G4	0.01	23	0.61E-03	0.03	0.11E-04	0.96E-05	0.20E-02	0.38E-03	0.	0.12E-03	0.25E-02
Inboard/Outboard	G4	0.16	258	0.83E-02	0.45	0.16E-03	0.13E-03	0.03	0.	0.10E-04	0.97E-03	0.03
Inboard	G4	0.05	64	0.25E-02	0.13	0.46E-04	0.39E-04	0.83E-02	0.	0.42E-04	0.28E-03	0.86E-02

TABLE 3-7. Continued.

Ozone Season Emissions
(Tons / Average Day)

		Fuel Use 1000 gal	# of Boats *	NOx	CO	SOx	PM	TOG Exhaust	TOG Crank	TOG Evap	TOG Refuel	TOG Total
Inboard Jet	G4	0.05	45	0.24E-02	0.13	0.45E-04	0.38E-04	0.80E-02	0.	0.	0.	0.80E-02
Auxiliary Sail	G4	0.15E-02	7	0.77E-04	0.42E-02	0.15E-05	0.12E-05	0.26E-03	0.49E-04	0.	0.15E-04	0.32E-03
Inboard	D	0.69E-02	7	0.13E-02	0.14E-02	0.24E-04	0.83E-04	0.65E-03	0.	0.	0.31E-06	0.65E-03
Auxiliary Sail	D	0.26E-02	13	0.50E-03	0.54E-03	0.92E-05	0.31E-04	0.24E-03	0.70E-05	0.	0.	0.25E-03
Personal Water Craft	G2	0.02	67	0.11E-03	0.04	0.17E-04	0.95E-03	0.02	0.	0.	0.	0.02
Total		0.40	917	0.02	1.03	0.41E-03	0.67E-02	0.18	0.37E-02	0.60E-04	0.24E-02	0.19
Shasta												
Outboard	G2	2.63	11380	0.03	5.91	0.25E-02	0.14	3.03	0.08	0.	0.03	3.14
Other	G2	0.04	537	0.56E-03	0.08	0.38E-04	0.21E-02	0.04	0.	0.	0.	0.04
Auxiliary Sail	G2	0.01	104	0.86E-04	0.03	0.13E-04	0.73E-03	0.02	0.	0.77E-03	0.13E-03	0.02
Outboard	G4	0.07	932	0.34E-02	0.18	0.64E-04	0.54E-04	0.01	0.21E-02	0.	0.65E-03	0.01
Inboard/Outboard	G4	4.35	6399	0.22	11.89	0.41E-02	0.35E-02	0.74	0.	0.15E-02	0.03	0.77
Inboard	G4	0.85	1258	0.04	2.31	0.80E-03	0.68E-03	0.14	0.	0.63E-02	0.48E-02	0.15
Inboard Jet	G4	0.66	1575	0.03	1.81	0.63E-03	0.53E-03	0.11	0.	0.	0.	0.11
Auxiliary Sail	G4	0.30E-02	85	0.15E-03	0.82E-02	0.29E-05	0.24E-05	0.51E-03	0.96E-04	0.	0.29E-04	0.63E-03
Inboard	D	0.51E-03	30	0.99E-04	0.11E-03	0.18E-05	0.61E-05	0.48E-04	0.	0.	0.23E-07	0.48E-04
Auxiliary Sail	D	0.65E-03	79	0.13E-03	0.14E-03	0.23E-05	0.78E-05	0.61E-04	0.17E-05	0.	0.	0.63E-04
Personal Water Craft	G2	0.29	803	0.18E-02	0.58	0.27E-03	0.02	0.32	0.	0.	0.	0.32
Total		8.90	23182	0.33	22.80	0.85E-02	0.16	4.42	0.09	0.86E-02	0.06	4.57
Sierra												
Outboard	G2	0.77	3238	0.82E-02	1.80	0.73E-03	0.04	0.88	0.02	0.	0.74E-02	0.91
Auxiliary Sail	G2	0.86E-02	64	0.38E-04	0.02	0.82E-05	0.46E-03	0.01	0.	0.60E-04	0.83E-04	0.01
Outboard	G4	0.01	20	0.55E-03	0.03	0.10E-04	0.87E-05	0.19E-02	0.35E-03	0.	0.11E-03	0.23E-02
Inboard/Outboard	G4	0.15	234	0.76E-02	0.41	0.14E-03	0.12E-03	0.03	0.	0.93E-05	0.88E-03	0.03
Inboard	G4	0.04	58	0.22E-02	0.12	0.42E-04	0.35E-04	0.75E-02	0.	0.38E-04	0.25E-03	0.78E-02
Inboard Jet	G4	0.04	41	0.22E-02	0.12	0.41E-04	0.34E-04	0.73E-02	0.	0.	0.	0.73E-02
Auxiliary Sail	G4	0.14E-02	7	0.70E-04	0.38E-02	0.13E-05	0.11E-05	0.24E-03	0.44E-04	0.	0.13E-04	0.29E-03
Inboard	D	0.62E-02	6	0.12E-02	0.13E-02	0.22E-04	0.75E-04	0.59E-03	0.	0.	0.28E-06	0.59E-03
Auxiliary Sail	D	0.24E-02	12	0.46E-03	0.49E-03	0.84E-05	0.28E-04	0.22E-03	0.64E-05	0.	0.	0.23E-03
Personal Water Craft	G2	0.02	61	0.10E-03	0.03	0.15E-04	0.86E-03	0.02	0.	0.	0.	0.02
Total		1.05	3741	0.02	2.53	0.10E-02	0.04	0.96	0.02	0.11E-03	0.88E-02	0.99
Siskiyou												
Outboard	G2	0.18	762	0.20E-02	0.40	0.17E-03	0.93E-02	0.20	0.56E-02	0.	0.17E-02	0.21
Other	G2	0.27E-02	36	0.38E-04	0.55E-02	0.25E-05	0.14E-03	0.30E-02	0.	0.	0.	0.30E-02
Auxiliary Sail	G2	0.92E-03	7	0.58E-05	0.20E-02	0.87E-06	0.49E-04	0.12E-02	0.	0.51E-04	0.89E-05	0.13E-02
Outboard	G4	0.41E-03	6	0.21E-04	0.11E-02	0.39E-06	0.33E-06	0.70E-04	0.13E-04	0.	0.40E-05	0.88E-04
Inboard/Outboard	G4	0.03	40	0.14E-02	0.07	0.26E-04	0.21E-04	0.46E-02	0.	0.95E-05	0.16E-03	0.47E-02
Inboard	G4	0.52E-02	8	0.26E-03	0.01	0.50E-05	0.42E-05	0.89E-03	0.	0.39E-04	0.30E-04	0.96E-03
Inboard Jet	G4	0.41E-02	10	0.21E-03	0.01	0.39E-05	0.33E-05	0.69E-03	0.	0.	0.	0.69E-03
Auxiliary Sail	G4	0.19E-04	1	0.94E-06	0.51E-04	0.18E-07	0.15E-07	0.31E-05	0.59E-06	0.	0.18E-06	0.39E-05
Inboard	D	0.32E-05	1	0.61E-06	0.66E-06	0.11E-07	0.38E-07	0.30E-06	0.	0.	0.14E-09	0.30E-06
Auxiliary Sail	D	0.40E-05	1	0.77E-06	0.83E-06	0.14E-07	0.48E-07	0.38E-06	0.11E-07	0.	0.	0.39E-06
Personal Water Craft	G2	0.18E-02	5	0.11E-04	0.36E-02	0.17E-05	0.95E-04	0.20E-02	0.	0.	0.	0.20E-02
Total		0.22	877	0.40E-02	0.51	0.21E-03	0.97E-02	0.22	0.56E-02	0.10E-03	0.19E-02	0.22
Solano												
Outboard	G2	2.80	11786	0.03	6.54	0.27E-02	0.15	3.21	0.09	0.	0.03	3.33
Auxiliary Sail	G2	0.03	233	0.14E-03	0.06	0.30E-04	0.17E-02	0.05	0.	0.22E-03	0.30E-03	0.05
Outboard	G4	0.11	204	0.55E-02	0.30	0.10E-03	0.87E-04	0.02	0.35E-02	0.	0.10E-02	0.02
Inboard/Outboard	G4	1.49	2335	0.08	4.08	0.14E-02	0.12E-02	0.25	0.	0.93E-04	0.87E-02	0.26

TABLE 3-7. Continued.

