STATUS OF GROUND-WATER RESOURCES AT U.S. NAVY SUPPORT FACILITY, DIEGO GARCIA: SUMMARY OF HYDROLOGIC AND CLIMATIC DATA, JANUARY 1995 THROUGH MARCH 1997

By Jill D. Torikai

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CONVERSION FACTORS AND ABBREVIATION

Multiply	By	To obtain
foot (ft)	0.3048	meter
gallon (gal)	3.785	liter
gallon per day (gal/d)	3.785	liter per day
million gallons per day (Mgal/d)	0.04381	cubic meter per second
inch (in.)	25.4	millimeter
inch per year (in/yr)	25.4	millimeter per year

Abbreviation used in water-quality descriptions

mg/L = milligrams per liter

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EXECUTIVE SUMMARY

This report describes the status of ground-water resources at U.S. Navy Support Facility, Diego Garcia. Data presented are from January 1995 through March 1997, with a focus on data from January through March 1997 (first quarter of 1997). A complete database of ground-water withdrawals and chloride-concentration records since 1985 is maintained by the U.S. Geological Survey from records provided by the U.S. Navy.

1. RAINFALL--Total rainfall for the period January through March 1997 was 37.60 inches, which is 14 percent more than the mean rainfall of 32.92 inches for the period January through March. Rainfall in January 1997 was 20.87 inches, and was 55 percent of the total rainfall in the first quarter of 1997.

2. GROUND-WATER WITHDRAWAL--Islandwide ground-water withdrawal during January through March 1997 averaged 888,000 gallons per day, which follows an overall trend of decreasing islandwide withdrawals since about April 1996.

3. CHLORIDE CONCENTRATION OF PUMPED GROUND WATER--At the end of March 1997, the chloride concentrations of water from the elevated tanks at Cantonment and Air Operations were 51 and 97 milligrams per liter, respectively. In January and February 1997, chloride concentrations of water from the tanks at Cantonment and Air Operations decreased, following overall increases in chloride concentration since about April 1995.

4. CHLORIDE CONCENTRATION OF GROUND WATER IN MONITORING WELLS--Chloride concentration of ground water in monitoring wells at Cantonment and Air Operations decreased in January 1997 compared with chloride concentrations during the period October through December 1996. The depth corresponding to the chloride concentration of 250 milligrams per liter increased from October 1996 to March 1997.

5. FUEL-DIVERSION PROGRAM AT AIR OPERATIONS--Injection and withdrawal rates at wells AO-10 through AO-12, well AO-14, and well AO-15 were between 2 and 40 percent less than the target withdrawal and injection rates during the first quarter of 1997. The target rates of withdrawal and injection were established to hydraulically divert fuel migration away from water-supply wells. The diversion program is a result of a fuel-pipeline leak discovered at the South Ramp of Air Operations in May 1991.

STATUS OF GROUND-WATER RESOURCES AT U.S. NAVY SUPPORT FACILITY, DIEGO GARCIA: SUMMARY OF HYDROLOGIC AND CLIMATIC DATA, JANUARY 1995 THROUGH MARCH 1997

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INTRODUCTION

Diego Garcia Atoll is part of the British Indian Ocean Territory and the site of a U.S. Navy Support Facility. The island's drinking-water supply is derived from ground water, and recharge to the ground-water system is from rainfall. Since 1985, the island's water-supply system has produced about 1 Mgal/d by maintaining low individual pumping rates at the many scattered wells (Torikai, 1995). Ground water is pumped from lens-shaped bodies of freshwater floating on seawater. Chloride concentrations of the water have been kept at acceptable levels for drinking by adjusting individual pumping rates. The water-supply system, which has been in operation since 1978, has 102 active wells in five production areas (fig. 1). Water from the Cantonment and Air Operations areas combined accounts for about 99 percent of islandwide withdrawal. The remainder is pumped for local use at Industrial Site South (I-Site), Transmitter Site (T-Site), and GEODSS Site.

Long-term ground-water monitoring has been facilitated by a cooperative agreement between the Navy Support Facility (NAVSUPPFAC) and the U.S. Geological Survey (USGS) since 1984. However, USGS involvement at Diego Garcia began in 1978 with a hydrogeologic investigation for the Naval Facilities Engineering Command, Pacific Division. The study provided estimates of ground-water resource potential, and helped with the subsequent design, layout, and testing of the water-supply wells (D.A. Davis, USGS, 1979, written commun. to U.S. Navy).

Organization of Report

This data summary contains hydrologic and climatic data that describe the status of ground-water resources at Navy Support Facility, Diego Garcia. Data presented are from January 1995 through March 1997. Data of primary relevance to the water supply are:

- Rainfall
- Volume of ground water withdrawn at production wells
- Chloride concentration of pumped ground water
- Chloride concentration of ground water sampled from monitoring wells
- Volume of ground water injected at Air Operations

The following narrative highlights trends in the data for January through March 1997, and makes comparisons with historical data. Ground-water withdrawal and chloride concentrations of water from individual wells are presented in the "Hydrologic-Data Section." The data section contains the following:

A. Maps of production and monitoring wells at Cantonment and Air Operations
B. Graphs of monthly mean ground-water withdrawal, January 1995 through March 1997
C. Graphs of chloride concentration of pumped water, January 1995 through March 1997

This report is part of a series of USGS reports, "Status of ground-water resources at U.S. Navy Support Facility, Diego Garcia: summary of hydrologic and climatic data." The first report in this series began with data for the period January 1985 through September 1993 (Torikai, 1995). Successive reports have been done on a quarterly basis.

Acknowledgments

Ground-water withdrawal and chloride-concentration data were provided by the NAVSUPPFAC, Public Works Department. Rainfall data were provided by the Naval Pacific Meteorology and Oceanography Detachment Diego Garcia (NAVPACMETOCDET). Logistical support from the staff of the Public Works Department is greatly appreciated.

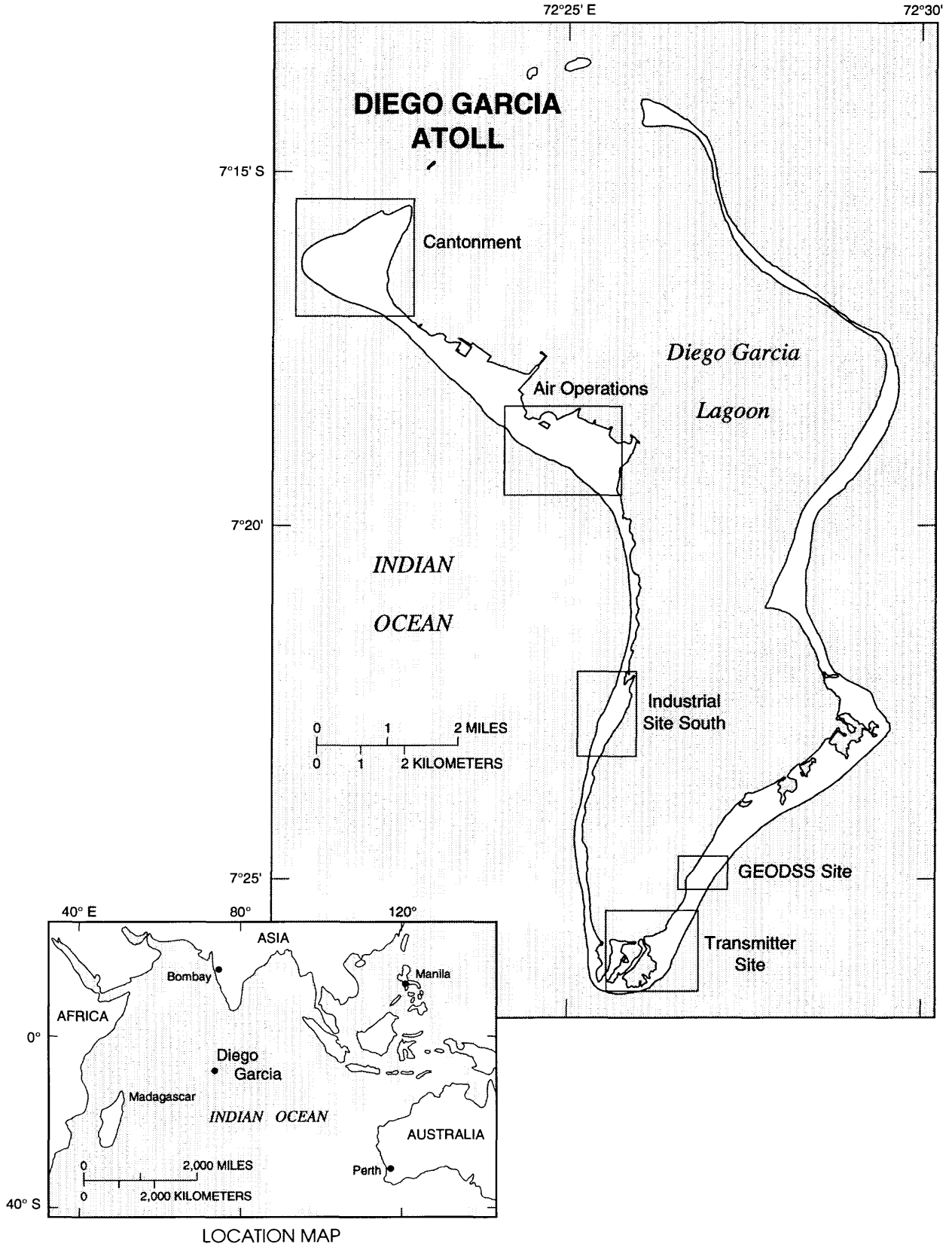


Figure 1. Areas of ground-water production, Diego Garcia.

RAINFALL

Background.--Rainfall data are available since 1951, and all mean rainfall values in this report are calculated for the base period 1951-96. Monthly rainfall are available in published records for the following periods: 1951-60 (U.S. Department of Commerce, 1968), 1961-70 (U.S. Department of Commerce, 1979), 1971 (U.S. Navy, 1978), and 1972-93 (U.S. Department of Commerce, 1995). Rainfall data for the period January 1994 through March 1997 are from the Naval Pacific Meteorology and Oceanography Detachment Diego Garcia (NAVPACMETOCDET).

The mean annual rainfall at Diego Garcia is 103.56 in/yr. Rainfall varies considerably from month to month and from year to year. A wet season occurs from about September through February, and a dry season from about March through August.

Recent trends.--Total rainfall for the period January through March 1997 (first quarter of 1997) was 37.60 inches, which is 14 percent more than the mean rainfall of 32.92 inches for the period January through March. For the same 3 months in 1996, the rainfall was 29.61 inches. The total rainfall in 1996 was 84.40 inches, which was 18 percent less than the mean annual rainfall of 103.56 inches.

Figure 2 shows recorded rainfall amounts and rainfall departures from mean monthly rainfall values that were averaged for the base period 1951-96. The months of January and February are part of the annual wet season, while March is the start of the dry season. Periods of below average rainfall can be inferred from the graph when the departure from the mean monthly rainfall is less than zero. Rainfall in January 1997 was 20.87 inches, which was 55 percent of the 37.60 inches for the first quarter of 1997, and was about 7 inches greater than the mean monthly rainfall for January. Monthly rainfall totals for February 1997 and March 1997 were about 1 inch less than the respective mean monthly rainfall for February and March. Since January 1996, there were 11 months with negative rainfall departures, and 4 months with positive departures.

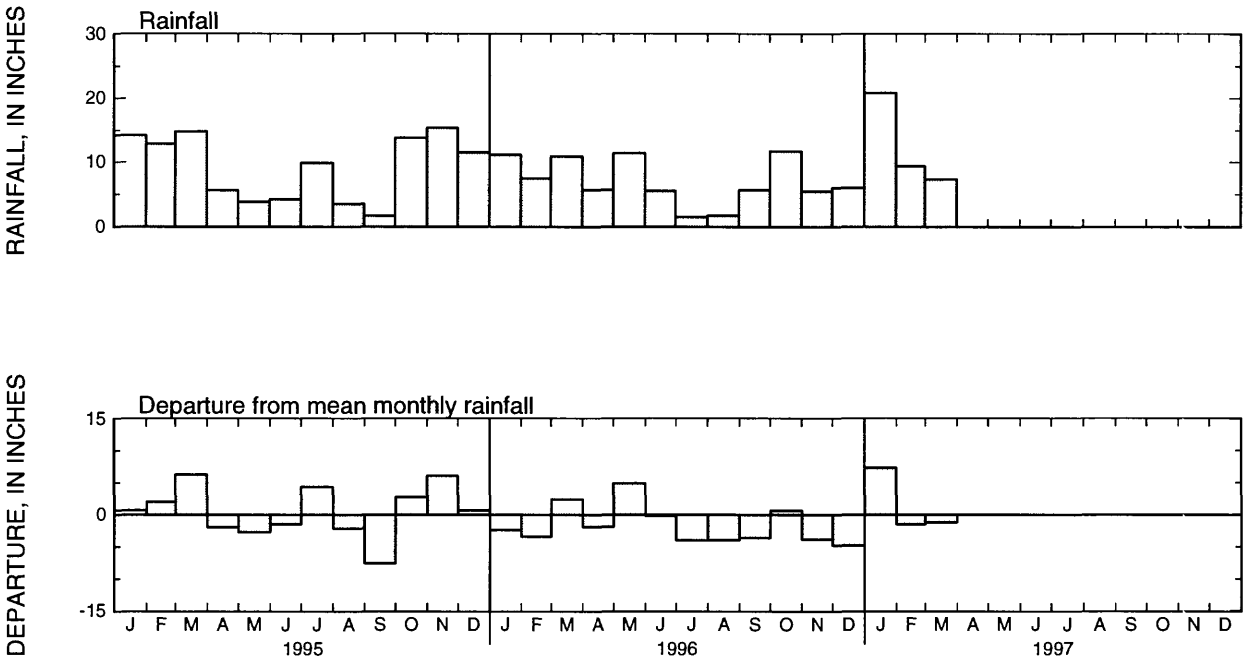


Figure 2. Monthly rainfall and monthly departure from mean monthly rainfall (for 1951-96) at Air Operations, Diego Garcia, January 1995 through March 1997. Data are from the Naval Pacific Meteorology and Oceanography Detachment Diego Garcia (NAVPACMETOCDET).

GROUND-WATER WITHDRAWAL

Background.--Withdrawal is measured by flow meters at all production wells and storage tanks in the water system. The data for withdrawal are provided by the U.S. Navy. Data were collected daily through November 1996, but since December 2, 1996, data are collected every Monday, Wednesday, Friday, and Saturday, and thus represent a total of 1 or 2 days of ground-water withdrawal. There are 102 production wells in 5 ground-water production areas. The primary production areas are in the Cantonment area (80 wells; fig. A1) and the Air Operations area (18 wells; fig. A2). The wells in the Cantonment area are further separated into sub-groups, and the measured ground-water withdrawals are presented by sub-group in this report. About 80 percent of islandwide withdrawal is from Cantonment, and about 19 percent is from Air Operations, with the remaining 1 percent from the other three ground-water production areas.

Ground-water withdrawal from the Cantonment area increased in 1991 because of decreased withdrawal at Air Operations (Torikai, 1995). From May 1991 through April 1992, 10 wells at Air Operations were temporarily shut down because of an underground fuel-pipeline leak near those wells. Pumping resumed at four wells in May 1992, but six Air Operations wells still do not contribute to the water supply because of their proximity to the fuel leak. The lost pumping capacity is about 15 percent of the islandwide withdrawal, and is being offset by increased withdrawal at Cantonment.

