FINAL

2000 AIR EMISSIONS INVENTORY

LAKE MEAD NATIONAL RECREATION AREA
NEVADAIARIZONA

U.S. NATIONAL PARK SERVICE

FINAL

2000 AIR EMISSIONS **INVENTORY**

LAKE MEAD NATIONAL RECREATION AREA
NEVADA/ARIZONA

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National Park Service
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Cover Photo by NPS

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1. INTRODUCTION

1.1 BACKGROUND

In August of 1999, the National Park Service (NPS) embarked on the Natural Resource Challenge, a major effort to substantially improve how the NPS manages the natural resources under its care. As part of Natural Resource Challenge, the NPS Air Resources Division (ARD) was tasked with the responsibility of expanding efforts to monitor and understand air quality and related values in the parks. In addition, the NPS Environmental Leadership policy directs the NPS to manage the parks in a manner "that demonstrates sound environmental stewardship by ¡mplementing sustainable practices in all aspects of NPS management...." In order to achieve both of these objectives, it is necessary to gain an understanding of air pollution emissions that result from activities within the park. In this regard, development of an in-park air emissions inventory for Lake Mead National Recreation Area (NRA) serves three functions. First, it provides an understanding of the sources and magnitude of in-park emissions and a basis for contrasting them with emissions from the surrounding area. Second, it identifies existing and potential strategies to mitigate in-park air emissions. Finally, it evaluates and ensures the compliance status of the park relative to state and federal air pollution regulations.

1.2 **TYPICAL** AIR EMISSION **SOURCES**

Typical air emission sources within NPS units include stationary, area, and mobile sources. Stationary sources can include fossil fuel-fired space and water heating equipment, generators, fuel storage tanks, and wastewater treatment plants. Area sources may include woodstoves, fireplaces, campfires, and prescribed burning. Mobile sources may include vehicles operated by visitors, tour operators, and NPS and concessioner employees, and nonroard vehicles and equipment.

The air pollutants that are addressed in this report are summarized in the table below. Of the pollutants noted, ozone is not produced and emitted directly from stationary, area, or mobile sources, but rather it is 1ˆwined as a result a chemical reaction of NOx and VOC emissions in the presence of sunlight. It is primarily an issue on the East Coast and Southern California, while particulate matter is more of an issue in the West. Carbon dioxide historically has not been considered a pollutant. However, in recent years, there has been much interest in its contribution to global climate waiming since it is considered a greenhouse gas.

AIR **POLLUTANTS AND THEIR CHARACTERISTICS**

Pollutant	Characteristics
Particulates (PM_{10})	• Mixture of solid particles and liquid droplets; fine particles (less than 2.5 micrometers) produced by fuel combustion, power plants, and diesel buses and trucks • Can aggravate asthma, produce acute respiratory symptoms, including aggravated coughing and difficult or painful breathing, and chronic bronchitis • Impairs visibility
Sulfur Dioxide (SO_2)	• Can cause temporary breathing difficulties for people with asthma • Reacts with other chemicals to form sulfate particles that are major cause of reduced visibility in many parts of the country
Nitrogen Oxides (NOx)	• High temperature fuel combustion exhaust product • Can be an irritant to humans and participates in the formation of ozone
Carbon Monoxide (CO)	• Odorless, colorless gas produced by fuel combustion, particularly mobile sources • May cause chest pains and aggravate cardiovascular diseases, such as angina • May affect mental alertness and vision in healthy individuals
Volatile Organic Compounds (VOCs)	• Fuel combustion exhaust product • Consists of a wide variety of carbon-based molecules • Participates in the formation of ozone
Ozone (0_3)	• Not directly emitted by mobile, stationary, or area sources • Formed from complex reactions between NOx and VOC emissions in the presence of sunlight • Occurs regionally due to multiplicity of sources • Can irritate the respiratory system • Can reduce lung function • Can aggravate asthma and increase susceptibility to respiratory infections • Can inflame and damage the lining of the lungs
Carbon Dioxide (CO_2)	• Does not directly impair human health • It is a greenhouse gas that traps the earth's heat and contributes to the potential for global warming

1.3 INVENTORY METHODOLOGY

The methodology to accomplish the air emissions inventory was outlined in a protocol that was prepared at the initiation of the project (EA Engineering 2001). Tasks consisted of a site survey in February 2002, interviews with Lake Mead NRA[1] personnel, review of applicable park records, emission calculations, review of applicable state and local air quality regulations, an assessment of mitigation measures and potential emission reduction initiatives, and report preparation. The data were used in conjunction with a number of manual and computer software computational tools to calculate emissions. Computational tools included U.S. Environmental Protection Agency (USEPA) emission factors such as the Factor Information Retrieval System (FIRE) database, USEPA *TANKS 4.0* model, U.S. Forest Service *First Order Fire Effects Model (FOFEM) 4.0* model, USEPA *MOBILE6.2* mobile source emissions model, and Federal Aviation

[1] Bill Burke, Resource Management Specialist (702) 293-8935

Administration *Emissions and Dispersion Modeling System (EDMS).* The year 2000 was selected as the basis for the air emission inventory since data for that year were the most recent available at the park. It should be noted that emissions are expected to vary from year to year due to fluctuations in visitation, prescribed and wildland fires, and other activities. Additional information on emission estimation methodology, including emission factors, is provided in Appendices A and B.

1.4 PARK DESCRIPTION

Lake Mead National Recreation Area (NRA) includes two reservoirs, Lake Mead and Lake Mohave, along 140 miles of the former Colorado River from the southern tip of Nevada to the northwest corner of Arizona (Figure 1). The park contains 1,501,216 acres of which 1,484,159 acres are in federal ownership administered by the NPS and 12,568 are nonfederal lands. The Bureau of Reclamation (BOR) administers an additional 4,488 acres surrounding Hoover and Davis Dams. Other agencies located within the park include the U.S. Fish and Wildlife Service and Nevada Wildlife Department, which operate fish hatcheries, Southern Nevada Water Authority, and the Arizona Game and Fish Department. The Hacienda Hotel and Casino that is located approximately three miles from Hoover Dam is an in-holding. The City of Las Vegas, NV lies approximately 20 miles to the northwest.

Lake Mead has a surface area of 157,900 acres with over 700 miles of shoreline, and Lake Mohave has a surface area of 28,260 acres and 150 miles of shoreline. Lake Mead has four large subbasins, including Boulder, Virgin, Temple, and Gregg's Basin, and four narrow canyons, Black, Boulder, Virgin, and Iceberg, are located between these basins. The shoreline area includes several large bays, including Grand Wash, Las Vegas, and Bonelli. The area surrounding Lakes Mead and Mohave is rugged with deep canyons, dry washes, sheer cliffs, and mountains. Lakeshore Scenic Drive is the most heavily used road in the park and provides access to the Alan Bible Visitor Center, Boulder Beach, and Las Vegas Bay developed areas on the southwestern portion of Lake Mead. Northshore Scenic Drive provides access to the Callville Bay, Echo Bay, and Overton Beach developed areas along the western edge of Lake Mead (see maps following Figure 1).

Information on the developed areas is summarized in Table 1, and maps of these areas are provided in Appendix D. Commercial services in the park that are authorized under numerous concession contract activities that may generate air emissions include lodging, food services, gasoline stations, stores and other retail establishments, motor boats, and marinas.

TABLE 1: LAKE MEAD NRA DEVELOPED AREAS

Name/Location	Function/Facilities
Boulder City	Headquarters, Maintenance Facility, Procurement Office
Boulder Beach	Visitor Center, Lake Mead Lodge, Beach Store, Gasoline Station, Marina, Launching Ramps, Campground, Employee Housing
Las Vegas Bay/Wash	Ranger Station, Boat Repair Ship, Store/Snack Bar, Gasoline Station, Marina, Launching Ramps, Campground, Employee Housing
Call 11e Bay	Ranger Station, Store, Gasoline Station, Restaurant, Marina, Launching Ramps, Campground, Dry Boat Storage, Employee Housing
Echo Bay	Ranger Station, Lodge, Store, Gasoline Station, Fish Cleaner, Marina, Launching Ramps, Campground, Dry Boat Storage, Water Treatment Plant, Employee Housing
Overton Beach	Ranger Station, Motel, Restaurant, Gasoline Station, Gasoline Dock and Supplies, Launching Ramp, Campground, Dry Boat Storage, Employee Housing
Temple Bar	Visitor Center/Ranger Station, Motel, Vacation Cabinsites, Cafe-Store-Post Office, Gasoline Station, Fish Cleaner, Maintenance Shop, Launching Ramp, Campground, Dry Boat Storage, Gasoline Dock, Employee Housing
Willow Beach	Ranger Station, Campground, Motel, Restaurant/Store, Gasoline Station, Marina, Launching Ramp, Dry Boat Storage, Employee Housing
Cottonwood Cove	Ranger Station, Motel, Post Office/Concession Office, Gasoline Station, Maintenance Shop, Launch Ramp, Campground, Dry Boat Storage, Marina, Gasoline Dock, Employee Housing
Katherine	Ranger Station, Motel, Store, Restaurant, Concession Office, Gasoline Station, Maintenance Yard, Launch Ramp, Campground, Boat Repair Facility, Gasoline Dock, Employee Housing
NV Department of Wildlife	Gasoline Tank

1.5 AIR QUALITY STATUS

Lake Mead NRA is located in Clark County, NV and Mohave County, AZ. Although the Nevada Division of Environmental Protection, Bureau of Air Quality has air quality jurisdiction over most counties in Nevada, the Clark County Department of Air Quality Management is the regulatory and enforcement agency for air quality matters in Clark County. A portion of Clark County (the Las Vegas planning area Hydrographic Basin 212) has been designated as a serious nonattainment area for the National Ambient Air Quality Standards (NAAQS) for particulate matter (PM_{10}) and carbon monoxide (CO); however, the park is not located in a nonattainment area (NPS 2002). Mohave County, AZ is in attainment for all national and state AAQS, including PM_{10} and CO.

Air pollutants originate primarily from sources outside the park and can concentrate, especially during periods of atmospheric inversion, in the park, causing visible smog. The major existing sources of air pollutants within or adjacent to the recreation area include the Mohave generating plant near Laughlin, Nevada; emissions from motor vehicles from the Las Vegas valley and other urban areas; gravel and gypsum quarries; fugitive dust from disturbed lands and construction

activities; and other power generating plants in the region. Localized impacts on air quality from fuel odors and smoke from exhaust are apparent around the marina areas and in areas where concentrated boating occurs (NPS 2002b).

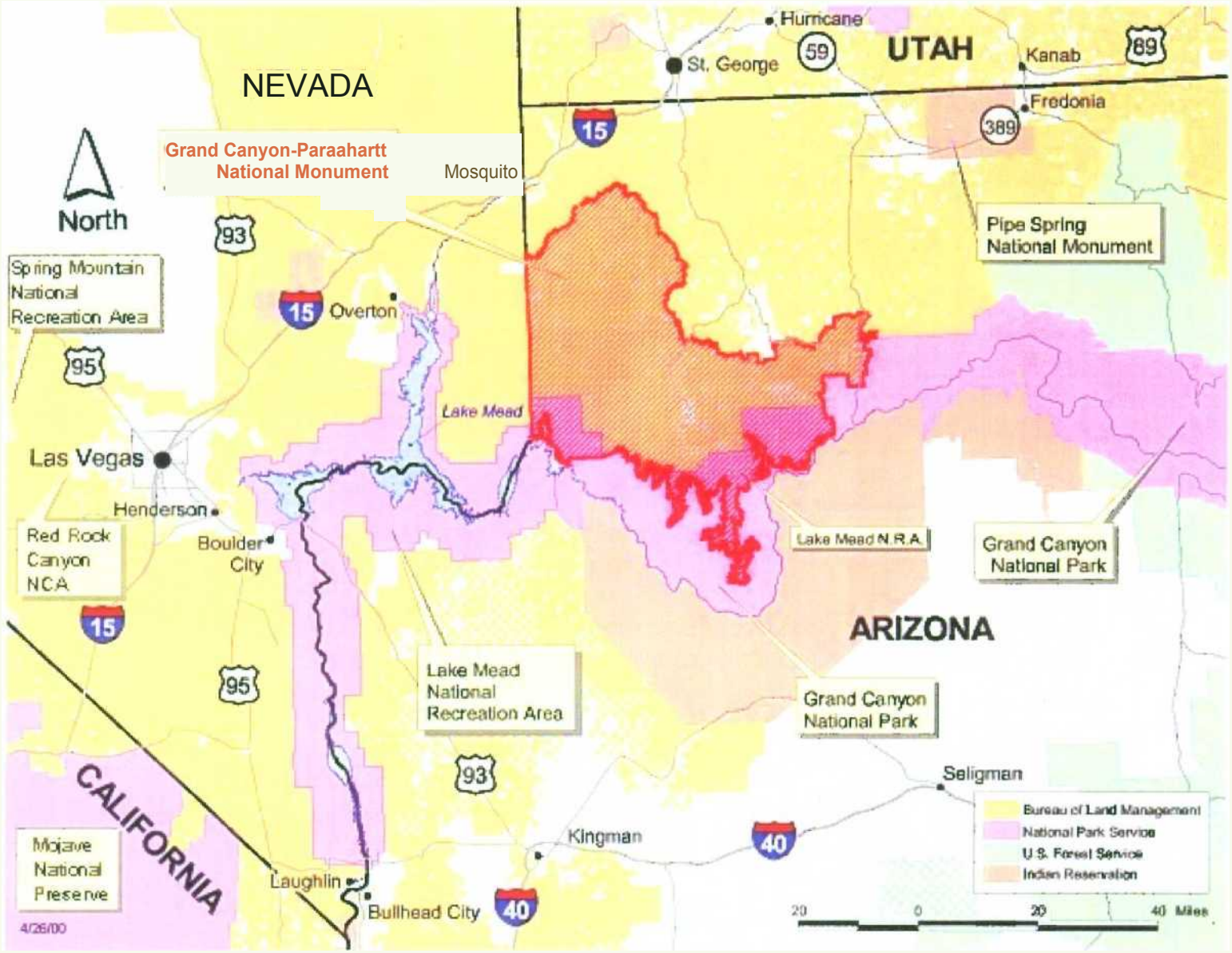
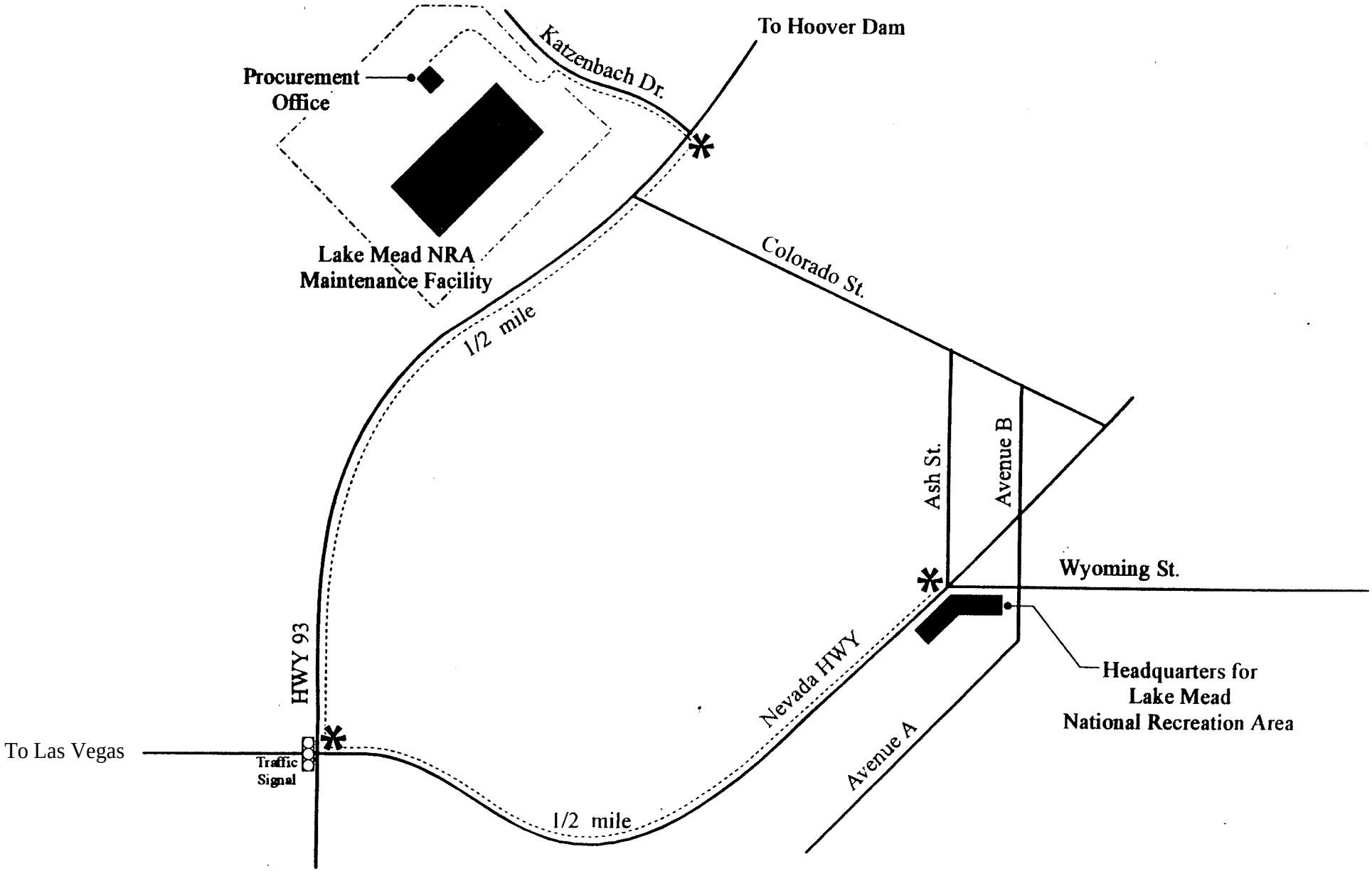


Figure 1. Lake Mead National Recreation Area Location


Procurement Office
Katzenbach Dr.
To Hoover Dam
Lake Mead NRA Maintenance Facility
Colorado St.
1/2 mile
Ash St.
Avenue B
Wyoming St.
HWY 93
Nevada HWY
Headquarters for Lake Mead National Recreation Area
To Las Vegas
Traffic Signal
Avenue A
1/2 mile
North

Lake Mead

National Recreation Area
National Park Service
U.S. Department of the Interior

LAKE MEAD	
Boulder Beach 13 km/2 mi)	
Las Vegas Bay (16 km/10 mil	
Lake Mead Marina 14 km/2.5 mil	
CeJlville Bay 143 km/27 mil	
Echo Bay179km/49 mil	
Overton Beach 1101 km/63 mil	
Temple Bar 181 km/50 mil	
LAKE MOHAVE	
Willaw Beach 135 km/22 mil	
Cottonwood Cove 187 km/54 mil	
Katherina Landing 1130 km/81 mil	

The chart at left details what you can find at each developed area in the park Distances are from Ma Alan Bible Visitor Center.

o Reserved for trailer ᵍage visitors

10 20 Kilometers
0 10 20 Miles

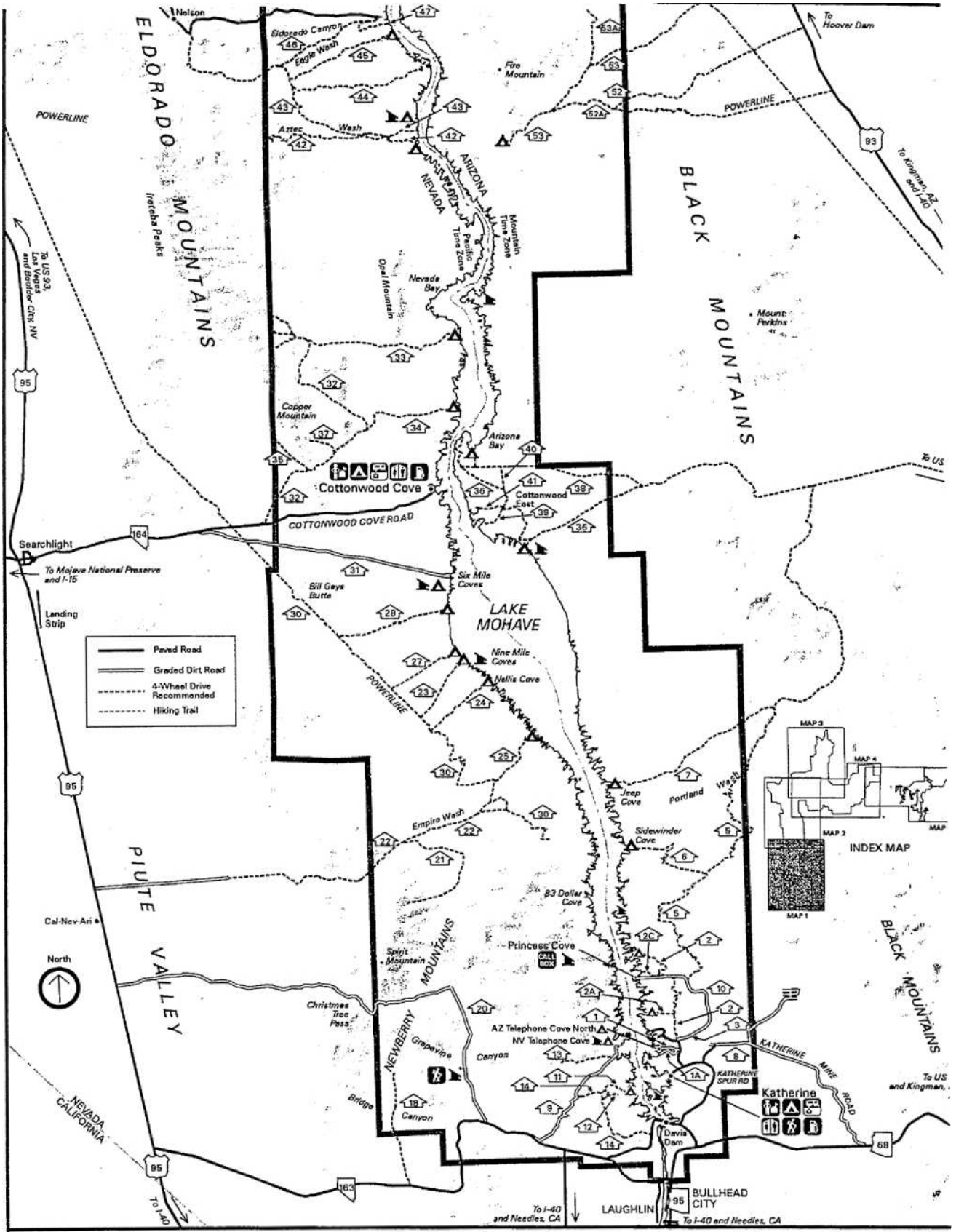
North

Ranger station Campground Swim beach
© Marina/boat launch Lodge
© Boat launch Rcnic area

For more information on backcountry roads, stop by visitor center contact ranger. See Lake *Mead*Nations/ Recreation Area Approved Raokeounry Roads map series (Maps 1- 6).

OVERTON
Overton Beach
VALLEY OF FIRE STATE PARK
Blue Point Spring
Im arinkirg yrs.)
Rogers Spring
drink in)) ...err)
Echo Bay
NORTH LAS VEGAS
Scenic Drive
Redstone (no drinking water)
Government Wash
Northshore
Callville Bay
Las Vegas Bay
Lakeshore Scenic Drive
LAS VEGAS
Lake Mead Marina
Lake Mead Cruises
Hemenway
Boulder Beach
HENDERSON
Hoover Dam
Alan Bible Visitor Center
Park Headquarters
BOULDER CITY
LAKE MEAD
Bonelli Landing
Temple Bar
SOUTH VIRGIN MOUNTAINS
GRAND WASH CLIFFS
Pearce Ferry
GRAND CANYON NATIONAL PARK
South Cove
Meadview
HUALAPAI INDIAN RESERVATION
Willow Beach
Eldorado Canyon
Nelson
ELDORADO MOUNTAINS
ARIZONA
NEVADA
BLACK MOUNTAINS
Dolan Springs
Cottonwood Cove
Searchlight
LAKE MOHAVE
NEVADA
CALIFORNIA
NEWBERRY MOUNTAINS
Princess Cove
Arizona Telephone Cove
Katherine Landing
Christmas Tree Pass
Davis Dam
MOJAVE NATIONAL PRESERVE
LAUGHLIN
BULLHEAD CITY
KINGMAN
93
15
169
147
167
515
146
165
95
164
163
68
40

3/98



Lake Mead National Recreation Area
Approved Backcountry Roads (Map 1)

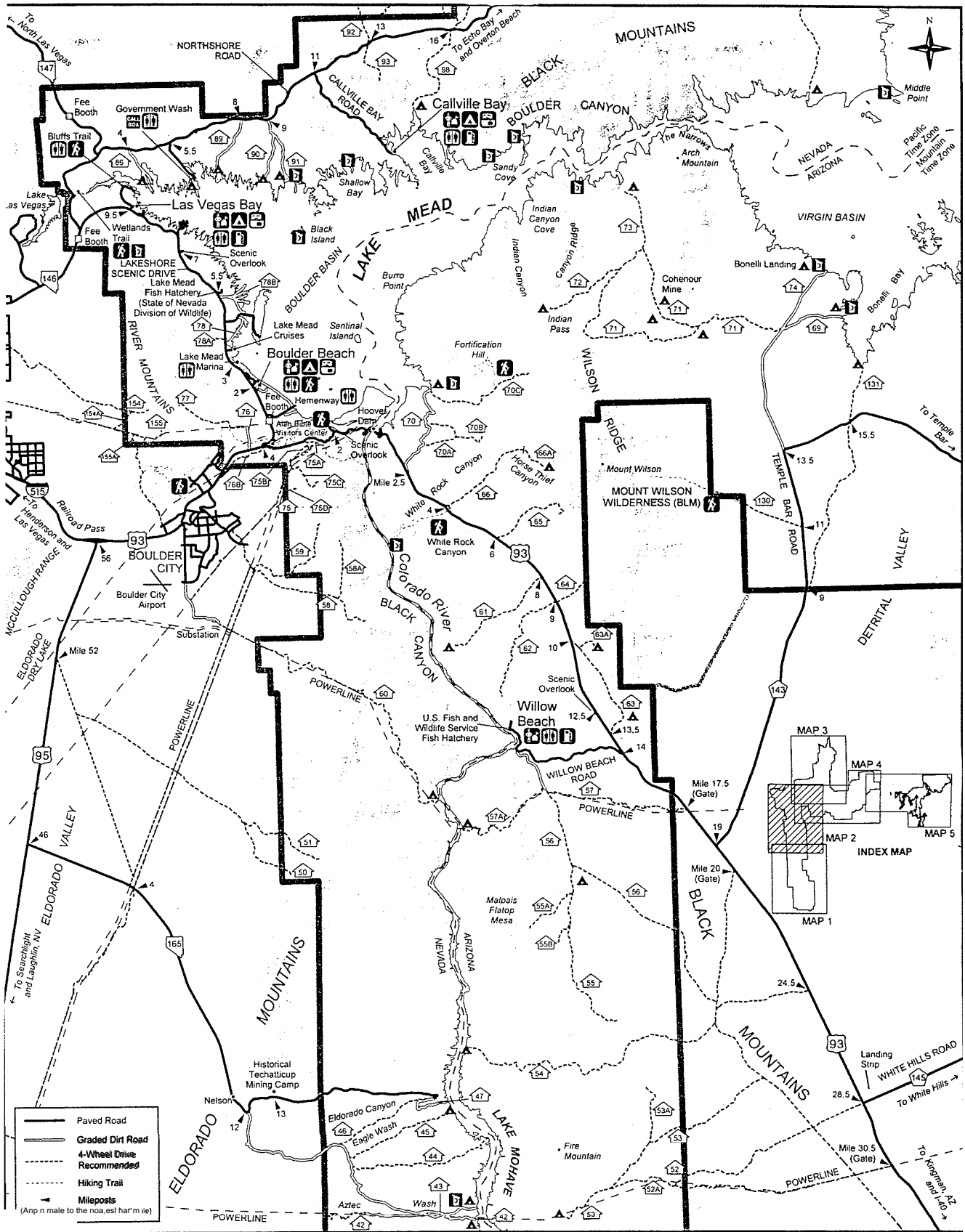
Lake Mohave South

0 10 Kilometer;

0 70 *MRea*

Ranger Station
Emergency Call Box
Gasoline
Campground
Sanitary disposal *station*
Full *service* restroom
Hiking trail
Rrmitiva camping *{no water}*
Backcountry toilet
Lake Mead NRA Approved %ckoaunuy Road

1.....NORTH TELEPHONE COVE ROAD
1A.....SOUTH TELEPHONE COVE ROAD
2..... MEA J-DAVIS POWERLINE ROAD AZ
2A. _ ..ARROWHEAD Cove ROAD
2C..... PRINCES5 WASH ROAD
5 - - - - -PORTLAND MINE ROAD
6.....SIDEW INOER COVE ROAD
7..... __JEEP COVE ROAD
8..... KATHERINE MINE ROAD
S.....NEVADA TELEPHONE COVE ROAD
10.....PRINCESS COVE ROAD
11.....RED HILL ROAD
12.....TRESTATE ROAD
13.....1OWER **GRAPEVINE** CANYON ROAD
ID._ _ _5TONEHODSE ROAD
Ia.....11PPER BRIDGE CANYON ROAD
20 _ -..CHRISTMAS THEE PASS ROAD
21 .....WHITE ROCK CANYON ROAD. NV
22 ..... EMPIRE WASH ROAD
23 ..... NIHE MILE COVE HOAD
24 .....N EWS *COVE* ROAD
25.....SAN DY WASH ROAD
27 _ .__TAMARISK ROAD
26 .....MID-GAS W ROAD
30.....MEAD-DAVIS POWERLINE ROAD. NV
SI.....SIX MILE COVE ROAD
32 ..... ROCKEFELLER MINE ROAD
33.....DPAL MOUNTAIN ROAD
34.....COPPER MOUNTAIN ROAD
35 ..... SOLICITOR MINE ROAD
36 .....COTTONWOOD EAST ROAD
ROAD
DR .....ARILONA BAY ROAD
30 .....CARP COVE ROAD
40 .....CROSSOVER ROAD
41 .....WILLOW TREE ROAD
42 ..... ELCOPADO ROWERL7NE ROAD, NV
43 ..... AZTECWASH ROAD
44.....FIRE MOUNTAIN COVE ROAR
45. - - - -.MONTANA WASH ROAD
45 ..... EAGLE WASH ROAD
47. - - ....PLACER COVE ROAD
52_ ..... **GOW** BUG MINEROAD
52 **DORADO** POW **ERLIME** ROAD. **AZ**
51.....FIRE MOUNTAIN ROAD
53k-SHEEP TANK ROAD



Lake Mead National Recreation Area
Approved Backcountry Roads (Map 2)