Ozone Season Emissions
(Tons / Average Day)

		Fuel Use 1000 gal	# of Boats *	NOx	CO	SOx	PM	TOG Exhaust	TOG Crank	TOG Evap	TOG Refuel	TOG Total
Inboard	G4	0.44	580	0.02	1.21	0.42E-03	0.35E-03	0.07	0.	0.38E-03	0.25E-02	0.08
Inboard Jet	G4	0.43	405	0.02	1.16	0.40E-03	0.34E-03	0.07	0.	0.	0.	0.07
Auxiliary Sail	G4	0.01	67	0.70E-03	0.04	0.13E-04	0.11E-04	0.24E-02	0.44E-03	0.	0.13E-03	0.29E-02
Inboard	D	0.06	61	0.01	0.01	0.22E-03	0.75E-03	0.58E-02	0.	0.	0.28E-05	0.58E-02
Auxiliary Sail	D	0.02	122	0.46E-02	0.49E-02	0.83E-04	0.28E-03	0.22E-02	0.64E-04	0.	0.	0.23E-02
Personal Water Craft	G2	0.16	603	0.10E-02	0.33	0.15E-03	0.86E-02	0.18	0.	0.	0.	0.18
Total		5.56	16396	0.17	13.73	0.55E-02	0.16	3.86	0.09	0.69E-03	0.04	4.00
Sonoma												
Outboard	G2	1.32	5564	0.01	3.09	0.13E-02	0.07	1.52	0.04	0.	0.01	1.57
Auxiliary Sail	G2	0.01	110	0.66E-04	0.03	0.14E-04	0.78E-03	0.02	0.	0.10E-03	0.14E-03	0.02
Outboard	G4	0.18	338	0.91E-02	0.49	0.17E-03	0.14E-03	0.03	0.58E-02	0.	0.17E-02	0.04
Inboard/Outboard	G4	2.47	3871	0.12	6.75	0.23E-02	0.20E-02	0.42	0.	0.15E-03	0.01	0.43
Inboard	G4	0.73	961	0.04	2.00	0.69E-03	0.59E-03	0.12	0.	0.63E-03	0.41E-02	0.13
Inboard Jet	G4	0.71	672	0.04	1.93	0.67E-03	0.56E-03	0.12	0.	0.	0.	0.12
Auxiliary Sail	G4	0.02	111	0.12E-02	0.06	0.22E-04	0.18E-04	0.39E-02	0.73E-03	0.	0.22E-03	0.49E-02
Inboard	D	0.10	100	0.02	0.02	0.37E-03	0.12E-02	0.97E-02	0.	0.	0.46E-05	0.97E-02
Auxiliary Sail	D	0.04	201	0.76E-02	0.81E-02	0.14E-03	0.47E-03	0.37E-02	0.11E-03	0.	0.	0.38E-02
Personal Water Craft	G2	0.27	1000	0.17E-02	0.54	0.26E-03	0.01	0.30	0.	0.	0.	0.30
Total		5.86	12928	0.25	14.93	0.59E-02	0.09	2.55	0.05	0.88E-03	0.03	2.63
Stanislaus												
Outboard	G2	0.73	3092	0.79E-02	1.72	0.70E-03	0.04	0.84	0.02	0.	0.71E-02	0.87
Auxiliary Sail	G2	0.82E-02	61	0.37E-04	0.02	0.78E-05	0.44E-03	0.01	0.	0.57E-04	0.79E-04	0.01
Outboard	G4	0.02	45	0.12E-02	0.07	0.23E-04	0.19E-04	0.41E-02	0.77E-03	0.	0.23E-03	0.51E-02
Inboard/Outboard	G4	0.33	517	0.02	0.90	0.31E-03	0.26E-03	0.06	0.	0.21E-04	0.19E-02	0.06
Inboard	G4	0.10	128	0.49E-02	0.27	0.93E-04	0.78E-04	0.02	0.	0.84E-04	0.55E-03	0.02
Inboard Jet	G4	0.09	90	0.48E-02	0.26	0.90E-04	0.75E-04	0.02	0.	0.	0.	0.02
Auxiliary Sail	G4	0.31E-02	15	0.16E-03	0.84E-02	0.29E-05	0.25E-05	0.52E-03	0.98E-04	0.	0.30E-04	0.65E-03
Inboard	D	0.01	13	0.27E-02	0.29E-02	0.49E-04	0.17E-03	0.13E-02	0.	0.	0.62E-06	0.13E-02
Auxiliary Sail	D	0.52E-02	27	0.10E-02	0.11E-02	0.18E-04	0.63E-04	0.49E-03	0.14E-04	0.	0.	0.50E-03
Personal Water Craft	G2	0.04	134	0.23E-03	0.07	0.34E-04	0.19E-02	0.04	0.	0.	0.	0.04
Total		1.35	4122	0.04	3.31	0.13E-02	0.04	0.99	0.02	0.16E-03	0.99E-02	1.02
Sutter												
Outboard	G2	0.46E-02	19	0.49E-04	0.01	0.44E-05	0.24E-03	0.53E-02	0.15E-03	0.	0.44E-04	0.54E-02
Auxiliary Sail	G2	0.51E-04	1	0.23E-06	0.11E-03	0.49E-07	0.27E-05	0.76E-04	0.	0.36E-06	0.50E-06	0.76E-04
Outboard	G4	0.56E-02	11	0.28E-03	0.02	0.53E-05	0.45E-05	0.96E-03	0.18E-03	0.	0.54E-04	0.12E-02
Inboard/Outboard	G4	0.08	121	0.39E-02	0.21	0.73E-04	0.62E-04	0.01	0.	0.48E-05	0.45E-03	0.01
Inboard	G4	0.02	30	0.12E-02	0.06	0.22E-04	0.18E-04	0.39E-02	0.	0.20E-04	0.13E-03	0.40E-02
Inboard Jet	G4	0.02	21	0.11E-02	0.06	0.21E-04	0.18E-04	0.37E-02	0.	0.	0.	0.37E-02
Auxiliary Sail	G4	0.72E-03	3	0.36E-04	0.20E-02	0.68E-06	0.57E-06	0.12E-03	0.23E-04	0.	0.69E-05	0.15E-03
Inboard	D	0.32E-02	3	0.62E-03	0.67E-03	0.11E-04	0.39E-04	0.30E-03	0.	0.	0.14E-06	0.30E-03
Auxiliary Sail	D	0.12E-02	6	0.24E-03	0.25E-03	0.43E-05	0.15E-04	0.11E-03	0.33E-05	0.	0.	0.12E-03
Personal Water Craft	G2	0.84E-02	31	0.54E-04	0.02	0.80E-05	0.44E-03	0.93E-02	0.	0.	0.	0.93E-02
Total		0.15	246	0.74E-02	0.38	0.15E-03	0.85E-03	0.04	0.35E-03	0.25E-04	0.69E-03	0.04
Tehema												
Outboard	G2	0.22	935	0.25E-02	0.49	0.21E-03	0.01	0.25	0.69E-02	0.	0.21E-02	0.26
Other	G2	0.33E-02	44	0.46E-04	0.67E-02	0.31E-05	0.17E-03	0.37E-02	0.	0.	0.	0.37E-02
Auxiliary Sail	G2	0.11E-02	9	0.71E-05	0.24E-02	0.11E-05	0.60E-04	0.15E-02	0.	0.63E-04	0.11E-04	0.16E-02
Outboard	G4	0.14E-02	19	0.70E-04	0.38E-02	0.13E-05	0.11E-05	0.23E-03	0.44E-04	0.	0.13E-04	0.29E-03
Inboard/Outboard	G4	0.09	131	0.45E-02	0.24	0.85E-04	0.71E-04	0.02	0.	0.32E-04	0.52E-03	0.02

TABLE 3-7. Continued.