Recent trends.--Figure 3 shows time-series graphs of monthly mean withdrawal islandwide and in each ground-water production area from January 1995 through March 1997. If the last day of a month is not a Monday, Wednesday, Friday, or Saturday, then the withdrawal is included in the withdrawal of the next month. Thus, some monthly mean withdrawal data may include the withdrawal data for the last day of the previous month.

Islandwide withdrawal decreased from 970,300 gal/d during the period January through March 1996 (first quarter of 1996) to 888,000 gal/d during the period January through March 1997 (first quarter of 1997). This decrease represents an 8 percent reduction in ground-water withdrawal, and follows an overall decrease in islandwide withdrawals since about April 1996. The lower total withdrawal during the first quarter of 1997 compared with first quarter of 1996 is because of reductions in withdrawal from all wells in the Cantonment area (figs. B1, B2, B3, and B4). The total withdrawal from the Air Operations area increased during the first quarter of 1997 (figs. 3 and B5), although withdrawals from individual wells both increased and decreased (fig. B6).

Withdrawal for the first quarter of 1997 in the Cantonment area was 727,100 gal/d or 82 percent of islandwide withdrawal; withdrawal in the Air Operations area was 153,500 gal/d or 17 percent of islandwide withdrawal. The remaining 1 percent of islandwide withdrawal was from the combined withdrawals at Industrial Site South (I-Site), Transmitter Site (T-Site), and GEODSS Site.

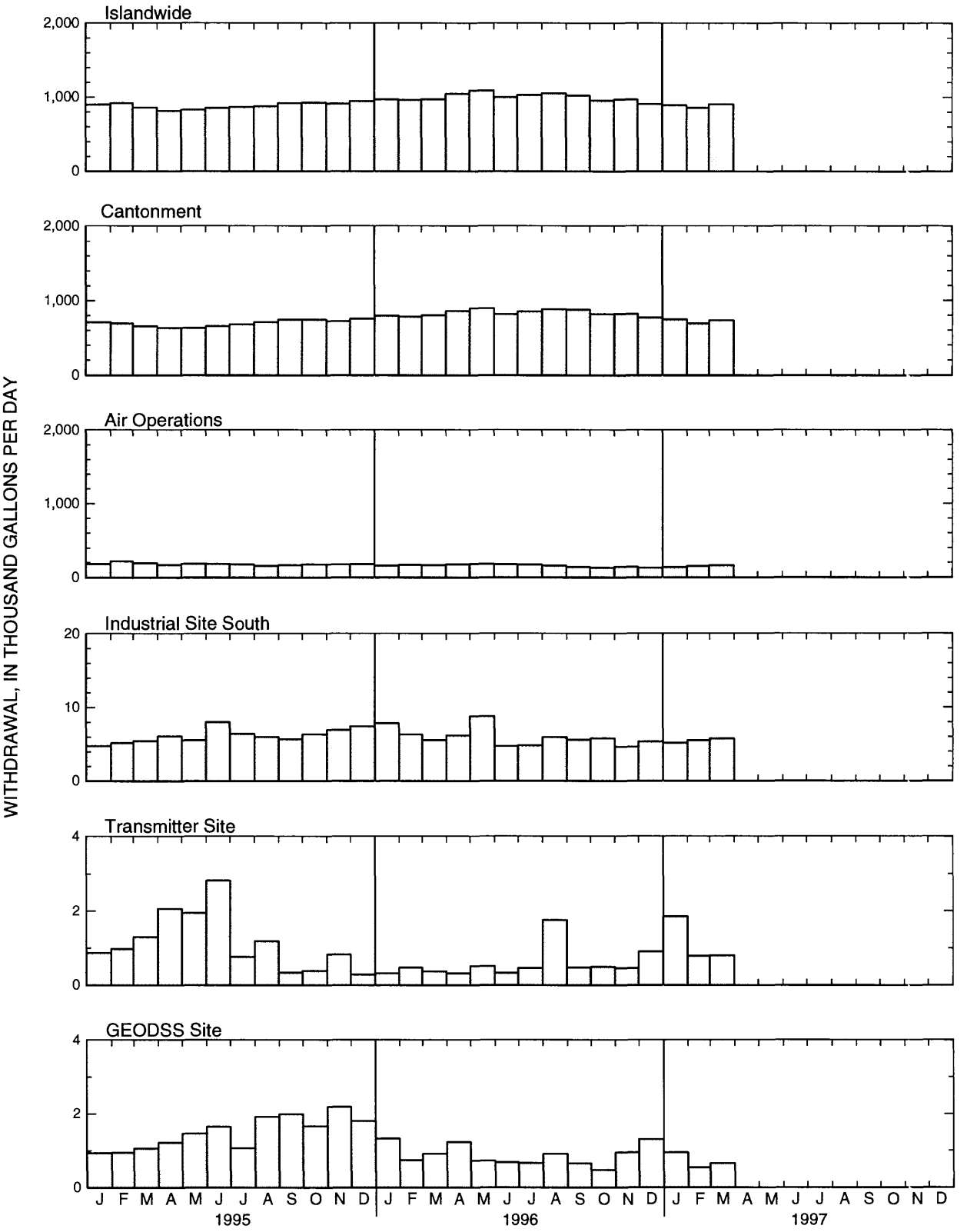


Figure 3. Monthly mean ground-water withdrawal islandwide and in the ground-water production areas, Diego Garcia, January 1995 through March 1997. Data are collected every Monday, Wednesday, Friday, and Saturday. If the last day of a month is not a scheduled data-collection day, then the withdrawal is included in the withdrawal of the next month.

CHLORIDE CONCENTRATION OF PUMPED GROUND WATER

Background.--In this report, chloride concentration is used as a quantitative measure of salinity. Chloride concentration in seawater at Diego Garcia is about 19,500 mg/L, whereas a concentration of 250 mg/L is the secondary maximum contaminant level (SMCL) under secondary drinking-water standards (U.S. Environmental Protection Agency, 1991). Secondary standards are not enforceable limits, but instead establish goals for constituents that may affect the aesthetic qualities of drinking water, such as taste or color.

Chloride-concentration data are provided by the U.S. Navy from analyses done at the on-island laboratory. Chloride concentration was analyzed daily through November 1996 from water samples collected from the elevated tanks at Cantonment and Air Operations, and from the tap at Industrial Site South (I-Site), Transmitter Site (T-Site), and GEODSS Site. These samples are representative of each of the five ground-water production areas (fig. 1). Since December 2, 1996, chloride concentrations from the five production areas are analyzed for water samples collected every Monday, Wednesday, Friday, and Saturday. Although daily chloride concentration data were available from the five production areas until November 1996, this report only uses the chloride concentrations from every seventh day that were extracted from the daily record through November 1996. From December 2, 1996, this report only uses the chloride concentrations from water samples collected every Saturday from the representative sites at all five production areas. Chloride concentrations of water collected from individual wells islandwide have always been determined only once a week.

Recent trends.--At the end of March 1997, the chloride concentrations of water from the elevated tanks at Cantonment and Air Operations were 51 and 97 mg/L, respectively. These concentrations are well below the 250 mg/L secondary drinking-water standard. The Cantonment and Air Operations areas combined account for about 99 percent of all pumped water.

The chloride concentration of water in the Cantonment and Air Operations areas reached maximum concentration in August 1996 with concentrations of 80 and 190 mg/L, respectively, for the period January 1995 through March 1997 (fig. 4). Peak concentrations for I-Site, T-Site, and GEODSS Site were recorded in January 1996, December 1995, and November 1996, respectively.

The overall upward trend in chloride concentration at all five ground-water production areas started about April 1995. During the period January through March 1997, chloride concentration of water from the five production areas decreased in January and February. This decrease coincided with the 20.87 inches of rainfall in January 1997 (fig. 2). Chloride concentrations in March 1997 increased by not more than 50 mg/L at Air Operations and T-Site, and remained steady at Cantonment, I-Site, and GEODSS Site. A similar trend of decreasing chloride concentration in January and February 1997 compared to December 1996, followed by an increase or levelling off of chloride concentration in March 1997 was recorded in individual wells in the Cantonment and Air Operations areas (figs. C1, C2, C3, and C4).

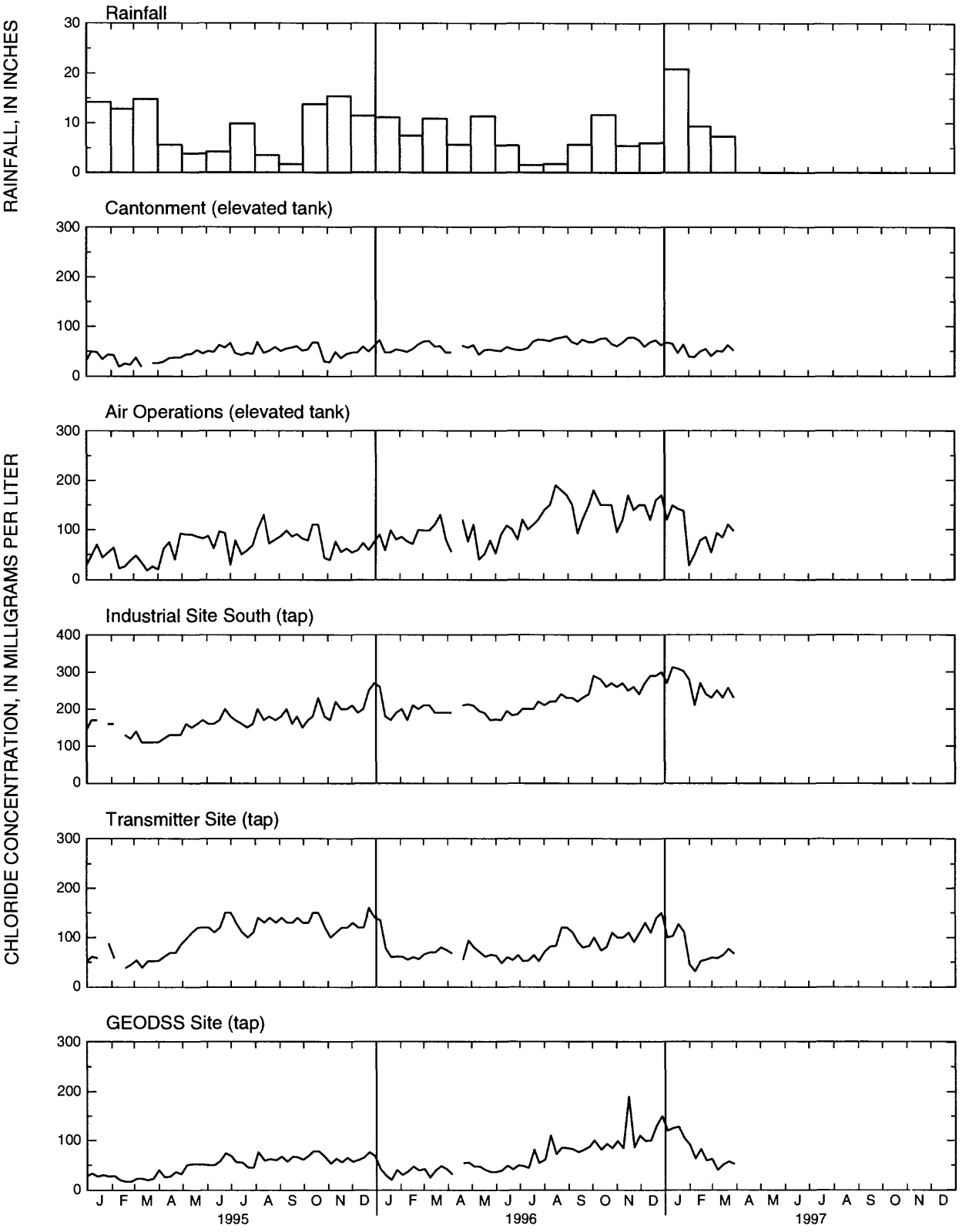


Figure 4. Chloride concentration of pumped water in the ground-water production areas, Diego Garcia, January 1995 through March 1997. Data shown for the period January 1995 through November 1996 are values from every seventh day extracted from the daily record. Data shown for the period December 1996 through March 1997 are values from every Saturday extracted from the data-collection schedule of every Monday, Wednesday, Friday, and Saturday. Rainfall data are shown for comparison.

CHLORIDE CONCENTRATION OF GROUND WATER IN MONITORING WELLS

Background.--Chloride concentration of ground water is analyzed monthly from water samples collected at 35 monitoring-well sites. These data are provided by the U.S. Navy. Each site comprises several wells, with each well having a short screened (open) interval that bottoms at a different depth. Most deeper wells tap the freshwater-saltwater mixing zones that underlie the freshwater bodies. Vertical chloride-concentration profiles help estimate the thickness of the freshwater bodies. For this report, the depth of the interface separating the freshwater and saltwater zones is defined as the depth at which chloride concentration is 250 mg/L. Chloride concentrations of water from these deep monitoring wells will typically provide the earliest indication that the freshwater bodies may be constricting.

Recent trends.--Monitoring sites AW16 and BW09 (figs. A3, A4) were selected to show trends in ground-water chloride concentration at Cantonment and Air Operations, respectively. Figures 5 and 6 are graphs of chloride concentration at three depths compared with time at the Cantonment and Air Operations sites, respectively.

During the period January through March 1997 (first quarter of 1997), the chloride concentration of water from sites AW16 and BW09 decreased in January 1997 as compared with values during the period October through December 1996, and then increased in February and March 1997. However, water from the 10-ft well at site AW16 increased about 80 mg/L during the first quarter of 1997.

Figures 5 and 6 also include vertical chloride-concentration profiles for October 1996, which was when chloride concentrations were relatively high for both sites, and for March 1997, which is the most recent data available. For comparison, the chloride concentration of 250 mg/L is shown. The depth corresponding to a chloride concentration of 250 mg/L increased from 35 ft below mean sea level in October 1996 to 48 ft below mean sea level in March 1997 at site AW16; the depth corresponding to a chloride concentration of 250 mg/L increased from 41 ft below mean sea level in October 1996 to 43 ft below mean sea level in March 1997 at site BW09.