Hoover Dam Area

0 5 10 Kilometers

0 5 10 Miles

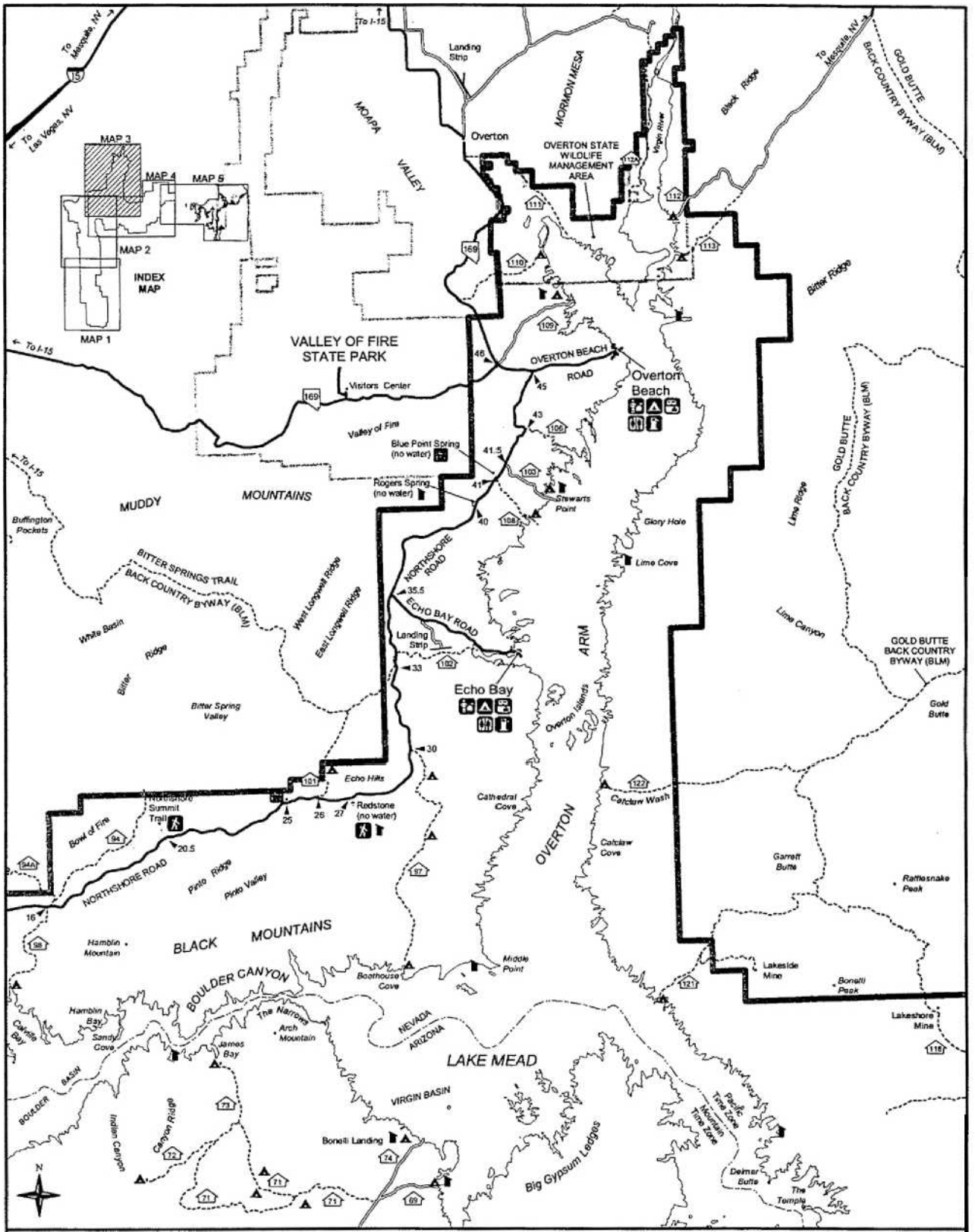
Ranger Station
Gasoline
Campground
Sanitary disposal station
Full service restroom
Hiking Trail
Emergency Call Box
Backcountry Toilet
Primitive Camping (no water)
Lake Mead NRA Approved Backcountry Road

NEVADA

ELDORADO
POWERLINE ROAD. NV
AZTEC WASH ROAD
FIRE MOUNTAIN COVE ROAD
MONTANA WASH ROAD
46 EAGLE WASH ROAD
PLACER COVE ROAD
50... FORLORN HOPE SPRING ROAD
51. YUCCA CAMP ROAD
58 CANYON POINT ROAD
CANYON POINT MESA ROAD
BOY SCOUT CANYON ROAD
BURRO WASH ROAD
]5.....GOLDSTRIKE PASS ROAD
75A.....GOLDSTRIKE CANYON ROAD
75B.....GOLDSTRIKE PARALLEL ROAD
75C.....BLACK CANYON OVERLOOK ROAD
750.....PETROGLYPH WASH ROAD
76.....HEMENWAY WASH ROAD
76A .COTTONWOOD TREE ROAD
768 .....OLD HIGHWAY 93. NV
77.....CHOLLA FOREST ROAD
78.....BACK BAY ROAD
(SPURS 1-7)
78A.....BOX CANYON ROAD
78B.....SAODLE COVE ROAD
(SPURS I-Si
86 UPPER GYPSUM ROAD
89 8 0 MILE ROAD
50 CRAWDAD COVE ROAD
91 BOXCAR COVE ROAD
92 WEST END WASH ROAD NORTH
93 WEST END WASH ROAD SOUTH
154 WEST RIVER MOUNTAINS ROAD
154A.....RIDGE ROAD
155 RIVER MOUNTAINS
SOUTH POWERLINE ROAD
155A.....RED MOUNTAIN ROAD

ARIZONA

52 GOLD BUG MINE ROAD
52 O ELDORADO
POWERLINE ROAD. AZ
FIRE MOUNTAIN ROAD
530.....SHEEP TANK ROAD
54 ELDORADO JEEP TRAIL
55.....JUMBO WASH -
WEST FORK ROAD
55A ... MALPAIS MESA ROAD
55B MESA VIEW ROAD
56.....JUMBO WASH ROAD
57.....MEAD-LIBERTYIPHOEN IX
POWERLINE ROAD
57A BIGHORN COVE ROAD
61.....CRANES NEST ROAD
62.....OLD RANGER STATION ROAD
63 .OLD HIGHWAY 93. AZ
63A.....2Bs MINE ROAD
6t.....BOUNDARY MINE ROAD
65.....BLACK JOE MINE ROAD
66 ..... WHITE ROCK CANYON ROAD
66A.....HORSE THIEF CANYON ROAD
69.....BONELLI BAY ROAD
70.....KINGMAN WASH ROAD
70A.....KINSMAN WASH SOUTH
MINE ROAD
708.....KINGMAN WASH NORTH
MINE ROAD
70C..... FORTIFICATION HILL ROAD
71..... COHENOUR LOOP ROAD
72.....INDIAN PASS ROAD
73.....GILBERT CANYON ROAD
74.....BONELLI LANDING ROAD
130.....WILDERNESS ACCESS ROAD
131.....DETRITAL WASH ROAD



Lake Mead National Recreation Area
Approved Backcountry Roads (Map 3)

Overton Arm

0 5 10 Kilometers

0 5 10 Miles

Ranger Station
Gasoline
Campground
Sanitary disposal station
Pay Service restroom
Hiking Trail
Emergency Call Box
Backcountry Toilet
Primitive Camping (no water)
Lake Mead NRA Approved Backcountry Road

Access from Northshore Road

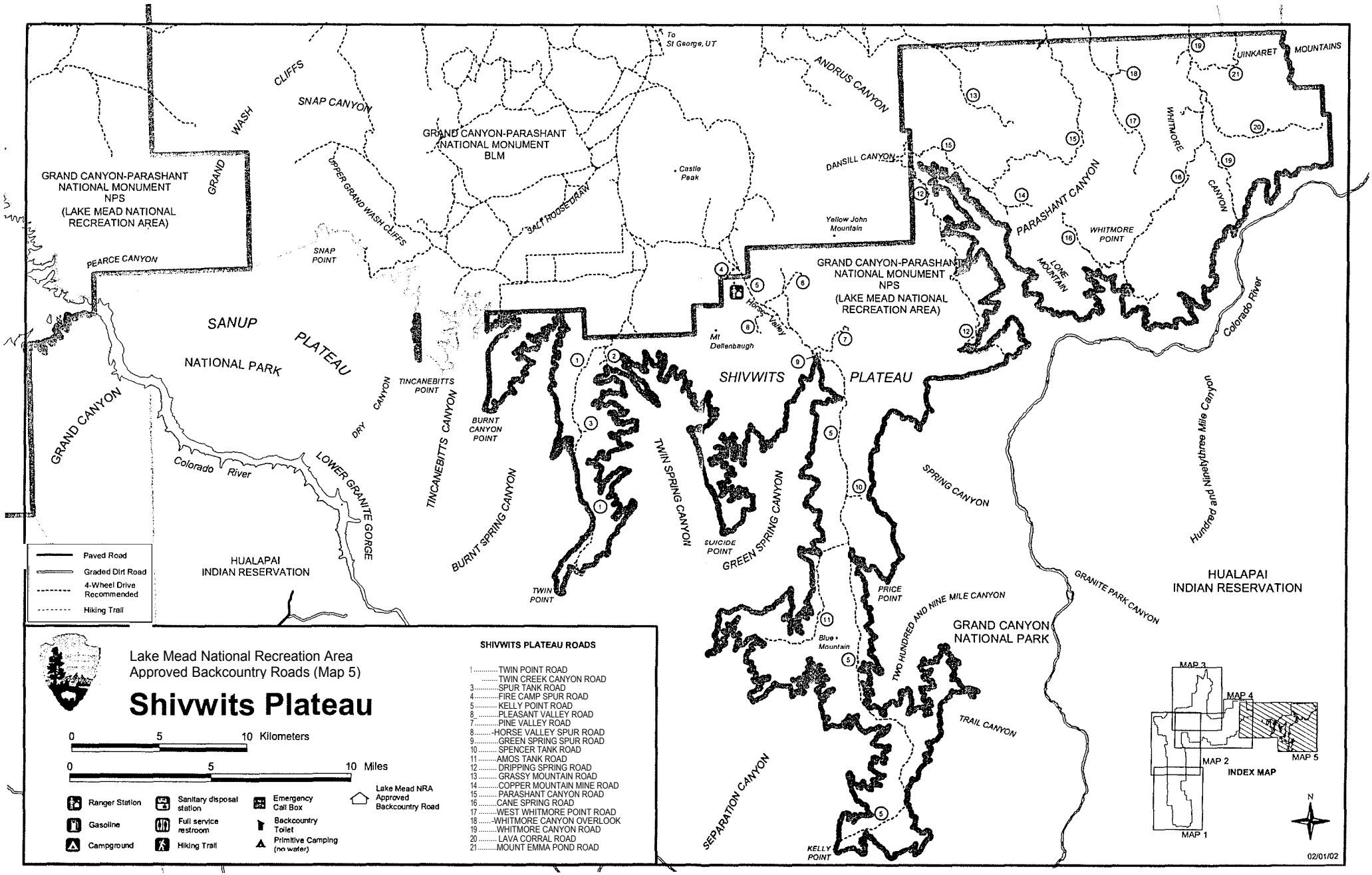
94 ..... CALLVILLE WASH NORTH ROAD
94A ..... ANNIVERSARY MINE ROAD
97 ..... BOATHOUSE COVE ROAD
98 ..... CALLVILLE WASH SOUTH ROAD
101 ..... BITTER SPRING ROAD
101E ..... ECHO WASH ROAD
103 ..... STEWARTS POINT ROAD
106 ..... FIRE COVE ROAD
108 ..... BLUE POINT BAY ROAD

Other Access

109 ..... OLD ST THOMAS ROAD
110 ..... SAND MINE ROAD
111 ..... MUDDY RIVER ROAD
112 ..... VIRGIN RIVER ACCESS ROAD
112A ..... VIRGIN RIVER WEST ROAD
113 ..... NARROWS ROAD NORTH
116 ..... SCANLON FERRY ROAD
121 ..... LAKESIDE BAY ROAD
122 ..... CATCLAW WASH ROAD

Paved Road
Graded Dirt Road
4-Wheel Drive Recommended
Hiking Trail
Mileposts

02/01/02


Lake Mead National Recreation Area
Approved Backcountry Roads (Map 5)
Shivwits Plateau
0 5 10 Kilometers
0 5 10 Miles
Ranger Station
Gasoline
Campground
Sanitary disposal station
Full service restroom
Hiking Trail
Emergency Call Box
Backcountry Toilet
Primitive Camping (no water)
Lake Mead NRA Approved Backcountry Road
Paved Road
Graded Dirt Road
4-Wheel Drive Recommended
Hiking Trail
SHIVWITS PLATEAU ROADS
1 TWIN POINT ROAD
TWIN CREEK CANYON ROAD
3 SPUR TANK ROAD
4 FIRE CAMP SPUR ROAD
5 KELLY POINT ROAD
8 PLEASANT VALLEY ROAD
7 PINE VALLEY ROAD
8 HORSE VALLEY SPUR ROAD
9 GREEN SPRING SPUR ROAD
10 SPENCER TANK ROAD
11 AMOS TANK ROAD
12 DRIPPING SPRING ROAD
13 GRASSY MOUNTAIN ROAD
14 COPPER MOUNTAIN MINE ROAD
15 PARASHANT CANYON ROAD
16 CANE SPRING ROAD
17 WEST WHITMORE POINT ROAD
18 WHITMORE CANYON OVERLOOK
19 WHITMORE CANYON ROAD
20 LAVA CORRAL ROAD
21 MOUNT EMMA POND ROAD
GRAND CANYON-PARASHANT NATIONAL MONUMENT NPS (LAKE MEAD NATIONAL RECREATION AREA)
GRAND CANYON-PARASHANT NATIONAL MONUMENT BLM
SANUP PLATEAU
NATIONAL PARK
SHIVWITS PLATEAU
HUALAPAI INDIAN RESERVATION
GRAND CANYON NATIONAL PARK
To St George, UT
CLIFFS
WASH
SNAP CANYON
GRAND
UPPER GRAND WASH CLIFFS
SALT ROOSE DRAW
ANDRUS CANYON
DANSILL CANYON
UINKARET MOUNTAINS
WHITMORE CANYON
PARASHANT CANYON
WHITMORE POINT
LONE MOUNTAIN
Colorado River
Castle Peak
Yellow John Mountain
PEARCE CANYON
SNAP POINT
Horse Valley
Mt Dellenbaugh
TINCANEBITTS POINT
TINCANEBITTS CANYON
BURNT CANYON POINT
BURNT SPRING CANYON
TWIN SPRING CANYON
GREEN SPRING CANYON
SUICIDE POINT
TWIN POINT
SPRING CANYON
Hundred and Ninetythree Mile Canyon
PRICE POINT
TWO HUNDRED AND NINE MILE CANYON
GRANITE PARK CANYON
Blue Mountain
TRAIL CANYON
SEPARATION CANYON
KELLY POINT
GRAND CANYON
Colorado River
LOWER GRANITE GORGE
MAP 1
MAP 2
MAP 3
MAP 4
MAP 5
INDEX MAP
N
02/01/02

2. STATIONARY AND AREA SOURCE EMISSIONS

This section summarizes emissions from sources at Lake Mead NRA for the year 2000. The discussion is divided into sections covering emissions from combustion sources, fuel storage sources, and area sources. The following emissions were calculated for each source: particulate matter (PM_{10}), sulfur dioxide (SO_2), nitrogen oxides (NO_X), carbon monoxide (CO), and volatile organic compounds (VOCs). In addition to SO_2, a small amount of SO_3 emissions are generated during combustion processes. Emission factors used in the calculations are provided in Appendices A and B.

2.1 STATIONARY SOURCES

2.1.1 Space And Water Heating Equipment

While the majority of space and water heating equipment is electric at Lake Mead NRA, there are several propane space heating units. Criteria air emissions were calculated using the appropriate residential unit emission factors. For example, PM emissions from a propane heating unit at the Lake Mojave Resort are calculated as follows:

$$12{,}000\ gal/yr\ x\ \frac{0.4\ lb\ PM}{1{,}000\ gal} = 5\ lb\ PM/yr$$

Actual criteria pollutant emissions from space and water heating equipment are summarized in Table 2. Potential emissions also were calculated by assuming that the heating units were operated continuously during the year or 8,760 hours per year, and these emissions are summarized in Table 3.

TABLE 2: 2000 ACTUAL CRITERIA EMISSIONS FROM HEATING EQUIPMENT AT LAKE MEAD NRA

Location	Consumption (gal/yr)	PM_{10} (lbs/yr)	SO_2 (Ibs/yr)	NO_X (Ibs/yr)	CO (Ibs/yr)	VOC (Ibs/yr)
Lake Mead Drive Entrance Station	2,719	1	0	38	5	1
Lake Mead Blvd Entrance Station	2,532	1	0	35	5	1
Callville Bay Marina Maintenance	400	0	0	6	1	0
Callville Bay Marina Housing	12,300	5	0	172	25	4
Lake Mojave Resort	12,000	5	0	168	24	4
Total	29,951	12	0	419	60	10

TABLE 3: 2000 POTENTIAL CRITERIA EMISSIONS FROM HEATING EQUIPMENT AT LAKE MEAD NRA

Location	Consumption (gallyr)	PM_{10} (lbs/yr)	SO_2 (lbs/yr)	NOx (lbs/yr)	CO (lbs/yr)	VOC (lbs/yr)
Lake Mead Drive Entrance Station	7,659	3	0	107	15	2
Lake Mead Blvd Entrance Station	7,659	3	0	107	15	2
Callville Bay Marina Maintenance	4,787	2	0	67	10	1
Callville Bay Marina Housing	143,607	57	1	2,010	287	43
Lake Mojave Resort	7,659	3	0	107	15	2
Total	171,371	68	1	2,398	342	50

2.1.2 Generators

2.1.2.1 Generator Emissions - Actual

Emissions were calculated by multiplying the unit rating (kW) of the generators by an estimated annual run time (hr/yr) to get the kW-hr/yr, and the appropriate emission factors were then applied. For example, PM emissions from the diesel 60 kW generator at Echo Bay are calculated as:

$$60\ kW \times \frac{1{,}460\ hours}{year} \times \frac{1.34\ hp}{kW} \times \frac{0.00220\ lb\ PM}{hp\text{-}hr} = 258 lb PM/yr$$

Actual generator criteria emissions are summarized in Table 4.

2.1.2.2 Generator Emissions - Potential

Potential emissions were also calculated for the generators, and the same emission factors that were used to calculate the actual emissions were used to calculate these potential emissions. To calculate potential emissions, EPA guidance on the number of hours of operation to assume was adopted:

> EPA does not recommend the use of 8,760 hours per year (i.e., full-year operation) for calculating PTE (potential to emit) for emergency generators...The EPA believes that 500 hours is an appropriate default assumption for estimating the number of hours that an emergency generator could be expected to operate under worst-case conditions (EPA 1995c).

For generators that were actually operated more than 500 hours a year, potential hours were assumed to be 8,760 hours. Potential criteria generator emissions are summarized in Table 5.

TABLE 4: 2000 ACTUAL LAKE MEAD NRA GENERATOR CRITERIA EMISSIONS

Facility	Fuel	Number	Rating (kW)	Run Time (hrslyr)	Output (kW-hr/yr)	PM_{10} (lbs/yr)	SO_2 (lbs/yr)	NOx (lbs/yr)	CO (lbs/yr)	VOC (lbs/yr)
Boulder City Headquarters	Propane	1	15	26	390	0	1	2	0	0
Lake Mead Blvd Station	Propane	1	10	26	260	0	0	1	0	0
Lake Mead Drive Station	Propane	1	10	26	260	0	0	1	0	0
Shivwits Plateau Ranger Stn	Propane	1	20	26	520	0	1	2	1	0
Echo Bay	Diesel	1	60	1,460	87,600	258	241	3,639	784	295
Callville Bay	Diesel	1	50	25	1,250	4	3	52	11	4
Callville Bay	Diesel	1	125	25	3,125	9	9	130	28	11
Lake Mead Cruises	Diesel	1	50	26	1,300	4	4	54	12	4
	Total	8				275	256	3,881	836	314

Began operation in March 2001

TABLE 5: 2000 POTENTIAL LAKE MEAD NRA GENERATOR CRITERIA EMISSIONS

Facility	Fuel	Number	Rating (kW)	Run Time (hrs/yr)	Output (kW-hr/yr)	PM_{10} (lbs/yr)	SO_2 (lbs/yr)	NOa (lbs/yr)	CO (lbs/yr)	VOC (Ibs/yr)
Boulder City Headquarters	Propane	1	15	500	7,500	2	14	35	9	2
Lake Mead Blvd Station	Propane	1	10	500	5,000	1	9	24	6	1
Lake Mead Drive Station	Propane	1	10	500	5,000	1	9	24	6	1
Shivwits Plateau Ranger Stn	Propane	1	20	500	10,000	2	18	47	12	3
Echo Bay	Diesel	1	60	8,760	525,600	1,549	1,444	21,833	4,705	1,768
Callville Bay	Diesel	1	50	500	25,000	74	69	1,039	224	84
Callville Bay	Diesel	1	125	500	62,500	184	172	2,596	559	210
Lake Mead Cruises	Diesel	1	50	500	25,000	74	69	1,039	224	84
	Total	8				1,887	1,803	26,637	5,745	2,153

2.1.3 Fuel Storage Tanks

Lake Mead NRA has aboveground and underground gasoline storage tanks that serve the general public vehicles and boats. The park has no gasoline tanks for its vehicles since park-operated vehicles are refueled at off-site commercial gas stations. Emissions from fuel storage tanks were calculated using the EPA *TANKS 4.0* model. The gasoline tanks are equipped with Phase I vapor emission controls that capture vapors displaced from the vapor space in the tank when it is refilled. Emissions associated with gasoline dispensing are accounted for in the mobile source model.

There are two basic types of VOC emissions from storage tanks: working losses and standing losses. Working losses are composed of both withdrawal and refilling loss emissions. Withdrawal loss emissions result from the vaporization of liquid fuel residue on the inner surface of tank walls as the liquid levels in the tank are decreased and air is drawn into the tank. Refilling losses refer to fuel vapor releases to the air during the process of refilling the tank as the liquid level in the tank increases and pressurizes the vapor space. Standing losses describe those tank emissions from the vaporization of the liquid fuel in storage due to changes in ambient temperatures. VOC losses are also a direct function of the annual product throughput or turnovers. VOC emissions from gasoline storage tanks are summarized in Table 6.

TABLE 6: LAKE MEAD NRA GASOLINE STORAGE TANK EMISSIONS

Location	Number	Type	Volume (gal)	Throughput (gallyr)	VOC (lbs/yr)
Boulder Beach (Lake Mead Resort)	2	AST	10,000	250,000	5,340
Calville Bay	1	UST	35,000	377,656	2,812
	1	UST	12,000	125,885	937
Cottonwood Cove	1	UST	23,000	292,172	2,175
Echo Bay	4	UST	10,000	259,093	1,929
Lake Mohave Resort	3	UST	12,000	400,000	2,978
Las Vegas Boat	2	AST	15,000	21,760	5,967
	1	AST	6,000	86,400	3,440
	1	AST	1,000	16,000	760
NV Department of Wildlife	1	AST	5,000	12,000	2,292
Overton Beach Resort	2	UST	10,000	180,000	1,340
Temple Bar	2	AST	12,000	308,000	7,589
Willow Beach Harbor	1	AST	8,000	80,000	3,543
	1	AST	4,000	40,000	1,997
Totals	23			2,448,966	43,099

2.1.4 Wastewater Treatment Plants

There are no wastewater treatment plants at Lake Mead NRA.

2.2 AREA SOURCES

2.2.1 Woodstoves/Fireplaces

There are no woodstoves or fireplaces in Lake Mead NRA.

2.2.2 Campfires

There are eight campgrounds throughout Lake Mead NRA that accommodate tent and recreation vehicles (RVs). Park personnel provided estimates of the total number of campers at both NPS and concessionaire operated sites. It was estimated that only 25 percent of these were tent campers, with the remainder being RV campers. It was further assumed that only tent campers had campfires. There were an estimated 2.5 campers per campsite and that approximately 50 percent had an evening or morning campfire at each campsite. Assuming that each campfire site consumes approximately 10 lbs of wood, air emissions from campsites in 2000 were calculated and are summarized in Table 7.

TABLE 7: 2000 LAKE MEAD NRA CAMPFIRE EMISSIONS

Location	Campfires	Fuel (tons/yr)	PM_{10} (lbs/yr)	SO_2 (lbs/yr)	NO_X (lbs/yr)	CO (lbs/yr)	VOC (lbs/yr)
NPS Frontcountry	11,197	56	1,937	22	146	14,141	12,820
NPS Backcountry	14,433	72	2,497	29	188	18,229	16,526
Concessionaires	8,512	43	1,473	17	111	10,750	9,746
Total	34,141	171	5,906	68	444	43,120	39,092
			tons/yr				
			2.95	0.03	0.22	21.56	19.55

2.2.3 Prescribed and Wildland Fires

Wildland fires are ignited naturally, usually by lightning and are typically suppressed, while prescribed fires are ignited intentionally in order to achieve fire management objectives. Prescribed burning is a land treatment process to accomplish natural resource management objectives, including reducing the potential for destructive wildfires, eliminating excessive fuel buildup, controlling insects and disease, improving wildlife habitat and forage production,

maintaining natural succession of plant communities, and restoring natural processes. Only prescribed burning emissions are considered as anthropogenic emissions; however, to the extent that prescribed burning is conducted to achieve ecological benefit, the emissions could be considered natural.

The First Order Fire Effects Model (FOFEM) was used to estimate emissions from prescribed fires. FOFEM is a computer program developed by the Intermountain Fire Sciences Lab, U.S. Forest Service to predict the effects of prescribed fire and wildfire in forests and rangelands throughout the U.S. In particular, it quantifies emissions of PM_{10}, $PM_{2.5}$, CH_4, CO, and CO_2, which are summarized in Table 8 for wildfires only. In 2001, there were four very small prescribed fires that consumed less than one acre.

TABLE 8: AIR EMISSIONS FROM WILDLAND FIRES IN 2001 IN LAKE MEAD NRA

Fire Name	Acres	PM_{10} (lbs/yr)	PM2.5 (Ibs/yr)	VOC* (lbs/yr)	CO (lbs/yr)	CO_2 (lbs/yr)
Sagebrush	50	550	450	200	2,800	200,650
Salt Desert Shrub	50	900	800	300	4,600	373,450
Total	100	1,450	1,250	500	7,400	574,100

As methane (CH_4)

2.2.4 Miscellaneous Area Sources

Miscellaneous area sources include food preparation, degreasers, paints and other surface coatings, lighter fluid consumption, consumer solvents, propane use by visitors in recreational vehicles, and highway maintenance, such as paving materials. However, few data on these activities and products were available, and they are assumed to be negligible.

2.3 SUMMARY OF STATIONARY AND AREA SOURCE EMISSIONS

Table 9 summarizes the stationary and area source emissions calculated above in a format that allows comparison between the various sources as well as providing totals for each pollutant or pollutant category under consideration.

TABLE 9: SUMMARY OF 2000 STATIONARY AND AREA SOURCE EMISSIONS AT LAKE MEAD NRA

Activity	Particulates (PM_{10})		Sulfur Dioxide		Nitrogen Oxides		Carbon Monoxide		VOCs	
	lbs/yr	tons/yr	lbs/yr	tons/yr	lbs/yr	tons/yr	lbs/yr	tons/yr	lbs/yr	tons/yr
Stationary Combustion Sources										
Space and Water Heating Units	12	<0.01	0	0	419	0.21	60	0.03	10	<0.01
Generators	275	0.14	259	0.13	3,881	1.94	836	0.42	314	0.16
Gasoline Storage Tanks									43,099	21.55
Stationary Sources Subtotal	287	0.14	259	0.13	4,300	2.15	896	0.45	43,423	21.71
Area Sources										
Campfires	5,906	2.95	68	0.03	444	0.22	43,120	21.56	39,092	19.55
Wildfires	1,450	0.72	--	--	--	--	7,400	3.70	500	0.25
Area Sources Subtotal	7,356	3.68	68	0.03	444	0.22	50,520_	25.26	39,592	19.80
Totals										
	Particulates (PM_{10})		Sulfur Dioxide		Nitrogen Oxides		Carbon Monoxide		VOCs	
	lbs/yr	tons/yr	lbs/yr	tons/yr	lbs/yr	tons/yr	lbs/yr	tons/yr	lbs/yr	tons/yr
Totals without Wildfires	6,193	3.10	327	0.16	4,744	2.37	44,016	22.01	82,515	41.26
Totals with Wildfires	7,643	3.82	327	0.16	4,744	2.37	51,416	25.71	83,015	41.51

As methane

3. MOBILE SOURCE EMISSIONS

This section summarizes emissions from mobile sources at Lake Mead NRA for 2000. Mobile emission sources include highway and nonroad vehicles, including marine vessels and aircraft.

3.1 HIGHWAY VEHICLES

3.1.1 Visitor Vehicles

An estimated 2,658,360 visitor vehicles and 1,370 tour buses entered the park through approximately 15 points. Park officials estimate visitor data by these entrances and estimate that the visitor per vehicle ratio is approximately 3.3. Using these data and roadway distances to principal destination points, the vehicle miles traveled by visitor vehicles were calculated and are presented in Table 10.

TABLE 10: ESTIMATED VISITOR VEHICLE TRAVEL IN LAKE MEAD NRA

Entrance	Visitors	Vehicles	Road Length (miles)	Vehicle Miles Traveled
Boulder Beach Access from US 90	2,130,427	645,584	4	2,582,336
Lakeshore Road Eastbound	2,038,311	617,670	25	15,441,750
Lake Mead Boulevard	1,121,567	339,869	14	4,758,163
Kingman Wash	12,693	3,846	20	76,927
Northshore Road (Southbound/Overton)	470,921	142,703	32	4,566,507
Valley of Fire Access Road	300,826	91,159	8	729,275
Temple Bar Access Road	161,788	49,027	40	1,961,067
South Cove - Pearce Ferry Road	159,553	48,349	32	1,547,181
Miscellaneous Access to Lake Mead	870,600	263,818	10	2,638,182
Willow Beach Access Road	199,942	60,588	8	484,708
Cottonwood Cove Access Road	138,713	42,034	14	588,479
Katherine Access Road	1,032,490	312,876	10	3,128,758
Miscellaneous Access to Lake Mohave	134,758	40,836	12	490,029
Total	8,772,589	2,658,359	--	38,993,362

The majority of mobile source emissions can be categorized as either exhaust or evaporative emissions. Exhaust emissions are related to the combustion of fuel in the engine and include VOC, NOx, CO, and PM_{10}. Exhaust emissions are dependent on a number of factors, including engine load, engine design and age, combustion efficiency, emissions equipment such as catalytic converters, and other factors. Evaporative emissions, which can occur while the vehicle is running or at rest, are related to the volatilization of fuel from vapor expansion, leaks and seepage, and fuel tank vapor displacement. Evaporative emissions are primarily dependent on daily temperature cycles and fuel volatility. In addition to vehicle exhaust, PM_{10} emissions also

result from brake and tire wear, as well as the re-entrainment of dust from paved and unpaved roads (referred to as fugitive dust).