Ozone Season Emissions
(Tons / Average Day)

		Fuel Use 1000 gal	# of Boats *	NOx	CO	SOx	PM	TOG Exhaust	TOG Crank	TOG Evap	TOG Refuel	TOG Total
Inboard	G4	0.02	26	0.88E-03	0.05	0.16E-04	0.14E-04	0.29E-02	0.	0.13E-03	0.98E-04	0.32E-02
Inboard Jet	G4	0.01	32	0.69E-03	0.04	0.13E-04	0.11E-04	0.23E-02	0.	0.	0.	0.23E-02
Auxiliary Sail	G4	0.62E-04	2	0.31E-05	0.17E-03	0.58E-07	0.49E-07	0.10E-04	0.20E-05	0.	0.59E-06	0.13E-04
Inboard	D	0.10E-04	1	0.20E-05	0.22E-05	0.37E-07	0.13E-06	0.98E-06	0.	0.	0.47E-09	0.98E-06
Auxiliary Sail	D	0.13E-04	2	0.26E-05	0.28E-05	0.47E-07	0.16E-06	0.12E-05	0.36E-07	0.	0.	0.13E-05
Personal Water Craft	G2	0.59E-02	16	0.38E-04	0.01	0.56E-05	0.31E-03	0.65E-02	0.	0.	0.	0.65E-02
Total		0.35	1217	0.87E-02	0.84	0.33E-03	0.01	0.28	0.69E-02	0.22E-03	0.27E-02	0.29
Trinity												
Outboard	G2	0.98	4245	0.01	2.20	0.93E-03	0.05	1.13	0.03	0.	0.95E-02	1.17
Other	G2	0.01	201	0.21E-03	0.03	0.14E-04	0.79E-03	0.02	0.	0.	0.	0.02
Auxiliary Sail	G2	0.51E-02	39	0.32E-04	0.01	0.49E-05	0.27E-03	0.70E-02	0.	0.29E-03	0.49E-04	0.73E-02
Outboard	G4	0.44E-02	61	0.22E-03	0.01	0.41E-05	0.35E-05	0.74E-03	0.14E-03	0.	0.42E-04	0.92E-03
Inboard/Outboard	G4	0.28	416	0.01	0.77	0.27E-03	0.23E-03	0.05	0.	0.10E-03	0.17E-02	0.05
Inboard	G4	0.05	82	0.28E-02	0.15	0.52E-04	0.44E-04	0.93E-02	0.	0.41E-03	0.31E-03	0.01
Inboard Jet	G4	0.04	102	0.22E-02	0.12	0.41E-04	0.34E-04	0.73E-02	0.	0.	0.	0.73E-02
Auxiliary Sail	G4	0.19E-03	6	0.98E-05	0.53E-03	0.19E-06	0.16E-06	0.33E-04	0.62E-05	0.	0.19E-05	0.41E-04
Inboard	D	0.33E-04	2	0.64E-05	0.69E-05	0.12E-06	0.40E-06	0.31E-05	0.	0.	0.15E-08	0.31E-05
Auxiliary Sail	D	0.42E-04	5	0.81E-05	0.88E-05	0.15E-06	0.50E-06	0.39E-05	0.11E-06	0.	0.	0.41E-05
Personal Water Craft	G2	0.02	52	0.12E-03	0.04	0.18E-04	0.10E-02	0.02	0.	0.	0.	0.02
Total		1.41	5211	0.03	3.34	0.13E-02	0.05	1.24	0.03	0.80E-03	0.01	1.28
Tulare												
Outboard	G2	0.37	1537	0.39E-02	0.85	0.35E-03	0.02	0.42	0.01	0.	0.35E-02	0.43
Auxiliary Sail	G2	0.41E-02	30	0.18E-04	0.85E-02	0.39E-05	0.22E-03	0.60E-02	0.	0.28E-04	0.39E-04	0.61E-02
Outboard	G4	0.10	196	0.53E-02	0.29	0.99E-04	0.84E-04	0.02	0.33E-02	0.	0.10E-02	0.02
Inboard/Outboard	G4	1.43	2242	0.07	3.91	0.14E-02	0.11E-02	0.24	0.	0.89E-04	0.84E-02	0.25
Inboard	G4	0.42	557	0.02	1.16	0.40E-03	0.34E-03	0.07	0.	0.36E-03	0.24E-02	0.07
Inboard Jet	G4	0.41	389	0.02	1.12	0.39E-03	0.33E-03	0.07	0.	0.	0.	0.07
Auxiliary Sail	G4	0.01	64	0.67E-03	0.04	0.13E-04	0.11E-04	0.23E-02	0.42E-03	0.	0.13E-03	0.28E-02
Inboard	D	0.06	58	0.01	0.01	0.21E-03	0.72E-03	0.56E-02	0.	0.	0.27E-05	0.56E-02
Auxiliary Sail	D	0.02	117	0.44E-02	0.47E-02	0.80E-04	0.27E-03	0.21E-02	0.61E-04	0.	0.	0.22E-02
Personal Water Craft	G2	0.16	579	0.10E-02	0.31	0.15E-03	0.82E-02	0.17	0.	0.	0.	0.17
Total		2.99	5769	0.14	7.70	0.31E-02	0.03	1.01	0.02	0.48E-03	0.02	1.04
Tuolumne												
Outboard	G2	1.30	5492	0.01	3.05	0.12E-02	0.07	1.50	0.04	0.	0.01	1.55
Auxiliary Sail	G2	0.01	108	0.65E-04	0.03	0.14E-04	0.77E-03	0.02	0.	0.10E-03	0.14E-03	0.02
Outboard	G4	0.37	691	0.02	1.01	0.35E-03	0.29E-03	0.06	0.01	0.	0.36E-02	0.08
Inboard/Outboard	G4	5.05	7913	0.26	13.81	0.48E-02	0.40E-02	0.86	0.	0.31E-03	0.03	0.89
Inboard	G4	1.49	1965	0.08	4.08	0.14E-02	0.12E-02	0.25	0.	0.13E-02	0.84E-02	0.26
Inboard Jet	G4	1.44	1374	0.07	3.94	0.14E-02	0.12E-02	0.24	0.	0.	0.	0.24
Auxiliary Sail	G4	0.05	226	0.24E-02	0.13	0.45E-04	0.38E-04	0.80E-02	0.15E-02	0.	0.45E-03	0.99E-02
Inboard	D	0.21	205	0.04	0.04	0.75E-03	0.25E-02	0.02	0.	0.	0.95E-05	0.02
Auxiliary Sail	D	0.08	412	0.02	0.02	0.28E-03	0.96E-03	0.75E-02	0.22E-03	0.	0.	0.77E-02
Personal Water Craft	G2	0.55	2045	0.35E-02	1.11	0.52E-03	0.03	0.61	0.	0.	0.	0.61
Total		10.57	20431	0.50	27.21	0.01	0.11	3.58	0.06	0.17E-02	0.05	3.69
Ventura												
Outboard	G2	0.90	3537	0.82E-02	2.14	0.86E-03	0.05	1.08	0.03	0.	0.87E-02	1.11
Other	G2	0.57E-02	181	0.51E-04	0.02	0.54E-05	0.30E-03	0.62E-02	0.	0.	0.	0.62E-02
Auxiliary Sail	G2	0.92E-02	114	0.77E-04	0.02	0.88E-05	0.49E-03	0.01	0.	0.94E-04	0.89E-04	0.01
Outboard	G4	0.18E-02	309	0.91E-04	0.49E-02	0.17E-05	0.14E-05	0.31E-03	0.58E-04	0.	0.17E-04	0.38E-03

TABLE 3-7. Concluded.