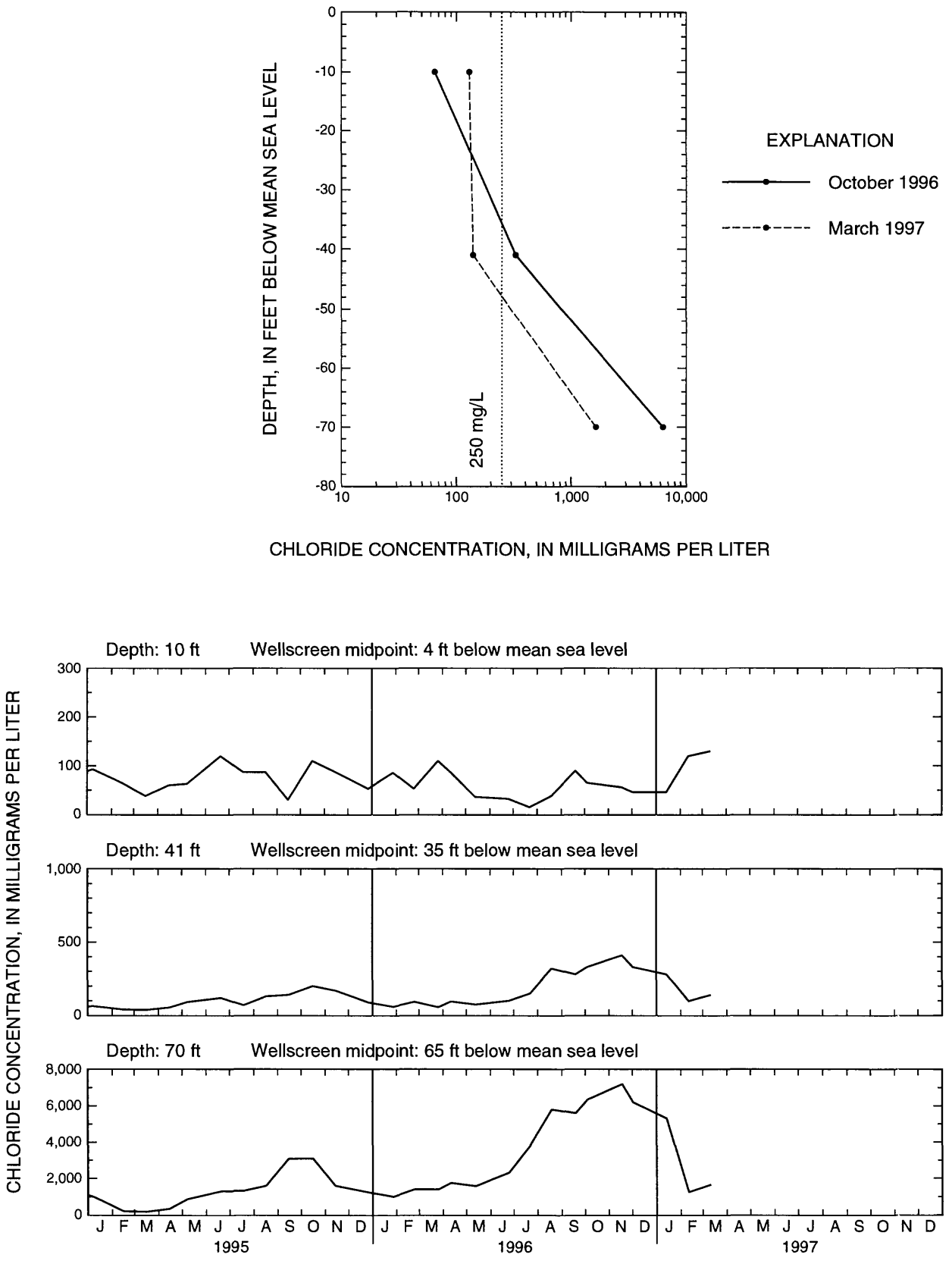


Figure 5. Chloride concentration of ground water (sampled at monthly intervals) displayed by time and depth in monitoring wells at site AW16 at Cantonment, Diego Garcia, January 1995 through March 1997.

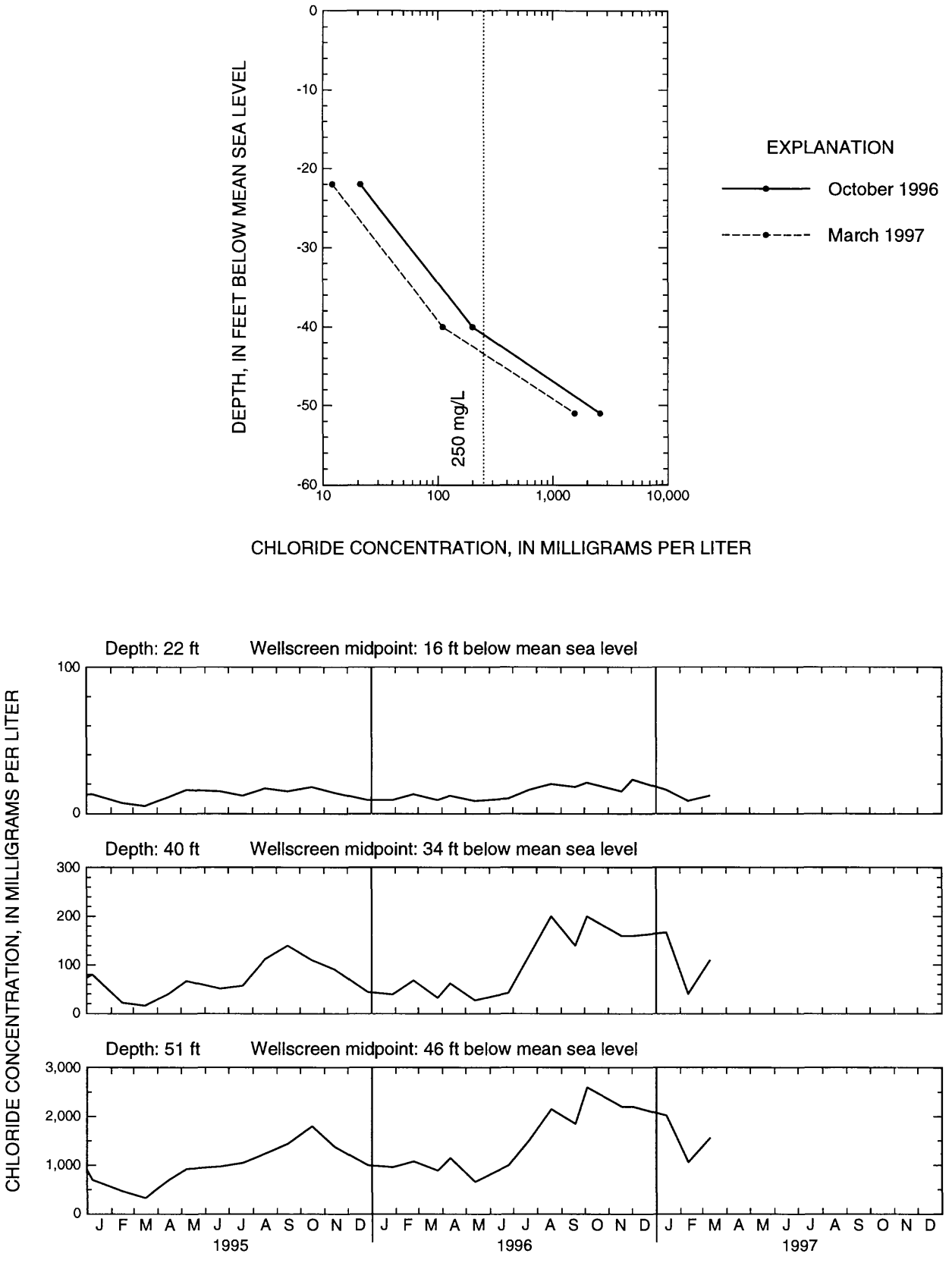


Figure 6. Chloride concentration of ground water (sampled at monthly intervals) displayed by time and depth in monitoring wells at site BW09 at Air Operations, Diego Garcia, January 1995 through March 1997.

FUEL-DIVERSION PROGRAM AT AIR OPERATIONS

Background.--The normal pattern of ground-water withdrawal at Air Operations has been disrupted since May 1991 by an underground JP-5 fuel-pipeline leak at the South Ramp parking apron (fig. A2). The leak was about 800 ft from several water-supply wells.

In August 1991, the USGS suggested a scheme to hydraulically alter the ground-water flow direction in the Air Operations area, and in April 1992, the program to divert fuel away from the production wells was initiated. The fuel-diversion program is a closed recirculation loop of withdrawal and injection. It utilizes six wells (AO-10 through AO-15), and consists of pumping about 150,000 gal/d of water from wells AO-14 and AO-15 and directing this water through the common collection main to the wells nearest the leak (AO-10 through AO-12), where it is injected back into the ground. Well AO-13 has been used only intermittently since the fuel leak was detected in 1991 (Torikai, 1995).

An elevated mound in the water table created by the injection water helps to retard the migration of fuel toward the water-supply wells. Subsequent to the leak detection, 10 wells were shut down from May 1991 to April 1992. However, with the inception of the diversion program, only six wells still do not contribute to the water supply. Lost production capacity is about 15 percent of islandwide withdrawal prior to the leak detection. It is expected that the fuel-diversion program will continue until the site is remediated.

Injection data for wells AO-10 through AO-12 from May 10, 1993 through March 1997 are from water-meter readings. From April 1992 through early May 1993, meter readings of injection were not available, and daily injection at each of the three wells was estimated to be one-third of the total daily withdrawal from wells AO-13 through AO-15 which provided the injection-supply water (Torikai, 1995).

Recent trends.--Target withdrawal and injection rates are listed in table 1 for wells AO-10 through AO-15 for the period January through March 1997 (first quarter of 1997). Daily mean withdrawal and injection rates for these wells are also shown. Injection and withdrawal rates at wells AO-10 through AO-12, well AO-14, and well AO-15 were between 2 and 40 percent less than the established target rates during the first quarter of 1997. The total mean injection was about 117,000 gal/d, while the total mean withdrawal was about 126,000 gal/d. The total target withdrawal is 150,000 gal/d, and the total target injection is 150,000 gal/d.

Monthly mean withdrawal and injection at wells AO-10 through AO-15 are shown in figure 7 for the period January 1995 through March 1997. Monthly mean withdrawal and injection for wells AO-10 through AO-12, well AO-14, and well AO-15 during the first quarter of 1997 decreased in January 1997, following withdrawal and injection rates that were close to the target rates since the start of the program in April 1992 (Torikai, 1995).

Table 1. Target and actual withdrawal and injection rates for fuel-diversion program, Diego Garcia, January through March 1997
[Injection is denoted by negative values; target rate and daily mean rate are in gallons per day.]

Well	Target rate	Daily mean rate	Difference between target rate and daily mean rate (percent)
AO-10	-30,000	-29,400	2
AO-11	-50,000	-45,500	9
AO-12	-70,000	-42,100	40
AO-13	0	0	0
AO-14	70,000	59,800	15
AO-15	80,000	66,000	18

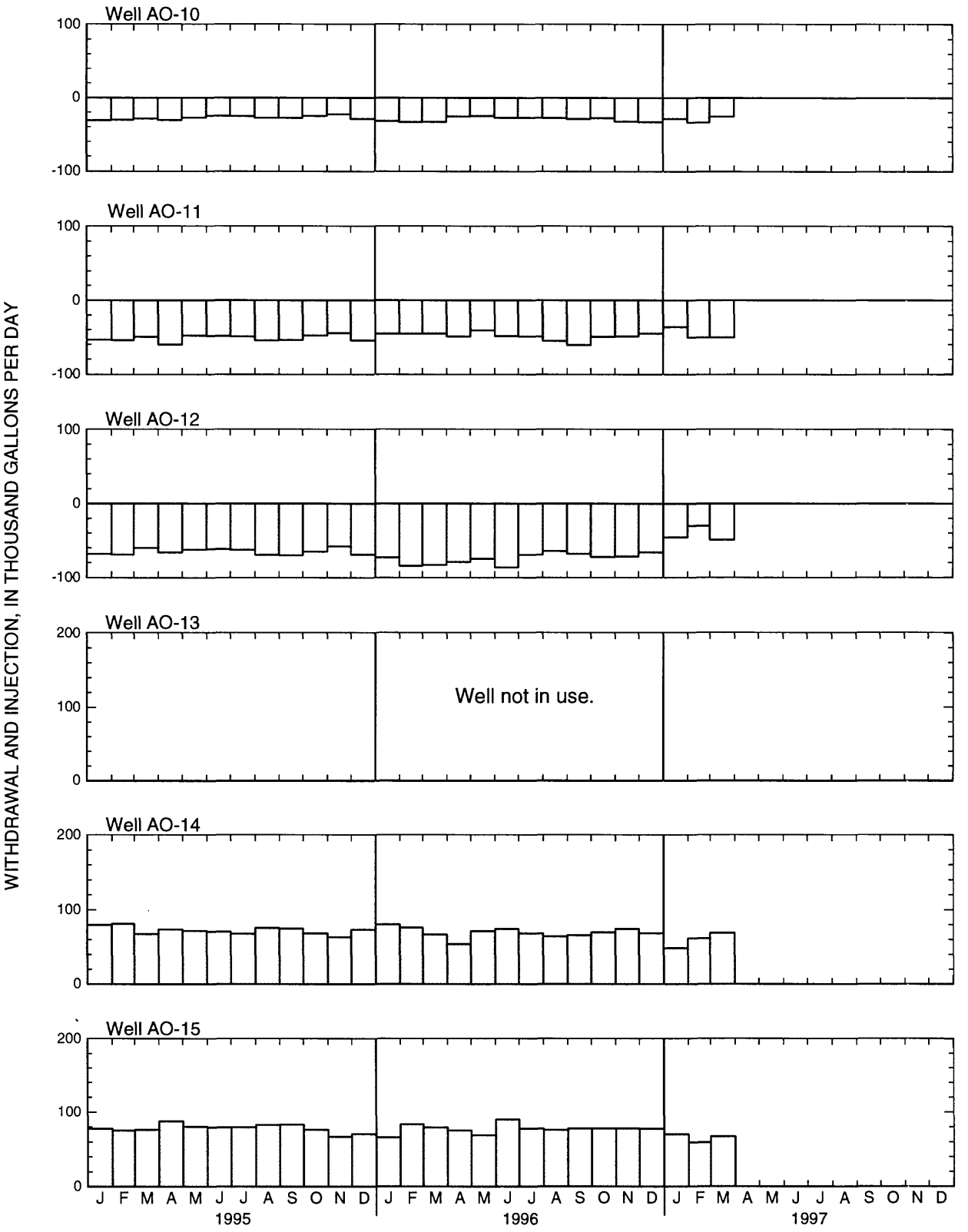


Figure 7. Monthly mean ground-water withdrawal and injection at wells AO-10 through AO-15 at Air Operations, Diego Garcia, January 1995 through March 1997. Injection is plotted as negative. Data are collected every Monday, Wednesday, Friday, and Saturday. If the last day of a month is not a scheduled data-collection day, then the withdrawal is included in the withdrawal of the next month.