Emission factors produced by the USEPA MOBILE6.2 model were used in conjunction with VMT data in order to estimate mobile source emissions for VOC (both exhaust and evaporative), NOx, CO, and PM,o (exhaust, brake, and tire) for visitor vehicles. MOBILE6.2 produces exhaust and evaporative emission factors for light duty gasoline vehicles, light duty gasoline trucks, heavy duty gasoline vehicles, light duty diesel vehicles, light duty diesel trucks, heavy duty diesel vehicles, and motorcycles. It also produces a composite emission factor for all vehicles based on the vehicle VMT mix supplied to the model. Inputs to the model include average vehicle speed, vehicle VMT mix, inspection and maintenance (UM) program information, fuel information, ambient temperature data, elevation, and others. Fugitive PM_{10} emissions resulting from tire-roadway interaction were based on EPA's road dust emission factors.

The MOBILE6.2 model are typically used to support planning and modeling efforts in urban or regional areas and include default inputs suited for these applications. Therefore, it is suitable for applications over large, regional transportation networks. Application of the MOBILE5b model required the utilization of unique inputs that were representative of mobile source activity within the park. In particular, it was necessary to utilize unique inputs for the visitor vehicle VMT mix and the vehicle age distribution. The Center for Environmental Research and Technology within the College of Engineering at the University of California's Riverside Campus (CE-CERT) established park-specific vehicle fleet characterizations in developing air emission inventories for Zion National Park (CE-CERT, 2001). CE-CERT found that the distribution of vehicle ages in the park reflected a larger fraction of newer vehicles compared to the general vehicle population. The park-specific mix vehicle types and vehicle age distribution developed by CE-CERT have been applied in the mobile modeling for Lake Mead NRA.

In addition to park-specific age distribution, CE-CERT also developed park-specific modeling inputs for driving patterns that differ significantly from the default driving patterns typically used in mobile modeling, such as the Federal Test Procedure (FTP). In particular, they found that the FTP reflects both higher speeds and a wider range of speeds than observed in national parks. However, since the MOBILE6.2 model is not designed to readily incorporate unique driving pattern data, the default driving cycle remains the basis for the mobile source emission estimates provided here.

Other important mobile modeling inputs that can significantly affect mobile emission factors are

the average speed, fuel characteristics, and I/M program parameters. The average speed input to the mobile model was 35 mph, fuel volatility was assumed to be Reid vapor pressure (RVP) of 9 (summer) and 14.1 (winter), and reformulated gasoline (RFG) was not assumed to be present. Finally, UM program inputs were not included since there are no I/M programs in the areas near the park.

In order to account for seasonal differences in mobile emissions, separate MOBILE6.2 runs were performed to produce emission factors for winter and summer. A composite emission factor for each season, reflecting a park specific VMT mix adapted from CE-CERT, served as the basis for mobile source emission estimates. Additional particulate emissions (or entrained road dust) from vehicles operating on paved roads in Lake Mead NRA also were calculated based on VMT. A summary of visitor vehicle emissions is provided in Table 14 at the end of this section.

3.1.2 GSA/NPS Highway Vehicles

Lake Mead NRA operates a fleet of highway vehicles that are owned by the NPS or leased from the General Services Administration (GSA). Emission factors that were specific to vehicle classes (e.g., LDGVs) were used to estimate emissions from the NPS and GSA vehicles. A summary of NPS and GSA vehicles and their estimated annual mileage is provided in Table 11, and emissions are summarized in Table 14 at the end of this section.

TABLE 11: **NPS** AND GSA ROAD VEHICLES AT LAKE MEAD NRA

Vehicle Type	Number	Annual Usage (mi/yr)
Light Duty Gasoline Vehicles (LDGV)		
Autos	37	249,585
Light Duty Gasoline Trucks (LDGT)		
Pickups	122	610,060
Sport Utility Vehicles	32	283,641
Vans	11	30,852
Suburbans	4	30,668
Heavy Duty Gasoline Vehicles (HDGV)		
Ambulances	5	464
Heavy Duty Diesel Trucks (HDDT)		
Fire Trucks	6	2,600
Dump Trucks	3	1 1,200
Buses	2	15,000
Heavy-Duty Trucks	2	13,100
Total	231	1,247,945

N.A. - Not Available

3.2 NPS NONROAD VEHICLES

The NPS also owns and operates nonroad motorized equipment that is used to maintain roads and grounds and for other purposes. There are records of the Lake Mead NRA equipment inventory, and park officials estimated usage data, which are noted in Table 12. Annual usage and mission factors from the USEPA nonroad emission database were used to calculate annual emissions that are provided in Table 14.

TABLE 12: NPS NONROAD VEHICLES AT LAKE MEAD NRA

Vehicle Type	Number	Annual Usage (hrs/yr)
Utility Carts	28	10,590
Backhoes	15	4,238
Dozers	3	912
Compressors	13	400
Sweepers	2	60
Chainsaws	57	6,285
Forklifts	14	8,020
Cranes	2	200
ATVs	4	300

3.3 MARINE VESSELS

Water-based activities are the principle recreation activities in the park. Data on marine vessels and estimated operation hours by public, including rental, marine vessels were obtained from a lake management plan (NPS 2001). Analogous data for NPS owned and operated marine vessels were provided by park personnel. A summary of these data are provided in Table 13, and emission factors for the various types of marine vessels are provided in Appendix B.

TABLE 13: LAKE MEAD NRA MARINE VESSEL EMISSIONS

Marine Vessel *Type*	Engine *Power (hp)*[1]	*Hours of* Operation	*HC* (lb/yr)	*CO* (lb/yr)	NO_x (lb/yr)	*PM* (lb/yr)
Public** Marine **Vessels						
<*30 HP* Outboard[1]	*20*	13,846	14,900	*29,609*	*152*	*986*
>*30 HP* Outboard[1]	*50*	*38,829*	104,464	*207,582*	*1,068*	6,912
4-Stroke Outboard[2]	*90*	*65,553*	*40,697*	925,183	*20,349*	164
Inboard/Outboard[2]	*200*	371,881	513,056	11,663,433	*256,528*	*2,063*
Inboard[2]	*200*	122,263	1,315,726	2,614,495	13,453	*87,052*
Inboard *Jet*[2]	*200*	*26,320*	*283,241*	*562,832*	*2,896*	*18,740*
Personal Watercraft[1]	155	170,009	1,417,895	2,817,515	14,498	*93,812*
Personal Watercraft[2]	*155*	*30,028*	*250,437*	*497,646*	2,561	16,570
		Public Total	3,940,418	19,318,294	311,506	226,297
***NPS Marine* Vessels**						
Barge[1]	*150*	*500*	*4,036*	8,019	41	*267*
	550	*600*	*17,756*	*35,284*	*182*	1,175
	225	*700*	*8,475*	*16,840*	*87*	*561*
	60	*625*	*2,018*	4,010	*21*	134
	90	15	*73*	144	1	5
	115	100	*619*	1,230	*6*	*41*
Motor *Boat*[1]	*220*	*800*	*9,470*	18,818	*97*	*627*
	25	*3,000*	*4,036*	8,019	41	*267*
	40	*3,200*	*6,887*	*13,686*	*70*	*456*
Chase Boat[1]	150	*5,000*	*40,355*	80,191	413	*2,670*
Ferry Boat[1]	125	*5,000*	*33,630*	*66,826*	*344*	*2,225*
Fire Boat	*200*[2]	*5,000*	*53,807*	106,921	*550*	*3,560*
	70	*350*	1,318	*2,620*	13	*87*
Fishing Boat[1]	15	*700*	*565*	1,123	*6*	*37*
	40	100	*215*	428	*2*	14
	25	*280*	*377*	*748*	4	*25*
Float *Boat*[1]	*60*	*9,600*	*30,993*	61,586	*317*	2,051
		NPS Totals	214,629	*426,492*	2,195	14,200
		Park Totals	4,155,047	19,744,785	313,700	240,498

1 Two-stroke gasoline *engines*
2 Four-stroke gasoline *engines*
3 *An average load factor of* 0.21 *was* applied *to* all rated *hp*

3.4 AIRCRAFT

The park operates a Cessna aircraft, and data on operating hours and landings and takoffs were provided by park officials. There are two paved airstrips and two dirt airstrips that are used by private transient aircraft on an intermittent basis; however, there were no data on number of operations or types of aircraft.

The approved method for calculating emissions from aircraft is based on the Federal Aviation Administration (FAA) model titled *Emissions and Dispersion Model System (EDMS),* and this model calculates emissions only during the take-off and landing cycle. These take-off and landing emissions were calculated using *EDMS,* and they are summarized in Table 14.

3.6 SUMMARY OF MOBILE SOURCE EMISSIONS

Table 14 summarizes the mobile source emissions calculated above in a format that allows comparison between the various sources as well as providing totals for each pollutant or pollutant category under consideration.

TABLE 14: SUMMARY **OF 2000 MOBILE** SOURCE EMISSIONS AT **LAKE MEAD NRA**

Activity	Particulates (PM i0)		Sulfur Dioxide		Nitrogen Oxides		Carbon Monoxide		VOCs	
	lbs/yr	tons/yr	lbs/yr	tons/yr	lbs/yr	tons/yr	lbs/yr	tons/yr	lbs/yr	tons/yr
Road Vehicles										
Visitor Vehicles	80,160[1]	40.08	--	--	415,940	207.97	1,090,240	545.12	71,540	35.77
Visitor Buses	60[1]	0.03	--	--	760	0.38	100	0.05	20	0.01
NPS/GSA Road Vehicles	2,400[1]	1.20	--	--	17,380	8.69	48,220	24.11	2,800	1.40
Road Vehicle Emission Subtotal	82,620[1]	41.31	--	--	434,080	217.04	1,138,560	569.28	74,360_	37.18
Nonroad Vehicles										
NPS Nonroad Vehicles	3,629	1.81	--	--	20,170	10.08	9,651	4.83	4,405	2.20
Public Marine Vessels	226,297	113.15	--	--	311,506	155.75	19,318,294	9,659.2	3,940,418	1,970.2
NPS Marine Vessels	14,200	7.10	--	--	2,195	1.10	426,492	213.25	214,629	107.31
Aircraft	--	--	--	--	28	0.01	8,610	4.31	210	0.11
Nonroad Vehicle Emission Subtotal	244,126	122.06	--	--	333,899	166.95	19,763,047	9,881.5	4,159,662	2,079.8
Totals										
	Particulates (PM, 0)		Sulfur Dioxide		Nitrogen Oxides		Carbon Monoxide		VOCs	
	lbs/yr	tons/yr	lbs/yr	tons/yr	lbs/yr	tons/yr	lbs/yr	tons/yr	lbs/yr	tons/yr
Totals	326,746	163.37	--	--	767,979	383.99	20,901,607	10,450	4,234,022	2,117.0

[1] Includes exhaust PM 1 o and road dust

4. LAKE **MEAD** NRA **AND REGIONAL EMISSION SUMMARY**

4.1 LAKE **MEAD** NRA **SUMMARY**

A summary of Lake Mead NRA emissions is provided in Table 15.

TABLE 15: ESTIMATED ANNUAL EMISSIONS FROM LAKE MEAD NRA

Source	PM~p (tons)	SO_2 (tons)	NO_X (tons)	CO (tons)	VOCs (tons)
Point Sources					
Space and Water Heaters	<0.01	0	0.21	0.03	<0.01
Generators	0.14	0.13	1.94	0.42	0.16
Gasoline Storage Tanks	--	--	--	--	21.55
Subtotal	0.14	0.13	2.15	0.45	21.71
Area Sources					
Campfires	2.95	0.03	0.22	21.56	19.55
Prescribed Burning	0.72	--	--	3.70	0.25
Subtotal	3.68	0.03	0.22	25.26	19.80
Mobile Sources					
Road Vehicles	41.31	--	217.04	569.28	37.18
Nonroad Vehicles	1.81	--	10.08	4.83	2.20
Marine Vessels	120.25	--	156.85	9,872.45	2,077.51
Aircraft	--	--	0.01	4.31	0.11
Subtotal	163.37	-=	383.98	10,450.87	2,117
Totals					
Totals	167.19	0.16	386.35	10,476.58	2,158.51

As methane

4.2 **Regional Air Emissions**

Emission estimates for Clark County, NV and Mohave County, AZ and the State of Nevada were obtained from the 1999 National Emission Inventory (NEI) maintained by USEPA. It is important to note that differences may exist between the methodologies used to generate the park emission inventory and those used to generate the NEI. For example, here gasoline storage tanks have been included as stationary sources, while the NEI treats them as area sources. Table 16 provides a comparison of Lake Mead NRA emissions with those from the surrounding counties and the state. For all pollutants, Lake Mead NRA emissions account for less than 1 percent of the surrounding county point source emissions. However, compared to total mobile sources in the two counties, mobile sources operating on park property account for approximately 5, 3, and 1 percent of VOC, CO, and PM_{10} emissions, respectively.

TABLE 16: ESTIMATED ANNUAL EMISSIONS FROM LAKE MEAD NRA, SURROUNDING COUNTIES, AND THE STATE OF NEVADA

Area	PM~p (tons/yr)	SO_2 (tons/yr)	NO_X (tons/yr)	CO (tons/yr)	VOC (tons/yr)
	Point Sources				
Lake Mead NRA Total	0.14	0.13	2.15	0.45	21.71
Clark County, NV	2,758	42,763	31,562	13,478	228
Mohave County, AZ	17	3	670	62	79
Surrounding County Total	2,775	42,766	32,232	13,540	307
Nevada Total	13,608	51,470	46,557	15,226	899
Arizona Total	32,013	175,796	173,171	26,577	22,718
	Area Sources				
Lake Mead NRA Total	3.68	0.03	0.22	25.26	19.80
Clark County, NV	50,606	1,425	2,679	27,690	17,690
Mohave County, AZ	399	69	966	3,730	2,849
Surrounding County Total	51,005	1,494	3,645	31,420	20,539
Nevada Total	90,458	3,232	8,969	86,207	38,900
Arizona Total	18,226	3,259	51,240	163,548	106,814
	Mobile Sources				
Lake Mead NRA Total	163.37	--	383.98	10,450.87	2,117
Clark County, NV	13,902	6,443	60,170	309,235	35,995
Mohave County, AZ	379	528	8,765	47,358	5,307
Surrounding County Total	14,281	6,971	68,935	356,593	41,302
Nevada Total	82,602	10,109	109,020	547,460	64,720
Arizona Total	13,757	19,231	236,151	1,263,163	137,114

5. COMPLIANCE AND RECOMMENDATIONS

5.1 COMPLIANCE

The Clark County Department of Air Quality Management (DAQM) is the governing authority for regulating air pollution in the park. Park personnel should continue to coordinate with the agency on permit issues relating to stationary sources, as well as prescribed burning activities. Prior to replacing or adding relatively large heating units, generators, and fuel storage tanks, the appropriate agency should be consulted regarding the need to obtain a permit to construct or a •peiniit to operate such sources. For example, the Air Quality Regulations of DAQM Section 0 excludes from its definition of stationary sources:

- Fuel burning equipment that aggregates to a maximum input rate of less than 10 million Btu per hour
- Emergency standby generators with a brake horsepower rating of less than 500 hp or 373 kW.
- Stationary internal combustion engines with a brake horsepower rating of less than 35 hp or 26 kW.

The park's Utility Branch indicated that it began operating a 60 kW generator at Echo Bay for four hours a day beginning in March 2001. Since this unit is greater than 26 kW and does not appear to be just an emergency standby generator, park officials should investigate the need to obtain a permit from the Clark County DAQM for its continued use.

The Clark County DAQM also has exemptions to open burning regulations that may apply to visitor activities in the park. Section 42 of the AQR exempts "small fires for recreational, educational, ceremonial, cooking purposes, including barbecues and outdoor fireplaces." Measures to prevent the creation of fugitive dust also must be taken. For example, Section 41 of the AQR requires that persons handling, transporting, or storing materials take reasonable precautions to prevent particulate matter from becoming airborne. These regulations are included in Appendix E of this report. Generally, the park is in compliance with these regulations with the possible exception of the new generator at Echo Bay, as noted above.

5.2 RECOMMENDATIONS

An initial recommendation is for the park to institute a more detailed recordkeeping system to monitor its energy use and cost by fuel type and end consumer (e.g., work-related buildings, residences, and vehicles). The FY2001 Energy Management Data Report, which is a park-wide

annual energy reporting form, for Lake Mead NRA contained data for electricity consumption by buildings and other facilities and diesel fuel consumed by vehicles. However, there were no data for propane consumption by facilities or generators or gasoline by park equipment. Although park road vehicles are refueled off-site at commercial facilities, it would be of interest to track total gasoline usage over time to ascertain increasing or decreasing gasoline consumption trends. In addition, these data provide a baseline against which to measure gasoline displacement by newly acquired CNG vehicles. Gasoline is also used within the park by nonroad equipment, such as grounds keeping equipment, and this should also be tracked. Finally, with the installation of a CNG refueling station, the consumption of CNG should be tracked and reported on the annual energy data form.

Actions to promote sustainable development in the design, retrofit, and construction of park facilities have associated air quality benefits. These include actions that reduce or replace consumption of conventional fossil fuels and/or reduce the consumption of other resources. Reductions in potable and non-potable water consumption also achieve concurrent reductions in energy consumption and associated air emissions. Acquisition of energy efficient appliances whenever possible also is an incremental energy saving measure that has associated air quality benefits.

The park has undertaken several actions that reduce emissions and the use of energy and water. These include:

- A 1.2 kW photovoltaic/hybrid system at the remote Shivwets Ranger Station.
- 12 solar parking lot lights at the South Cove boat launch and parking area.
- Construction of one of four planned 2.5 kW photovoltaic roof-mounted arrays to provide solar-generated power to four entrance stations.
- Solar lighting on public courtesy docks at six locations, including Overton Beach, Echo Bay, Cailville Bay, Government Wash, Hemenway Harbor, and Temple Bar.
- Installation of waterless urinals.

With respect to alternative fuel vehicles, the park recently procured nine compressed natural gas (CNG) bi-fuel vehicles, including eight pickups and one sedan. In February 2002, the park opened a slow-fill CNG refueling facility that can refuel six vehicles simultaneously. The park is a member of the Las Vegas Regional Clean Cities Coalition that consists of approximately 100 stakeholders representing over 50 public and private organizations in the area. Through 2001, there were over 3,000 alternative fuel vehicles operating in the Las Vegas Valley.

The park also should consider the utilization of biodiesel fuels for its diesel-fueled equipment. Many of the National Park units, particularly in the western states, have implemented B20, a mixture of 20 percent biodiesel and 80 percent petroleum diesel. In addition to Yellowstone and Grand Teton NPs, Grand Canyon NP is planning to implement B20. The primary benefit of B20 is a reduction of 10, 11, and 21 percent of PM_{10}, CO, and VOC emissions, respectively, relative to petroleum diesel (EPA 2002). Emissions of NOx, however, increase by approximately 2 percent. The park could learn from the implementation experience of Grand Canyon NP and utilize the resources available from Las Vegas Regional Clean Cities Coalition to locate convenient, cost-efficient supplies of B20 locally.

The majority of the marine vessels operated by the NPS are equipped with 2-stroke engines. As these engines and vessels are replaced, models with 4-stroke engines should be procured. Four-stroke engines produce significantly lower PM_{10} and VOC emissions compared to 2-stroke models. However, NOx and CO emissions would increase.

Marine engines are estimated to produce about 95 percent of both CO and VOC emissions that are generated by stationary, area, and mobile sources within the park. Except for NOx emissions, emissions from marine vessels operated by the public on Lake Meredith NRA far exceed emissions from visitor road vehicles. However, over time levels of VOC emissions will decrease as new marine gasoline engines that meet 1996 EPA standards are phased in. Covered by the rule are outboard engines and gasoline marine engines used in personal watercraft and jet boat applications. Once the program is fully implemented, VOC emissions from outboard and personal watercraft (OB/PWC) marine engines are expected to be reduced by over 75 percent from present levels. Since the reduction in the inventory depends on sales of these newer technology engines, EPA expects to achieve a 50 percent reduction in VOC emissions from marine engines by the year 2020 and a full phase in by the year 2025.

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APPENDIX A

FUEL DATA AND EMISSION FACTORS

FUEL DATA

Fuel	Heating Value	Sulfur Content
No. 2 Distillate Fuel Oil/Diesel	140,000 Btu/gal	0.05% by weight
Natural Gas	1,050 Btu/ft^3	2,000 grains/10^6 ft^3
Propane	91,500 Btu/gal	0.18 grains/100 ft^3

STATIONARY SOURCE EMISSION FACTORS - BOILERS/HEATING UNITS

DISTILLATE OIL (DF-2) - CRITERIA POLLUTANTS

Combustor Type	Emission Factor (lb/1,000 gal fuel burned)				
	PM[a]	SO_2[b]	NO_X[e]	CO	VOC[d]
Residential Furnace[e]	0.4	142S	18	5	0.713
Boilers < 100 Million Btu/hr (Commercial/Institutional Combust.[f])	2	142S	20	5	0.34
Boilers < 100 Million Btu/hr (Industrial Boilers[g])	2	142S	20	5	0.2
Boilers > 100 Million Btu/hr (Utility Boilers[h])	2	157S	24	5	--

Source: AP-42, 5th Edition, Supplements A, B, C, D, and E, Tables 1.3-1 and 1.3-3.

NATURAL GAS - CRITERIA POLLUTANTS

Combustor Type (MMBtu/hr Heat Input)	Emission Factor (lb/10^6 ft^3 fuel burned)				
	PM[j]	SOS	NO_X[ce>]	CO	VOC
Residential Furnaces (<0.3)					
-Uncontrolled	7.6	0.6	94	40	5.5
Tangential-Fired Boilers (All Sizes)					
-Uncontrolled	7.6	0.6	170	24	5.5
-Controlled-Flue gas recirculation	7.6	0.6	76	98	5.5
Small Boilers (<100)					
-Uncontrolled	7.6	0.6	100	84	5.5
-Controlled-Low NO_X burners	7.6	0.6	50	84	5.5
-Controlled-Low NO_X burners/Flue gas recirculation	7.6	0.6	32	84	5.5
Large Wall-Fired Boilers (>100)					
-Uncontrolled (Pre-NSPS)[k]	7.6	0.6	280	84	5.5
-Uncontrolled (Post-NSPS)[k]	7.6	0.6	190	84	5.5
-Controlled-Low NO_X burners	7.6	0.6	140	84	5.5
-Controlled-Flue gas recirculation	7.6	0.6	100	84	5.5

Source: AP-42, 5th Edition, Supplements A, B, C, D, and E, Tables 1.4-1 and 1.4-2.

STATIONARY SOURCE EMISSION FACTORS - BOILERS/HEATING UNITS (Continued)

PROPANE (LPG) - CRITERIA POLLUTANTS					
Combustor Type	Emission Factor (lb/1,000 al fuel burned)				
	PM[a]	SOP[b]	NO,,[c]	CO	VOC[d]
Commercial Boilers[f]	0.4	0.10S	14	1.9	0.3
Industrial Boilers[g]	0.6	0.10S	19	3.2	0.3
Source: AP-42, 5th Edition, Supplements A, B, C, D, and E, Table 1.5-1.					

STATIONARY SOURCE EMISSION FACTORS - GENERATORS

For generators rated at less than or equal to 448 kW (600 hp):

Fuel Type	Emission Factor (lb/hp-hr)				
	PM	SO_X	NO,,	CO	VOC
DF-2	2.20 E-03	2.05 E-03	0.031	6.68 E-03	2.51 E-03
Gasoline	7.21 E-04	5.91 E-04	0.011	0.439	0.022
Natural Gas/Propane	1.54 E-04	7.52 E-03(S)	3.53 E-03	8.6 E-04	1.92E-04
Source: AP-42, 5th Edition, Supplements A, B, C, D, and E, Table 3.3-1 and 3.1-1					

For generators rated at greater than 448 kW (600 hp):

Fuel Type	Emission Factor (lb/hp-hr)				
	PM	SO_X[b]	NO_X	CO	VOC
DF-2	0.0007	(8.09 E-03)S	0.024	5.5 E-03	6.4 E-04
Source: AP-42, 5th Edition, Supplements A, B, C, D, and E, Table 3.4-1.					

FIREPLACE EMISSION FACTORS

Fuel Type	Emission Factor (lb/ton)				
	PM°)	SO_X	NO_X(>	CO	VOC
Wood	34.6	0.4	2.6	252.6	229.0
Source: AP-42, 5th Edition, Supplements A, B, C, D, and E, Table 1.9-1.					

WOODSTOVE EMISSION FACTORS

Stove Type	Emission Factor (lb/ton)				
	PM[j]	SO,	NO,[,]	CO	VOC
Conventional	30.6	0.4	2.8	230.8	53
Noncatalytic	19.6	0.4	--	140.8	12
Catalytic	20.4	0.4	2.0	104.4	15
Source: AP-42, 5th Edition, Supplements A, B, C, D, and E, Table 1.10-1.					

STATIONARY SOURCE EMISSION FACTORS - SURFACE COATING OPERATIONS

Surface Coating Type	VOC Emission Factor (lb/gal)
Paint: Solvent Base	5.6
Paint: Water Base	1.3
Enamel: General	3.5
Lacquer: General	6.1
Primer: General	6.6
Varnish/Shellac: General	3.3
Thinner: General	7.36
Adhesive: General	4.4
Source: *Calculation Methods for Criteria Air Pollutant Emission Inventories*, AL/OE-TR-1994-0049, July 1994. Armstrong Laboratory.	

(a) PM = Filterable Particulate Matter.
(b) These factors must be multiplied by the fuel sulfur content (for example, if the sulfur content is 0.05%, then S equals 0.05).
(c) Expressed as NO_2.
(d) Emission factors given in AP-42 are actually for non-methane total organic compounds (NMTOC) which includes all VOCs and all exempted organic compounds (such as ethane, toxics and HAPs, aldehydes and semivolatile compounds) as measured by EPA reference methods.
(e) Unit Rating <300,000 Btu/hr.
(0 Unit Rating 2300,000 Btu/hr, but <10,000,000 Btu/hr.
(g) Unit Rating 310,000,000 Btu/hr, but <100,000,000 Btu/hr.
(h) Unit Rating 3100,000,000 Btu/hr.
(i) POM = Particulate POM only.
(j) PM = Filterable Particulate Matter + Condensible Particulate Matter.
(k) NSPS = New Source Performance Standard as defined in 40 CFR 60 Subparts D and Db. Post-NSPS units are boilers with greater than 250 MMBtu/hr of heat input that commenced construction, modification, or reconstruction after August 17, 1971, and units with heat input capacities between 100 and 250 MMBtu/hr that commenced construction, modification, or reconstruction after June 19, 1984.
(I) Emission factors are given on a fuel input basis (lb/MMBtu). To convert to a power output basis (lb/hp-hr), use an average brake-specific fuel consumption (BSFC) of 7,000 Btu/hp-hr.