Ozone Season Emissions
(Tons / Average Day)

		Fuel Use 1000 gal	# of Boats *	NOx	CO	SOx	PM	TOG Exhaust	TOG Crank	TOG Evap	TOG Refuel	TOG Total
Inboard/Outboard	G4	2.78	3474	0.14	7.61	0.26E-02	0.22E-02	0.47	0.	0.15E-03	0.02	0.49
Inboard	G4	1.26	955	0.06	3.45	0.12E-02	0.10E-02	0.21	0.	0.62E-03	0.71E-02	0.22
Inboard Jet	G4	0.46	1254	0.02	1.27	0.44E-03	0.37E-03	0.08	0.	0.	0.	0.08
Auxiliary Sail	G4	0.04	153	0.22E-02	0.12	0.42E-04	0.35E-04	0.75E-02	0.14E-02	0.	0.42E-03	0.93E-02
Inboard	D	0.14	180	0.03	0.03	0.50E-03	0.17E-02	0.01	0.	0.	0.63E-05	0.01
Auxiliary Sail	D	0.12	341	0.02	0.03	0.44E-03	0.15E-02	0.01	0.33E-03	0.	0.	0.01
Personal Water Craft	G2	0.50	2958	0.32E-02	1.00	0.47E-03	0.03	0.55	0.	0.	0.	0.55
Total		6.24	13456	0.29	15.68	0.66E-02	0.08	2.44	0.03	0.87E-03	0.03	2.51
Yolo												
Outboard	G2	0.50	2095	0.53E-02	1.16	0.47E-03	0.03	0.57	0.02	0.	0.48E-02	0.59
Auxiliary Sail	G2	0.56E-02	41	0.25E-04	0.01	0.53E-05	0.30E-03	0.82E-02	0.	0.39E-04	0.54E-04	0.83E-02
Outboard	G4	0.07	138	0.37E-02	0.20	0.70E-04	0.59E-04	0.01	0.23E-02	0.	0.71E-03	0.02
Inboard/Outboard	G4	1.01	1579	0.05	2.75	0.96E-03	0.81E-03	0.17	0.	0.63E-04	0.59E-02	0.18
Inboard	G4	0.30	392	0.02	0.81	0.28E-03	0.24E-03	0.05	0.	0.26E-03	0.17E-02	0.05
Inboard Jet	G4	0.29	274	0.01	0.79	0.27E-03	0.23E-03	0.05	0.	0.	0.	0.05
Auxiliary Sail	G4	0.94E-02	45	0.47E-03	0.03	0.89E-05	0.75E-05	0.16E-02	0.30E-03	0.	0.90E-04	0.20E-02
Inboard	D	0.04	41	0.82E-02	0.88E-02	0.15E-03	0.50E-03	0.40E-02	0.	0.	0.19E-05	0.40E-02
Auxiliary Sail	D	0.02	82	0.31E-02	0.33E-02	0.56E-04	0.19E-03	0.15E-02	0.43E-04	0.	0.	0.15E-02
Personal Water Craft	G2	0.11	408	0.70E-03	0.22	0.10E-03	0.58E-02	0.12	0.	0.	0.	0.12
Total		2.35	5095	0.10	5.99	0.24E-02	0.03	0.99	0.02	0.36E-03	0.01	1.02
Yuba												
Outboard	G2	1.05	4556	0.01	2.36	0.10E-02	0.06	1.21	0.03	0.	0.01	1.26
Other	G2	0.02	215	0.23E-03	0.03	0.15E-04	0.84E-03	0.02	0.	0.	0.	0.02
Auxiliary Sail	G2	0.55E-02	42	0.35E-04	0.01	0.52E-05	0.29E-03	0.75E-02	0.	0.31E-03	0.53E-04	0.78E-02
Outboard	G4	0.03	377	0.14E-02	0.07	0.26E-04	0.22E-04	0.46E-02	0.87E-03	0.	0.26E-03	0.57E-02
Inboard/Outboard	G4	1.76	2586	0.09	4.80	0.17E-02	0.14E-02	0.30	0.	0.63E-03	0.01	0.31
Inboard	G4	0.34	508	0.02	0.93	0.32E-03	0.27E-03	0.06	0.	0.25E-02	0.19E-02	0.06
Inboard Jet	G4	0.27	636	0.01	0.73	0.25E-03	0.21E-03	0.05	0.	0.	0.	0.05
Auxiliary Sail	G4	0.12E-02	34	0.61E-04	0.33E-02	0.12E-05	0.97E-06	0.21E-03	0.39E-04	0.	0.12E-04	0.26E-03
Inboard	D	0.21E-03	12	0.40E-04	0.43E-04	0.73E-06	0.25E-05	0.19E-04	0.	0.	0.93E-08	0.19E-04
Auxiliary Sail	D	0.26E-03	32	0.51E-04	0.55E-04	0.93E-06	0.31E-05	0.25E-04	0.71E-06	0.	0.	0.25E-04
Personal Water Craft	G2	0.12	324	0.75E-03	0.24	0.11E-03	0.62E-02	0.13	0.	0.	0.	0.13
Total		3.59	9322	0.13	9.19	0.34E-02	0.07	1.78	0.03	0.35E-02	0.02	1.84
Total		313.16	739685	13.12	788.68	0.32	5.43	148.70	2.69	0.06	1.83	153.28

*NOTE: Number of boats does not include Rental Boats or Documented Vessels.

*NOTE: No fuel usage reported for gasoline-powered "Other" vessels in Central region. (8434 boats)

*NOTE: No fuel usage reported for diesel-powered "Other" vessels in Southern region. (399 boats)

*NOTE: No fuel usage reported for diesel-powered "Outboard" vessels in Southern region. (102 boats)

TABLE 3-8. Annual emissions (ton/yr) and average emissions factors (lb/1000 gal) by county.[1]