HYDROLOGIC-DATA SECTION

TYPES OF DATA INCLUDED

A. Maps of production and monitoring wells at Cantonment and Air Operations
B. Graphs of monthly mean ground-water withdrawal, January 1995 through March 1997
C. Graphs of chloride concentration of pumped water, January 1995 through March 1997

DESCRIPTIONS OF PRINCIPAL PRODUCTION SOURCES AT CANTONMENT AND AIR OPERATIONS AREAS

Cantonment Area

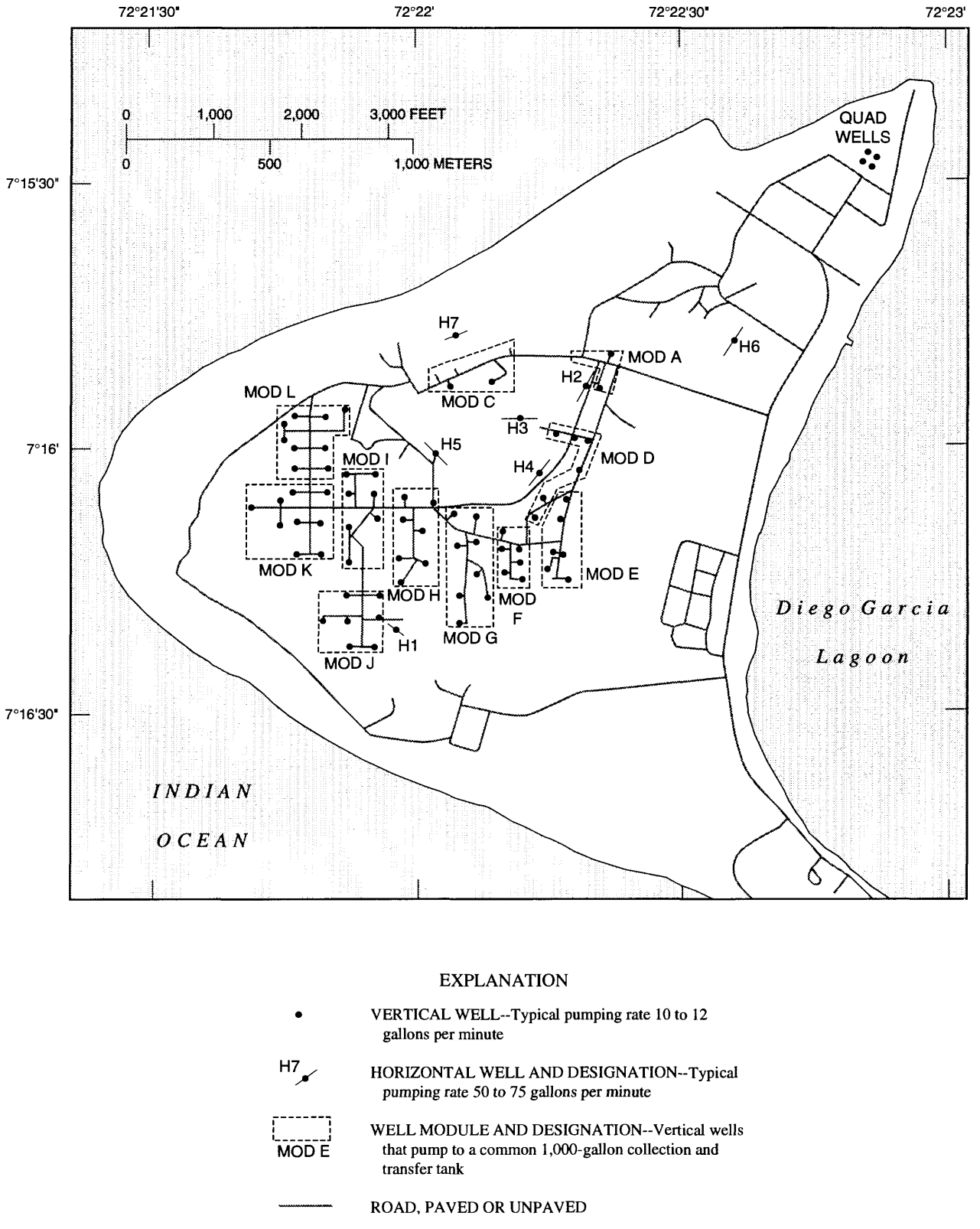
1. Modules A, C through L - each module is a well field of two to nine vertical wells that are pumped to a common collection/ transfer tank.
2. Wells H1 through H7 are horizontal wells.
3. Quad wells are a well field of four vertical wells

Air Operations Area

1. Wells AO-2 through AO-5 are vertical wells.
2. Wells AO-6 through AO-9 are horizontal wells.
3. Wells AO-10 through AO-15 are horizontal wells. AO-10 through AO-12 are currently receiving injection water from water pumped at wells AO-14 and AO-15 to divert contaminants from a nearby fuel leak; AO-13 is not pumped. No samples are currently collected for chloride-concentration analysis.
4. AO-16 through AO-19 are horizontal wells.

SECTION A

Maps of production and monitoring wells at Cantonment and Air Operations



EXPLANATION

- • VERTICAL WELL--Typical pumping rate 10 to 12 gallons per minute
- H7 HORIZONTAL WELL AND DESIGNATION--Typical pumping rate 50 to 75 gallons per minute
- MOD E WELL MODULE AND DESIGNATION--Vertical wells that pump to a common 1,000-gallon collection and transfer tank
- ROAD, PAVED OR UNPAVED

Figure A1. Ground-water production wells at Cantonment, Diego Garcia.

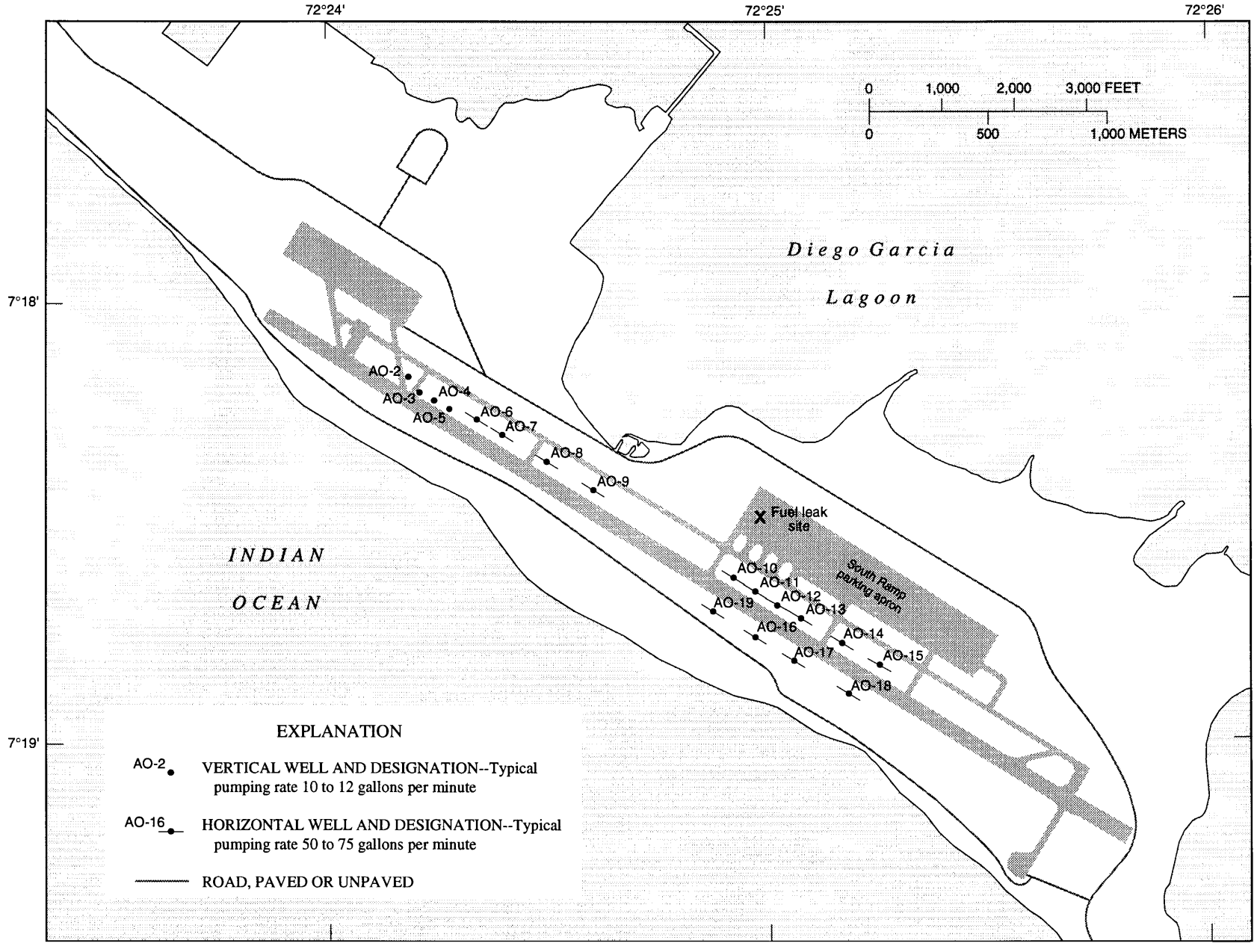
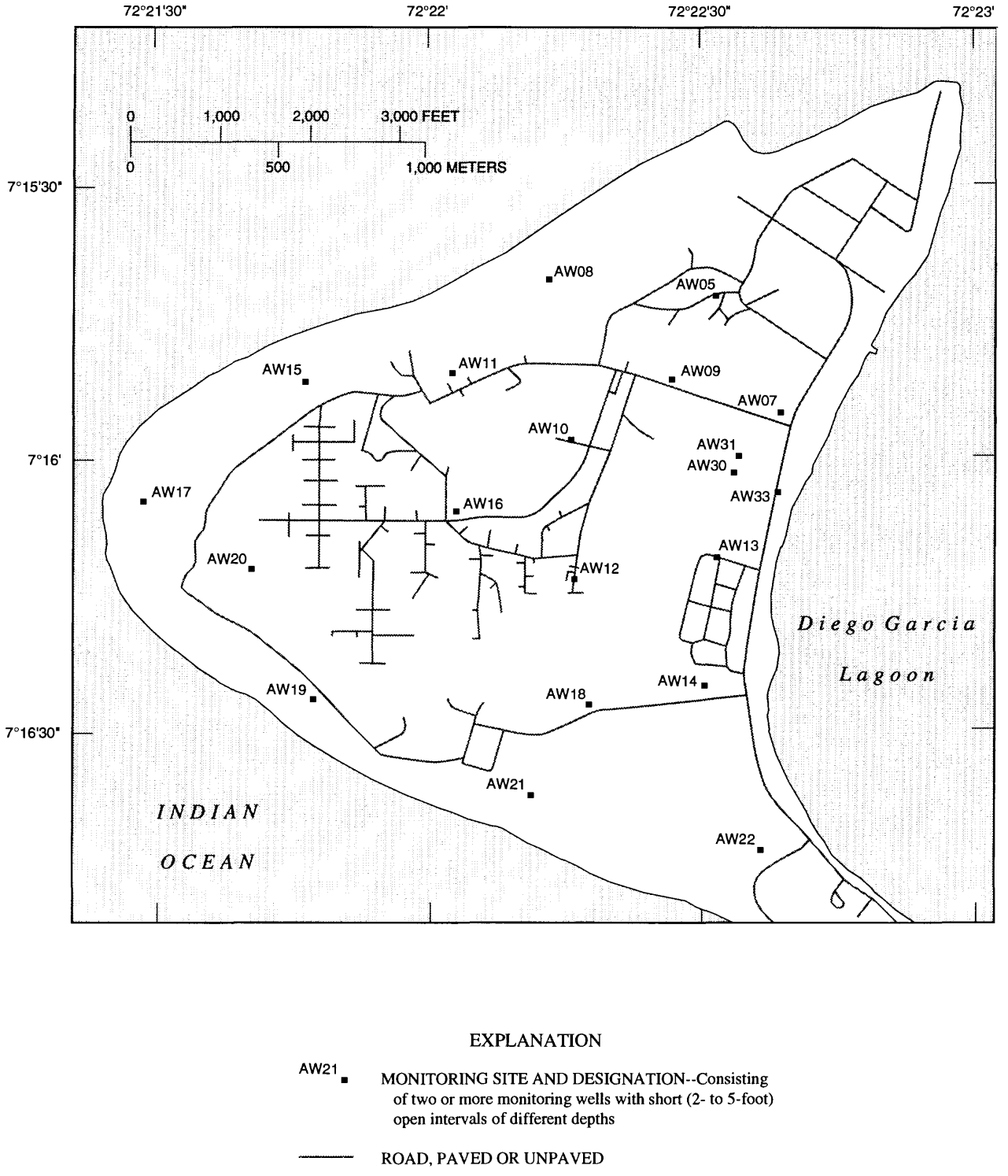


Figure A2. Ground-water production wells at Air Operations, Diego Garcia.



EXPLANATION

AW21 ■ MONITORING SITE AND DESIGNATION--Consisting of two or more monitoring wells with short (2- to 5-foot) open intervals of different depths

——— ROAD, PAVED OR UNPAVED

Figure A3. Monitoring wells at Cantonment, Diego Garcia.

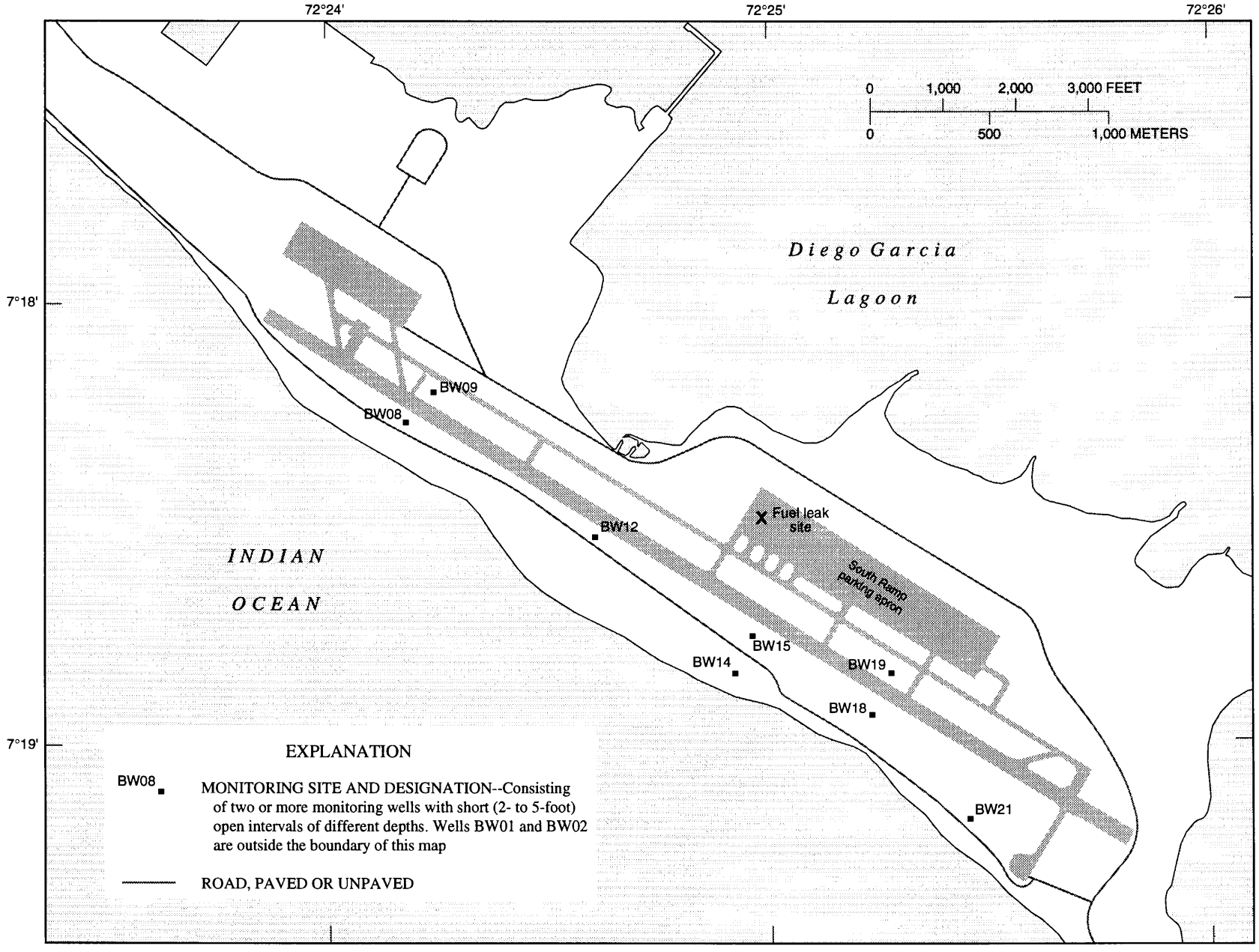


Figure A4. Monitoring wells at Air Operations, Diego Garcia.