APPENDIX B

EMISSION CALCULATIONS

2000 ACTUAL CRITERIA EMISSIONS FROM **HEATING** UNITS AT LAKE MEAD NRA

Location	Fuel	Number of Sources	Capacity (Btu/hr)		Consumption (gal/yr)	PM (Ibs/yr)	SO_2 (Ibs/yr)	NOx (lbs/yr)	CO (lbs/yr)	VOC (Ibs/yr)
Lake Mead Drive Entrance Station	Propane	1	80,000	80,000	2,719	1	0	38	5	1
Lake Mead Blvd Entrance Station	Propane	1	80,000	80,000	2,532	1	0	35	5	1
Callville Bay Marina Maintenance	Propane	1	50,000	50,000	400	0	0	6	1	0
Callville Bay Marina Housing	Propane	30	50,000	1,500,000	12,300	5	0	172	25	4
Lake Mohave Resort Heating Equipment	Propane	1	80,000	80,000	12,000	5	0	168	24	4
	Totals	34		1,790,000	29,951	12	0	419	60	9
Emission Factors from AP-42, Tables 1.5-1 for commercial boilers, 5=.05 Formula = Consumption (gal/yr) ' Emission Factor (lb/1,000 gal)						0.4	0.01	14.00	1.90	0.30

2000 POTENTIAL CRITERIA EMISSIONS FROM **HEATING UNITS** AT LAKE MEAD NRA

Location	Fuel	Number of Sources	Capacity (Btu/hr)		Consumption (gal/yr)	PM (lbs/yr)	SO_2 (Ibs/yr)	NO_h (Ibs/yr)	CO (Ibs/yr)	VOC (Ibs/yr)
Lake Mead Drive Entrance Station	Propane	1	80,000	80,000	7,659	3	0	107	15	2
Lake Mead Blvd Entrance Station	Propane	1	80,000	80,000	7,659	3	0	107	15	2
Callville Bay Marina Maintenance	Propane	1	50,000	50,000	4,787	2	0	67	10	1
Callville Bay Marina Housing	Propane	30	50,000	1,500,000	I43,607	57	1	2,010	287	43
Lake Mohave Resort Heating Equipment	Propane	1	80,000	80,000	7,659	3	0	107	15	2
	Totals	34		1,790,000	171,370	69	1	2,399	343	51
Emission Factors from AP-42, Tables 1.5-1 for commercial boilers, S=.05 Formula = Consumption (gal/yr) * Emission Factor (lb/1,000 gal)						0.4	0.01	14.00	1.90	0.30

2000 ACTUAL CRITERIA EMISSIONS FROM GENERATORS AT LAKE MEAD NRA

Emission Source	Location	Fuel	Number of Sources	Rating (kW)	Run Time (hrs/yr)	Output (kW-hr/yr)	PM (lbs/yr)	SO_2 (lbs/yr)	NO, (lbs/yr)	CO, (lbs/yr)	CO (lbs/yr)	VOC (lbs/yr)
National Park Service												
Generator	Boulder City Headquarters	Propane	1	15	26	390	0	1	2		0	0
Generator	Lake Mead Blvd Station	Propane	1	10	26	260	0	0	1		0	0
Generator	Lake Mead Drive Station	Propane	1	10	26	260	0	0	1		0	0
Generator	Shivwits Plateau Ranger Stn	Propane	1	20	26	520	0	1	2		1	0
	Propane Generator Totals		4	55			0	3	7		2	0
Emission Factors from AP-42, Chapter 3.1-1 for natural gas large uncontrolled gas turbines (lb/hp-hr), S = .18							1.54E-04	7.52E-03*S	3.53E-03		8.60E-04	1.92E-04
Formula = Emission Factor (lb/hp-hr) * 608 (g/kW-hr / lb/hp-hr) * Output (kW-hr/yr) / 453.6 (g/lb)												
Generator	Echo Bay	Diesel	1	60	1,460	87,600	258	241	3,639	134,992	784	295
Generator	Callville Bay	Diesel	1	50	25	1,250	4	3	52	1,926	11	4
Generator	Callville Bay	Diesel	1	125	25	3,125	9	9	130	4,816	28	11
Generator	Lake Mead Cruises	Diesel	1	50	26	1,300	4	4	54	2,003	12	4
	Diesel Generator Totals		4		1,536	*93,275*	275	256	3,875	143,737	835	314
Emission Factors from AP-42, Chapter 3.3 Table 3.3-1 for generators rated less than 448 kW							2.20E-03	0.00205	3.10E-02	1.15E+00	6.68E-03	2.51 E-03
Formula = Output (kW-hr/yr) * 1.34 (hp/kW) * Emission Factor (lb/hp-hr)												
						Park Totals (lbs/yr)	275	259	3,881		837	314
						Park Totals (tons/yr)	0.14	0.13	1.94		0.42	0.16

2000 POTENTIAL CRITERIA EMISSIONS FROM GENERATORS AT LAKE MEAD NRA

Emission Source	Location	Fuel	Number of Sources	Rating (kW)	Run Time (hrs/yr)	Output (kW-hr/yr)	PM (lbs/vr)	SO_2 (Ibs/yr)	NO, (lbs/yr)	CO_2 (Ibs/yr)	CO (Ibs/yr)	VOC (Ibs/yr)
					Na ogal Park Scrvicc							
Generator	Boulder City Headquarters	Propane	1	15	500	7,500	2	14	35		9	2
Generator	Lake Mead Blvd Station	Propane	1	10	500	5,000	1	9	24		6	1
Generator	Lake Mead Drive Station	Propane	1	10	500	5,000	1	9	24		6	1
Generator	Shivwits Plateau Ranger Stn	Propane	1	20	500	10,000	2	18	47		12	3
	Propane Generator Totals		4	55			6	50	130		32	7
Emission Factors from AP-42, Chapter 3.1-1 for natural gas large uncontrolled gas turbines (lb/hp-hr), S=.18 Formula = Emission Factor (lb/hp-hr) * 608 (g/kW-hr / lb/hp-hr) * Output (kW-hr/yr) / 453.6 (glib)							1.54E-04	7.52E-03*S	3.53E-03		8.60E-04	1.92E-04
Generator	Echo Bay	Diesel	1	60	8,760	525,600	1,549	1,444	21,833	809,950	4,705	1,768
Generator	Callville Bay	Diesel	1	50	500	25,000	74	69	1,039		224	84
Generator	Callville Bay	Diesel	1	125	500	62,500	184	172	2,596		559	210
Generator	Lake Mead Cruises	Diesel	1	50	500	25,000	74	69	1,039		224	84
	Diesel Generator Totals		4				1,881	1,753	26,507		5,712	2,146
Emission Factors from AP-42, Chapter 3.3 Table 3.3-1 for generators rated less than 448 kW Formula = Output (kW-hr/yr) * 1.34 (hp/kW) * Emission Factor (lb/hp-hr)							2.20E-03	0.00205	3.10E-02		6.68E-03	2.51E-03
						Park Totals (lbs/yr)					c	Ica
						Park Totals (tons/yr)	0.94	0.90	13.32		2.87	1.08
						Park Totals (tons/yr)	0.00	0.00	0.01		0.00	0.00

TANKS 4.0
Emissions Report - Summary Format
Tank Identification and Physical Characteristics

Identification

User Identification:	Boulder Beach
City:	Las Vegas
State:	Nevada
Company:	NPS
Type of Tank:	Horizontal Tank
Description:	10000

Tank Dimensions

Shell Length (ft):	17.00
Diameter (ft):	10.00
Volume (gallons):	10,000.00
Turnovers:	0.00
Net Throughput (gal/yr):	250,000.00
Is Tank Heated (yin):	N
Is Tank Underground (y/n):	N

Paint Characteristics

Shell Color/Shade:	Gray/Light
Shell Condition:	Good

Breather Vent Settings

Vacuum Settings (psig):	-0.03
Pressure Settings (psig):	0.03

Meteorological Data used in Emissions Calculations: Las Vegas, Nevada (Avg Atmospheric Pressure = 13.6 psia)

TANKS 4.0
Emissions Report - Summary Format
Liquid Contents of Storage Tank

Mixture/Component	Month	Liquid - Daily Liquid Surf. Temperatures (deg F) Avg.			Liquid - Bulk Temp. (deg F)	Liquid - Vapor Pressures (psia) Avg.	Min.	Max.	Vapor Mol. Weight	Liquid Mass Fract.	Vapor Mass Fract.	Mot. Weight	Basis for Vapor Pressure Calculations
Gasoline (RVP 8)	All	75.96	64.37	87.56	69.31	5.5126	4.4098	6.8262	68.0000			92.00	Option 4: RVP=8, ASTM Slope=3

TANKS 4.0
Emissions Report - Summary Format
Individual Tank Emission Totals

Annual Emissions Report

	Losses(lbs)		
Components	Working Loss	Breathing Loss	Total Emissions
Gasoline (R VP 8)	2,231.27	3,109.00	5,340.27

TANKS 4.0
Emissions Report - Summary Format
Tank Identification and Physical Characteristics

Identification

User Identification:	Callville Bay
City:	Las Vegas
State:	Nevada
Company:	NPS
Type of Tank:	Horizontal Tank
Description:	

Tank Dimensions

Shell Length (ft):	47.00
Diameter (ft):	11.25
Volume (gallons):	35,000.00
Turnovers:	0.00
Net Throughput (gal/yr):	377,656.00
Is Tank Heated (yin):	N
Is Tank Underground (y/n):	Y

Paint Characteristics

Shell Color/Shade:	
Shell Condition:	

Breather Vent Settings

Vacuum Settings (psig):	0.00
Pressure Settings (psig):	0.00

Meteorological Data used in Emissions Calculations: Las Vegas, Nevada (Avg Atmospheric Pressure = 13.6 psia)

TANKS 4.0
Emissions Report - Summary Format
Liquid Contents of Storage Tank

Mixture/Component	Month	Daily Liquid Surf. Temperatures (deg F) Avg	Min.	Max.	Liquid Bulk Temp. (deg F)	Vapor Pressures (psia) Avg.	Min.	Max.	Vapor Mol. Weight	Liquid Mass Fract.	Vapor Mass Fract.	Mol. Weight	Basis for Vapor Pressure Calculations
Gasoline (RVP 8)	All	66.51	66.51	66.51	66.07	4.5990	4.5990	4.5990	68.0000			92.00	Option 4: RVP=8, ASTM Slope=3

TANKS 4.0
Emissions Report - Summary Format
Individual Tank Emission Totals

Annual Emissions Report

	Losses(lbs)		
Components	Working Loss	Breathing Loss	Total Emissions
Gasoline (RVP 8)	2,812.00	0.00	2,812.00

TANKS 4.0
Emissions Report - Summary Format
Tank Identification and Physical Characteristics

Identification

User Identification:	Callville Bayl
City:	Las Vegas
State:	Nevada
Company:	NPS
Type of Tank:	Horizontal Tank
Description:	12000 Gal UST

Tank Dimensions

Shell Length (ft):	20.50
Diameter (ft):	10.00
Volume (gallons):	12,000.00
Turnovers:	0.00
Net Throughput (gal/yr):	125,885.00
Is Tank Heated (y|n):	N
Is Tank Underground (y/n):	Y

Paint Characteristics

Shell Color/Shade:	
Shell Condition:	

Breather Vent Settings

Vacuum Settings (psig):	0.00
Pressure Settings (psig):	0.00

Meteorological Data used in Emissions Calculations: Las Vegas, Nevada (Avg Atmospheric Pressure = 13.6 psia)

TANKS 4.0
Emissions Report - Summary Format
Liquid Contents of Storage Tank

Mixture/Comment	Month	Daily Liquid Surf. Temperatures (deg F) Avg.	Min.	Max.	Liquid Bulk Temp. (deg F)	Vapor Pressures (psia) Avg.	Min.	Max.	Vapor Mol. Weight	Liquid Mass Fract.	Vapor Mass Fract.	Mol. Weight	Basis for Vapor Pressure Calculations
Gasoline (RVP 8)	All	66.51	66.51	66.51	66.07	4.5990	4.5990	4.5990	68.0000			92.00	Option 4: RVP=8, ASTM Slope=3

TANKS 4.0
Emissions Report - Summary Format
Individual Tank Emission Totals

Annual Emissions Report

	Losses(lbs)			
Components	Working Loss	Breathing Loss	Total Emissions	
Gasoline (RVP 8)	937.33	0.00	937.33	

TANKS 4.0
Emissions Report - Summary Format
Tank Identification and Physical Characteristics

Identification

User Identification:	Cottowood Cove
City:	L
State:	Nevada
Company:	NPS
Type of Tank:	Horizontal Tank
Description:	23000 gal AST

Tank Dimensions

Shell Length (ft):	38.00
Diameter (ft):	10.00
Volume (gallons):	23,000.00
Turnovers:	0.00
Net Throughput (gal/yr):	292,172.00
Is Tank Heated (yin):	N
Is Tank Underground (y/n):	Y

Paint Characteristics

Shell Color/Shade:	
Shell Condition:	

Breather Vent Settings

Vacuum Settings (psig):	0.00
Pressure Settings (psig):	0.00

Meteorological Data used in Emissions Calculations: Las Vegas, Nevada (Avg Atmospheric Pressure = 13.6 psia)

TANKS 4M

Emissions Report - Summary Format
Liquid Contents of Storage Tank

Mixture/Component	Month	Daily Liquid Surf. Temperatures (deg F) Avg	Min.	Max.	Liquid Bulk Temp. (g F)	Vapor Pressures (psia) Avg.	Min.	Max.	Vapor Mal. Weight	Liquid Mass Fract.	Vapor Mass Fract.	Mal. Weight	Basis for Vapor Pressure Calculations
Gasoline (RVP 8)	All	66.51	66.51	66.51	66.07	4.5990	4.5990	4.5990	68.0000			92.00	Option 4: RVP=8, ASTM Slope=3

TANKS 4.0
Emissions Report - Summary Format
Individual Tank Emission Totals

Annual Emissions Report

	Losses(lbs)			
Components	Working Loss	Breathing Loss	Total Emissions	
Gasoline (RVP 8)	2,175.49	0.00	2,175.49	

TANKS 4.0
Emissions Report - Summary Format
Tank Identification and Physical Characteristics

Identification

User Identification:	Echo Bay
City:	Las Vegas
State:	Nevada
Company:	NPS
Type of Tank:	Horizontal Tank
Description:	10000 gal UST

Tank Dimensions

Shell Length (ft):	17.00
Diameter (ft):	10.00
Volume (gallons):	10,000.00
Turnovers:	0.00
Net Throughput (gal/yr):	259,093.00
Is Tank Heated (y/n):	N
Is Tank Underground (y/n):	Y

Paint Characteristics

Shell Color/Shade:	
Shell Condition:	

Breather Vent Settings

Vacuum Settings (psig):	0.00
Pressure Settings (psig):	0.00

Meteorological Data used in Emissions Calculations: Las Vegas, Nevada (Avg Atmospheric Pressure = 13.6 psia)

TANKS 4.0
Emissions Report - Summary Format
Liquid Contents of Storage Tank

Mixture/Component	Month	Daily Liquid Surf. Temperatures (deg F) Avg.	Min.	Max.	Liquid Bulk Temp. Sdeg	Vapor Pressures (psia) Avg.	Min.	Max.	Vapor Mol. Weight	Liquid Mass Fract.	Vapor Mass Fract.	Mol. Weight	Basis for Vapor Pressure Calculations
Gasoline (RVP 8)	All	66.51	66.51	66.51	66.07	4.5990	4.5990	4.5990	68.0000			92.00	Option RVP=8, ASTM Slope=3

TANKS 4.0
Emissions Report - Summary Format
Individual Tank Emission Totals

Annual Emissions Report

	Losses(lbs)		
Components	Working Loss	Breathing Loss	Total Emissions
Gasoline_(HVP 8)	1,929.19	0,00	1,929.19

TANKS 4.0
Emissions Report - Summary Format
Tank Identification and Physical Characteristics

Identification

User Identification:	Lake Mohave Resort
City:	Las Vegas
State:	Nevada
Company:	NPS
Type of Tank:	Horizontal Tank
Description:	12000 gal UST

Tank Dimensions

Shell Length (ft):	20.50
Diameter (ft):	10.00
Volume (gallons):	12,000.00
Turnovers:	0.00
Net Throughput (gal/yr):	400,000.00
Is Tank Heated (yin):	N
Is Tank Underground (y/n):	Y

Paint Characteristics

Shell Color/Shade:	
Shell Condition:	

Breather Vent Settings

Vacuum Settings (psig):	0.00
Pressure Settings (psig):	0.00

Meteorological Data used in Emissions Calculations: Las Vegas, Nevada (Avg Atmospheric Pressure = 13.6 psia)

TANKS 4.0
Emissions Report - Summary Format
Liquid Contents of Storage Tank

Mixture/Component	Month	Daily Liquid Surf. Temperatures (deg F) Avg.	Min.	Max.	Liquid Bulk Temp. (deg F)	Vapor Pressures (psia) Avg.	Min.	Max.	Vapor Mol. Weight	Liquid Mass Fract.	Vapor Mass Fract.	Mol. Weight	Basis for Vapor Pressure Calculations
Gasoline (AVP 8)	All	66.51	66.51	66.51	66.07	4.5990	4.5990	4.5990	68.0000			92.00	Option 4: AVP=8, ASTM Slope=3

TANKS 4.0
Emissions Report - Summary Format
Individual Tank Emission Totals

Annual Emissions Report

	Losses(lbs)			
Components	Working Loss	Breathin_g Loss	Total Emissions	
Gasoline (RVP 8)	2,978.37	0.00	2,978.37	

TANKS 4.0
Emissions Report - Summary Format
Tank Identification and Physical Characteristics

Identification

User Identification:	Las Vegas Boat
City:	Las Vegas
State:	Nevada
Company:	NPS
Type of Tank:	Horizontal Tank
Description:	15000 gal AST

Tank Dimensions

Shell Length (ft):	25.50
Diameter (ft):	10.00
Volume (gallons):	15,000.00
Turnovers:	0.00
Net Throughput (gal/yr):	21,760.00
Is Tank Heated (y|n):	N
Is Tank Underground (y/n):	N

Paint Characteristics

Shell Color/Shade:	Gray/Medium
Shell Condition:	Good

Breather Vent Settings

Vacuum Settings (psig):	-0.03
Pressure Settings (psig):	0.03

Meteorological Data used in Emissions Calculations: Las Vegas, Nevada (Avg Atmospheric Pressure = 13.6 psia)

TANKS 4.0
Emissions Report - Summary Format
Liquid Contents of Storage Tank

Mixture/Component	Month	Daily Liquid Surf. Temperatures (deg F) Avg.	Min.	Max.	Liquid Bulk Temp. ~deg F1	Vapor Pressures (psia) Avg	Min.	Max.	Vapor Mol. Weight	Liquid Mass Fract.	Vapor Mass Fract.	Mol. Weight	Basis for Vapor Pressure Calculations
Gasoline (RVP 8)	All	78.42	65.06	91.77	70.15	5.7717	4.4705	7.3600	68.0000			92.00	Option 4: RVP=8, ASTM Slope=3

TANKS 4.0
Emissions Report - Summary Format
Individual Tank Emission Totals

Annual Emissions Report

	Lossesl_s)			
Components	Working Loss	Breathing Loss	Total Emissions	
Gasoline (RVP 8)	203.34	5,763.47	5,966.81	

TANKS 4M
Emissions Report - Summary Format
Tank Identification and Physical Characteristics

Identification

User Identification:	Las Vegas Boati
City:	Las Vegas
State:	Nevada
Company:	NPS
Type of Tank:	Horizontal Tank
Description:	6000 gal AST

Tank Dimensions

Shell Length (ft):	16.00
Diameter (ft):	8.00
Volume (gallons):	6,000.00
Turnovers:	0.00
Net Throughput (gal/yr):	86,400.00
Is Tank Heated (y|n):	N
Is Tank Underground (y/n):	N

Paint Characteristics

Shell Color/Shade:	Gray/Medium
Shell Condition:	Good

Breather Vent Settings

Vacuum Settings (psig):	-0.03
Pressure Settings (psig):	0.03

Meteorological Data used in Emissions Calculations: Las Vegas, Nevada (Avg Atmospheric Pressure = 13.6 psia)

TANKS 4.0
Emissions Report - Summary Format
Liquid Contents of Storage Tank

Mixture/Component	Month	Daily Liquid Surf. Temperatures (deg F) Avg	Min	Max.	Liquid Bulk Temp. (deg F)	Vapor Pressures (psia) Avg	Min.	Max.	Vapor Mol. Weight	Liquid Mass Fract.	Vapor Mass Fract.	Mal. Weight	Basis for Vapor Pressure Calculations
Gasoline (RVP 8)	All	78.42	65.06	91.77	70.15	5.7717	4.4705	7.3600	68.0000			92.00	Option 4: RVP=8, ASTM Slope=3

TANKS 4.0
Emissions Report - Summary Format
Individual Tank Emission Totals

Annual Emissions Report

	Losses(lbs)		
Components	Working Loss	Breathing Loss	Total Emissions
Gasoline (RVP 8)	807.38	2,632.82	3,440.20

TANKS 4.0
Emissions Report - Summary Format
Tank Identification and Physical Characteristics

Identification

User Identification:	Las Vegas Boat2
City:	Las Vegas
State:	Nevada
Company:	NPS
Type of Tank:	Horizontal Tank
Description:	1000 gal AST

Tank Dimensions

Shell Length (ft):	10.75
Diameter (ft):	4.00
Volume (gallons):	1,000.00
Turnovers:	0.00
Net Throughput (gai/yr):	16,000.00
Is Tank Heated (y/n):	N
Is Tank Underground (y/n):	N

Paint Characteristics

Shell Color/Shade:	Gray/Medium
Shell Condition:	Good

Breather Vent Settings

Vacuum Settings (psig):	-0.03
Pressure Settings (psig):	0.03

Meteorological Data used in Emissions Calculations: Las Vegas, Nevada (Avg Atmospheric Pressure = 13.6 psia)

TANKS 4.0
Emissions Report - Summary Format
Liquid Contents of Storage Tank

Mixture/Component	Month	Daily Liquid Surf. Temperatures (deg F) Avg.	Min.	Max.	Liquid Bulk Temp. (deg Fes_	Vapor Pressures (psia) Avg.	Min.	_Max.	Vapor Mol. Weight	Liquid Mass Fract.	Vapor Mass Fract.	Mol. Weight	Basis for Vapor Pressure Calculations
Gasoline (RVP 8)	All	78.42	65.06	91.77	70.15	5.7717	4.4705	7.3600	68.0000			92.00	Option 4: RVP=8, ASTM Slope=3

TANKS 4.0
Emissions Report - Summary Format
Individual Tank Emission Totals

Annual Emissions Report

	_Losses(lbsL		
Components	Working Loss	Breathing Loss	Total Emissions
Gasoline (RVP 8)	149.51	610.09	759.61

TANKS 4.0
Emissions Report - Summary Format
Tank Identification and Physical Characteristics

Identification

User Identification:	NV Wildlife
City:	Las Vegas
State:	Nevada
Company:	NPS
Type of Tank:	Horizontal Tank
Description:	5000 gal AST

Tank Dimensions

Shell Length (ft):	13.25
Diameter (ft):	8.00
Volume (gallons):	5,000.00
Turnovers:	0.00
Net Throughput (gal/yr):	12,000.00
Is Tank Heated (y/n):	N
Is Tank Underground (y/n):	N

Paint Characteristics

Shell Color/Shade:	Gray/Medium
Shell Condition:	Good

Breather Vent Settings

Vacuum Settings (psig):	-0.03
Pressure Settings (psig):	0.03

Meteorological Data used in Emissions Calculations: Las Vegas, Nevada (Avg Atmospheric Pressure = 13.6 psia)

TANKS 4.0
Emissions Report - Summary Format
Liquid Contents of Storage Tank

Mixture/Component	Month	Daily Liquid Surf. Temperatures (deg F) Avg	Min.	Max.	Liquid Bulk Temp. (deg F)	Vapor Pressures (psia)	Min.	Max.	Vapor Mol. Weight	Liquid Mass Fract.	*Vapor* Mass Fract.	Mol. Weight	Basis for Vapor Pressure Calculations
Gasoline (RVP 8)	All	78.42	65.06	91.77	70.15	5.7717	4.4705	7.3600	68.0000			92.00	Option 4: RVP=8, ASTM Slope=3

TANKS 4.0
Emissions Report - Summary Format
Individual Tank Emission Totals

Annual Emissions Report

	Losses(lbs)		
Components	Working Loss	Breathing Loss	Total Emissions
Gasoline (RVP)	112.14	2,180.31	2,292.44

TANKS 4.0
Emissions Report - Summary Format
Tank Identification and Physical Characteristics

Identification

User Identification:	Overton Beach 1
City:	Las Vegas
State:	Nevada
Company:	NPS
Type of Tank:	Horizontal Tank
Description:	10000 gal UST

Tank Dimensions

Shell Length (ft):	17.00
Diameter (it):	10.00
Volume (gallons):	10,000.00
Turnovers:	0.00
Net Throughput (gai/yr):	180,000.00
Is Tank Heated (y/n):	N
Is Tank Underground (y/n):	Y

Paint Characteristics

Shell Color/Shade:	
Shell Condition:	

Breather Vent Settings

Vacuum Settings (psig):	0.00
Pressure Settings (psig):	0.00

Meteorological Data used in Emissions Calculations: Las Vegas, Nevada (Avg Atmospheric Pressure = 13.6 psia)

TANKS 4.0
Emissions Report - Summary Format
Liquid Contents of Storage Tank

Mixture/Component	Month	Daily Liquid Surf. Temperatures (deg F) Avg.	Min.	Max.	Liquid Bulk Temp. (deg F)	Vapor Pressures (psia) Avg.	Min.	Max.	Vapor Mol. Weight	Liquid Mass Fract.	Vapor Mass Fract.	Mol. Weight	Basis for Vapor Pressure Calculations
Gasoline (RVP 8)	All	66.51	66.51	66.51	66.07	4.5990	4.5990	4.5990	68.0000			92.00	Option 4: RVP=8, ASTM Slope=3

TANKS 4.0
Emissions Report - Summary Format
Individual Tank Emission Totals

Annual Emissions Report

Components	Losses(lbs) Working Loss	Breathing Loss	Total Emissions
Gasoline (RVP 8)	1,340.27	0.00	1,340.27

TANKS 4.0
Emissions Report - Summary Format
Tank Identification and Physical Characteristics

Identification

User Identification:	Temple Bar
City:	Las Vegas
State:	Nevada
Company:	NPS
Type of Tank:	Horizontal Tank
Description:	12000 gal AST

Tank Dimensions

Shell Length (ft):	20.50
Diameter (ft):	10.00
Volume (gallons):	12,000.00
Turnovers:	0.00
Net Throughput (gal/yr):	308,000.00
Is Tank Heated (y/n):	N
Is Tank Underground (yin):	N

Paint Characteristics

Shell Color/Shade:	Gray/Medium
Shell Condition:	Good

Breather Vent Settings

Vacuum Settings (psig):	0.00
Pressure Settings (psig):	0.00

Meteorological Data used in Emissions Calculations: Las Vegas, Nevada (Avg Atmospheric Pressure = 13.6 psia)

TANKS 4.0
Emissions Report - Summary Format
Liquid Contents of Storage Tank

Mixture/Component	Month	Daily Liquid Surf. Temperatures (deg F) Min.	Max.	Liquid Bulk Temp. de F	Vapor Pressures (psia) Avg.	Min.	Max.	Vapor Mol. Weight	Liquid Mass Fract.	Vapor Mass Fract.	Mol. Weight	Basis for Vapor Pressure Calculations
Gasoline (RVP 8)	All	78.42	65.06	91.77	70.15	5.7717	4.4705	7.3600	68.0000			92.00 Option 4: RVP=8, ASTM Slope=3

TANKS 4.0
Emissions Report - Summary Format
Individual Tank Emission Totals

Annual Emissions Report

	Losses(lbs)			
Components	W orkingLoss	Breathing Loss	Total Emissions	
Gasoline (RVP 8)	2,878.15	4,710.46	7,588.61	

TANKS 4.0
Emissions Report - Summary Format
Tank Identification and Physical Characteristics

Identification

User Identification:	Willow Beach Harbor
City:	Las Vegas
State:	Nevada
Company:	
Type of Tank:	Horizontal Tank
Description:	8000 gal AST

Tank Dimensions

Shell Length (ft):	21.30
Diameter (ft):	8.00
Volume (gallons):	8,000.00
Turnovers:	0.00
Net Throughput (gal/yr):	80,000.00
Is Tank Heated (y|n):	N
Is Tank Underground (y/n):	N

Paint Characteristics

Shell Color/Shade:	Gray/Light
Shell Condition:	Good

Breather Vent Settings

Vacuum Settings (psig):	-0.03
Pressure Settings (psig):	0.03

Meteorological Data used in Emissions Calculations: Las Vegas, Nevada (Avg Atmospheric Pressure = 13.6 psia)

TANKS 4.0
Emissions Report - Summary Format
Liquid Contents of Storage Tank

Mixture/Component	Month	Daily Liquid Surf. Temperatures (deg F) Avg.	Min.	Max.	Liquid Bulk Temp. (deg F)	Vapor Pressures (psia) Avg.	Min.	Max.	Vapor Mol. Weight	Liquid Mass Fract.	Vapor Mass Fract.	Mol. Weight	Basis for Vapor Pressure Calculations
Gasoline (RVP 8)	All	75.96	64.37	87.56	69.31	5.5126	4.4098	6.8262	68.0000			92.00	Option 4: RVP=8, ASTM Slope=3

TANKS 4.0
Emissions Report - Summary Format
Individual Tank Emission Totals

Annual Emissions Report

Components	Losses(lbs) Working Loss	Breathing Loss	Total Emissions
Gasoline (RVP 8)	714.01	2828.92	3,542.93

TANKS 4.0
Emissions Report - Summary Format
Tank Identification and Physical Characteristics

Identification

User Identification:	Willow Beach Harborl
City:	Las Vegas
State:	Nebraska
Company:	NPS
Type of Tank:	Horizontal Tank
Description:	4000 gal AST

Tank Dimensions

Shell Length (ft):	19.00
Diameter (ft):	6.00
Volume (gallons):	4,000.00
Turnovers:	0.00
Net Throughput (gal/yr):	40,000.00
Is Tank Heated (yin):	N
Is Tank Underground (y/n):	N

Paint Characteristics

Shell Color/Shade:	Gray/Light
Shell Condition:	Good

Breather Vent Settings

Vacuum Settings (psig):	-0.03
Pressure Settings (psig):	0.03

Meteorological Data used in Emissions Calculations: Las Vegas, Nevada (Avg Atmospheric Pressure = 13.6 psia)

TANKS 4.0
Emissions Report - Summary Format
Liquid Contents of Storage Tank

Mixture/Component	Month	Daily Liquid Surf. Temperatures (deg F) Avg.	Min.	Max.	Liquid Bulk Temp. (deg F)	Vapor Pressures (psia) Avg.	Min.	Max.	Vapor Mol. Weight	Liquid Mass Fract.	Vapor Mass Fract.	Mol. Weight	Basis for Vapor Pressure Calculations
Gasoline (RVP 8)	All	75.96	64.37	87.56	69.31	5.5126	4.4098	6.8262	68.0000			92.00	Option 4: RVP=8, ASTM Slope=3

TANKS 4.0
Emissions Report - Summary Format
Individual Tank Emission Totals

Annual Emissions Report

	Losses(lbsL		
Components	Working_Loss_	Breathing Loss	Total Emissions_
Gasoline (AVP3) – __	357.00	1,640.44	1_997.45

2000 ACTUAL EMISSIONS FROM CAMPFIRES AT LAKE MEAD NRA

Location	Total Campers	Tent Campers	Camps[1]	Fires/Yr[2]	Tons/Yr[3]	PM (lbs/yr)	SO_2 (Ibs/yr)	$NO_{,,}$ (Ibs/yr)	CO (Ibs/yr)	VOC (lbs/yr)
NPS Campgrounds	223,931	55,983	22,393	11,197	56	1,937	22	146	14,141	12,820
NPS Backcountry	288,659	72,165	28,866	14,433	72	2,497	29	188	18,229	16,526
Concessionaires	170,233	42,558	17,023	8,512	43	1,473	17	111	10,750	9,746
Totals	682,823	170,706	68,282	34,141	171	5,906	68	444	43,120	39,092
						tons/yr	tons/yr	tons/yr	tons/yr	tons/yr
						2.95	0.03	0.22	21.56	19.55

Assumptions:

[1] There were an estimated 2.5 campers per campsite

[2] Fifty percent of camp sites have either an evening or morning campfire

[3] Assumes 10 lbs wood per fire

	PM	SO_2	$NO_{,,}$	CO	VOC
Emission Factor (lbs/ton)	34.60	0.40	2.60	252.60	229.00

TITLE: Results of FOFEM model execution on date: 1/3/2003

FUEL CONSUMPTION CALCULATIONS

Region: Interior West
Cover Type: SAF/SRM - SRM 406 - Low Sagebrush
Fuel Type: Natural
Fuel Reference: FOFEM 461

FUEL CONSUMPTION TABLE

Fuel Component Name	Preburn Load (t/acre)	Consumed Load (t/acre)	Postburn Load (t/acre)	Percent Reduced (%)	Equation Reference Number	Moisture
Litter	0.07	0.07	0.00	100.0	999	
Wood (0-1/4 inch)	0.00	0.00	0.00	0.0	999	
Wood (1/4-1 inch)	0.00	0.00	0.00	0.0	999	25.0
Wood (1-3 inch)	0.00	0.00	0.00	0.0	999	
Wood (3+ inch) Sound	0.00	0.00	0.00	0.0	999	20.0
3->6	0.00	0.00	0.00	0.0		
6->9	0.00	0.00	0.00	0.0		
9->20	0.00	0.00	0.00	0.0		
20->	0.00	0.00	0.00	0.0		
Wood (3+ inch) Rotten	0.00	0.00	0.00	0.0	999	20.0
3->6	0.00	0.00	0.00	0.0		
6->9	0.00	0.00	0.00	0.0		
9->20	0.00	0.00	0.00	0.0		
20->	0.00	0.00	0.00	0.0		
Duff	0.00	0.00	0.00	0.0	2	100.0
Herbaceous	0.45	0.45	0.00	100.0	22	
Shrubs	1.26	0.63	0.63	50.0	232	
Crown foliage	0.00	0.00	0.00	0.0	37	
Crown branchwood	0.00	0.00	0.00	0.0	38	
Total Fuels	1.78	1.15	0.63	64.6		

FIRE EFFECTS ON FOREST FLOOR COMPONENTS

Forest Floor Component	Preburn Condition	Amount Consumed	Postburn Condition	Percent Reduced	Equation Number
Duff Depth (in)	0.0	0.0	0.0	0.0	6
Min Soil Exp (%)	.0	21.9	21.9	21.9	10

	Emissions -- lbs/acre flaming	smoldering	total
PM 10	7	4	11
PM 2.5	6	3	9
CH 4	2	2	4
CO	14	42	56
CO 2	3841	172	4013

	Consumption tons/acre	Duration hour:min:sec
Flaming:	1.08	00:01:00
Smoldering:	0.07	00:01:00
Total:	1.15	

TITLE: Results of FOFEM model execution on date: 1/3/2003

FUEL **CONSUMPTION CALCULATIONS**

Region: Interior West
Cover Type: SAF/SRM - SRM 414 - Salt Desert Shrub (moderate shrub cover)
Fuel Type: Natural
Fuel Reference: FOFEM 321

FUEL CONSUMPTION TABLE

Fuel Component Name	Preburn Load (t/acre)	Consumed Load (t/acre)	Postburn Load (t/acre)	Percent Reduced (%)	Equation Reference Number	Moisture
Litter	0.11	0.11	0.00	100.0	999	
Wood (0-1/4 inch)	0.00	0.00	0.00	0.0	999	
Wood (1/4-1 inch)	0.00	0.00	0.00	0.0	**999**	25.0
Wood (1-3 inch)	0.00	0.00	0.00	0.0	**999**	
Wood (3+ inch) Sound	0.00	0.00	0.00	0.0	**999**	20.0
3->6	0.00	0.00	0.00	0.0		
6->9	0.00	0.00	0.00	0.0		
9->20	0.00	0.00	0.00	0.0		
20->	0.00	0.00	0.00	0.0		
Wood (3+ inch) Rotten	0.00	0.00	0.00	0.0	999	20.0
3->6	0.00	0.00	0.00	0.0		
6->9	0.00	0.00	0.00	0.0		
9->20	0.00	0.00	0.00	0.0		
20->	0.00	0.00	0.00	0.0		
Duff	0.00	0.00	0.00	0.0	2	100.0
Herbaceous	0.20	0.20	0.00	100.0	22	
Shrubs	2.28	1.82	0.46	80.0	231	
Crown foliage	0.00	0.00	0.00	0.0	37	
Crown branchwood	0.00	0.00	0.00	0.0	38	
Total Fuels	2.59	2.13	0.46	82.4		

FIRE EFFECTS ON FOREST FLOOR COMPONENTS

Forest Floor Component	Preburn Condition	Amount Consumed	Postburn Condition	Percent Reduced	Equation Number
Duff Depth (in)	0.0	0.0	0.0	0.0	6
Min Soil Exp (%)	.0	21.9	21.9	21.9	10

	Emissions -- lbs/acre flaming	smoldering	total
PM 10	12	6	18
PM 2.5	11	5	16
CH 4	3	3	6
CO	26	66	92
CO 2	7199	270	7469

	Consumption tons/acre	Duration hour:min:sec
Flaming:	2.02	00:01:00
Smoldering:	0.11	00:01:00
Total:	2.13	

2001 FIRES EMISSIONS AT LAKE MEAD NATIONAL RECREATION AREA

Fuel Type	Acres	PM_{10} (lbs/yr)	$PM_{2.5}$ (lbs/yr)	CH_4 (lbs/yr)	CO (lbs/yr)	CO, (lbs/yr)
Sagebrush	50	550	450	200	2,800	200,650
Salt Desert Shrub	50	900	800	300	4,600	373,450
Totals	100	1,450	1,250	500	7,400	574,100
			tons/yr			
		0.73	0.63	0.25	3.70	287

Totals

Emission Factors

	PM_{10} (lbs/acre)	PM_{25} (lbs/acre)	CH_4 (lbs/acre)	CO (lbs/acre)	CO_2 (lbs/acre)
Sagebrush	11	9	4	56	4,013
Salt Desert Shrub	18	16	6	92	7,469

MOBILE6.2 Draft (21-Mar-2002)
* Input file: LAKEMEAD.IN (file 1, run 1).