			Annual Emissions (Tons / year)					Average Emissions (lb./1000 gal)				
	Fuel Use 1000 gal	# of Boats *	NOx	CO	SOx	PM	TOG	NOx	CO	SOX	PM	TOG
Alameda	701.3	7308	28.8	1777.9	0.7	12.2	332.6	82.1	5070.5	2.0	34.9	948.4
Alpine	94.5	969	3.9	239.8	0.1E+00	1.6	43.6	83.3	5077.8	2.0	33.6	923.9
Amador	317.2	4139	10.1	784.7	0.3	9.0	215.6	63.6	4948.1	2.0	56.5	1359.5
Butte	538.6	7138	17.6	1347.7	0.5	13.3	332.7	65.3	5004.6	1.9	49.3	1235.5
Calaveras	982.6	14729	24.6	2386.8	1.0	35.6	816.7	50.0	4857.9	2.0	72.5	1662.2
Colusa	71.0	1166	1.4	170.1	0.7E-01	3.0	67.0	39.9	4791.1	1.9	84.3	1886.4
Contra Costa	1813.9	16614	82.6	4651.9	1.8	22.3	681.2	91.0	5129.3	2.0	24.5	751.1
Del Norte	61.3	628	2.6	160.3	0.6E-01	0.8	23.5	83.6	5231.2	1.9	24.5	767.4
El Dorado	1356.2	11791	64.0	3492.9	1.4	14.1	460.1	94.3	5150.9	2.0	20.7	678.5
Fresno	771.5	9114	27.9	1931.0	0.8	17.9	449.7	72.3	5005.7	2.0	46.4	1165.9
Glenn	54.4	1004	0.9	125.5	0.5E-01	2.5	55.5	33.7	4614.7	1.9	91.9	2040.8
Humboldt	86.0	1416	2.0	204.7	0.8E-01	3.3	74.6	45.6	4762.1	1.9	75.8	1736.4
Imperial	456.8	3723	24.4	1159.9	0.5	2.9	116.8	106.8	5078.8	2.2	12.7	511.5
Inyo	13.3	202	0.3	32.2	0.1E-01	0.5	11.2	48.7	4849.2	2.0	74.0	1691.4
Kern	824.5	7892	39.1	2075.4	0.9	10.4	314.1	95.0	5034.1	2.1	25.1	761.8
Kings	12.1	179	0.3	29.4	0.1E-01	0.4	9.9	51.4	4867.1	2.0	70.8	1631.5
Lake	2041.2	18726	92.8	5234.2	2.1	25.2	768.9	90.9	5128.6	2.0	24.7	753.4
Lassen	187.0	3189	3.9	441.3	0.2	7.5	170.8	42.1	4718.4	1.9	80.6	1826.8
Los Angeles	9350.4	107769	368.0	23248.7	9.7	197.6	5170.2	78.7	4972.8	2.1	42.3	1105.9
Madera	840.4	8442	35.6	2137.8	0.9	13.4	373.9	84.8	5088.0	2.0	31.8	889.8
Marin	1002.9	14127	28.3	2457.2	1.0	32.6	762.8	56.3	4900.0	2.0	65.0	1521.1
Mariposa	550.1	8828	11.7	1322.5	0.5	22.3	502.8	42.5	4808.5	1.9	81.2	1828.0
Mendicino	516.2	6072	18.8	1292.6	0.5	11.9	298.9	72.7	5008.0	2.0	46.0	1158.2
Merced	104.0	1932	1.3	243.9	0.1E+00	5.3	115.5	24.8	4691.1	1.9	101.9	2222.3
Modoc	0.9	17	0.3E-01	2.2	0.8E-03	0.2E-01	0.4	73.6	5107.8	1.9	38.0	1022.3
Mono	27.4	471	0.5	65.1	0.3E-01	1.2	27.5	34.5	4755.8	1.9	90.5	2005.0
Monterey	1354.8	16034	48.9	3390.1	1.4	31.5	792.1	72.2	5004.7	2.0	46.5	1169.4
Napa	1059.0	10365	45.9	2700.6	1.1	15.7	449.7	86.6	5100.0	2.0	29.7	849.2
Nevada	554.6	7910	16.4	1366.6	0.5	16.0	386.2	59.1	4928.4	1.9	57.6	1392.9
Orange	5712.4	52952	278.4	14405.6	6.1	64.2	2023.8	97.5	5043.6	2.1	22.5	708.6
Placer	2413.2	22031	110.1	6190.6	2.5	29.3	900.7	91.2	5130.6	2.0	24.3	746.5
Plumas	462.9	5956	15.7	1165.1	0.4	10.7	272.0	67.6	5033.8	1.9	46.1	1175.2
Riverside	1926.7	19093	88.8	4839.3	2.0	27.1	791.2	92.2	5023.5	2.1	28.1	821.3
Sacramento	2334.6	19436	113.1	6032.7	2.4	20.7	724.7	96.9	5168.1	2.0	17.7	620.8
San Benito	5.4	52	0.2	13.8	0.5E-02	0.7E-01	2.2	88.8	5114.4	2.0	27.2	801.2
San Bernardino	6274.5	73405	242.5	15583.7	6.5	137.3	3565.2	77.3	4967.3	2.1	43.8	1136.4
San Diego	7500.3	71457	357.5	18883.9	8.0	92.8	2827.3	95.3	5035.5	2.1	24.7	753.9
San Francisco	761.1	8731	28.4	1911.0	0.8	16.6	423.3	74.8	5021.7	2.0	43.5	1112.4
San Joaquin	3172.8	28145	147.6	8158.5	3.2	35.2	1120.0	93.1	5142.7	2.0	22.2	706.0
San Luis Obispo	705.7	9338	22.8	1735.7	0.7	20.2	496.3	64.5	4919.2	2.0	57.2	1406.7
San Mateo	378.6	5516	10.0	923.4	0.4	13.1	302.3	52.9	4877.5	2.0	69.0	1596.6
Santa Barbara	227.2	3318	6.0	553.9	0.2	7.9	187.3	53.1	4876.0	2.0	69.2	1648.5
Santa Clara	733.6	5423	38.0	1911.4	0.8	3.7	174.2	103.5	5211.5	2.1	10.0	475.1
Santa Cruz	89.9	917	3.8	228.4	0.9E-01	1.5	41.1	83.7	5080.5	2.0	33.2	914.9
Shasta	1981.8	23182	74.1	5075.5	1.9	36.1	984.1	74.8	5122.0	1.9	36.4	993.1
Sierra	234.1	3741	5.0	563.2	0.2	9.4	212.7	43.0	4811.7	1.9	80.6	1817.4
Siskiyou	48.6	876	0.9	112.8	0.5E-01	2.1	48.0	36.3	4646.3	1.9	88.5	1975.6
Solano	1237.6	16395	38.5	3056.1	1.2	36.0	860.2	62.2	4938.9	2.0	58.2	1390.1
Sonoma	1304.1	12928	55.9	3321.7	1.3	20.0	566.6	85.7	5094.2	2.0	30.7	869.0
Stanislaus	299.9	4122	8.8	737.0	0.3	9.3	220.1	58.7	4915.7	2.0	62.3	1468.2

[1] The fuel usage, annual emissions, and average emission factors include registered, documented, and rental vessels. The number of boats only includes registered vessels. The TOG emissions are exhaust only.

Continued

TABLE 3-8. Concluded.

	Fuel Use 1000 gal	# of Boats *	Annual Emissions (Tons / year) NOx	CO	SOx	PM	TOG	Average Emissions (lb./1000 gal) NOx	CO	SOX	PM	TOG
Sutter	32.4	246	1.7	84.4	0.3E-01	0.2	8.2	102.1	5202.6	2.1	11.6	505.1
Tehema	77.4	1216	1.9	186.6	0.7E-01	2.7	62.6	50.3	4819.7	1.9	69.5	1617.5
Trinity	312.7	5209	7.0	742.4	0.3	12.1	276.1	44.5	4747.9	1.9	77.4	1765.8
Tulare	665.1	5769	31.4	1713.4	0.7	6.8	224.5	94.5	5151.9	2.0	20.6	675.2
Tuolumne	2351.5	20431	110.9	6056.5	2.4	24.3	796.6	94.3	5151.2	2.0	20.7	677.6
Ventura	1387.8	13454	65.2	3490.6	1.5	18.2	543.6	93.9	5030.3	2.1	26.2	783.4
Yolo	522.5	5095	22.7	1332.9	0.5	7.7	220.4	86.9	5101.8	2.0	29.4	843.5
Yuba	798.6	9322	29.9	2045.9	0.8	14.5	395.1	74.9	5123.8	1.9	36.3	989.4
Total	69697.0	739681	2919.2	175529.5	71.5	1209.6	33095.0	83.8	5036.9	2.1	34.7	949.7

*NOTE: Number of boats does not include Rental Boats or Documented Vessels.

*NOTE: No fuel usage reported for gasoline-powered "Other" vessels in Central region. (8434 boats)

*NOTE: No fuel usage reported for diesel-powered "Other" vessels in Southern region. (399 boats)

*NOTE: No fuel usage reported for diesel-powered "Outboard" vessels in Southern region. (102 boats)

where they boated. For documented vessels, a population was estimated but not included in the totals since this number is only a rough estimate and no current data are available on where these vessels are operated. In addition, the vessel populations given in the tables do not correspond to the total given in Table 2-1. This is because of the way the population is allocated to the counties from the regional level. In PCEM, if the population of an engine-propulsion type is less than one, after multiplication of the allocation factor by the regional population, a minimum population of one vessel type per county is assigned.