SECTION B

Graphs of monthly mean ground-water withdrawal, January 1995 through March 1997

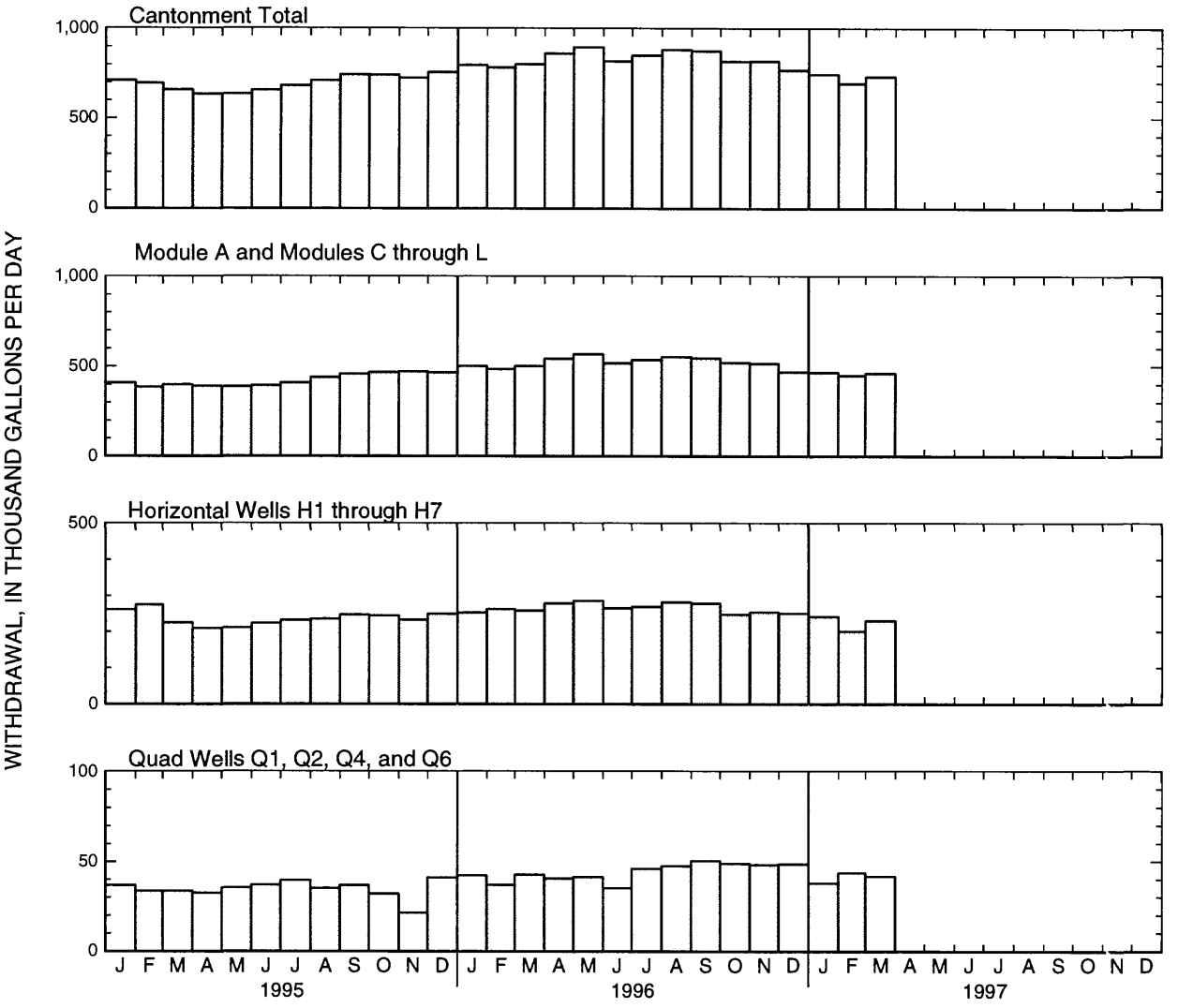


Figure B1. Monthly mean ground-water withdrawal at Cantonment, Diego Garcia, January 1995 through March 1997. Data are collected every Monday, Wednesday, Friday, and Saturday. If the last day of a month is not a scheduled data-collection day, then the withdrawal is included in the withdrawal of the next month.

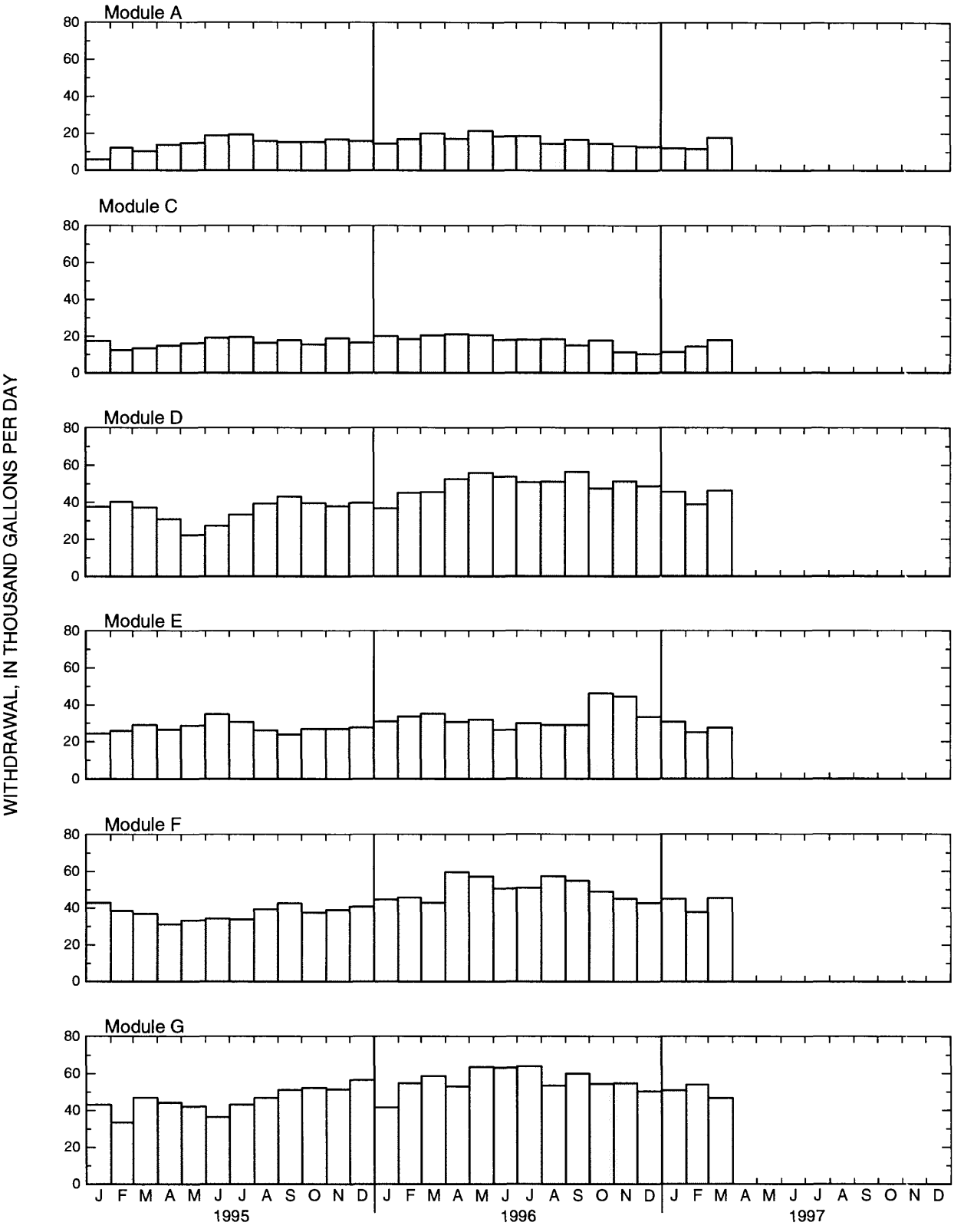


Figure B2. Monthly mean ground-water withdrawal at Module A and Modules C through L at Cantonment, Diego Garcia, January 1995 through March 1997. Data are collected every Monday, Wednesday, Friday, and Saturday. If the last day of a month is not a scheduled data-collection day, then the withdrawal is included in the withdrawal of the next month.

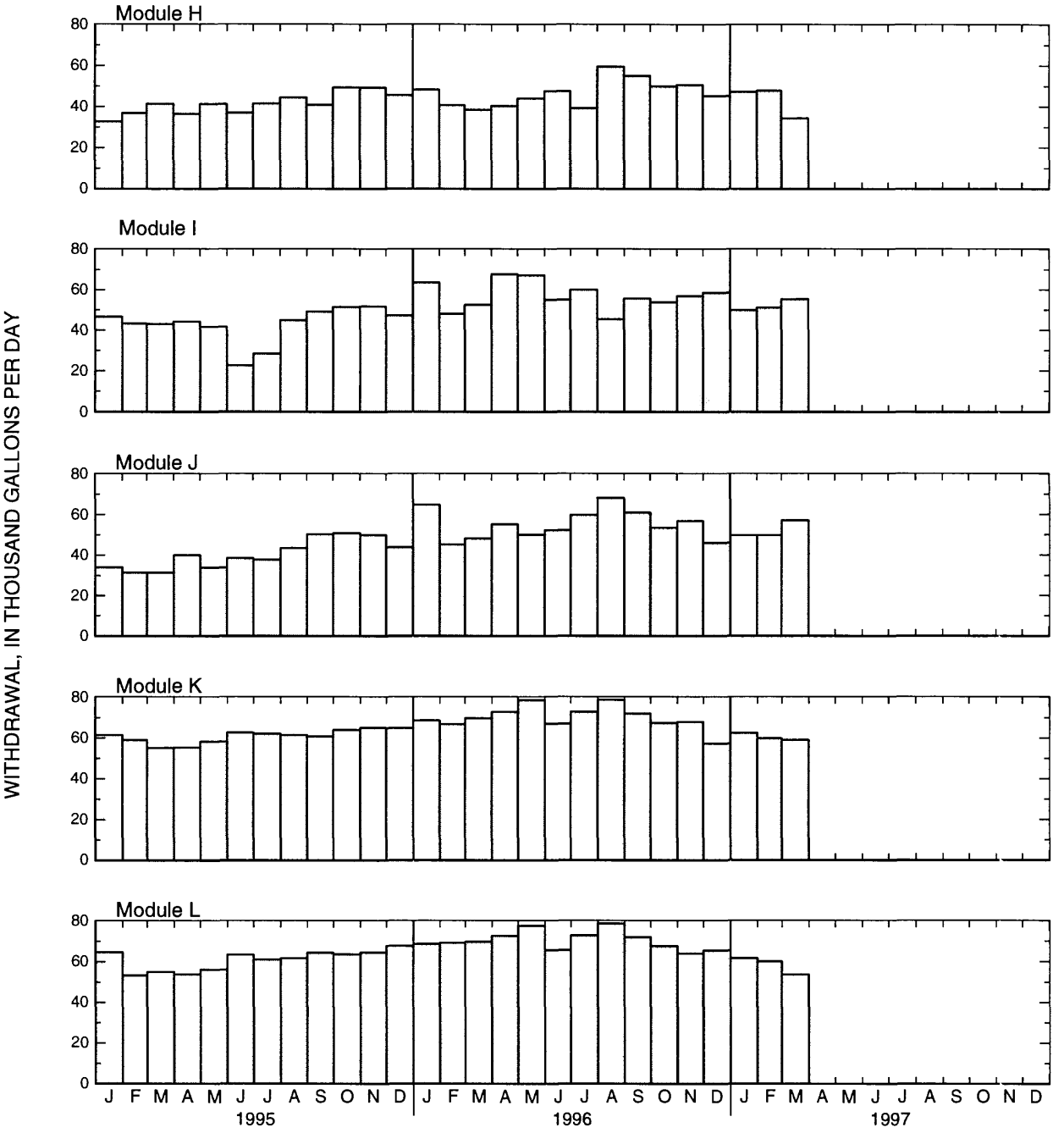


Figure B2. Monthly mean ground-water withdrawal at Module A and Modules C through L at Cantonment, Diego Garcia, January 1995 through March 1997. Data are collected every Monday, Wednesday, Friday, and Saturday. If the last day of a month is not a scheduled data-collection day, then the withdrawal is included in the withdrawal of the next month--Continued.

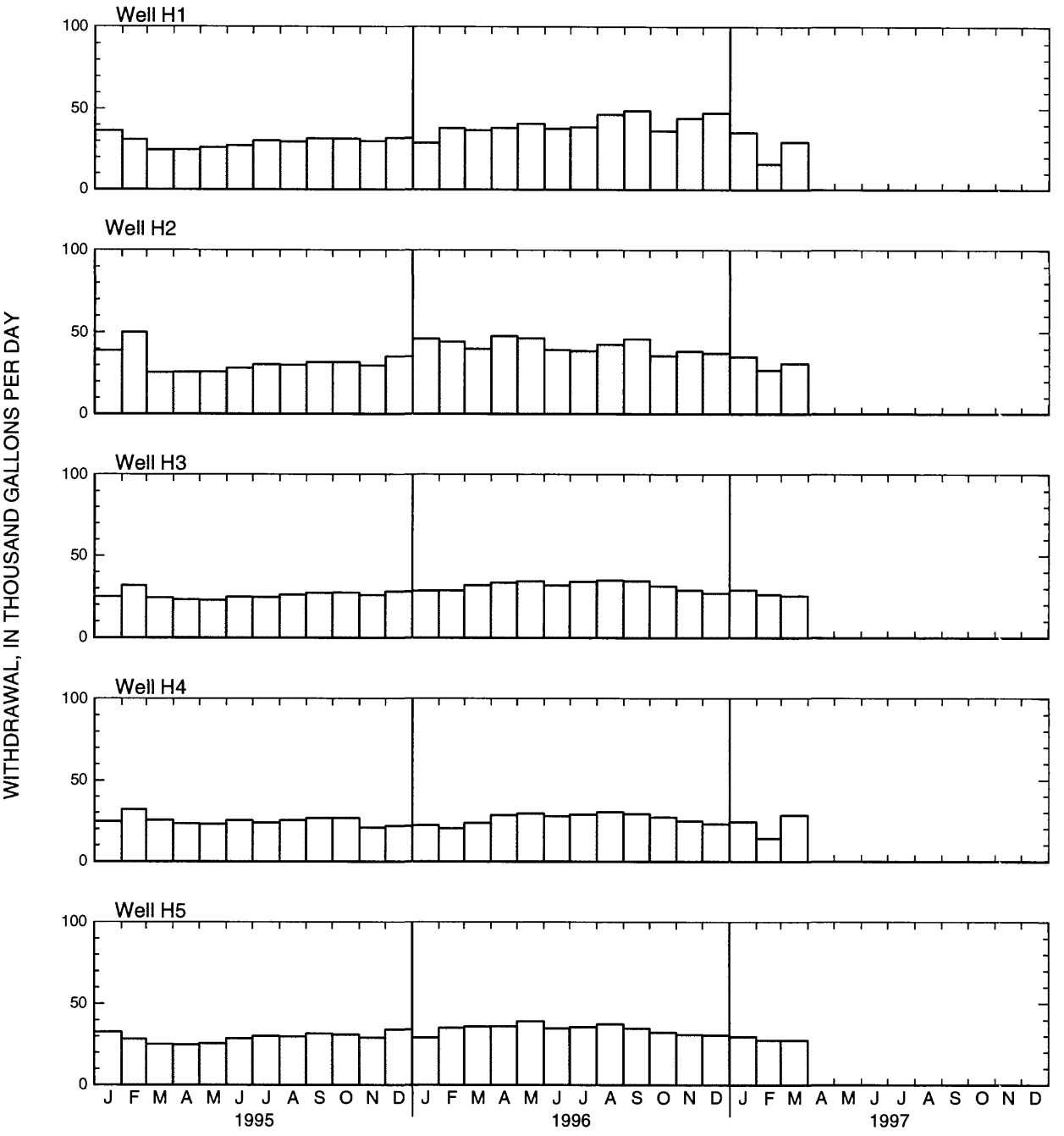


Figure B3. Monthly mean ground-water withdrawal at Horizontal wells H1 through H7 at Cantonment, Diego Garcia, January 1995 through March 1997. Data are collected every Monday, Wednesday, Friday, and Saturday. If the last day of a month is not a scheduled data-collection day, then the withdrawal is included in the withdrawal of the next month.