M601 Comment:
User has enabled STAGE II REFUELING.

• Reading Registration Distributions from the following external
* data file: REGDATA.D

M 49 Warning:
0.999 MYR sum not = 1. (will normalize)

M 49 Warning:
0.999 MYR sum not = 1. (will normalize)

M 49 Warning:
0.999 MYR sum not = 1. (will normalize)

M 49 warning:
0.999 MYR sum not = 1. (will normalize)

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0.999 MYR sum not = 1. (will normalize)

M 49 Warning:
0.999 MYR sum not = 1. (will normalize)

M 49 Warning:
0.999 MYR sum not = 1. (will normalize)

M615 Comment:
User supplied VMT mix.

* Lake mead winter Conditions.
* File 1, Run 1, Scenario 1.

M584 Warning:
The user supplied area wide average speed of 35.0
will be used for all hours of the day. 100% of VMT
has been assigned to a fixed combination of freeways,
freeway ramps, arterial/collector and local roadways
for all hours of the day and all vehicle types.

Reading PM Gas carbon ZML Levels
from the external data file PMGZML.CSV

Reading PM Gas Carbon DR1 Levels
from the external data file PMGDR1.CSV

Reading PM Gas Carbon DR2 Levels
from the external data file PMGDR2.CSV

Reading PM Diesel Zero Mile Levels
from the external data file PMDZML.CSV

Reading the First PM Deterioration Rates
from the external data file PMDDR1.CSV

Reading the second PM Deterioration Rates
from the external data file PMDDR2.CSV

User supplied gasoline sulfur content = 300.0 ppm.

M616 Comment:
user has supplied post-1999 sulfur levels.
M 48 Warning:
there are no sales for vehicle class HDGV8b

Reading Ammonia (NH3) Basic Emissiion Rates
from the external data file PMNH3BER.D

Reading Ammonia (NH3) sulfur Deterioration Rates
from the external data file PMNH3SDR.D

calendar Year:	2001	
Month:	Jan.	
Altitude:	Low	
Minimum Temperature:	30.0	(F)
Maximum Temperature:	57.0	(F)
Absolute Humidity:	75.	grains/lb
Nominal Fuel RVP:	14.4	psi
weathered RVP:	14.4	psi
Fuel Sulfur Content:	299.	ppm

Exhaust I/M Program: No
Evap I/M Program: No
ATP Program: No
Reformulated Gas: No

Vehicle Type:	LDGV	LDGT12	LDGT34	LDGT	HDGV	LDDV	LDDT	HDDV	MC	All Veh
GVWR:		<6000	>6000	(All)						

VMT Distribution:	0.I339	0.3439	0.I595		U.I0]]	0.0001	0.0025	O.2567	0.0000	1.0000
[nmposite Emission Factors (g/mi):										
Composite VOC :	0.919	1.101	0.988	1.065	0.754	0.365	0.439	0.396	0.00	0.840
composite Co :	16.46	21.67	19.69	21.04	8.82	I.I14	0.834	1.800	0.00	I4.172
Composite **NOX:**	0.791	1.I39	1.329	1.199	4.50I	1.254	1.232	14.652	0.00	4.950

Veh. Type:	LDGT1	LDGT2	LDGT3	LDGT4	LDDT12	LDDT34
VMT Mix:	0.0790	0.2549	0.I094	0.0502	0.000I	0.0024

Composite Emission Factors (g/mi):						
Composite m0[:	1.040	1.119	0.965	1.040	1.825	0.385
Composite CO :	20.90	21.90	19.57	18.84	3.I24	0.745
Composite **NOX:**	0.894	I.2I2	1.I98	1.613	2.602	1.179

veh. Type:	HDGV2B	HDGV]	HDGV4	HDGV5	**HDGV6**	HDGV7	HDGV8A	HDGV8B
VMT Mix:	0.0871	0.0028	0.0009	0.0032	0.0063	0.0026	0.0000	0.0000

[omposite Emission Factors (g/mi):								
Composite VOC :	0.731	0.737	0.819	0.894	0.889	0.960	I.048	0.000
Composite CO :	8.55	8.83	9.06	10.44	10.36	I1.45	I2.46	0.00
Composite NOX:	4.531	4.716	4.304	4.951	4.918	5.422	5.875	0.000

Veh. Type:	HDDV2B	HDDV3	HDDV4	HDDV5	HDDV6	HDDV7	HDDV8A	HDDV8B
VMT Mix:	0.0299	0.0092	0.0081	0.0038	0.0I87	0.0274	0.0330	0.1I90

Composite Emission Factors (g/mi):								
Composite **VO[:**	0.184	0.208	0.243	0.265	0.379	0.467	0.404	0.456
Composite CO :	0.788	0.920	1.069	1.162	1.I54	1.43I	2.03I	2.302
Composite **NOX:**	4.068	4.602	5.408	5.826	8.883	1I.009	I7.636	I9.963

##########################
Lake mead Summer Conditions.
File 1, Run 1, Scenario 2.
##########################
M584 warning:
The user supplied area wide average speed of 35.0
will be used for all hours of the day. 100% of VMT
has been assigned to a fixed combination of freeways,
. ~] freeway ramps, arterial/collector and local roadways
for all hours of the day and all vehicle types.

Reading PM Gas Carbon ZML Levels

from the external data file PMGZML.CSV

Reading PM Gas carbon DR1 Levels
from the external data file PMGDR1.CSV

Reading PM Gas carbon DR2 Levels
from the external data file PMGDR2.CSV

Reading PM Diesel zero mile Levels
from the external data file PMDZML.CSV

Reading the First PM Deterioration Rates
from the external data file PMDDR1.CSV

Reading the second PM Deterioration Rates
from the external data file PMDDR2.CSV

M616 Comment:
User has supplied post-1999 sulfur levels.

M 48 Warning:
there are no sales for vehicle class HDGV8b

Calendar Year:	2001
Month:	July
Altitude:	Low
Minimum Temperature:	72.0 (F)
Maximum Temperature:	105.0 (F)
Absolute Humidity:	75. grains/lb
Nominal Fuel RVP:	9.0 psi
weathered RVP:	8.2 psi
Fuel sulfur content:	299. ppm
Exhaust I/M Program:	No
Evap I/M Program:	No
ATP Program:	No
Reformulated Gas:	No

vehicle Type:	LDGV	LDGT12	LDGT34	LDGT	HDGV	LDDV	LDDT	HDDV	MC	All Veh
GVWR:		<6000	>6000	(All)						
VMT Distribution:	0.1339	0.3439	0.1596		0.1034	0.0001	0.0025	0.2566	0.0000	1.0000
composite Emission Factors (g/mi):										
Composite VOC :	0.935	1.037	1.000	1.025	0.818	0.343	0.459	0.393	0.00	0.828
t,Composite CO :	13.72	16.17	15.97	16.11	8.11	1.101	0.853	1.786	0.00	11.246
Composite NOX :	0.799	1.050	1.333	1.140	4.445	1.157	1.256	14.042	0.00	4.747

Veh. Type:	LDGT1	LDGT2	LDGT3	LDGT4	LDDT12	LDDT34

LAKEMEAD

Veh. Type:								
VMT Mix:	0.0790	0.2649	0.1094	0.0502	0.0001	0.0024		
Composite Emission Factors (g/mi):								
Composite VOC :	0.998	1.048	0.982	1.039	1.893	0.412		
Composite CO :	15.76	16.29	15.88	16.18	3.247	0.774		
Composite NOX :	0.832	1.115	1.201	1.620	2.621	1.211		

Veh. Type:	HDGV2B	HDGV3	HDGV4	HDGV5	HDGV6	HDGV7	HDGV8A	HDGV8B
VMT Mix:	0.0874	0.0028	0.0009	0.0031	0.0062	0.0026	0.0000	0.0000
Composite Emission Factors (g/mi):								
Composite VOC :	0.795	0.784	0.911	0.962	0.958	1.023	1.122	0.000
Composite CO :	7.86	8.13	8.30	9.58	9.50	10.50	11.40	0.00
Composite NOX :	4.386	4.568	4.106	4.732	4.698	5.182	5.607	0.000

Veh. Type:	HDDV2B	HDDV3	HDDV4	HDDV5	HDDV6	HDDV7	HDDV8A	HDDV8B
VMT Mix:	0.0296	0.0092	0.0081	0.0039	0.0188	0.0274	0.0330	0.1190
Composite Emission Factors (g/mi):								
Composite VOC :	0.182	0.206	0.241	0.263	0.377	0.466	0.402	0.453
Composite CO :	0.794	0.925	1.075	1.167	1.145	1.420	2.012	2.278
Composite NOX :	3.997	4.527	5.320	5.732	8.586	10.645	16.830	19.026

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MOBILE6.2 Draft (21-Mar-2002)
Input file: LAKEMEAD.IN (file 1, run 1).
::i::fif*'..... *4f".:4:q:&****'fdf****'.f****dfdf'f::;f'...::f4:if4.....:f'fi;'.fX:fi:':::&df****dC'.r'.'.fif:Cdf'f'..'***

It # # # # # It # # # # # # # # # # # # # #
Lake mead winter conditions.
File 1, Run 1, Scenario 1.
# #

Calendar Year: 2001
Month: Jan.
Gasoline Fuel sulfur content: 299. ppm
Diesel Fuel sulfur content: 500. ppm
Particle size Cutoff: 10.00 Microns
Reformulated Gas: No

vehicle Type:	LDGV	LDGT12	LDGT34	LDGT	HDGV	LDDV	LDDT	HDDV	MC	All veh
GVWR:		<6000	>6000	(All)						
VMT Distribution:	0.1339	0.3439	0.1596		0.1033	0.0001	0.0025	0.2567	0.0000	1.0000
Composite Emission Factors (g/mi):										
Lead:	0.0000	0.0000	0.0000	0.0000	0.0000	------	------	------	0.0000	0.0000
GASPM:	0.0042	0.0047	0.0044	0.0046	0.0520	------	------	------	0.0205	0.0083
ECARBON:	- - - - - - - - - -	------	------	------	0.1198	0.0502	0.1268	------		0.0327
OCARBON:	- - - - - - - - - -	------	------	------	0.0338	0.0722	0.0657	------		0.0170
SO4:	0.0028	0.0049	0.0047	0.0049	0.0109	0.0049	0.0105	0.0306	0.0000	0.0118
Total Exhaust PM:	0.0071	0.0096	0.0091	0.0095	0.0629	0.1584	0.1330	0.2231	0.0205	0.0699
Brake:	0.0125	0.0125	0.0125	0.0125	0.0125	0.0125	0.0125	0.0125	0.0000	0.0125
Tire:	0.0080	0.0080	0.0080	0.0080	0.0086	0.0080	0.0080	0.0257	0.0000	0.0126
Total PM:	0.0276	0.0302	0.0296	0.0300	0.0841	0.1790	0.1535	0.2614	0.0205	0.0950
SO2:	0.0684	0.0804	0.1134	0.0908	0.1666	0.0934	0.2017	0.4376	0.0000	0.1849
NH3:	0.1016	0.1005	0.1015	0.1008	0.0451	0.0068	0.0068	0.0270	0.0000	0.0760
Idle Emissions (/hr)										
PM Idle:	- - - - -							1.0438		0.2680

Veh. Type:	LDGT1	LDGT2	LDGT3	LDGT4	LDDT12	LDDT34
VMT Mix:	0.0790	0.2649	0.1094	0.0502	0.0001	0.0024
Composite Emission Factors (g/mi):						
Lead:	0.0000	0.0000	0.0000	0.0000		
GASPM:	0.0047	0.0047	0.0044	0.0044		
ECARBON:	------	------	------	------	0.1498	0.0463
OCARBON:	------	------	------	------	0.2156	0.0667
SO4:	0.0049	0.0049	0.0047	0.0047	0.0062	0.0107
Total Exhaust PM:	0.0096	0.0096	0.0091	0.0091	0.3717	0.1237

Brake	0.0125	0.0125	0.0125	0.0I25	0.0125	0.0125
Ti re:	0.0080	0.0080	0.0080	0.0080	0.0080	0.0080
Total PM:	0.0302	0.0302	0.0296	0.0296	0.3922	0.1443
S02:	0.0804	0.0804	0.1134	0.1134	0.1196	0.2049
NH3:	0.1005	0.I005	0.I0I5	0.I0I5	0.0058	0.0058
Idle Emissions (g/hr)						
PM Idle:						

veh. Type:	HDGV2B	HDGV3	HDGV4	HDGV5	HDGV6	HDGV7	HDGV8A	HDGV8B
VMT Mix:	0.0871	0.0028	0.0009	0.0032	0.0063	0.0026	0.0000	0.0000

composite Emission Factors }:

Lead:	0.0000	0.000O	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
GASPM:	0.0523	0.O52]	0.0503	0.0504	0.0503	0.0503	0.0503	0.0000
ECARBON:								
OCARBON:								
SO4:	0.0118	0.0118	0.0049	0.0050	0.0050	0.0049	0.0048	0.0000
Total Exhaust PM:	0.0640	0.0841	0.0553	0.0554	0.0553	0.0553	0.0551	0.0000
Brake:	0.0125	0.0I25	0.0I25	0.0I25	0.0125	0.0125	0.0I25	0.0000
Tire:	0.0080	0.0I20	0.0120	0.0I20	0.0120	0.0I20	0.0300	0.0000
Total PM:	0.0848	0.0887	0.0798	0.0799	0.0799	0.0798	0.I036	0.0000
SO2:	0.1603	0.1730	0.1764	0.2054	0.2026	0.2213	0.2339	0.0000
NH3:	0.0451	0.0451	0.0451	0.0451	0.0451	0.0451	0.0451	0.0000
Idle Emissions (g/hr)								
PM Idle:								

Veh. Type:	HDDV2B	HDDV3	HDDV4	HDDV5	HDDV6	HDDV7	HDDV8A	HDDV8B
VMT Mix:	0.0299	0.0092	0.008I	0.0038	0.0187	0.0274	0.0]]0	0.1190

Composite Emission Factors (g/mi):

Lead:								
G4SPM:								
ECARBON:	0.0513	0.0486	0.0475	0.0466	0.1058	0.1043	0.1234	0.1676
OCARBON:	0.0534	0.0506	0.0495	0.0485	0.0831	0.0819	0.0970	0.0529
S04:	0.0I72	0.0190	0.0217	0.0224	0.0254	0.0294	0.0]]7	0.0]5]
Total Exhaust PM:	0.12I9	0.1182	0.1189	0.1175	0.2I43	0.2156	0.2540	0.2558
Brake:	0.0125	0.0125	0.0125	0.0I25	0.0I25	0.0125	0.0I25	0.0I25
Tire:	0.0080	0.0I20	0.0120	0.0120	0.0I20	0.0I20	0.0360	0.0360
Total PM:	0.1424	0.1427	0.1434	0.1420	0.2389	0.240I	0.3036	0.3043
SO2:	0.2452	0.2722	0.3107	0.3208	0.]6]7	0.4200	0.4813	0.5043
NH3:	0.0270	0.0270	0.0270	0.0270	0.0270	0.0270	0.0270	0.0270
Idle Emissions (g/hr)								
PM Idle:	1.8607	1.0424	1.0459	1.039I	1.0381	1.0402	I.0381	1.0417

~ #

Lake Mead Summer Conditions.
File 1, Run 1, Scenario 2.
# #

Calendar Year: 2001
Month: July
Gasoline Fuel Sulfur Content: 299. ppm
Diesel Fuel Sulfur Content: 500. ppm
Particle size cutoff: 10.00 microns
Reformulated Gas: No

Vehicle Type: / GVWR:	**LDGV**	**LDGT12** <6000	LDGT34 >6000	LDGT (All)	HDGV	LDDV	LDDT	**HDDV**	MC	All Veh
VMT Distribution:	0.1]]9	0.3439	0.I595		0.1094	0.0001	0.0025	0.2556	0.0000	I.0000
Composite Emission Factors (g/mi):										
Lead:	0.0000	0.0000	0.0000	0.0000	0.0000	------	------	------	0.0000	0.0000
GASPM:	0.0042	0.0046	0.0044	0.0046	0.0520	------	------	------	0.0205	0.0082
ECARBON:	------	------	------	------	------	0.I150	0.0496	0.I241	------	0.0330
OCARBON:	------	------	------	------	------	0.0324	0.0714	0.084I	------	0.0I60
S04:	0.0038	0.0049	0.0047	0.0040	0.0113	0.0040	0.0106	0.0306	0.0000	0.0118
Total Exhaust PM:	0.0070	0.0095	0.0091	0.0094	0.0633	0.I522	0.1316	0.3187	0.0205	0.0687
Brake:	0.0125	0.0I25	0.0I25	0.0I25	0.0125	0.0I25	0.0125	0.0I25	0.0000	0.0125
Tire:	0.0080	0.0080	0.0080	0.0080	0.0086	0.0080	0.0080	0.0258	0.0000	0.0126
Total PM:	0.0275	0.0300	0.0297	0.0299	0.0845	0.I728	0.I522	0.2570	0.0205	0.0038
502:	0.0684	0.0804	0.1134	0.0908	0.1063	0.0924	0.2022	0.4374	0.0000	0.1840
NH3:	0.I016	0.I007	0.10I5	0.1009	0.0451	0.0068	0.0068	0.0270	0.0000	0.0700
Idle Emissions (g/hr)										
PM Idle:	------	------	------	------	------	------	------	I.0356	------	0.2657

Veh. Type:	LDGT1	LDGT2	LDGT3	LDGT4	LDDT12	LDDT34
VMT Mix:	0.0790	0.2649	0.I094	0.0502	0.0001	0.0024
Composite Emission Factors (g/mi):						
Lead:	0.0000	0.0000	0.0000	0.0000	------	------
GASPM:	0.0046	0.0046	0.0044	0.0044	------	------
E[ARBUN:	------	------	------	------	0.1498	0.0483
OCARBON:	------	------	------	------	0.2I56	0.0867
S04:	0.0049	0.0049	0.0047	0.0047	0.0062	0.0107
Total Exhaust PM:	0.0095	0.0095	0.0091	0.0091	0.3717	0.I237
Brake:	0.0125	0.0125	0.0125	0.0125	0.0125	0.0125
Tire:	0.0080	0.0080	0.0080	0.0080	0.0080	0.0080
Total PM:	0.0300	0.0300	0.0297	0.0397	0.3922	0.1443
SO2:	0.0804	0.0804	0.1I34	0.1I34	0.1196	0.2049
NH3:	0.1007	0.I007	0.I015	0.I015	0.0088	0.0058
Idle Emissions (g/hr)						

PM Idle:

Veh. Type:	HDGV2B	HDGV3	HDGV4	HDGV5	HDGV6	HDGV7	HDGV8A	HDGV8B
VMT Mix:	0.0874	0.0028	0.0009	0.0031	0.0062	0.0026	0.0000	0.0000
Composite Emission Factors (g/mi):								
Lead:	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
GASPM:	0.0523	0.0523	0.0506	0.0506	0.0506	0.0506	0.0505	0.0000
ECARBON:								
OCARBON:								
SO4:	0.0120	0.0121	0.0061	0.0062	0.0062	0.0062	0.0060	0.0000
Total Exhaust PM:	0.0643	0.0644	0.0567	0.0568	0.0568	0.0568	0.0565	0.0000
Brake:	0.0125	0.0125	0.0125	0.0125	0.0125	0.0125	0.0125	0.0000
Tire:	0.0080	0.0120	0.0120	0.0120	0.0120	0.0120	0.0360	0.0000
Total PM:	0.0848	0.0889	0.0813	0.0814	0.0814	0.0813	0.1051	0.0000
SO2:	0.1601	0.1728	0.1758	0.2049	0.2021	0.2208	0.2332	0.0000
NH3:	0.0451	0.0451	0.0451	0.0451	0.0451	0.0451	0.0451	0.0000
Idle Emissions (g/hr)								
PM Idle:								

Veh. Type:	HDDV2B	HDDV3	HDDV4	HDDV5	HDDV6	HDDV7	HDDV8A	HDDV8B
VMT Mix:	0.0296	0.0092	0.0081	0.0039	0.0188	0.0274	0.0330	0.1190
Composite Emission Factors (g/mi):								
Lead:								
GASPM:								
ECARBON:	0.0502	0.0478	0.0468	0.0459	0.1020	0.1004	0.1214	0.1647
OCARBON:	0.0523	0.0497	0.0487	0.0477	0.0802	0.0789	0.0954	0.0520
SO4:	0.0171	0.0190	0.0217	0.0224	0.0254	0.0294	0.0337	0.0352
Total Exhaust PM:	0.1196	0.1165	0.1172	0.1161	0.2076	0.2087	0.2504	0.2519
Brake:	0.0125	0.0125	0.0125	0.0125	0.0125	0.0125	0.0125	0.0125
Tire:	0.0080	0.0120	0.0120	0.0120	0.0120	0.0120	0.0360	0.0360
Total PM:	0.1402	0.1410	0.1417	0.1406	0.2322	0.2332	0.2990	0.3005
SO2:	0.2449	0.2719	0.3106	0.3207	0.3635	0.4199	0.4810	0.5038
NH3:	0.0270	0.0270	0.0270	0.0270	0.0270	0.0270	0.0270	0.0270
Idle Emissions (/hr)								
PM Idle:	1.0495	1.0341	1.0377	1.0321	1.0309	1.0326	1.0307	1.0338

LAKE MEAD NATIONAL RECREATION AREA TOTAL VISITOR VMT

Entrance	Visitors	Vehicles	Road Length (miles roundtrip)	Annual VMT
Boulder Beach Access from US 90	2,130,427	645,584	4	2,582,336
Lakeshore Road Eastbound	2,038,311	617,670	25	15,441,750
Lake Mead Boulevard	1,121,567	339,869	14	4,758,163
Kingman Wash	12,693	3,846	20	76,927
Northshore Road (Southbound/Overton)	470,921	142,703	32	4,566,507
Valley of Fire Access Road	300,826	91,159	8	729,275
Temple Bar Access Road	161,788	49,027	40	1,961,067
South Cove - Pearce Ferry Road	159,553	48,349	32	1,547,181
Miscellaneous Access to Lake Mead	870,600	263,818	10	2,638,182
Willow Beach Access Road	199,942	60,588	8	484,708
Cottonwood Cove Access Road	138,713	42,034	14	588,479
Katherine Access Road	1,032,490	312,876	10	3,128,758
Miscellaneous Access to Lake Mohave	134,758	40,836	12	490,029
	8,772,589	2,658,360	229	38,993,361
All Buses		1,370	18	24,133

LAKE MEAD NATIONAL RECREATION AREA VISITOR VEHICLE EMISSIONS

Annual VMT	Bus VMT
38,993,361	24,133

Emission Factors (glmi) - All Vehicles

				PM_{10}		
	NOx	CO	VOC	Exhaust, Brake, and Tire	Fugitive	Total
Summer	4.75	11.25	0.83	0.0938	0.84	0.9338
Winter	4.95	14.17	0.84	0.0950	0.84	0.9350
Average	4.85	12.71	0.83			0.934

Emissions (tons/yr) - **All Vehicles**

NOx	CO	VOC	PM_{10}
207.97	545.12	35.77	40.08

Emission Factors (glmi) - Buses

				PM_{10}		
	NOx	CO	VOC	Exhaust, Brake, and Tire	Fugitive	Total
Summer	14.042	1.786	0.393	0.257	0.840	1.097
Winter	14.652	1.800	0.396	0.261	0.840	1.101
Average	14.347	1.793	0.395			1.099

Emissions (tons/yr) - Buses

NOx	CO	VOC	PM_{10}
0.38	0.05	0.01	0.03

Emissions (tons/yr) - Total

NOx	CO	VOC	PM_{10}
208.35	545.17	35.78	40.11

LAKE MEAD NRA NPS AND GSA VEHICLES

	LDGV	LDGT	HDGV	HDDV	Total
Total Miles	249,585	955,221	464	41,900	1,247,170

Emission Factors (glmi) - LDGV

	NOx	CO	VOC	PM10 Exhaust, Brake, and Tire	PM10 Fugitive	PM10 Total
Summer	0.799	13.720	0.935	0.028	0.840	0.868
Winter	0.791	16.460	0.919	0.028	0.840	0.868
Average	0.795	15.090	0.927			0.868

Emissions (tonslyr) - LDGV

NOx	CO	VOC	PM10
0.22	4.14	0.25	0.24

Emission Factors (glmi) - LDGT

	NOx	CO	VOC	PM10 Exhaust, Brake, and Tire	PM10 Fugitive	PM10 Total
Summer	13.720	16.170	1.037	0.030	0.840	0.870
Winter	1.139	21.670	1.101	0.032	0.840	0.872
Average	7.430	18.920	1.069			0.871

Emissions (tonslyr) - LDGT

NOx	CO	VOC	PM10
7.81	19.88	1.12	0.92

Emission Factors (glmi) - HDGV

	NOx	CO	VOC	PM10 Exhaust, Brake, and Tire	PM10 Fugitive	PM10 Total
Summer	4.445	8.110	0.818	0.085	0.840	0.925
Winter	4.601	8.820	0.754	0.084	0.840	0.924
Average	4.523	8.465	0.786			0.924

Emissions (tonslyr) - HDGV

NOx	CO	VOC	PM10
0.00	0.00	0.00	0.00

Emission Factors (glmi) - HDDV

	NOx	CO	VOC	PM10 Exhaust, Brake, and Tire	PM10 Fugitive	PM10 Total
Summer	14.042	1.786	0.393	0.257	0.840	1.097
Winter	14.652	1.800	0.396	0.261	0.840	1.101
Average	14.347	1.793	0.395			1.099