As noted in Section 2, Sierra County was included in the Central region instead of the Northern region for this study. The error associated with this assignment results in a less than one percent change in county-level emissions (i.e., the emissions for each county change on average by about one percent). If Sierra County's emissions were moved to the Northern region, statewide emissions would not change, but rather there would be an insignificant redistribution of the emissions within the counties.

Statewide annual emissions for the period of the survey are given in Table 3-9 and are compared to the CARB 1990 inventory. As stated earlier, the total annual fuel consumption estimated in this study is about half of that estimated by the CARB. The CARB estimate is based on the DENOD study done in the early 1970s and projected to current levels. The quantities estimated in this study, however, do correspond well with those estimated for California in the *National Recreational Boating Survey*. Since the total and average fuel consumption data correspond well between these two more recent studies, it is assumed that fuel consumption was overestimated for the 1990 inventory.

The differences in the emission totals given in Table 3-9 occur because of the updated emission factors and fuel consumption estimated in this study. The emission factors used by the CARB for the 1990 inventory are based on AP-42 factors and do not include in-use effects. Overall, NO_x, TOG, and SO_x emissions decrease by about 45, 18, and 85 percent, respectively, while CO and PM increase by about 3 and 100 percent compared to the 1990 inventory.

TABLE 3-9. Comparison of statewide annual emission estimates between the current updated inventory and those generated in 1990 by ARB.

Source	Fuel (1000 gal)	Annual Emissions (tons per year)				
		NO_x	TOG[a]	CO	SO_x	PM
Current	69,697	2,919	34,113	175,530	72	1,210
1990 ARB	125,834	5,299	41,278	171,157	476	605

[a] Includes exhaust, evaporative, crank, and refueling.

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Appendix A

MAIL SURVEY PACKET

Freeman, Sullivan & Co.

131 Steuart Street
Suite 500
San Francisco
CA 94105

Tel: (415) 777-070
Fax: (415) 777-242

August 27, 1993

[redacted]

Dear [redacted]:

The State of California and boat manufacturers are jointly sponsoring a scientific study on the use of boat and other watercraft engines in California. This study is vitally important to the production of new engines to be designed to help preserve California's boating environment for future generations. These results will not affect existing marine engine technology in use today.

Freeman, Sullivan and Co., an independent research laboratory, is conducting this study. Based on a profile of registered boaters in California, you and a small number of other registered boat owners have been randomly selected to represent how boats or personal watercraft (for example, a Jetski or Waverunner) are used in the state.

All the information you provide will be kept confidential. Your name and address will not be revealed or given out to any commercial enterprise or government agency.

Please fill out the enclosed questionnaire as accurately as possible. We have done everything we could to make it quick and easy for you to complete. It should take less than ten minutes.

The questions relate to your boat and its engine. You will also be asked to identify by California county your boat usage in the past two weeks. To help you correctly identify the counties where you boat, we have provided a color map showing major waterways and lakes. Please keep this map for yourself and return only your questionnaire to us in the postage-paid envelope.

A quick reply will prevent future reminders being mailed to you. I urge you to please try to complete this today. If you have any questions, please call me at 1-800-777-0737. Thank you in advance for your cooperation.

Sincerely,

Charles DiSogra
Research Director

Vessel/Hull ID No.
31013181
Enclosures.

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Freeman, Sullivan & Co.

REGARDING YOUR REGISTERED BOAT

Sailboats with Engines • Power Boats • Other Boats with Engines • Personal Water Craft

- If you own the boat listed above and this boat is powered by an engine:

  You should complete this form today and return it in the enclosed postage-paid envelope. Please begin on the next page.

  In this study, you represent hundreds of other boat owners like yourself!

- If you no longer own the boat listed above

  or

  the boat is not powered by either a primary or auxiliary engine:

  You only need to complete this cover page.

  Please check the appropriate box below and return the blank form in the enclosed postage-paid envelope. Thank you!

  ☐ I no longer own the boat

  ☐ I own a sailboat with no auxiliary engine

  ☐ I own a boat that is not powered by an engine

  ☐ I have never owned this boat

All questions refer ONLY to the boat with the registration number printed on the front page next to your name.

1. Check the <u>one</u> category which describes your registered boat.

- ☐ 1.1 Sailboat with engine
- ☐ 1.2 Personal Water Craft (Jetski, Waverunner, etc.)
- ☐ 1.3 Power Boat (cruiser, speedboat, houseboat, etc.)

2. Which category below describes your primary propulsion engine?
(Do not describe any secondary propulsion used for low speed trolling and fishing.)

- ☐ 2.1 Two-Stroke Gasoline Engine (requires gasoline and oil fuel mixture)
- ☐ 2.2 Four-Stroke Gasoline Engine (has an oil sump and dipstick)
- ☐ 2.3 Diesel Engine (either 2 or 4 Stroke, requires diesel fuel)

3. Which one of the following is the primary propulsion type for your boat?
(Include auxiliary motors for sailboats, but do not include secondary motors for low speed trolling or fishing. Please read all choices.)

- ☐ 3.1 Outboard
- ☐ 3.2 Sterndrive (Inboard/Outboard)
- ☐ 3.3 Inboard Propeller
- ☐ 3.4 Inboard Jet
- ☐ 3.5 Personal Water Craft Jet (Jetski engine, Waverunner engine, etc.)
- ☐ 3.6 Other (please specify):_____

4. **How many primary propulsion engines are on this boat?**

(Include auxiliary motors for sailboats, but do not include secondary motors for low speed trolling or fishing.)

- ☐ 4.1 One
- ☐ 4.2 Two
- ☐ 4.3 More than two. Please specify number: _____

5. **What is the horsepower for <u>each</u> primary engine?**

(If unsure, you might check the specifications in the owner's manual, otherwise give your best estimate.)

_____ hp 5.1-4

6. **What year was your engine manufactured?**

(If unsure, you might find the model year in the owner's manual.)

19____ 6.1-2

- ☐ 6.a.1 Not sure, but probably <u>before 1990</u>
- ☐ 6.a.2 Not sure, but probably 1990 or later
- ☐ 6.a.3 Don't Know

Important

The following questions refer to the TWO WEEK period ending LAST SUNDAY evening. Please keep in mind that you are answering for those two weeks only.

ALSO, your answers must only be for the boat whose registration number is printed on the front page of this survey next to your name.

7. Please enter today's date: _____/_____/_____ 7.1-6

month day year

8. During the two weeks ending last Sunday, how many gallons of fuel did you buy for your boat, personal watercraft, or sailboat engine(s)?

(If unsure of the exact amount, make your best estimate; if you bought no fuel, even if you used your boat, enter "0".)

_____ gallons bought in the past two weeks 8.1-3

9. Whether you bought fuel or not, how many gallons do you estimate you used in the two weeks ending last Sunday?

_____ gallons used in the two weeks 9 1-3

10. Did you use your boat *(went out under power)* during the two weeks ending last Sunday?

☐ 10.1 Yes If yes, go to question 11 below

☐ 10.1 No. If no, skip to question 12 on Page 7

11. If you used your boat in the two weeks ending last Sunday, please read the instructions on the following page and complete the boating log as thoroughly as possible for any boating you did in California, on the Colorado River, or along the California coast.

A correct county location is important to this study. Use the enclosed Waterways Map -- Northern California (side 1) and Southern California (side 2) -- to locate the counties where you used your boat.