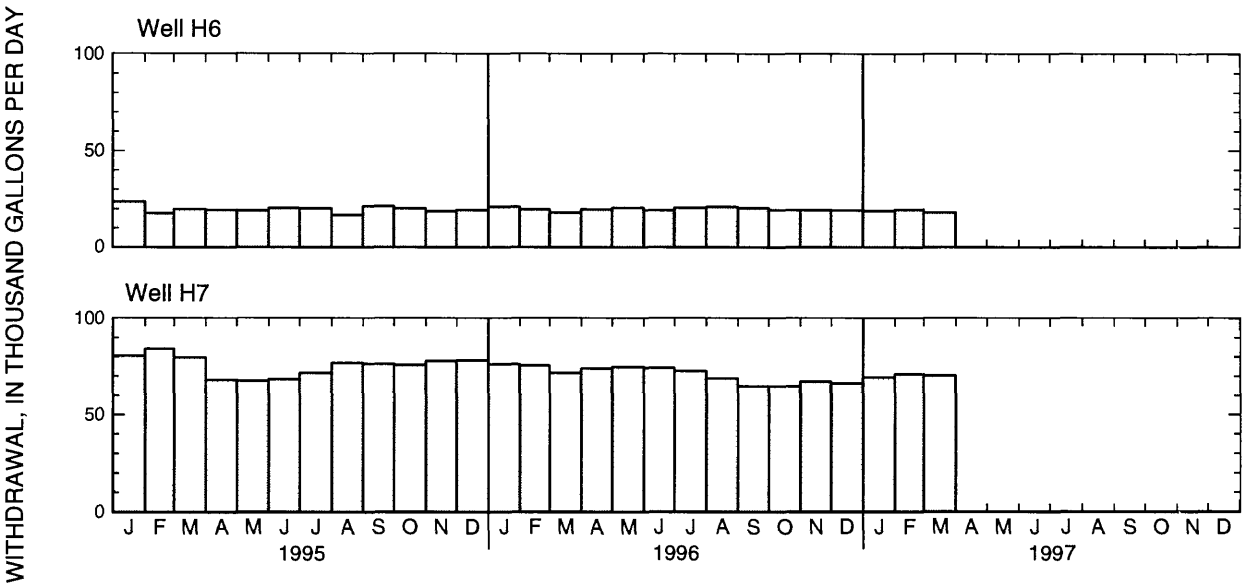


Figure B3. Monthly mean ground-water withdrawal at Horizontal wells H1 through H7 at Cantonment, Diego Garcia, January 1995 through March 1997. Data are collected every Monday, Wednesday, Friday, and Saturday. If the last day of a month is not a scheduled data-collection day, then the withdrawal is included in the withdrawal of the next month--Continued.

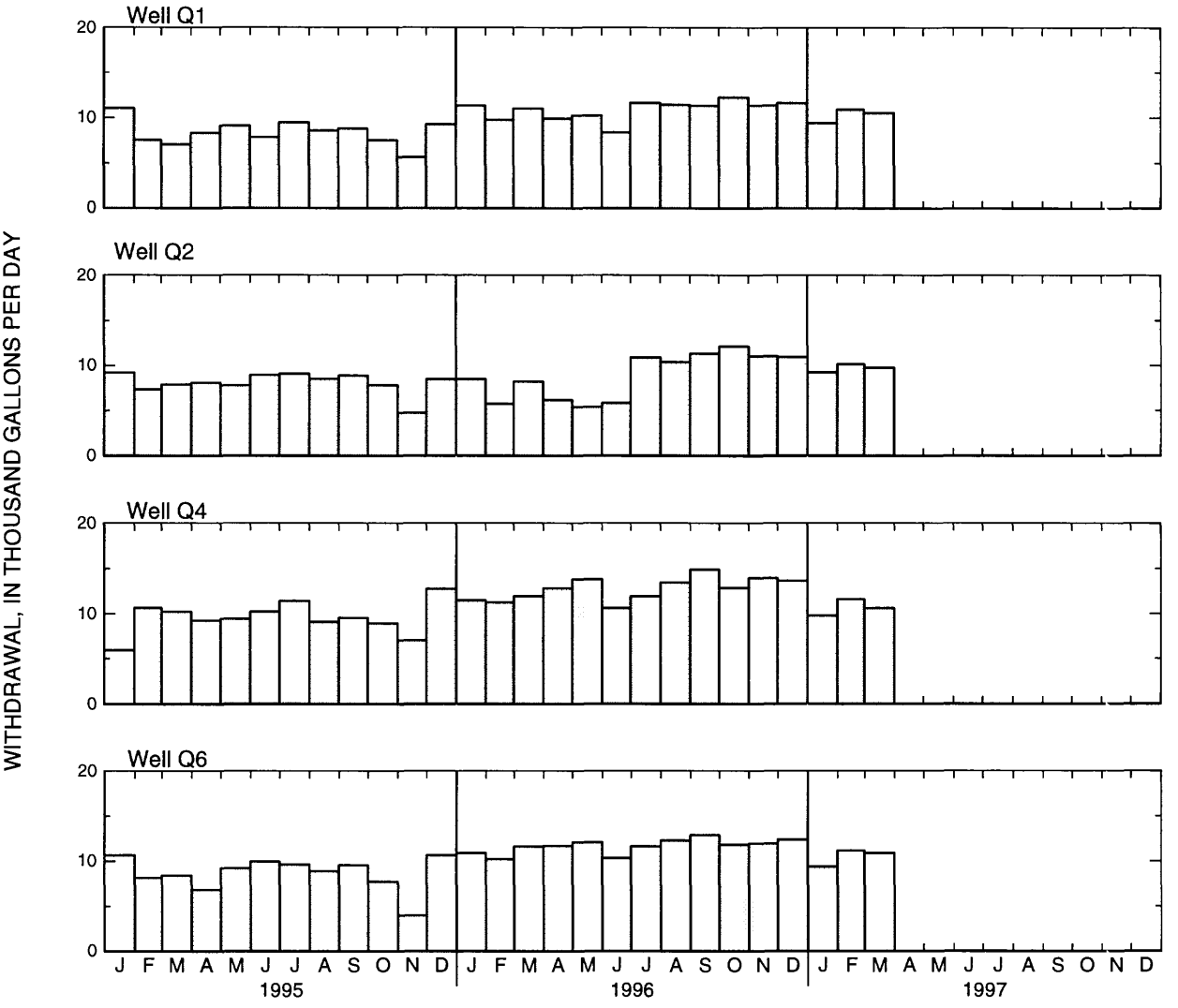


Figure B4. Monthly mean ground-water withdrawal at Quad wells Q1, Q2, Q4, and Q6 at Cantonment, Diego Garcia, January 1995 through March 1997. Data are collected every Monday, Wednesday, Friday, and Saturday. If the last day of a month is not a scheduled data-collection day, then the withdrawal is included in the withdrawal of the next month.

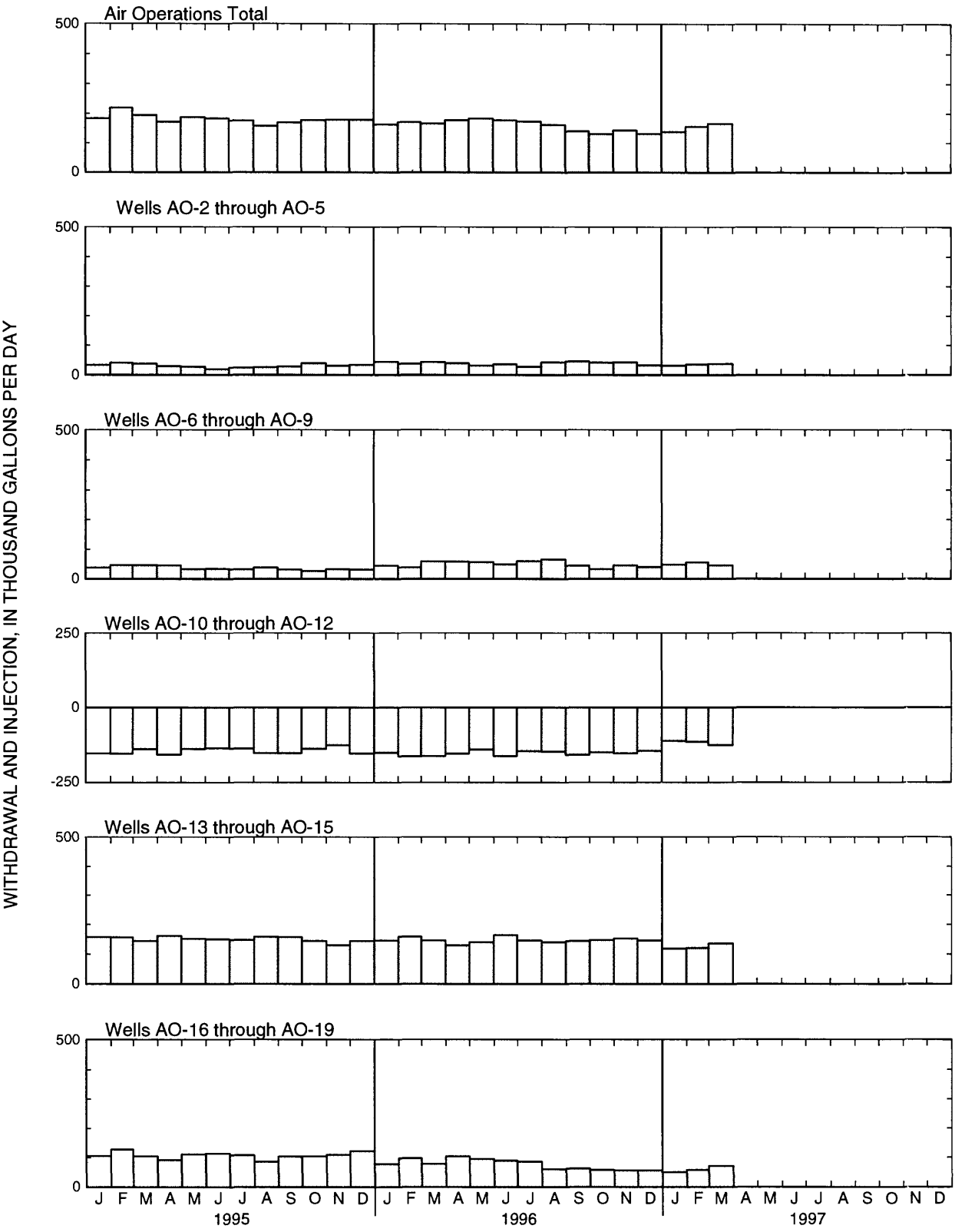


Figure B5. Monthly mean ground-water withdrawal and injection at Air Operations, Diego Garcia, January 1995 through March 1997. Data are collected every Monday, Wednesday, Friday, and Saturday. If the last day of a month is not a scheduled data-collection day, then the withdrawal is included in the withdrawal of the next month. Injection is plotted as negative.

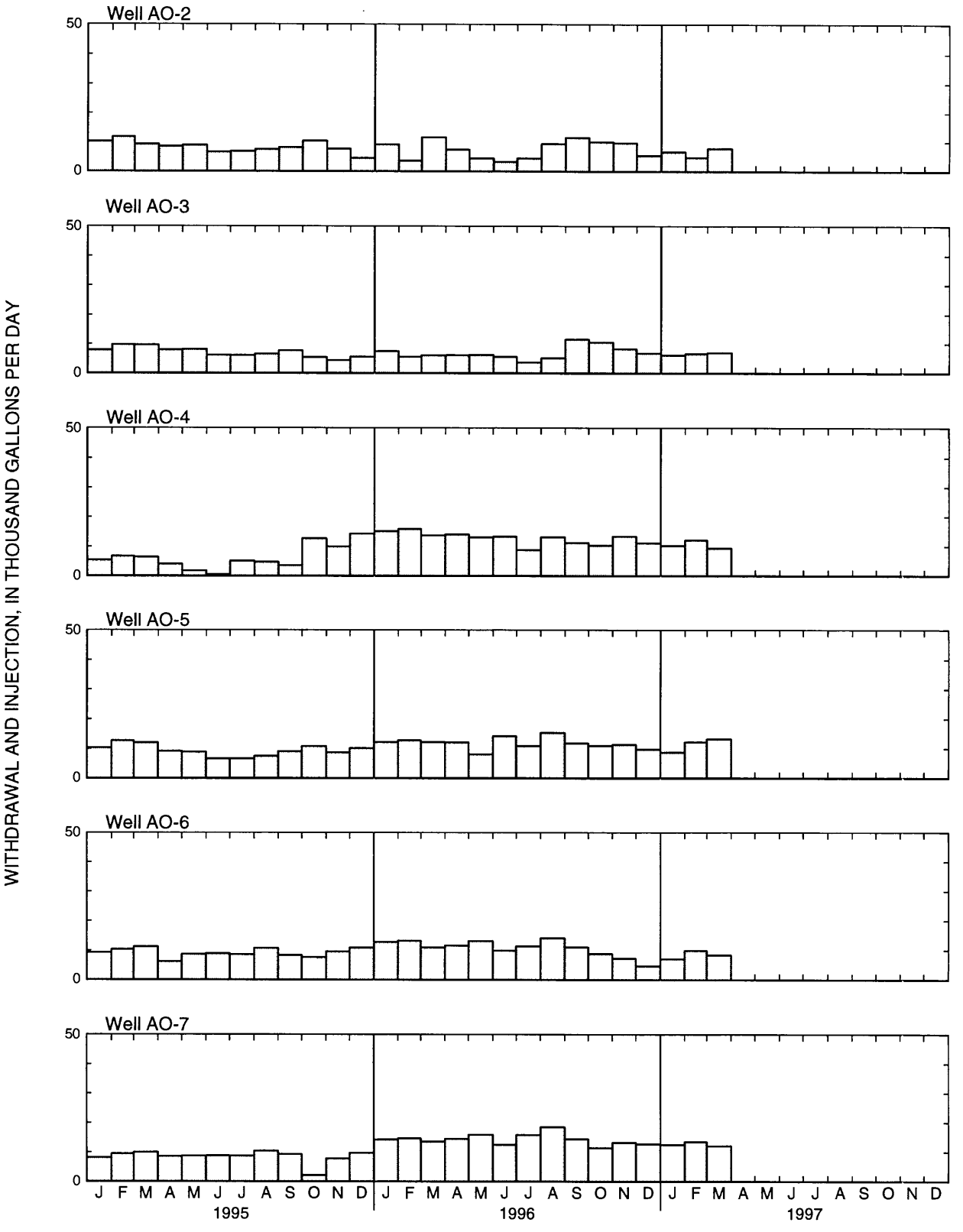


Figure B6. Monthly mean ground-water withdrawal and injection at wells AO-2 through AO-19 at Air Operations, Diego Garcia, January 1995 through March 1997. Data are collected every Monday, Wednesday, Friday, and Saturday. If the last day of a month is not a scheduled data-collection day, then the withdrawal is included in the withdrawal of the next month. Injection is plotted as negative.