Emissions (tonslyr) - HDDV

NOx	CO	VOC	PM10
0.66	0.08	0.02	0.05

Emissions (tonslyr) - Total

NOx	CO	VOC	PM10
8.69	24.11	1.40	1.20

2000 LAKE MEAD NRA NP NONROAD VEHICLE EMISSIONS

		Emission Factors (gm/hp-hr)							Emissions (lbs/yr)			
Vehicle	No.	PM	Nox	CO	VOC	hp	load	hrs/yr	PM	Nox	CO	VOC
Utility Cart	28	2.04	1.03	2.31	2.19	15	0.55	10,590	392	198	444	421
Tractors	0	2.04	1.03	2.31	2.19	42.35	0.68	0	0	0	0	0
Backhoe	15	2.04	1.03	2.31	2.19	77	0.55	4,238	806	0 407	0 912	865
Riding Mower	0	1.11	10.3	4.8	1.3	15	0.55	0	0	0	0	0
Brush Mower	0	1.11	10.3	4.8	1.3	15	0.55	0	0	0	0	0
Bobcat	0	2.04	1.03	2.31	2.19	15	0.55	0	0	0	0	0
Dozer	3	2.04	1.03	2.31	2.19	77	0.55	912	173	88	196	186
Grader	0	1.06	9.6	3.8	1.43	172	0.61	0	0	0	0	0
Power Pruner	0	3.99	0.9	4.8	1.3	5	0.55	0	0	0	0	0
Stihl Brushcutters	0	3.99	0.9	4.8	1.3	5	0.55	0	0	0	0	0
Stihl 14 Quick Cut Saw	0	3.99	0.9	4.8	1.3	5	0.55	0	0	0	0	0
Post Hole Digger	0	3.99	0.9	4.8	1.3	5	0.55	0	0	0	0	0
Case Plate Tamper	0	3.99	0.9	4.8	1.3	5	0.55	0	0	0	0	0
Tamper Rammer	0	3.99	0.9	4.8	1.3	5	0.55	0	0	0	0	0
Pionjar	0	3.99	0.9	4.8	1.3	5	0.55	0	0	0	0	0
Wacker Trash Pump	0	3.99	0.9	4.8	1.3	5	0.55	0	0	0	0	0
Generators	0	3.99	0.9	4.8	1.3	5	0.55	0	0	0	0	0
Welder-Arc-Generator	0	3.99	0.9	4.8	1.3	5	0.55	0	0	0	0	0
Air Compressor	13	3.99	0.9	4.8	1.3	5	0.55	400	10	2	12	3
Sweeper	2	1.7	14	6.06	1.46	30	0.68	60	5	38	16	4
Leaf Blowers	0	3.99	0.9	4.8	1.3	1.2	0.55	0	0	0	0	0
Chainsaws	57	3.6	0.96	4.8	1.3	3	0.55	6,285	82	22	110	30
Trimmer	0	3.99	0.9	4.8	1.3	1.2	0.55	0	0	0	0	0
Weed Wacker	0	3.99	0.9	4.8	1.3	1.2	0.55	0	0	0	0	0
50 gallon Sprayer	0	1.7	14	6.06	1.46	9	0.55	0	0	0	0	0
Forklift	14	1.06	9.6	3.8	1.43	172	0.61	8,020	1,962	17,772	7,035	2,647
Front End Loader	0	1.11	10.3	4.8	1.3	77	0.55	0	0	0	0	0
Roller/Compactor	0	2.04	1.03	2.31	2.19	30	0.55	0	0	0	0	0
Skid Loader	0	1.11	10.3	4.8	1.3	77	0.55	0	0	0	0	0
Chipper	0	3.99	0.9	1372	495	30	0.55	0	0	0	0	0
Crane	2	1.06	9.6	3.8	1.43	172	0.61	200	49	443	175	66
ATVs	4	1	8	5	1.22	350	0.65	300	150	1,201	751	183
							Totals:	(lbs/yr)	3,629	20,170	9,651	4,405
								(tons/yr)	1.81	10.08	4.83	2.20
Snowmobiles	0	2.7	0.86	300	110	48	0.34	0	0	0	0	0
							Totals:	(lbs/yr)	0	0	0	0
								(tons/yr)	0.00	0.00	0.00	0.00

LAKE MEAD NRA PUBLIC MARINE VESSEL EMISSIONS

Diesel Engine Emission Factors [1]

Units	HC	CO	NO_x	PM	SO_2		
(g/hp-hr)	1.26	1.91	8.92	0.563	0.352	1 g =	0.002202
(lb/hp-hr)	0.003	0.004	0.020	0.001	0.001	BSFC =	0.367

[1] Source: Exhaust Emission Factors for Nonroad Engine Modeling - Compression-Ignition EPA Report No., NR-009A; Table 1

2-Stroke Gasoline Engine Emission Factors [3]

Units	HC	CO	NO_x	PM	SO_2
(g/hp-hr)	116.38	231.26	1.19	7.7	0.000
(lb/hp-hr)	0.256	0.509	0.003	0.017	0.000

4-Stroke Gasoline Engine Emission Factors [3]

Units	HC	CO	NO_x	PM	SO_2
(g/hp-hr)	14.92	339.18	7.46	0.06	0.000
(lb/hp-hr)	0.033	0.747	0.016	0.000	0.000

[3] Source: Nonroad Emission Inventory Model, Draft, June 17, 1998

Criteria Pollutant Emissions [3]

Vessel Type	Number of Trips	No. of Engines	Engine Power (hp)	Hours of Operation	Load Factor	HC (lb/yr)	CO (lb/yr)	NO_x (lb/yr)	PM (lb/yr)	SO_2 (lb/yr)
<30 HP Outboard [1]	2,982	1	20	13,846	0.21	14,900	29,609	152	986	0
>30 HP Outboard [1]	7,047	1	50	38,829	0.21	104,464	207,582	1,068	6,912	0
4-Stroke Outboard [2]	15,373	1	90	65,553	0.21	40,697	925,183	20,349	164	0
Inboard/Outboard [2]	64,155	1	200	371,881	0.21	513,056	11,663,433	256,528	2,063	0
Inboard [2]	21,961	1	200	122,263	0.21	1,315,726	2,614,495	13,453	87,052	0
Inboard Jet [1]	4,896	1	200	26,320	0.21	283,241	562,832	2,896	18,740	0
Personal Watercraft [1]	39,447	1	155	170,009	0.21	1,417,895	2,817,515	14,498	93,812	0
Personal Watercraft [2]	5,991	1	155	30,028	0.21	250,437	497,646	2,561	16,570	0
					Total	3,940,418	19,318,294	311,506	226,297	0
							tons/year			
						1,970.21	9,659.15	155.75	113.15	0.00

[1] Assumes 2-stroke engine
[2] Assumes 4-stroke engine
Emissions = Emission Factor * No. of Engines * Engine Power * Hours of Operation *Load Factor

LAKE MEAD NRA NPS MARINE VESSEL EMISSIONS

Diesel **Engine Emission Factors**[1]

Units	HC	CO	NO_x	PM	SO_2		
(g/hp-hr)	1.26	1.91	8.92	0.563	0.352	1 g =	0.0022016 lbs
(lb/hp-hr)	0.003	0.004	0.020	0.001	0.001	BSFC =	0.367 lb/hp-hr

[1] Source: Exhaust Emission Factors for Nonroad Engine Modeling -- Compression-Ignition EPA Report No., NR-009A; Table 1

2-Stroke Gasoline Engine Emission Factors[3]

Units	HC	CO	NO_x	PM	SO_2
(g/hp-hr)	116.38	231.26	1.19	7.7	0.000
(lb/hp-hr)	0.256	0.509	0.003	0.017	0.000

4-Stroke Gasoline Engine Emission Factors[3]

Units	HC	CO	NO_x	PM	SO_2
(g/hp-hr)	14.92	339.18	7.46	0.06	0.000
(lb/hp-hr)	0.033	0.747	0.016	0.000	0.000

[3] Source: Nonroad Emission Inventory Model, Draft, June 17, 1998

Criteria Pollutant Emissions [3]

NPS Vessel	Number	No. of Engines	Engine Power (hp)	Hours of Operation	Load Factor	HC (lb/yr)	CO (lb/yr)	NO_x (lb/yr)	PM (lb/yr)	SO_2 (lb/yr)
Barge[1]	7	1	150	500	0.21	4,036	8,019	41	267	0
	1	1	550	600	0.21	17,756	35,284	182	1,175	0
	4	1	225	700	0.21	8,475	16,840	87	561	0
	3	1	60	625	0.21	2,018	4,010	21	134	0
	1	1	90	15	0.21	73	144	1	5	0
	2	1	115	100	0.21	619	1,230	6	41	0
Motor Boat[1]	4	1	220	800	0.21	9,470	18,818	97	627	0
	6	1	25	3,000	0.21	4,036	8,019	41	267	0
	8	1	40	3,200	0.21	6,887	13,686	70	456	0
Chase Boat[1]	4	1	150	5,000	0.21	40,355	80,191	413	2,670	0
Ferry Boat[1]	5	1	125	5,000	0.21	33,630	66,826	344	2,225	0
Fire Boat	1[1]	1	200	5,000	0.21	53,807	106,921	550	3,560	0
	1[2]	1	70	350	0.21	1,318	2,620	13	87	0
Fishing Boat[1]	7	1	15	700	0.21	565	1,123	6	37	0
	2	1	40	100	0.21	215	428	2	14	0
	4	1	25	280	0.21	377	748	4	25	0
Float Boat[1]	8	1	60	9,600	0.21	30,993	61,586	317	2,051	0
					Total	214,629	426,492	2,195	14,200	0
								tons/year		
						107.31	213.25	1.10	7.10	0.00

[1] Assumes 2-stroke engines
[2] Assumes 4-stroke engine
Emissions = Emission Factor * No. of Engines * Engine Power * Hours of Operation *Load Factor

EDMS 3.23 Emissions Inventory Report

Study Name: Lake Mead

Airport: MC CARRAN INTL

Report Date: 11/06/02

SUMMARY

(Tons/Year)

NAME	CO	HC	NOx	SOx	PM10
Aircraft	4.305	.105	.014	.000	.000
GSE/AGE/APU	.000	.000	.000	.000	.000
Total	4.305	.105	.014	.000	.000

AIRCRAFT EMISSIONS

(Tons/Year)

Aircraft	Engine	Mode	CO	HC	NOx	SOx	PM10
Cessna 150	0-200	TAXI	.000	.000	.000	.000	.000
Cessna 150	0-200	TKOF	.137	.003	.001	.000	.000
Cessna 150	0-200	CLMB	2.283	.049	.011	.000	.000
Cessna 150	0-200	APCH	1.885	.053	.002	.000	.000
Cessna 150	0-200	APU	.000	.000	.000	.000	.000
Cessna 150	0-200	GSE	.000	.000	.000	.000	.000

" Denotes User Created Aircraft

EDMS 3.23 Study Information Lake Mead

Date: Friday, December 20, 2002
Study Created: Wednesday, November 06, 2002
Study Pathname: C:\EDMS\LAKE MEAD\Lake Mead.EDM

Airport: MC CARRAN INTL, NV LAS
Airport Location (lat / lon): 36-04-49.859N 115-09-03.956W
Field elevation: 2175
Metric airport layout units selected
Average temperature: 58.
Mixing Height: 3000
Vehicle fleet year: 2002

Hourly Profiles:
DEFAULT

Hour	Fraction of Peak	Hour	Fraction of Peak	Hour	Fraction of Peak
1	1.000	9	1.000	17	1.000
2	1.000	10	1.000	18	1.000
3	1.000	11	1.000	19	1.000
4	1.000	12	1.000	20	1.000
5	1.000	13	1.000	21	1.000
6	1.000	14	1.000	22	1.000
7	1.000	15	1.000	23	1.000
8	1.000	16	1.000	24	1.000

Daily Profiles:
DEFAULT

Day	Fraction of Peak	Day	Fraction of Peak
Monday	1.000	Friday	1.000
Tuesday	1.000	Saturday	1.000
Wednesday	1.000	Sunday	1.000
Thursday	1.000		

Monthly Profiles:
DEFAULT

Month	Fraction of Peak	Month	Fraction of Peak
January	1.000	July	1.000
February	1.000	August	1.000
March	1.000	September	1.000
April	1.000	October	1.000
May	1.000	November	1.000
June	1.000	December	1.000

Aircraft:

Aircraft Name	Engine Type	Aircraft Category	Identification
Cessna 150	0-200	SGPP	#1

Annual LTO: 000000001250
TGO: 0
Annual Average Taxi Time: 0.00
Annual Average Queue Time: 0.00
Hourly Profile: DEFAULT
Daily Profile: DEFAULT
Monthly Profile: DEFAULT

Assigned Gate:
Aircraft does not use configurations
Assigned Taxiway 1: -NONE-
Assigned Taxiway 2: -NONE-
Assigned Taxiway 3: -NONE-
Assigned Runway:
Assigned GSE/AGE:

GSE	Op Time

Advanced Dispersion Settings
Urban vs. Rural flag set to urban
Aircraft Settings

Aircraft Size:	Small	Large	Heavy
Initial Sigma Y:	6	15	25
Initial Sigma Z:	2	4	7

Stationary Source Settings
Initial Sigma Y: 2
Initial Sigma Z: 2

APPENDIX C

PUBLIC USE DATA

UNITED STATES DEPARTMENT OF THE INTERIOR
NATIONAL PARK SERVICE
LAKE MEAD NATIONAL RECREATION AREA
601 NEVADA HIGHWAY
BOULDER CITY, NEVADA 89005-2426

VISITOR AND VISITOR USE STATISTICS FOR: DECEMBER, 2001

	This Month	Year to Date
1. Recreational Visitors	350,687	8,772,589

2. Travel Trends: December 2001 under December 2000 by 20.4%.
December 2001 under November 2001 by 41%.
2001 year to date under 2000 by 3.3%.

DISTRIBUTION

	DECEMBER 2001	DECEMBER 2000	2001 Year To Date	2000 Year To Date
LAKE MEAD				
1. Boulder Beach access from US 93	88,727	109,280	2,130,427	2,198,088
2. Lakeshore Road (Eastbound)	111,276	104,702	2,038,311	2,224,819
3. Lake Mead Boulevard	56,579	62,769	1,121,567	1,295,084
4. Kingman Wash	475	673	12,693	13,323
5. Northshore Road (Southbound/Overton)	22,292	31,511	470,921	485,539
6. Valley of Fire access road	6,544	17,982	300,826	276,306
7. Temple Bar access road	4,877	7,494	161,788	196,816
8. South Cove - Pearce Ferry Road	7,913	3,868	159,553	169,050
9. Miscellaneous access to Lake Mead	4,875	45,911	870,600	522,307
Lake Mohave				
1. Willow Beach access road	7,270	10,900	199,942	216,400
2. Cottonwood Cove access road	4,208	9,900	138,713	202,218
3. Katherine access road	28,951	29,400	1,032,490	1,119,537
4. Miscellaneous access to Lake Mohave	6,700	6,286	134,758	153,058
Total	350,687	440,676	8,772,589	9,072,545
Informational entries (included in above totals):				
Lake Mead Marina access road	42,606	41,342	802,683	1,074,430
Las Vegas Bay Marina access road	30,479	33,264	722,660	635,363
Callville Bay access road	16,500	16,500	664,998	504,904
Echo Bay access road	11,256	29,288	270,022	344,581
Overton Beach access road	13,844	12,659	317,214	337,585

SPECIAL TRAVEL DATA

U.S. 93 Eastbound-Hoover Dam	561,000	561,059	7,526,802	7,827,363
U.S. 93 Westbound-Hoover Dam	615,120	615,242	7,928,745	8,396,860
Nevada Highway 163 Eastbound-Davis Dam	25,895	37,511	1,370,959	1,490,200
Nevada Highway 68 Westbound-Davis Dam	53,028	14,469	1,529,289	1,303,693
Total	1,255,043	1,228,281	18,355,795	19,018,116
Recreational Visitors (No. 1 above)	350,687	440,676	8,772,589	9,072,545
TOTAL TRAVEL: Lake Mead N. R. A.	1,605,730	1,668,957	27,128,384	28,090,661

UNITED STATES DEPARTMENT OF THE INTERIOR
NATIONAL PARK SERVICE
LAKE MEAD NATIONAL RECREATION AREA
Boulder City, Nevada 89005

SUMMARY OF VISITOR TRAVEL FOR THE CALENDAR YEARS 1937 THROUGH 2001

Year	Total Travel	Cumulative Total	Number Over or Under Previous Year	Percent Over or Under Previous Year
1937	552,128	552,128		
1938	533,914	1,086,042	18,214	3.30%
1939	649,624	1,735,666	+ 115,710	+ 21.67%
1940	668,027	2,403,693	+ 18,403	+ 2.83%
1941	844,733	3,248,426	+ 176,706	+ 26.45%
1942	338,778	3,587,204	505,955	59.90%
1943	214,190	3,801,394	- 124,588	- 36.78%
1944	263,533	4,064,927	+ 49,343	+ 23.04%
1945	587,436	4,652,363	+ 323,903	+ 122.91%
1946	1,165,369	5,817,732	+ 577,933	+ 98.38%
1947	1,426,831	7,244,563	+ 261,462	+ 22.44%
1948	1,654,004	8,898,567	+ 227,173	+ 15.92%
1949	1,423,552	10,322,119	- 230.452	13.93%
1950	1,798,280	12,120,399	+ 374,728	+ 26.32%
1951	2,053,619	14,174,018	+ 255,339	+ 14.20%
1952	1,946,706	16,120,724	106,913	5.21%
1953	2,220,940	18,341,664	+ 274,234	+ 14.09%
1954	2,112,724	20,454,388	- 108,216	- 4.87%
1955	2,675,371	23,129,759	+ 562,647	+ 26.60%
1956	2,672,774	25,802,533	- 2,597	0.10%
1957	2,955,257	28,757,790	+ 282,483	+ 10.57%
1958	3,190,580	31,948,370	+ 235,323	+ 7.96%
1959	3,390,574	35,338,944	+ 199,994	+ 6.27%
1960	2,254,185	37,593,129	- 1,136,389	33.50%
1961	2,219,960	39,813,089	- 34,225	- 1.50%
1962	2,688,745	42,501,834	+ 468,785	+ 21.10%
1963	3,349,565	45,851,399	+ 660,820	+ 24.60%
1964	3,462,580	49,313,979	+ 113,015	+ 3.40%
1965	3,594,065	52,908,044	+ 131,485	+ 3.80%
1966	3,720,485	56,628,529	+ 126,420	+ 3.50%
1967	4,102,335	60,730,864	+ 381.850	+ 10.30%
1968	4,751,795	65,482,659	+ 649,460	+ 15.80%
1969	5,614,940	71,097,599	+ 863,145	+ 18.20%
1970	4,897,135	75,994,734	- 717,805	12.80%
1971	4,570,229	80,564,963	- 326,906	6.70%
1972	4,888.636	85,453,599	+ 318,407	+ 6.90%
1973	5,534,315	90,987,914	+ 645,679	+ 13.20%
1974	5,939,533	96,927,447	+ 405,218	+ 7.32%
1975	6,219,220	103,146,667	+ 279,687	+ 4.70%
1976	6,948,611	110,095,278	+ 729,391	+ 11.72%
1977	6,529,848	116,625,126	418,763	6.00%
1978	6,879,870	123,504,996	+ 350.022	+ 5.30%
1979	6,378,341	129,883,337	501,529	- 7.30%
1980	5,145,699	135,029,036	- 1,232,642	19.30%
1981	5,406,184	140,435,220	+ 260,485	+ .05%
1982	5,565,467	146,000,687	+ 159,283	+ 3.00%
1983	6,128,254	152,128,941	+ 562,787	+ 10.10%
1984	6,504,206	158,633,147	+ 375,952	+ 6.10%
1985	7,204,295	165,837,442	+ 700.089	+ 10.70%
1986	8,034,542	173,871,984	+ 830.247	+ 11.50%
1987	8,392,419	182,264,403	+ 357,877	+ 4.50%
1988	8,629,895	190,894,298	+ 237,476	+ 2.83%
1989	8,803,414	199,697,712	+ 173,519	+ 2.00%
1990	8,893,495	208,591,207	+ 90.081	+ 1.02%
1991	8,751,312	217,342,519	- 142,183	1.59%
1992	9,343,549	226,686,068	+ 592,237	+ 6.80%
1993	9,265,520	235,951,588	- 78,029	- .84%
1994	9,913,705	245,865,293	+ 648,185	+ 7.00%
1995	10,195,546	256,060,839	+ 281,841	+ 2.85%
1996	9,689,997	265,750,836	- 505,549	4.96%
1997	8,837,742	274,588,578	852,255	8.80%
1998	9,106,793	283,695,371	+ 269,051	+ 3.00%
1999	9,351,237	293,046,608	+ 244,444	+ 2.68%
2000	9,072,545	302,119,153	278,692	- 3.00%
2001	8,772,589	310,891,742	299,956	- 3.31%

Month	Recreation Visits	Non-Recreation Visits	Total Visits	Concessioner Lodging	Concessioner Campgrounds	Tent Campers	RV Campers	Total RV/Tent Campers	Back-country Campers	Misc. Campers	Non-Rec Overnight Stays	Total Overnight Stays
January]	469,6521	17,0341	486,6861	2,8131	19,9361	9,3531	11,9041	21,2571	13,4421	7,590	23,445	88,483
February'	551,0791	19,9871	571,0661	2,3041	15,0421	13,7831	17,5421	31,3251	26,7701	12,9071	22,6751	111,023
March'	601,7621	21,8261	623,5881	3,1451	19,0251	12,1531	15,4681	27,6211	16,5541	7,7581	21,6831	95,786
April'	861,2631	31,2381	892,5011	4,8091	16,0241	15,9961	20,3591	36,3551	18,1091	14,153	20,6471	1 10,097
MayI	850,4091	30,8441	881,253	5,8471	15,2861	10,9711	13,964	24,935	37,1701	15,0251	22,742	121,005
June1	1,165,1541	42,2591	1,207,4131	5,5431	15,2041	9,5011	12,0931	21,594'	41,5011	9,9541	23,2491	1 17,045
Julys	871,2951	31,6011	902,8961	8,5391	16,2721	6,5751	8,3681	14,9431	60,121	14,787	27,5621	142,224
Augusts	850,7221	30,8551	881,5771	9,6051	15,567'	6,1561	7,834	13,9901	31,8261	14,0621	27,715	1 12,765
September'	741,7961	26,9051	768,7011	6,575	13,3581	7,0281	8,9451	15,9731	38,6831	14,025	22,012	1 10,626
October!	770,4981	27,9461	798,4441	5,601	14,5841	I I ,0341	14,0431	25,0771	30,3421	13,566	22,1791	1 1 1,349
November	596,1231	21,62 I	617,7441	2,204	14,5831	6,8161	8,6761	15,4921	1 1,9841	8,0161	22,0451	74,324
December!	425,2521	15,424!	440,6761	1,2201	14,0621	5,0671	6,4481	11,5151	12,4531	14,672	22,8191	76,741
ITotals:	8,755,0051	317,5401	9,072,5451	58,2051	188,943!	114,4331	145,644'	260,0771	338,9551	146,515	278,7731	1,271,468

Tents and Recreational Vehicles

The percentage of Total National Park Service Campers using tents and recreational vehicles for each month are as follows:

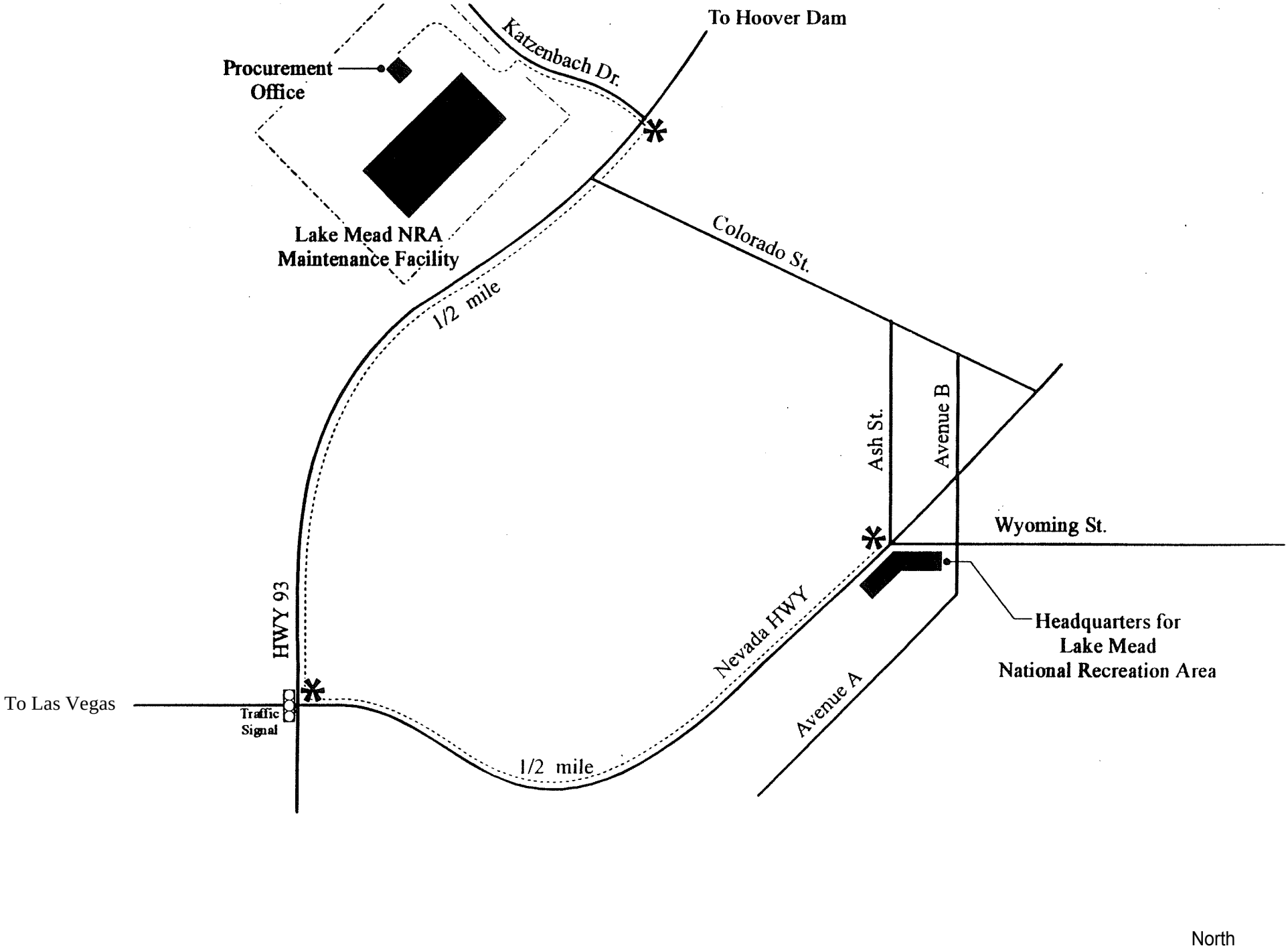
MONTH	TENT %	RV %
JANUARY	10%	90%
FEBRAURY	12%	88%
MARCH	21%	79%
APRIL	28%	72%
MAY	27%	73%
JUNE	28%	72%
JULY	44%	56%
AUGUST	43%	57%
SEPTEMBER	27%	73%
OCTOBER	27%	73%
NOVEMBER	21%	79%
DECEMBER	15%	85%

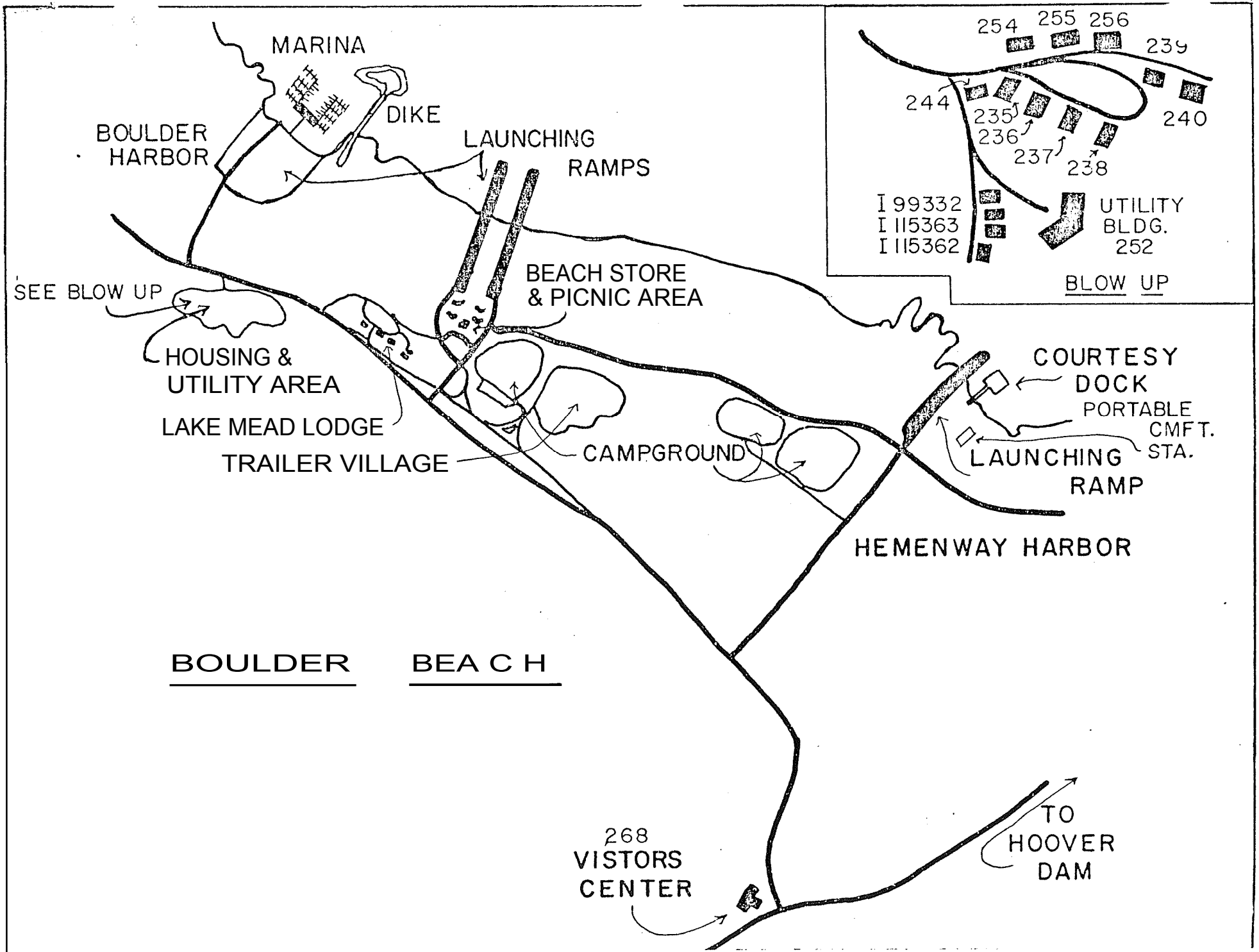
Tents =- % of total National Park Service campers for each month

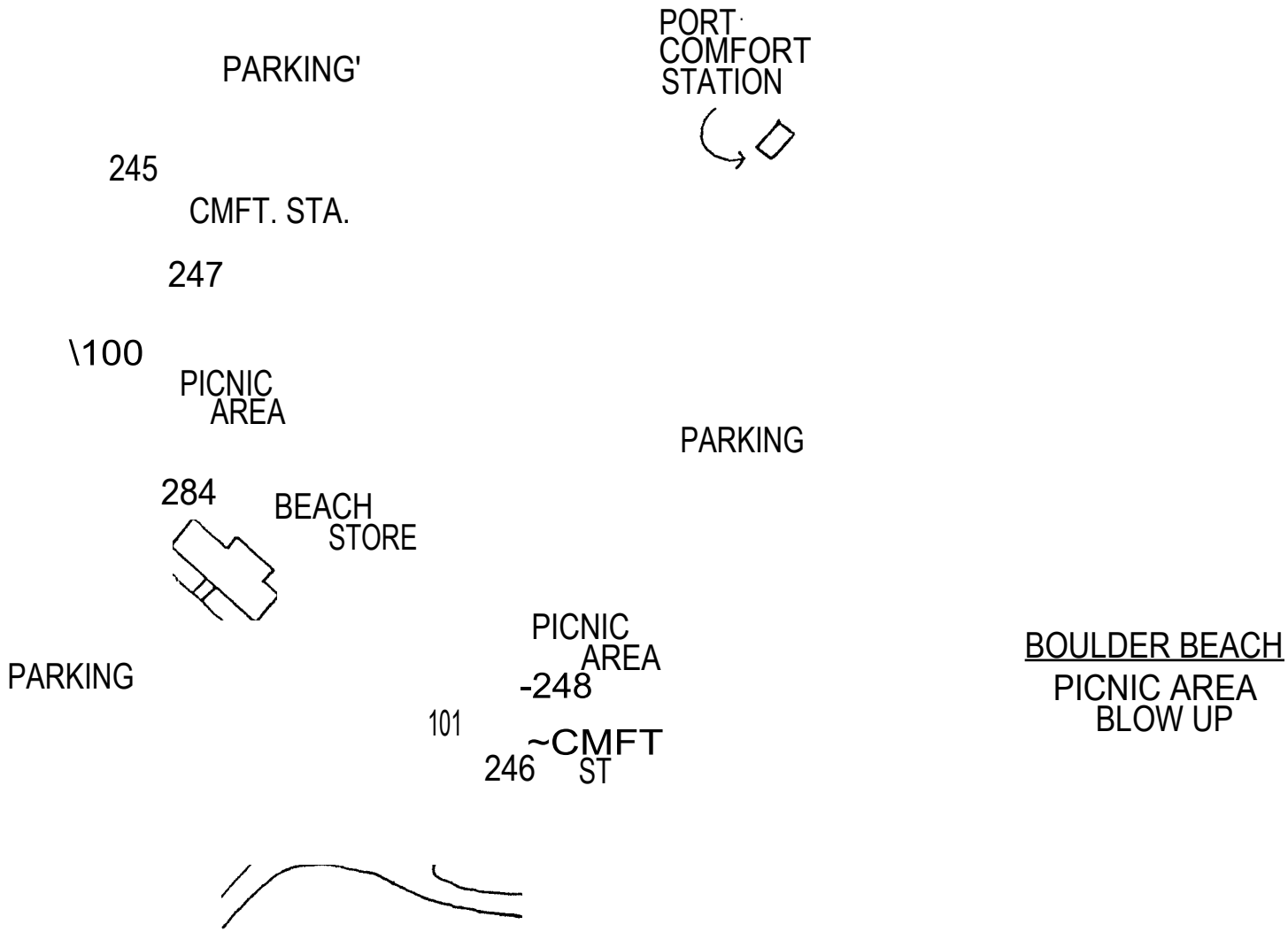
Recreational vehicles =_____% of total National Park Service campers for each month.