Step 1. Read this example. **Step 2.** Fill out the log on the next page

For the days you used your boat, fill in the county codes for those counties where you boated or boated offshore. Enter up to three counties where you did most of your boating on that day. **USE ENCLOSED WATERWAYS MAP FOR COUNTY CODES.**

Enter the time you started out on the water and the time you returned to the dock or landing at the end of your boating day.

Enter the approximate percentage of this time during which you used your boat's primary (or sailboat auxiliary) engine.

If you used your boat on any day in one or more of the five specific locations listed on the right, check the appropriate box or boxes. Leave the boxes blank if you did not boat in these places on a given day. (Note: Lake Perris is in Riverside County)

EXAMPLE: Last Sunday you used your boat in Lake Berryessa in Napa County (code # 21) between 11:30 am and 4:00 pm, operating the engine for about half the time (50%). You also used your boat the previous day, Saturday, in San Francisco Bay off Alameda County (code # 1) and Contra Costa County (code # 7) from 12:00 pm to 2:15 pm when you operated the engine for about a quarter of the time (25%).

Your Boat and Engine Use Over the Two Weeks Ending Last Sunday

Day of Week	Counties Where You Boated or Boated Offshore (Use Map Code Numbers)			Time On The Water Each Day		Percent Of Time On The Water You Used Your Boat Engine	Check Boxes Only If You Boated Here				
	County Code	County Code	County Code	Time Started	Time Finished	Percent	Pacific Ocean	San Francisco Bay San Pablo Bay	Sacramento Delta Suisun Bay	Mission or San Diego Bays	Lake Perris (Riverside Co.)
Example from Previous Page:											
Last Sunday	# 21	#	#	11:30 am/pm	4:00 am / pm	50 %					
Saturday	# 1	# 7	#	12:00 am/pm	2:15 am / pm	25 %		X			
Friday	#	#	#	: am / pm	: am / pm	%					
Last Sunday	#	#	#	: am / pm	: am / pm	%					
Saturday	#	#	#	: am / pm	: am / pm	%					
Friday	#	#	#	: am / pm	: am / pm	%					
Thursday	#	#	#	: am / pm	: am / pm	%					
Wednesday	#	#	#	: am / pm	: am / pm	%					
Tuesday	#	#	#	: am / pm	: am / pm	%					
Monday	#	#	#	: am / pm	: am / pm	%					
Sunday	#	#	#	: am / pm	: am / pm	%					
Saturday	#	#	#	: am / pm	: am / pm	%					
Friday	#	#	#	: am / pm	: am / pm	%					
Thursday	#	#	#	: am / pm	: am / pm	%					
Wednesday	#	#	#	: am / pm	: am / pm	%					
Tuesday	#	#	#	: am / pm	: am / pm	%					
Monday	#	#	#	: am / pm	: am / pm	%					

12. In which county is your primary **residence located?** *(Use the county code printed on the enclosed Waterways Map.)*

County Code: _____ 12.1 2

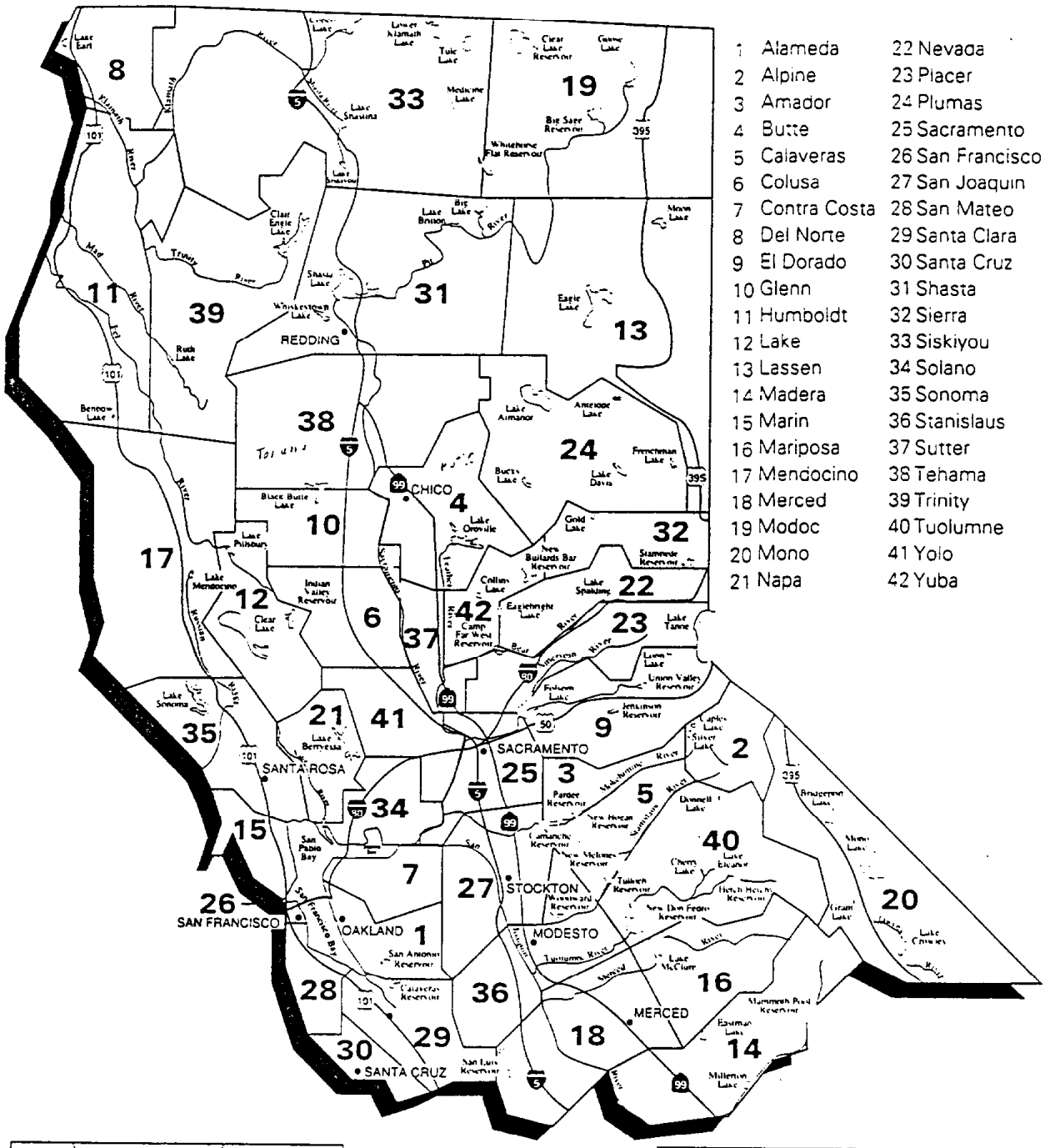
☐ 12a.1 Primary residence is outside California

13. (Optional) Please use the following space for any comments you have about this study.

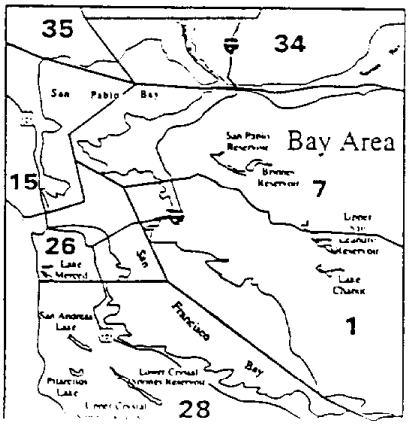
Thank you for your cooperation!