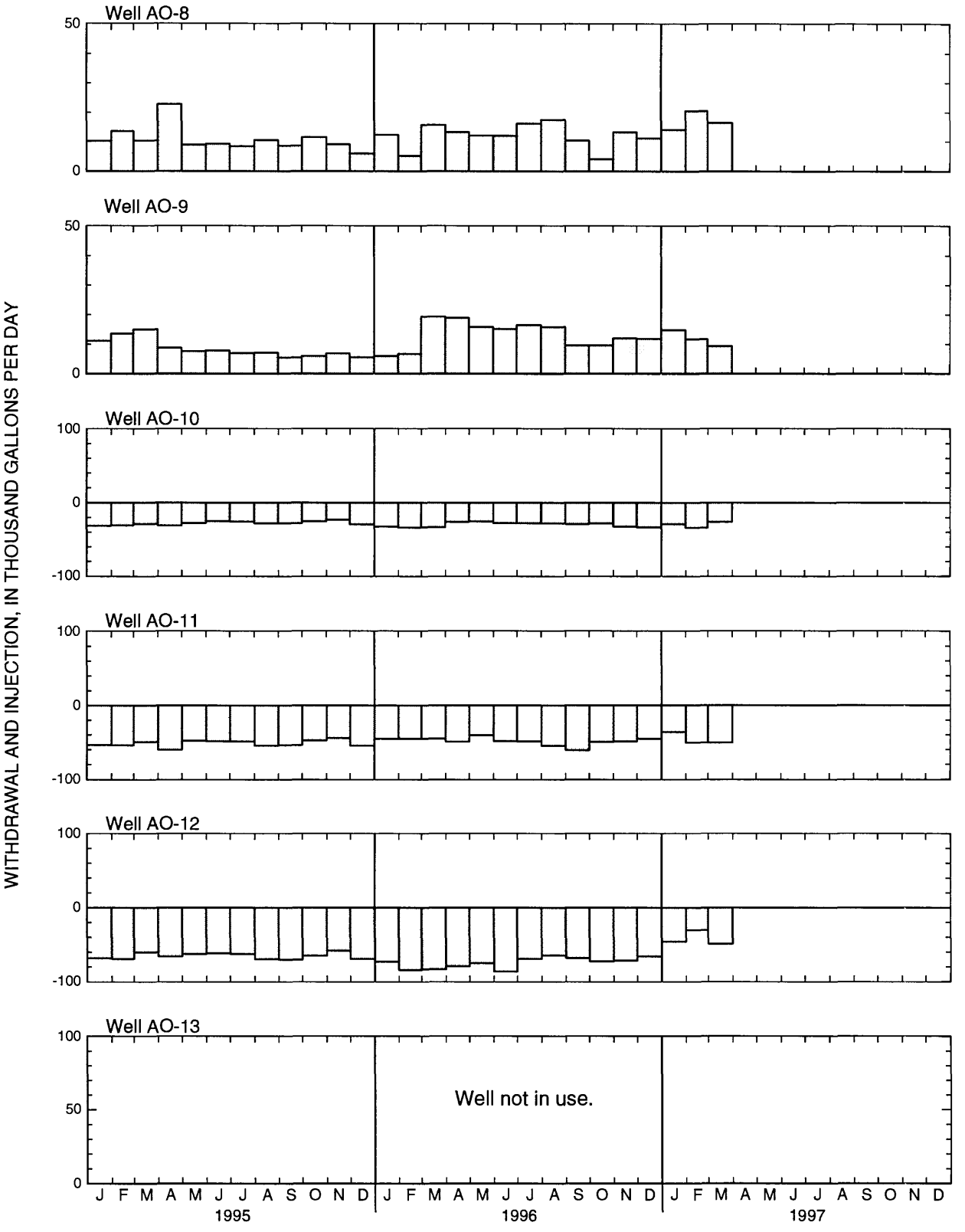


Figure B6. Monthly mean ground-water withdrawal and injection at wells AO-2 through AO-19 at Air Operations, Diego Garcia, January 1995 through March 1997. Data are collected every Monday, Wednesday, Friday, and Saturday. If the last day of a month is not a scheduled data-collection day, then the withdrawal is included in the withdrawal of the next month. Injection is plotted as negative--Continued.

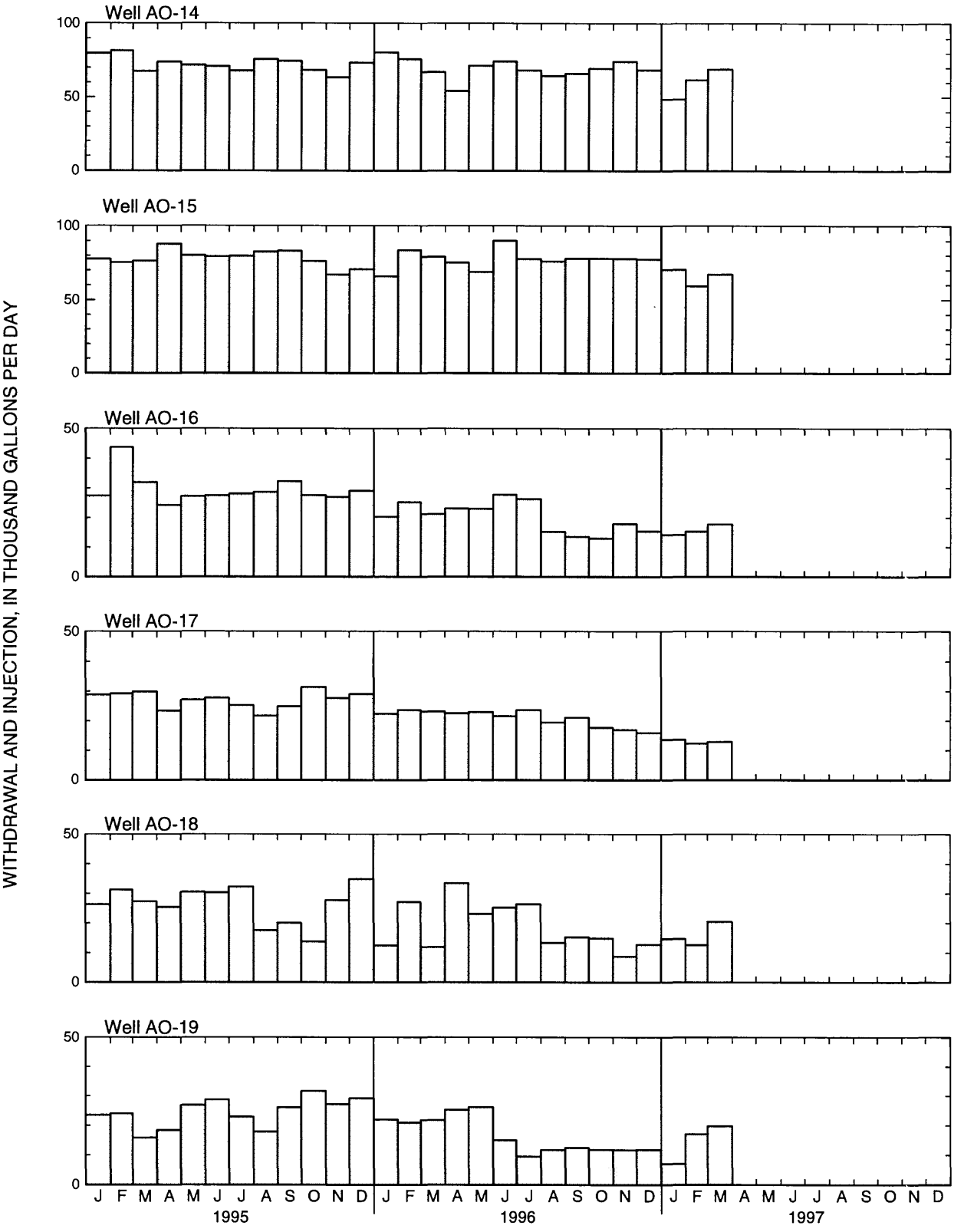


Figure B6. Monthly mean ground-water withdrawal and injection at wells AO-2 through AO-19 at Air Operations, Diego Garcia, January 1995 through March 1997. Data are collected every Monday, Wednesday, Friday, and Saturday. If the last day of a month is not a scheduled data-collection day, then the withdrawal is included in the withdrawal of the next month. Injection is plotted as negative--Continued.

SECTION C

Graphs of chloride concentration of pumped water, January 1995 through March 1997

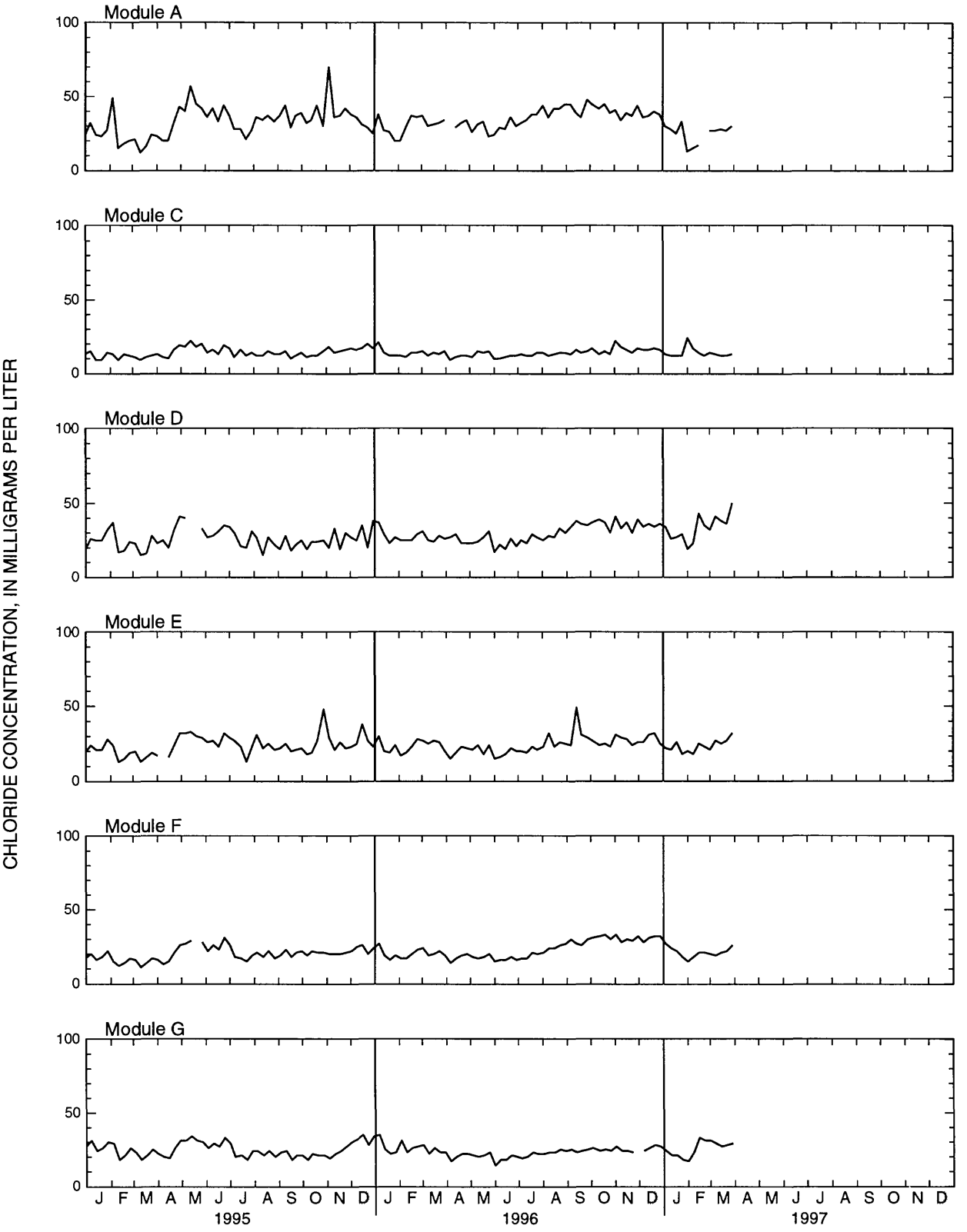


Figure C1. Chloride concentration of pumped water (sampled at weekly intervals) at Module A and Modules C through L at Cantonment, Diego Garcia, January 1995 through March 1997.

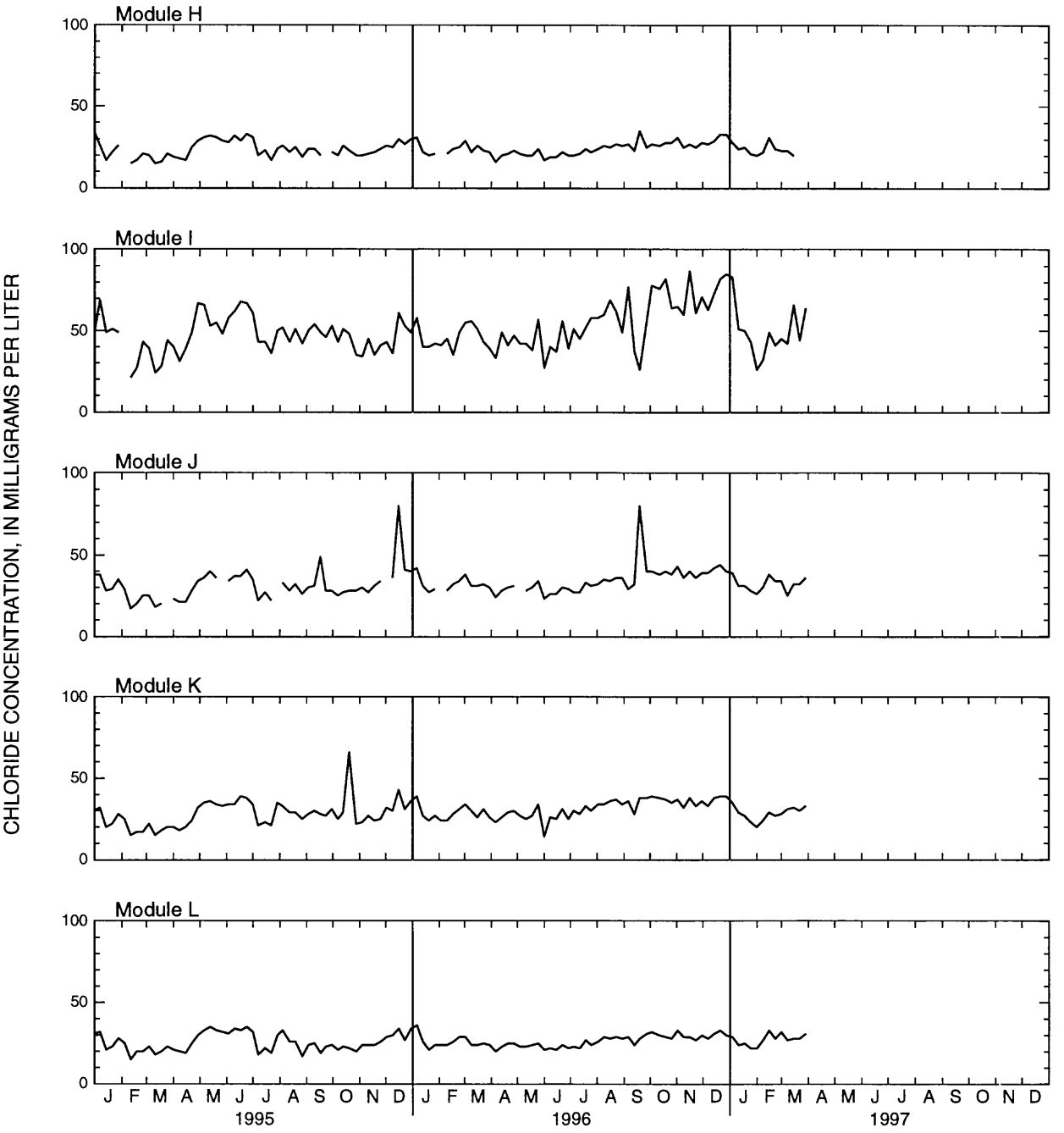


Figure C1. Chloride concentration of pumped water (sampled at weekly intervals) at Module A and Modules C through L at Cantonment, Diego Garcia, January 1995 through March 1997--Continued.