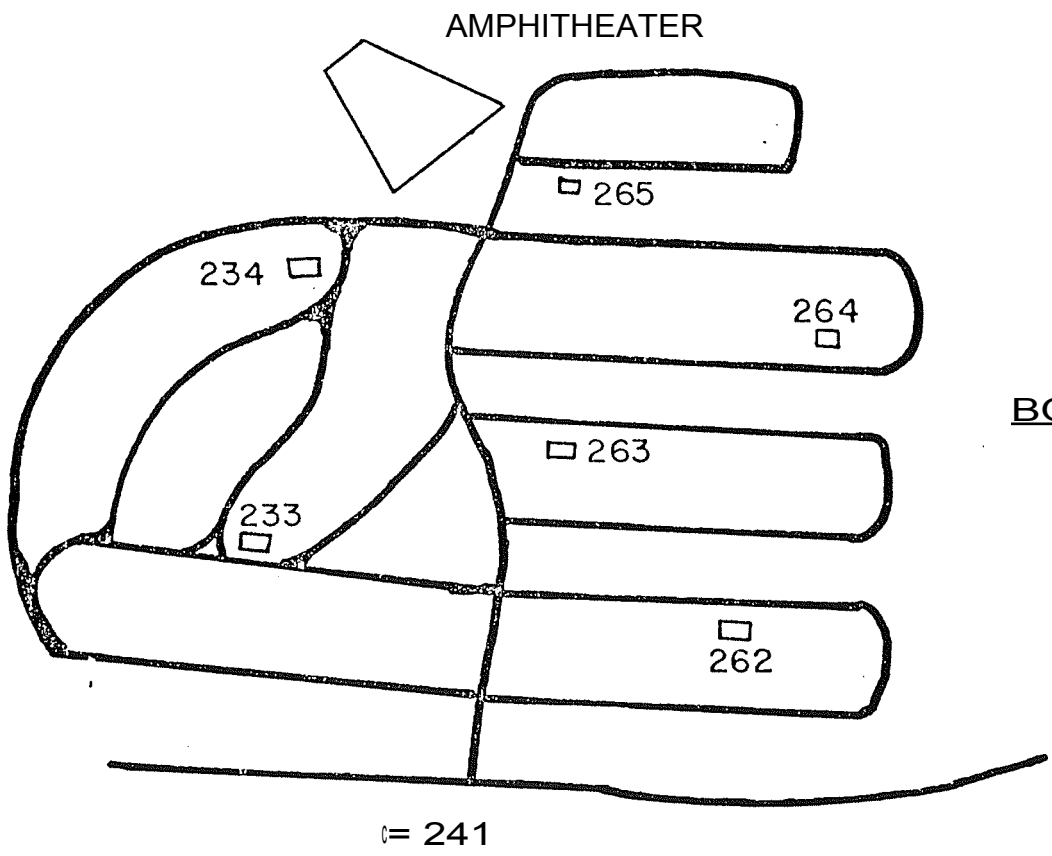
APPENDIX D

DEVELOPED AREAS IN LAKE MEAD N RA, NV/AZ


To Hoover Dam
Katzenbach Dr.
Procurement Office
Lake Mead NRA Maintenance Facility
Colorado St.
1/2 mile
Ash St.
Avenue B
Wyoming St.
HWY 93
Nevada HWY
Headquarters for Lake Mead National Recreation Area
To Las Vegas
Traffic Signal
1/2 mile
Avenue A
North

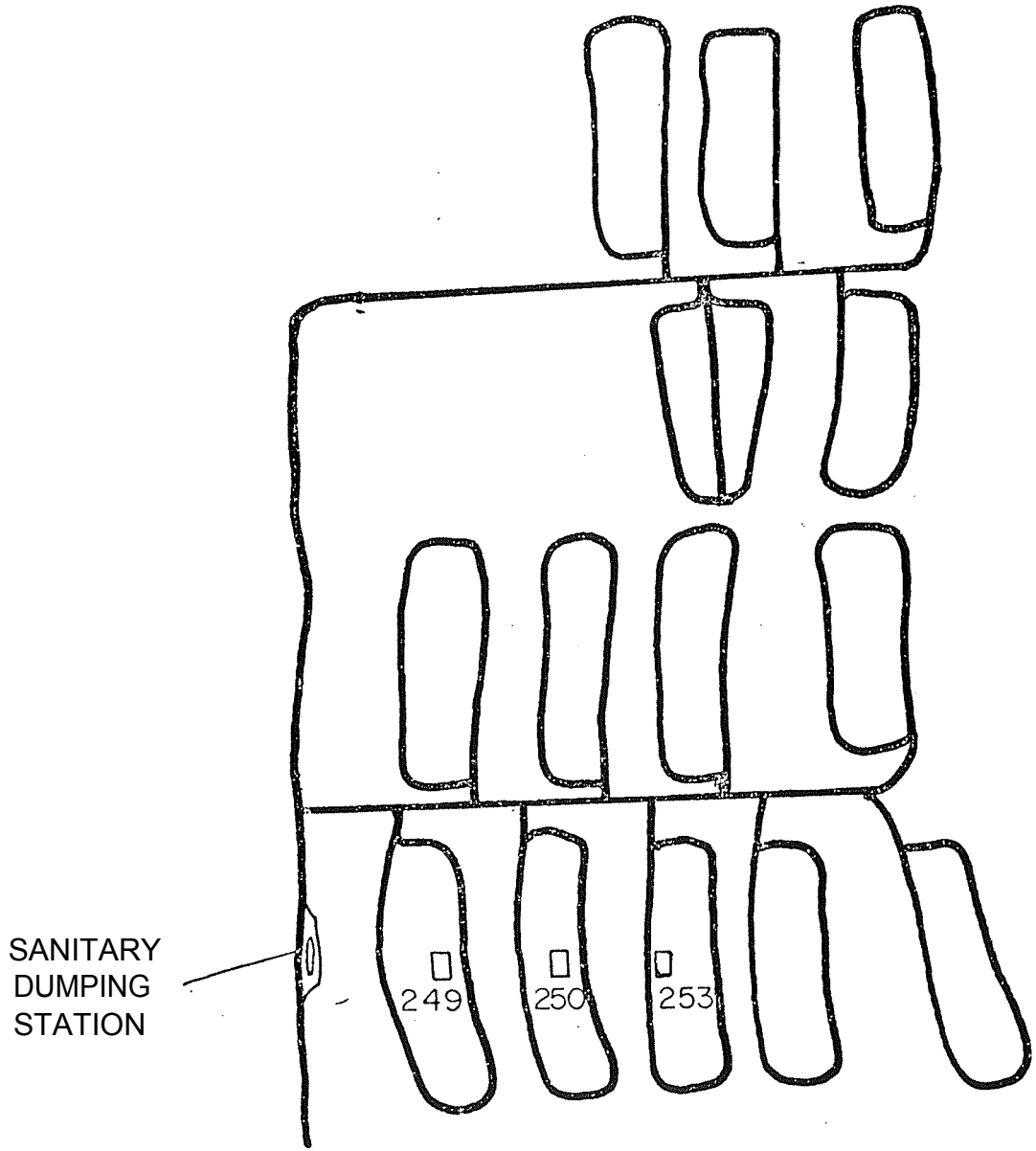

MARINA
DIKE
BOULDER HARBOR
LAUNCHING RAMPS
SEE BLOW UP
BEACH STORE & PICNIC AREA
HOUSING & UTILITY AREA
LAKE MEAD LODGE
TRAILER VILLAGE
CAMPGROUND
COURTESY DOCK
PORTABLE CMFT. STA.
LAUNCHING RAMP
HEMENWAY HARBOR
BOULDER BEACH
268 VISTORS CENTER
TO HOOVER DAM
254 255 256 239
244 235 236 237 238 240
I 99332
I 115363
I 115362
UTILITY BLDG. 252
BLOW UP


PARKING'
PORT
COMFORT
STATION
245
CMFT. STA.
247
\100
PICNIC
AREA
PARKING
284
BEACH
STORE
PICNIC
AREA
PARKING
-248
101
~CMFT
246
ST
BOULDER BEACH
PICNIC AREA
BLOW UP



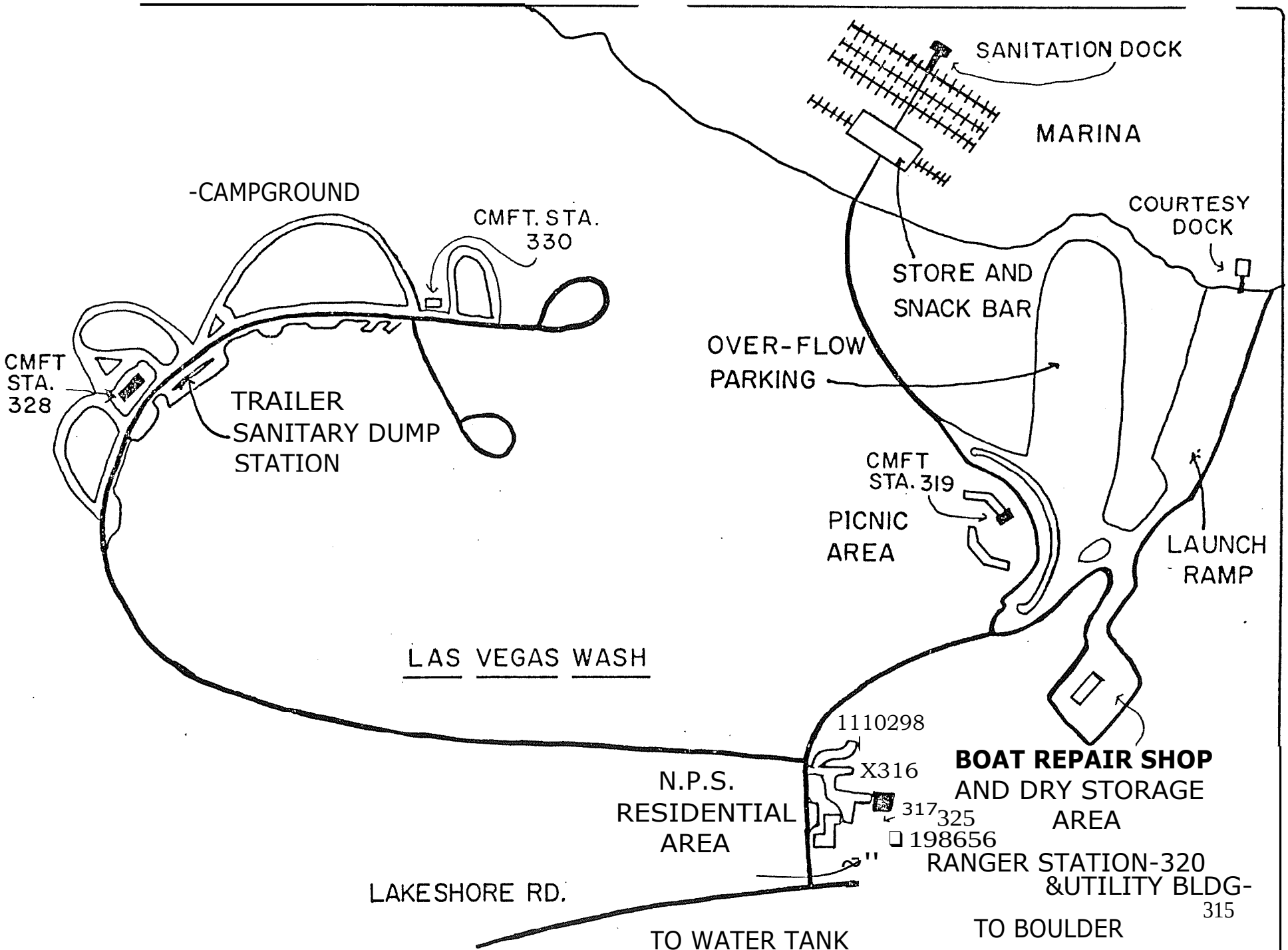
BOULDER BEACH

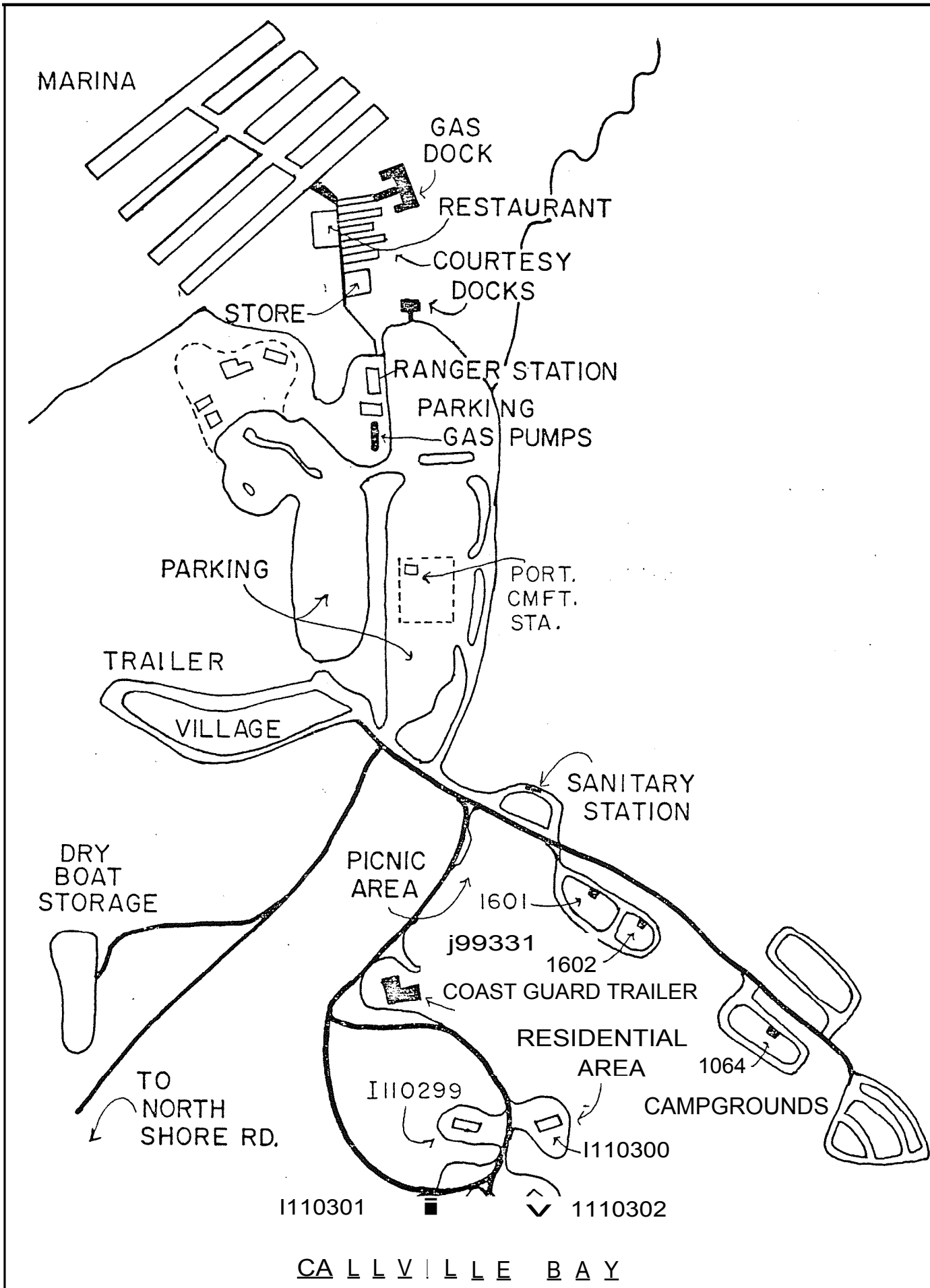
CAMPGROUND
BLOW-UP

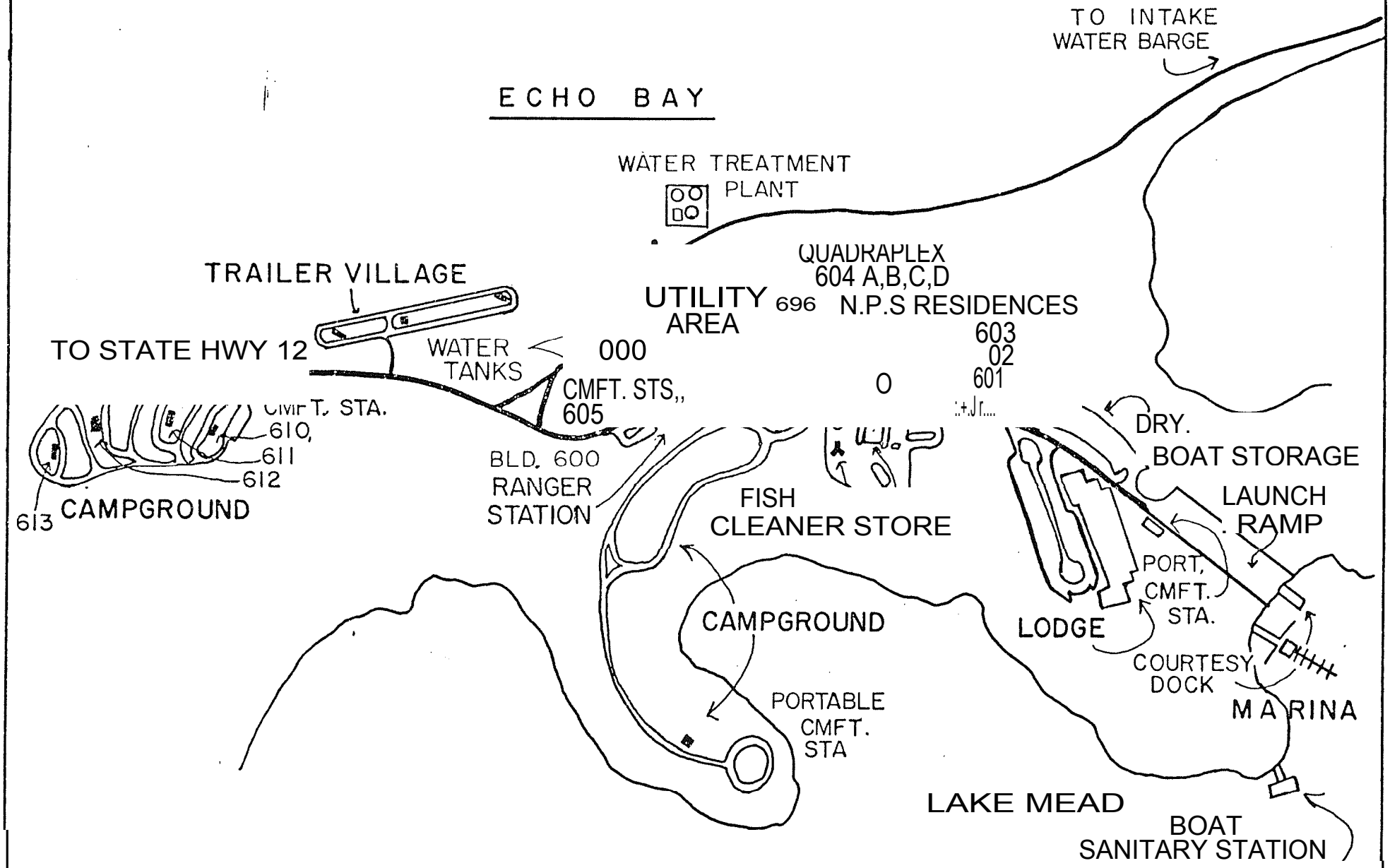


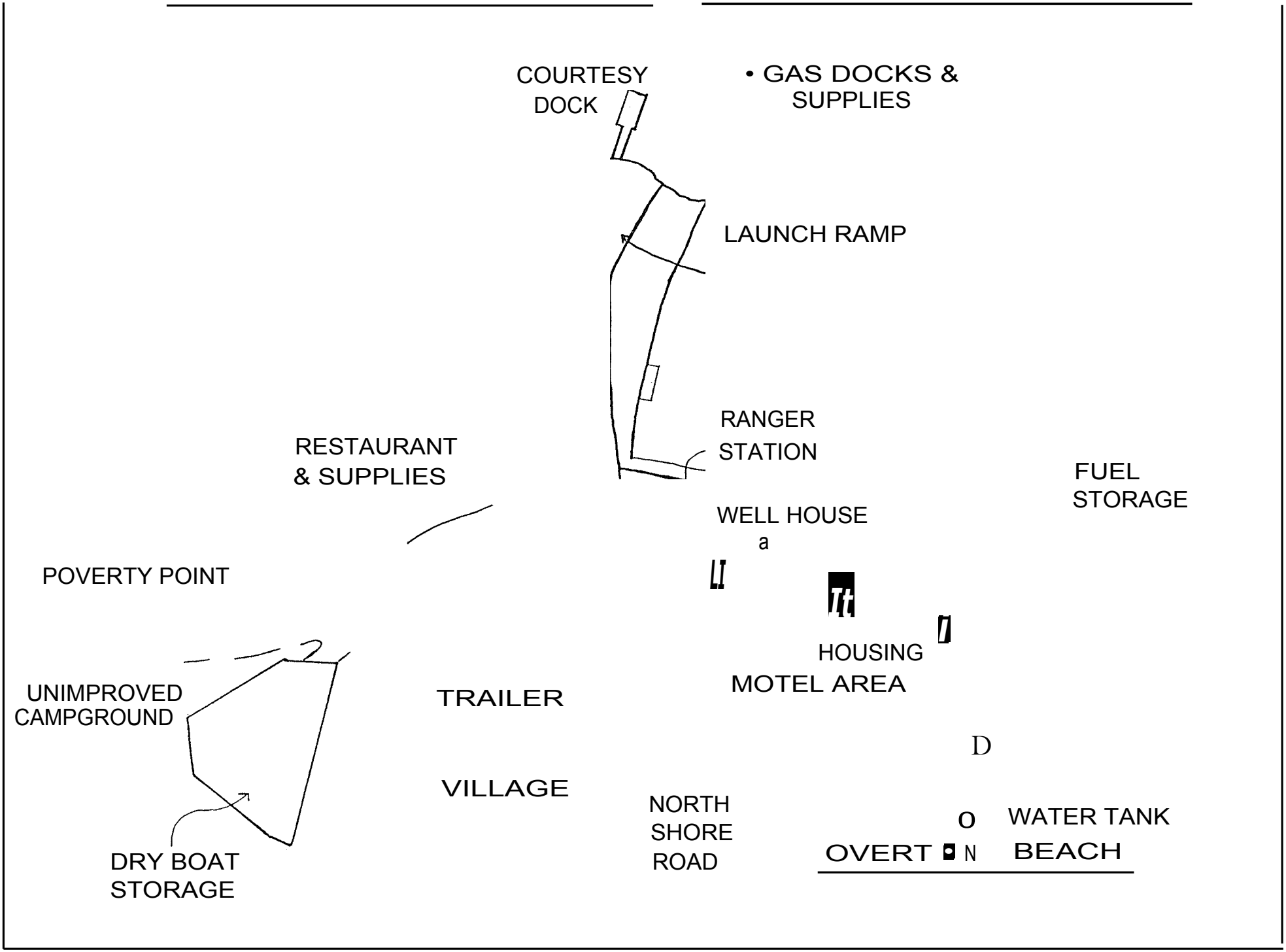
HEMENWAY. BEACH

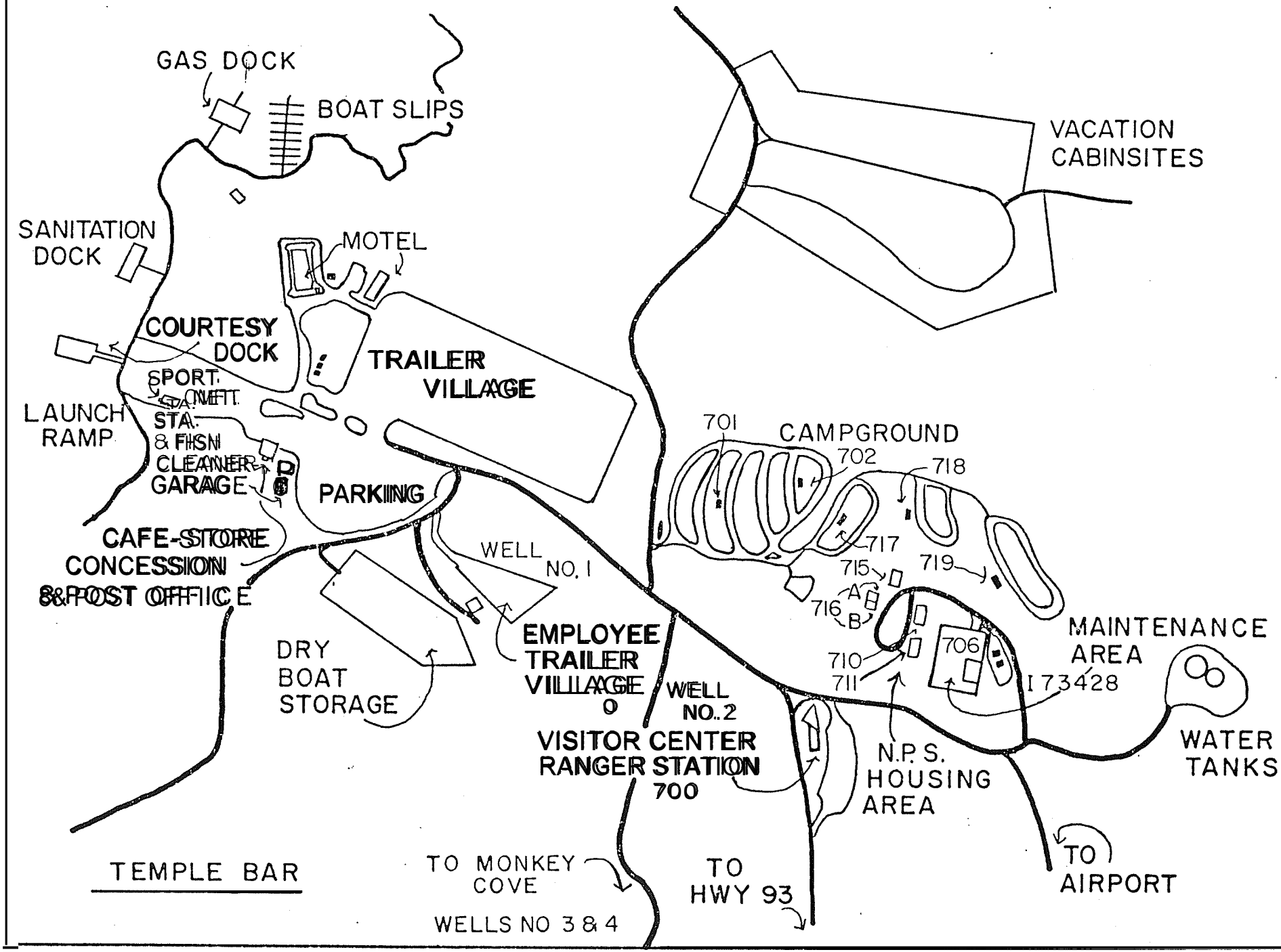
CAMPGROUND BLOW-UP

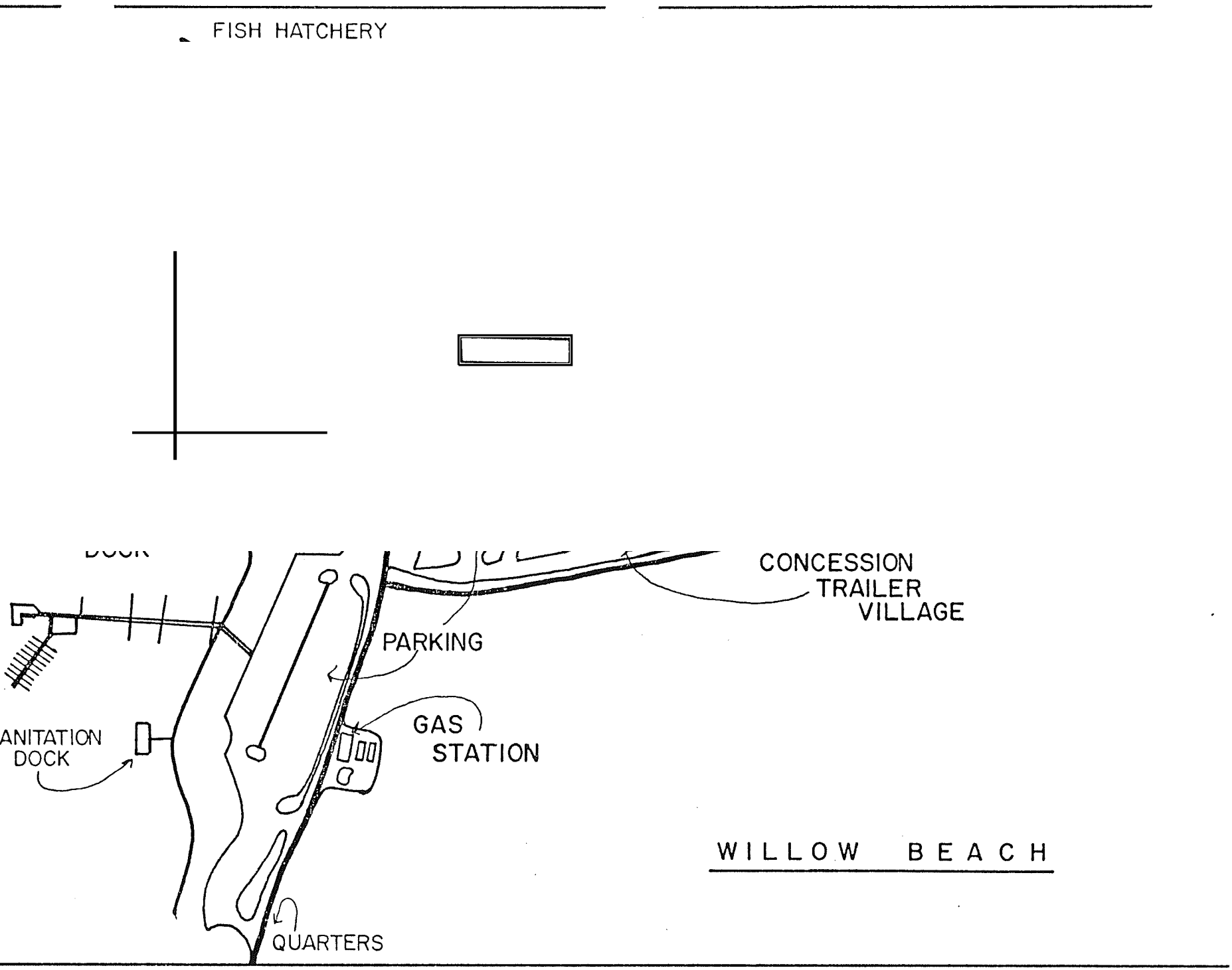

SANITATION DOCK
MARINA
-CAMPGROUND
CMFT. STA. 330
COURTESY DOCK
STORE AND SNACK BAR
CMFT STA. 328
TRAILER SANITARY DUMP STATION
OVER-FLOW PARKING
CMFT STA. 319
PICNIC AREA
LAUNCH RAMP
LAS VEGAS WASH
1110298
X316
BOAT REPAIR SHOP AND DRY STORAGE AREA
N.P.S. RESIDENTIAL AREA
317
325
198656
RANGER STATION-320 &UTILITY BLDG-315
LAKESHORE RD.
TO WATER TANK
TO BOULDER