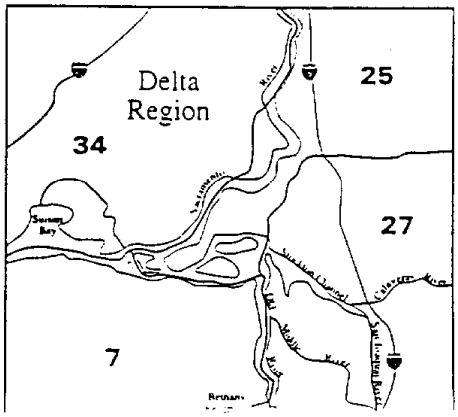
Mail this back today in the enclosed postage-paid envelope to:

Northern California Waterways Map



1 Alameda
2 Alpine
3 Amador
4 Butte
5 Calaveras
6 Colusa
7 Contra Costa
8 Del Norte
9 El Dorado
10 Glenn
11 Humboldt
12 Lake
13 Lassen
14 Madera
15 Marin
16 Mariposa
17 Mendocino
18 Merced
19 Modoc
20 Mono
21 Napa
22 Nevada
23 Placer
24 Plumas
25 Sacramento
26 San Francisco
27 San Joaquin
28 San Mateo
29 Santa Clara
30 Santa Cruz
31 Shasta
32 Sierra
33 Siskiyou
34 Solano
35 Sonoma
36 Stanislaus
37 Sutter
38 Tehama
39 Trinity
40 Tuolumne
41 Yolo
42 Yuba





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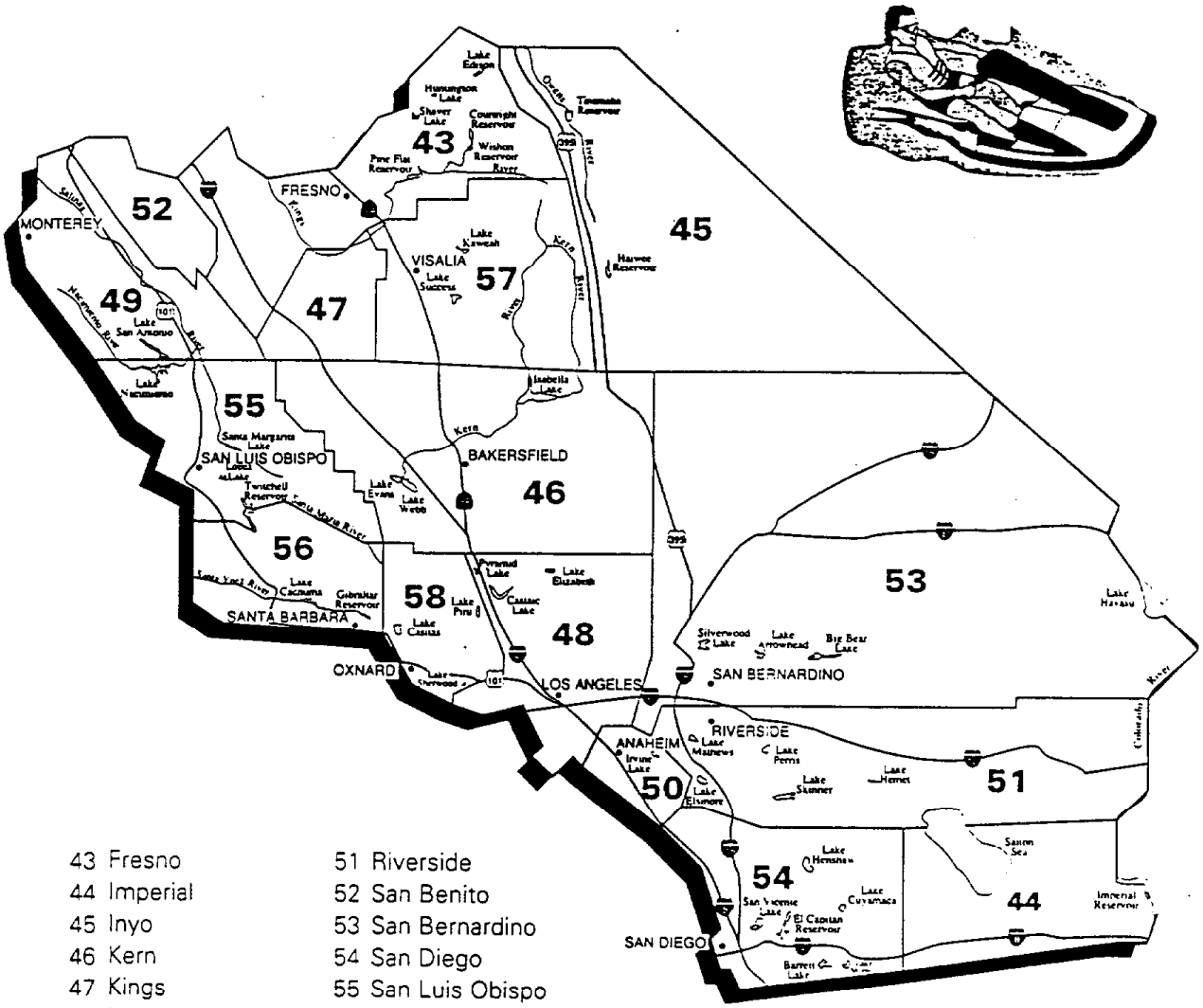
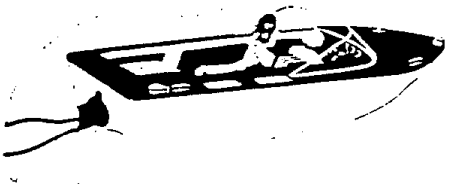
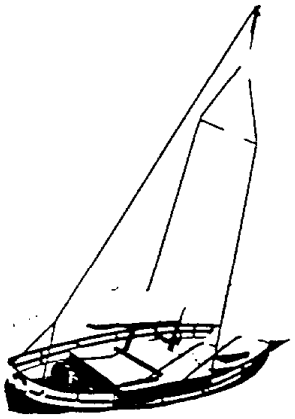
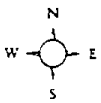
Southern California Waterways Map



43 Fresno
44 Imperial
45 Inyo
46 Kern
47 Kings
48 Los Angeles
49 Monterey
50 Orange
51 Riverside
52 San Benito
53 San Bernardino
54 San Diego
55 San Luis Obispo
56 Santa Barbara
57 Tulare
58 Ventura







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Fax: (415) 777-2420

September 17, 1993

[redacted]

Dear [redacted]

We have, as yet, not received the completed boating survey that was sent to you by the State of California and boat manufacturers. You represent hundreds of fellow boaters in your region in this study, and in not filling out the enclosed survey you undervalue the lakes and waterways you use to the boating community. This study is vitally important to the production of new engines to be designed to help preserve these boating environments for future generations. These results will not affect existing marine engine technology in use today.

All the information you provide will be kept confidential. Your name and address will not be revealed or given out to any commercial enterprise or government agency.

Please fill out the enclosed questionnaire as accurately as possible. We have done everything we could to make it quick and easy for you to complete. It should take less than ten minutes.

You will be asked to identify by California county your boat usage in the past two weeks. To help you correctly identify the counties where you boat, we have provided a color map showing major waterways and lakes. Please keep this map for yourself and return only your questionnaire to us in the postage-paid envelope.

Please, I urge you to take the time to complete this survey today. If you have any questions, please call me at 1-800-777-0737. Thank you for your cooperation.

Sincerely,

Charles DiSogra
Research Director

Vessel/Hull ID No.
21012122
Enclosures.

REMINDER NOTICE

Dear Boat Owner:

Recently we mailed you a questionnaire on the use of boat and other watercraft engines in California. If you have not yet completed it, please take a few minutes to do so today. We still need your response, even if you did not use your boat in the specified time. If you have already sent in your questionnaire, thank you for your time and your help in this important study.

If you have not received a questionnaire, or if it was misplaced, please call Freeman, Sullivan & Co., 1-800-777-0737, and another one will be mailed to you.

Sincerely,

Charles DiSogra
Research Director
Freeman, Sullivan & Co.