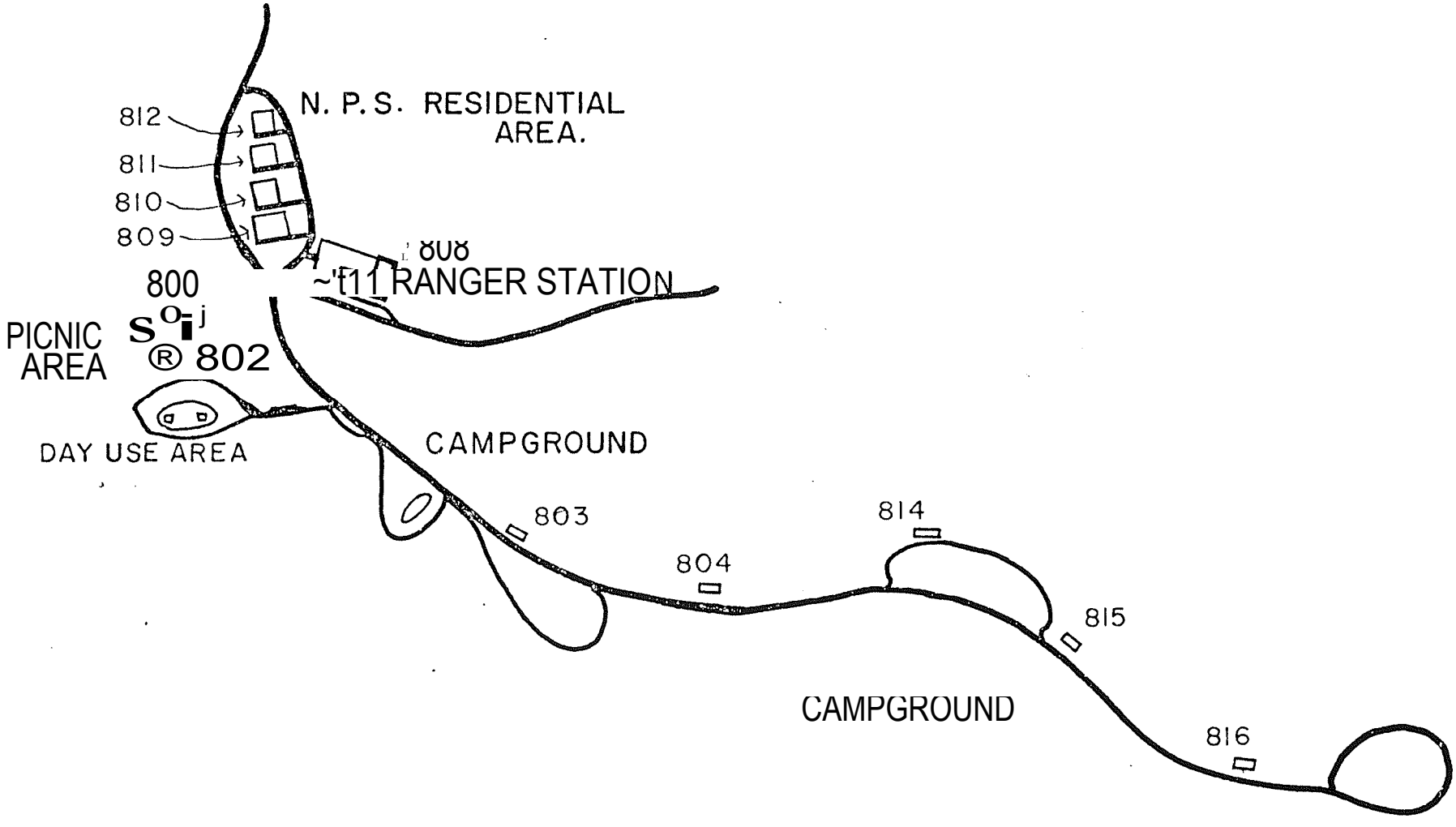

MARINA
GAS DOCK
RESTAURANT
COURTESY DOCKS
STORE
RANGER STATION
PARKING
GAS PUMPS
PARKING
PORT. CMFT. STA.
TRAILER VILLAGE
SANITARY STATION
DRY BOAT STORAGE
PICNIC AREA
1601
j99331
1602
COAST GUARD TRAILER
RESIDENTIAL AREA
1064
CAMPGROUNDS
TO NORTH SHORE RD.
I110299
I110300
I110301
1110302
CALLVILLE BAY


ECHO BAY
TO INTAKE WATER BARGE
WATER TREATMENT PLANT
TRAILER VILLAGE
TO STATE HWY 12
WATER TANKS
CMFT. STS,, 605
UTILITY AREA
696
QUADRAPLEX 604 A,B,C,D
N.P.S RESIDENCES
603
02
601
000
0
CMFT. STA.
610
611
612
613
CAMPGROUND
BLD. 600 RANGER STATION
FISH CLEANER STORE
DRY. BOAT STORAGE
LAUNCH RAMP
PORT. CMFT. STA.
LODGE
COURTESY DOCK
MARINA
CAMPGROUND
PORTABLE CMFT. STA
LAKE MEAD
BOAT SANITARY STATION

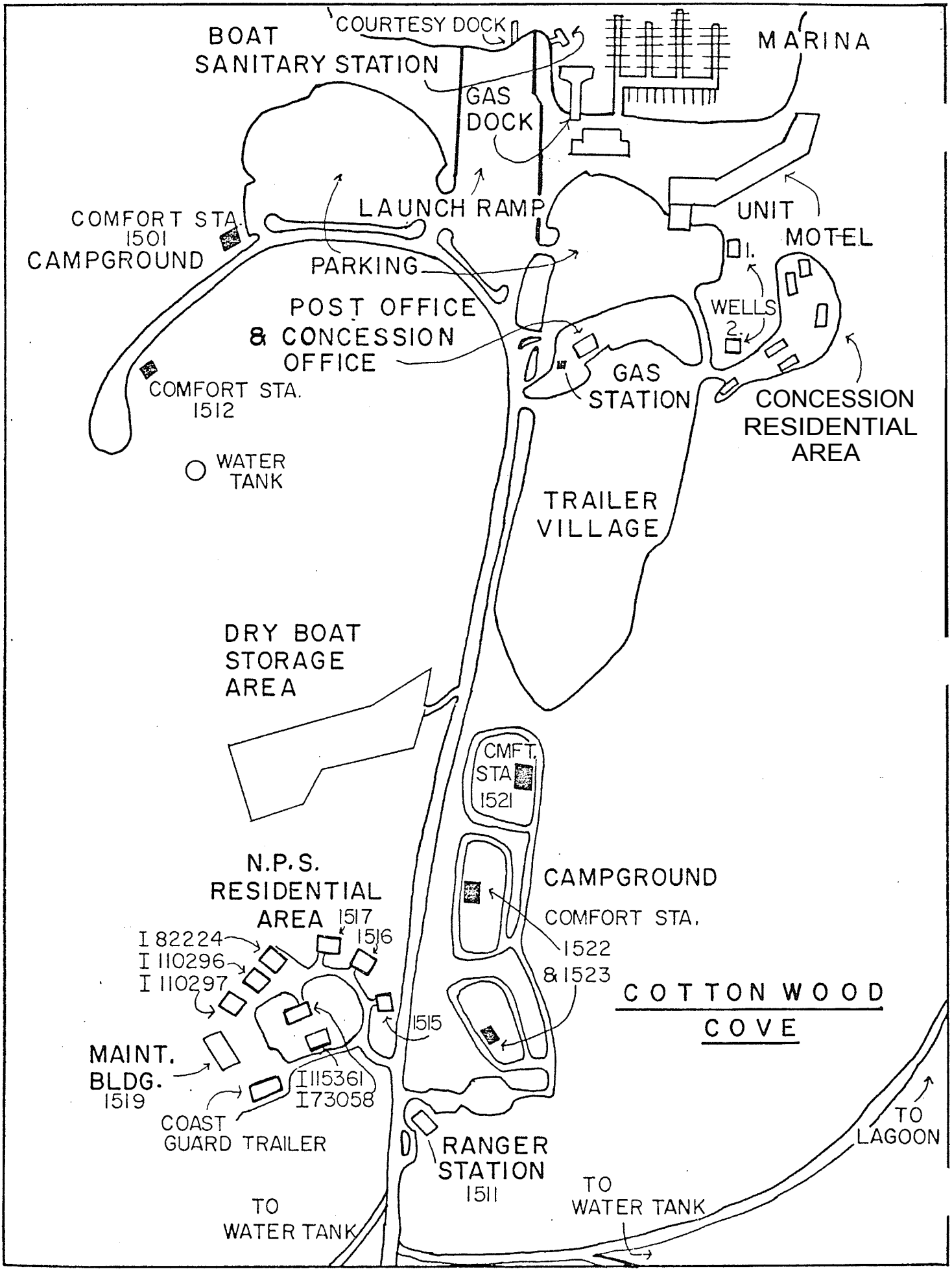

COURTESY DOCK
• GAS DOCKS & SUPPLIES
LAUNCH RAMP
RANGER STATION
RESTAURANT & SUPPLIES
FUEL STORAGE
WELL HOUSE
a
POVERTY POINT
HOUSING
MOTEL AREA
UNIMPROVED CAMPGROUND
TRAILER
VILLAGE
D
NORTH SHORE ROAD
WATER TANK
OVERT N BEACH
DRY BOAT STORAGE

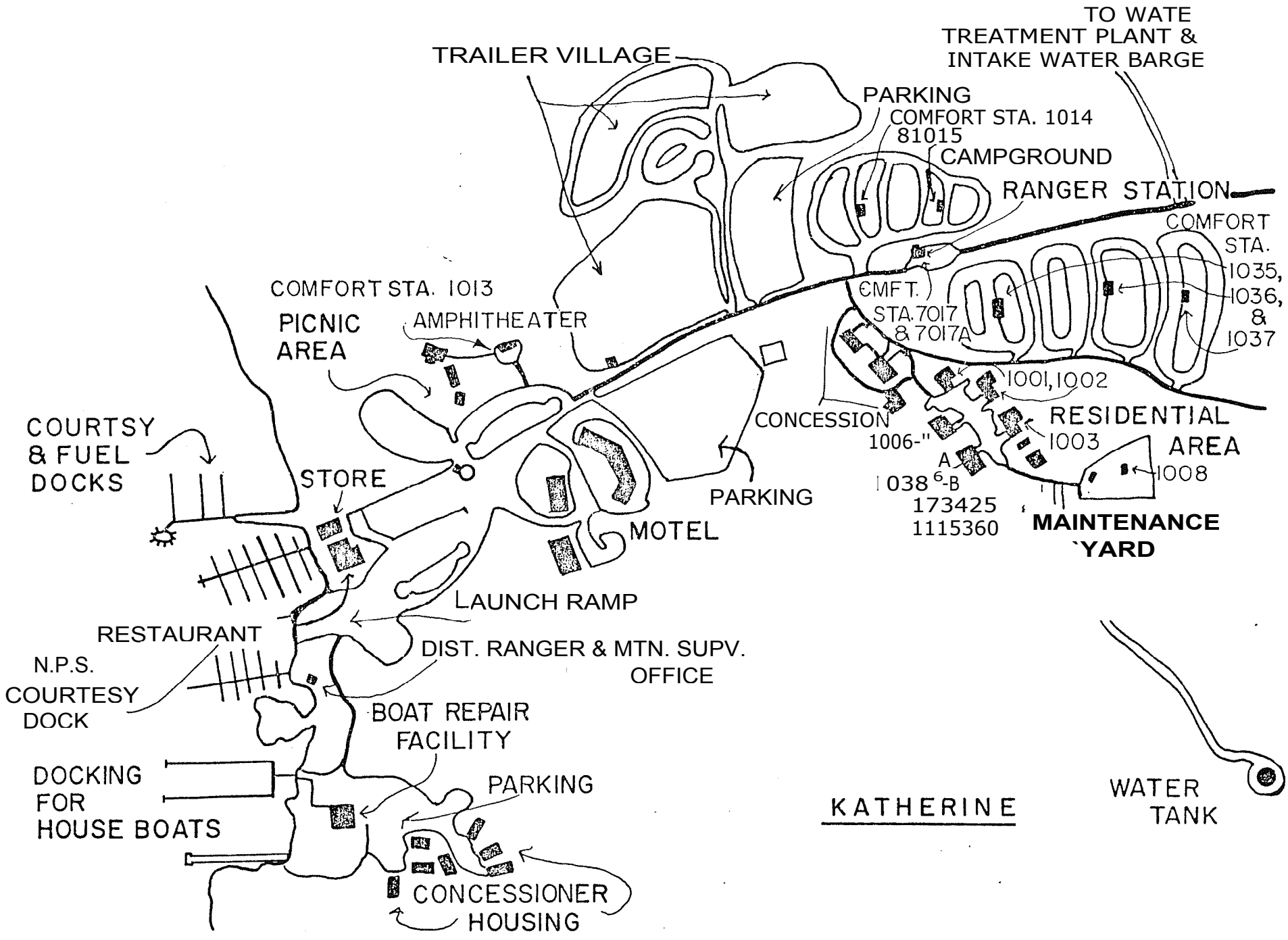

GAS DOCK
BOAT SLIPS
VACATION CABINSITES
SANITATION DOCK
MOTEL
COURTESY DOCK
TRAILER VILLAGE
SPORT. FISH. STA. & FISH CLEANER
LAUNCH RAMP
GARAGE
PARKING
701
CAMPGROUND
702
718
717
715
719
716
A
B
CAFE-STORE CONCESSION & POST OFFICE
WELL NO. 1
EMPLOYEE TRAILER VILLAGE
DRY BOAT STORAGE
WELL NO. 2
710
711
706
MAINTENANCE AREA
I 73428
VISITOR CENTER RANGER STATION 700
N.P.S. HOUSING AREA
WATER TANKS
TO AIRPORT
TEMPLE BAR
TO MONKEY COVE
WELLS NO 3 & 4
TO HWY 93


FISH HATCHERY
CONCESSION
TRAILER
VILLAGE
PARKING
GAS
STATION
SANITATION
DOCK
QUARTERS
WILLOW BEACH



WILLOW BEACH-' 2


COURTESY DOCK
BOAT SANITARY STATION
MARINA
GAS DOCK
LAUNCH RAMP
UNIT MOTEL
COMFORT STA. 1501 CAMPGROUND
PARKING
POST OFFICE & CONCESSION OFFICE
WELLS 1. 2.
COMFORT STA. 1512
GAS STATION
CONCESSION RESIDENTIAL AREA
WATER TANK
TRAILER VILLAGE
DRY BOAT STORAGE AREA
CMFT. STA. 1521
N.P.S. RESIDENTIAL AREA
1517
1516
I 82224
I 110296
I 110297
CAMPGROUND
COMFORT STA. 1522 & 1523
COTTON WOOD COVE
1515
MAINT. BLDG. 1519
I 115361
I 73058
COAST GUARD TRAILER
RANGER STATION 1511
TO LAGOON
TO WATER TANK
TO WATER TANK


TO WATE
TREATMENT PLANT &
INTAKE WATER BARGE
TRAILER VILLAGE
PARKING
COMFORT STA. 1014
81015
CAMPGROUND
RANGER STATION
COMFORT
STA.
1035,
1036,
&
1037
COMFORT STA. 1013
PICNIC
AREA
AMPHITHEATER
CMF T.
STA. 7017
& 7017A
1001, 1002
COURTSY
& FUEL
DOCKS
STORE
CONCESSION
1006-"
A
038 6-B
173425
1115360
RESIDENTIAL
AREA
1003
1008
PARKING
MOTEL
MAINTENANCE
YARD
LAUNCH RAMP
RESTAURANT
N.P.S.
COURTESY
DOCK
DIST. RANGER & MTN. SUPV.
OFFICE
BOAT REPAIR
FACILITY
DOCKING
FOR
HOUSE BOATS
PARKING
KATHERINE
WATER
TANK
CONCESSIONER
HOUSING

APPENDIX E

SELECTED CLARK COUNTY, NV AIR QUALITY REGULATIONS

DISTRICT BOARD OF HEALTH OF CLARK COUNTY

AIR QUALITY REGULATIONS

SECTION 40 - PROHIBITIONS OF NUISANCE CONDITIONS

40.1 **No PERSON shall cause, suffer or allow the discharge from any source whatsoever such quantities of air contaminants or other material which cause a NUISANCE.**

SECTION 42 - OPEN BURNING

42.1 No PERSON shall cause, suffer, allow, or permit the burning of any combustible material in any open fire except as provided in this section and then only when such burning has been approved in advance by the CONTROL OFFICER. Such exceptions are as follows:

42.1.1 When in the judgment of the CONTROL OFFICER, no other safe method for the disposal of combustible, explosive, or dangerous material exists or can reasonably be obtained;

42.1.2 Small fires for recreational, educational, ceremonial, cooking purposes and warmth of human beings, including barbecues and outdoor fireplaces provided they do not create a public nuisance;

42.1.3 Where fire is set either by OFFICERS of governmental agencies, in performance of their official duties or for the purposes of training and instruction of fire-fighting and fire-rescue personnel;

42.1.4 Outside the Las Vegas Valley, when such fire is set on a field used for growing crops in the course of disposing of unused portions of a crop and intermingled weeds resulting from an agriculture operation;

42.1.5 Domestic burning of material originating on premises, exclusive of garbage, at a property used exclusively as a private residence or dwelling where there is no collection service available for such material.

42.2 Notwithstanding Subsection 42.1, any burning so permitted by this section must be controlled so that public nuisance or traffic hazards are not created as a result of the air contaminants being emitted.

42.3 Nothing in this section shall be construed to prohibit or make unlawful the construction and use of private barbecue pits, grills, or outdoor fireplaces for the preparation of food for consumption by individuals; nor shall any permit from the CONTROL OFFICER be required therefor.

42.4 Open burning shall be prohibited during air pollution episode conditions as defined in Section 6 of the Implementation Plan for the State of Nevada entitled, EMERGENCY EPISODE PLAN.

DISTRICT BOARD OF HEALTH OF CLARK COUNTY

AIR QUALITY REGULATIONS

SECTION 41 - FUGITIVE DUST

41.1 Prohibitions:

41.1.1 Any PERSON engaged in activities involving the dismantling or demolition of buildings, grubbing, grading, clearing of land, public or private construction, the operation of machines and equipment, the grading of roads, trenching operations, the operation and use of UNPAVED PARKING facilities, AGRICULTURAL OPERATIONS, use and operation of live stock arenas, horse arenas and feed lots, and operation and use of raceways for MOTOR VEHICLES shall take all reasonable precautions to abate FUGITIVE DUST from becoming airborne from such activities. Reasonable precautions may include, but are not limited to the conditions agreed upon in the AQD permit for the project, sprinkling, compacting, enclosure, chemical, or asphalt sealing, cleaning up, sweeping, or such other measures as the CONTROL OFFICER may specify to accomplish satisfactory results;

41.1.1.1 The following circumstances represent examples of FUGITIVE DUST becoming airborne:

a) a visible plume of dust, resulting from construction activities, which extends more than 100 yards from the point of origin or beyond the nearest property line, whichever is less;

visible dust EMISSIONS on an unpaved road at a construction site being used by haul trucks;

c) visible dust EMISSIONS generated by vehicles traveling over mud and dirt carried out to a paved road near or adjacent to a construction site.

41.1.1.2 A visible plume of dust resulting from construction activities which extends more than 50 yards from the point of origin, but less than 100 yards and which has not crossed the nearest property line may be subject to an issuance of a Notice of Violation including an Order to take Corrective Action for which no penalty will be assessed.

41.1.2 No person shall cause or permit the handling, transporting, or storage of any material in a manner which allows or may allow controllable particulate matter to become airborne;

41.1.3 Sand and abrasive blasting operation will not be permitted unless effective enclosures or other such dust control devices including but not limited to the injection of water have been installed to prevent excessive sand and dust dispersal.

41.2 Off-road vehicle and motocross racing;

41.2.1 No person shall cause, permit, or allow the conduct of off-road vehicle racing or motocross racing within the designated boundaries of the Non-Attainment Area as defined in Section 1 of these Regulations unless adequate dust control measures are provided and approved in advance by the CONTROL OFFICER.

41.2.2 Motocross racing will only be permitted at permanent motocross race courses within the Non-Attainment Area.

41.2.3 Permanent motocross race courses, within the Non-Attainment Area as defined in Section 1 of these Regulations, shall be registered with and permitted by the CONTROL OFFICER in accordance with Subsections 15.1 and 15.6.

41.3 Correction of condition:

41.3.1 If loose sand, dust, or dust particles are found to exist in excess of acceptable limits, as determined by the CONTROL OFFICER, the CONTROL OFFICER shall notify the owner, lessee, occupant, operator, or user of said land that said situation is to be corrected within a specified period of time, dependent upon the scope and extent of the problem. The failure to correct said situation within the specified period of time shall be in violation of this section.

41.4 Remedial Action:

41.4.1 The CONTROL OFFICER, his designated agent, or any other authorized representative of the Health Department, after due notice shall be further empowered to enter upon any said land where any sand or dust problem exists, and to take such remedial and corrective action as may be deemed appropriate to cope with and relieve, reduce, or remedy the existent sand and dust situation and condition, when the OWNER, occupant, OPERATOR, or

any tenant, lessee, or holder of any possessory interest or right in the involved land fails to do so.

41.5 Costs:

41.5.1 Any cost incurred in connection with any such remedial or corrective action by the Health Department or any person acting for the Health Department shall remain in full force and effect until any and all such costs shall have been fully paid.

SECTION 17 - DUST CONTROL PERMIT FOR CONSTRUCTION ACTIVITIES INCLUDING SURFACE GRADING AND TRENCHING

17.1 Prohibitions:

17.1.1 No OWNER, lessee, occupant, operator, user, or any other PERSON shall engage in CONSTRUCTION ACTIVITIES, including disturbing the TOPSOIL, grading, clearing and grubbing operations, TRENCHING or excavate, or the addition or removal of dirt or fill for CONSTRUCTION of a building or dwelling unit(s) on property in excess of a) an aggregate of one-quarter acre or more; b) or a TRENCH at least 100 feet in length if the aggregate is less than one quarter acre of any property or contiguous properties within Clark County, Nevada or any incorporated city therein prior to the issuance of a Dust Control Permit for CONSTRUCTION ACTIVITIES including Surface Grading and TRENCHING by the CONTROL OFFICER and then only if said permit is current and valid.

17.1.2 No PERSON shall engage in CONSTRUCTION ACTIVITIES, including disturbing the TOPSOIL, grading, clearing and grubbing operations, TRENCHING or the addition or removal of dirt or fill in excess of an aggregate of a) one-quarter acre or more b) or a TRENCH at least 100 feet in length if the aggregate is less than one quarter acre of any property or contiguous properties within Clark County, Nevada or any incorporated city therein at the request of or under contract to the OWNER, lessee, occupant, user or any other PERSON until he has in his possession a copy of the Dust Control Permit required by Subsection 17.1.1.

17.1.3 No PERSON shall engage in the destruction, demolition or removal of any structure, 1000 square feet or larger, located on any property within Clark County, Nevada or any incorporated city therein prior to the issuance of Dust Control permit by the CONTROL OFFICER and then only if said permit is current and valid.

17.1.4 Dust Control Permits will not be issued for any real property, regardless of size, within Clark County, Nevada or any incorporated city therein which is

to remain unoccupied, unused, vacant or undeveloped unless it is certified by the Chief Health Officer, or the Departments of Police, Fire, Building or Public Works, in their jurisdiction, that an adverse health or safety hazard exists that can only be corrected by this method.

17.2 Exceptions:

17.2.1 The requirement for Dust Control permits in this section shall not apply to:

(a) agricultural operations
(b) landscaping by a PERSON at his place of residence
(c) routine maintenance activities conducted by government agency personnel on publicly maintained roads and road shoulders
(d) routine maintenance activities conducted by government agency personnel on flood control channels
(e) other maintenance activities conducted by government agency personnel

17.3 Permit Applications:

17.3.1 Applications for Dust Control permits will be obtained from the Office of the Air Quality CONTROL OFFICER, 625 Shadow Lane, Las Vegas, Nevada 89106, and will be filed with the CONTROL OFFICER. The permit shall only be issued to the OWNER, lessee, developer, or prime contractor.

17.4 Each application will be accompanied by payment of a fee in accordance with Subsection 18.6.

17.5 Conditions of Dust Control Permit:

17.5.1 Said permit is to be granted subject to the right of inspection of such land and determination by the CONTROL OFFICER of any present or potential sand, dust, or dust particle problems. The permit shall be granted subject, but not limited, to the following conditions.

17.5.1.1 The applicant is responsible for ensuring his contractor and/or subcontractor, TRENCHING subcontractor and all other PERSONS abide by the conditions of the permit. The applicant is responsible for supplying copies of the Dust Control Permit for CONSTRUCTION ACTIVITIES including Surface Grading and TRENCHING and Section 41 to all of his subcontractors.

17.5.1.2 The applicant presents and agrees to implement an acceptable method to prevent PARTICULATE MATTER from becoming airborne.

17.5.1.3 The applicant presents and agrees to implement an acceptable method of securing the TOPSOIL when the project is finished.

17.5.1.4 The applicant agrees in writing to take additional precautions as may be reasonably prescribed by the CONTROL OFFICER, consistent with the provisions of this section of the Regulations.

17.5.1.5 The applicant agrees in writing to suspend all or part of these activities, which are related or which may be contributing to a violation of Section 41 of the Regulations, if he cannot provide satisfactory control of airborne particles, or upon notification by the CONTROL OFFICER or his representative.

17.5.1.6 Signage Requirement (Effective Date is March 1, 1997):

(a) For each Dust Control Permit aggregating less than or equal to ten (10) acres:

(1) The applicant shall install a sign on such property prior to COMMENCING CONSTRUCTION ACTIVITY which is visible to the public that meets the following requirements:

(i) Such sign shall measure at least four (4) feet wide by four (4) feet high; and

(ii) conform to the District's policy on Dust Control Permit Design and Posting of Signage.

(b) For each Dust Control Permit aggregating over ten (10) acres:

(1) The applicant shall install a sign on such property prior to COMMENCING CONSTRUCTION ACTIVITY which is visible to the public that meets the following requirements:

(i) Such sign shall measure at least eight (8) feet wide by four (4) feet high; and

(ii) conform to the District's policy on Dust Control Permit Design and Posting of Signage.

17.5.1.7 As an additional condition to the issuance of a permit under Section 17 of these Regulations, the CONTROL OFFICER may require the posting of a surety bond in a form acceptable to him. Any such bond must be executed by the applicant for the permit as principal with a corporation authorized to

transact surety business in the STATE of Nevada, and shall be conditioned upon faithful performance of all other conditions of the permit and faithful compliance with the provisions of these Regulations. The amount of each bond required by this section shall be fixed by the Air Quality CONTROL OFFICER with reference to the applicant's financial and professional responsibility and the magnitude of his operations, but shall not be less than $500.00 or more than $20,000.00.

17.5.1.8 The permittee's signature or that of his authorized agent on the permit shall constitute agreement by the permittee to accept responsibility for meeting the conditions of the permit.

17.6 Suspension or Revocation of Permit:

17.6.1 The CONTROL OFFICER Or his representative may suspend or revoke the permit if he finds that any of its conditions are not being fulfilled. Non-fulfillment of any condition set forth in the permit shall be in violation of this section. Upon suspension or revocation of a permit, that work which gives rise to violation to the terms of the permit will cease. The CONTROL OFFICER shall post notices of suspension or revocation conspicuously on the property involved. The notice shall indicate the date and time of suspension or revocation and shall state the reasons therefore. The suspension or revocation will remain in effect until such time as rescinded by the CONTROL OFFICER and a new permit is issued upon payment of a fee in accordance with Section 18 provided that the permittee shall have a right to hearing before the HEARING BOARD within five (5) working days from date of issuance of the suspension or revocation.

17.6.2 Any PERSON aggrieved by a decision of the CONTROL OFFICER pursuant to this section may appeal to the HEARING BOARD as provided in Section 7 of these Regulations.

17.7 Processing Permit Applications:

17.7.1 Permit applications will be processed by the CONTROL OFFICER as rapidly as possible. Plat or plot plans will be submitted to the CONTROL OFFICER for

review at the time of application. Permits will be issued from approved applications.

17.7.2 Permits will not be issued to an applicant who has outstanding unpaid penalties imposed by the AQD HEARING BOARD Or HEARING OFFICER.

17.8 Information:

17.8.1 The CONTROL OFFICER shall keep local government planning, engineering, and building agencies, and contractors' associations supplied with a written summary of the dust control and permit requirements of Sections 17 and 41.