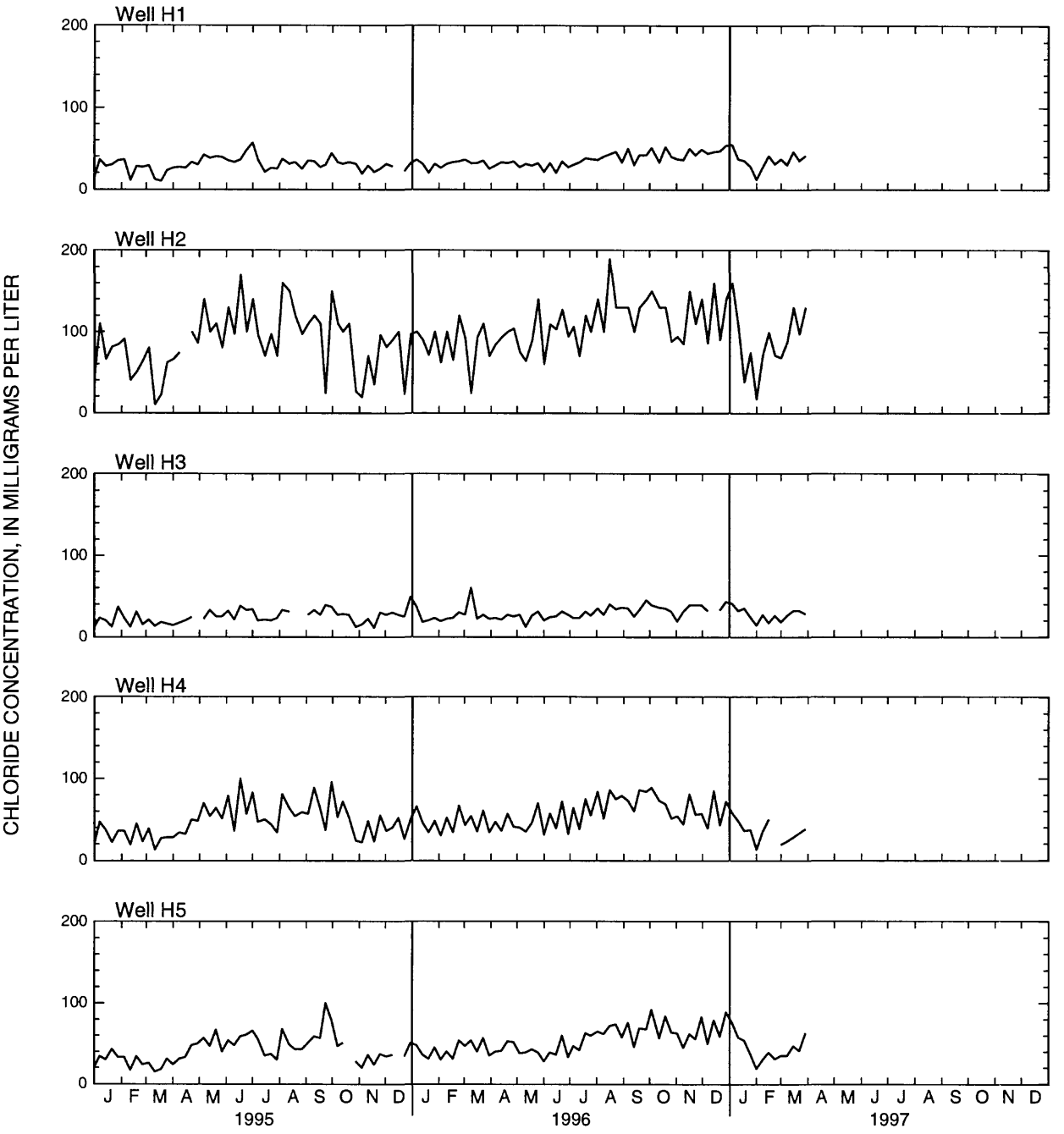


Figure C2. Chloride concentration of pumped water (sampled at weekly intervals) at Horizontal wells H1 through H7 at Cantonment, Diego Garcia, January 1995 through March 1997.

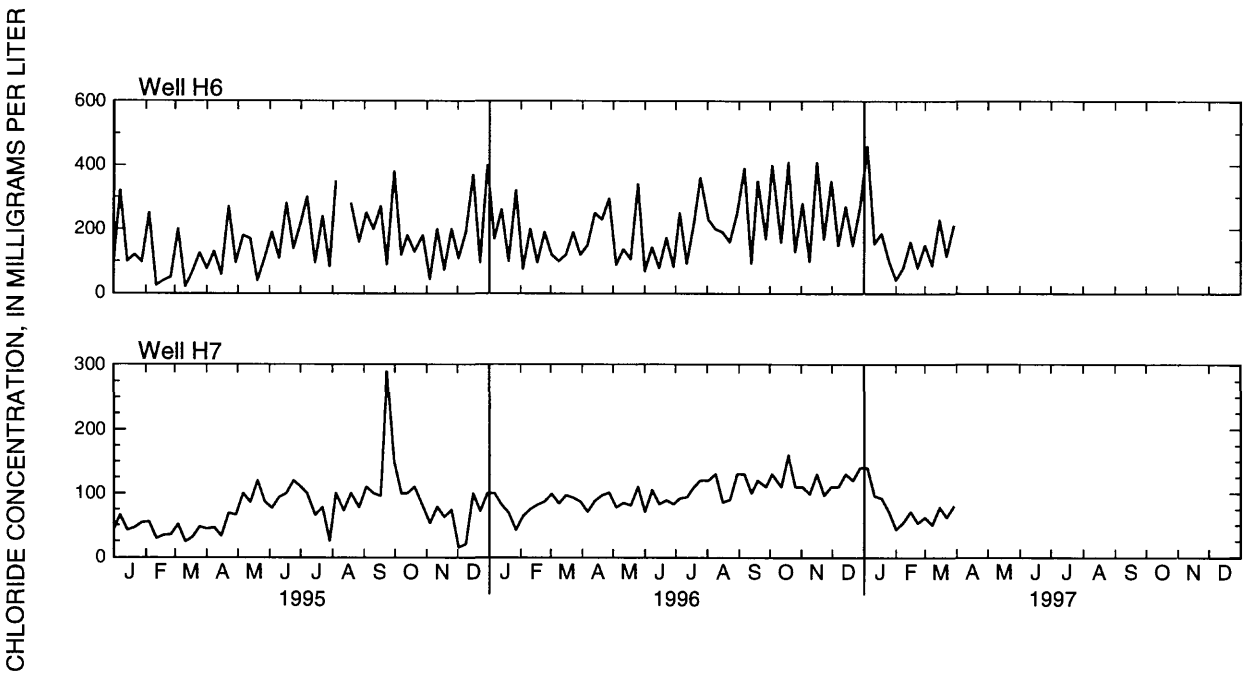


Figure C2. Chloride concentration of pumped water (sampled at weekly intervals) at Horizontal wells H1 through H7 at Cantonment, Diego Garcia, January 1995 through March 1997--Continued.

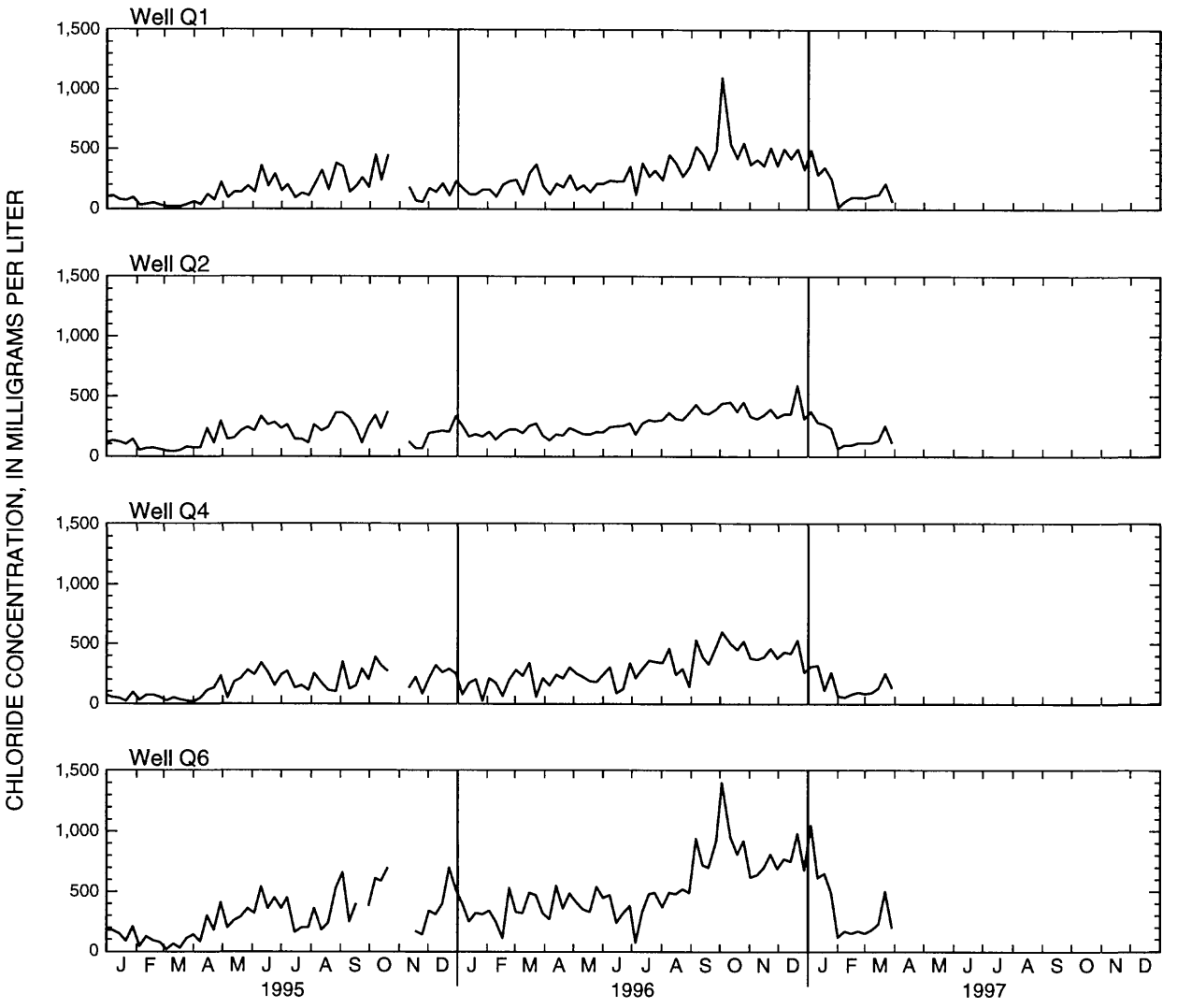


Figure C3. Chloride concentration of pumped water (sampled at weekly intervals) at Quad wells Q1, Q2, Q4, and Q6 at Cantonment, Diego Garcia, January 1995 through March 1997.

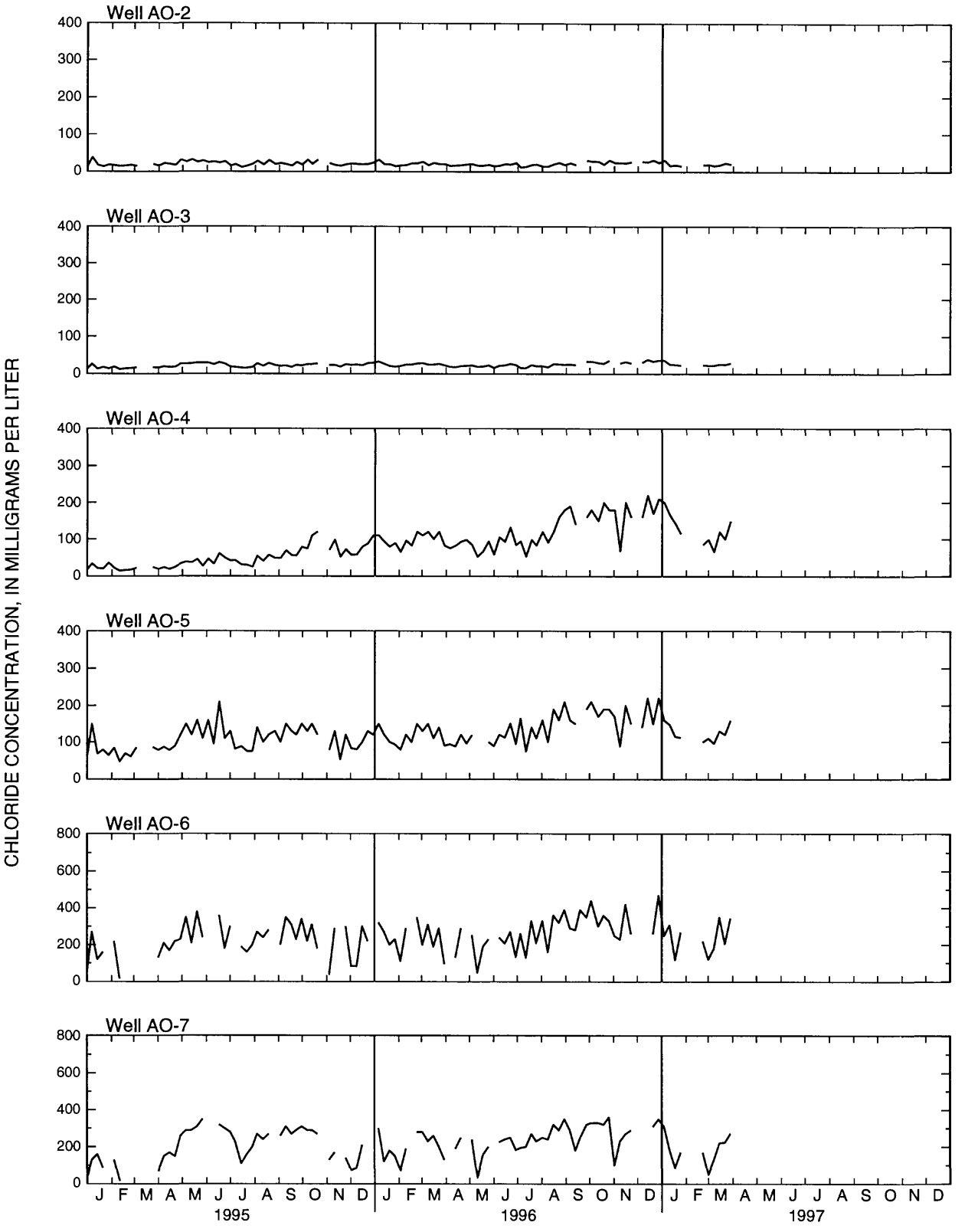


Figure C4. Chloride concentration of pumped water (sampled at weekly intervals) at wells AO-2 through AO-9 and wells AO-13 through AO-19 at Air Operations, Diego Garcia, January 1995 through March 1997. Water from well AO-13 has not been sampled since April 1993.

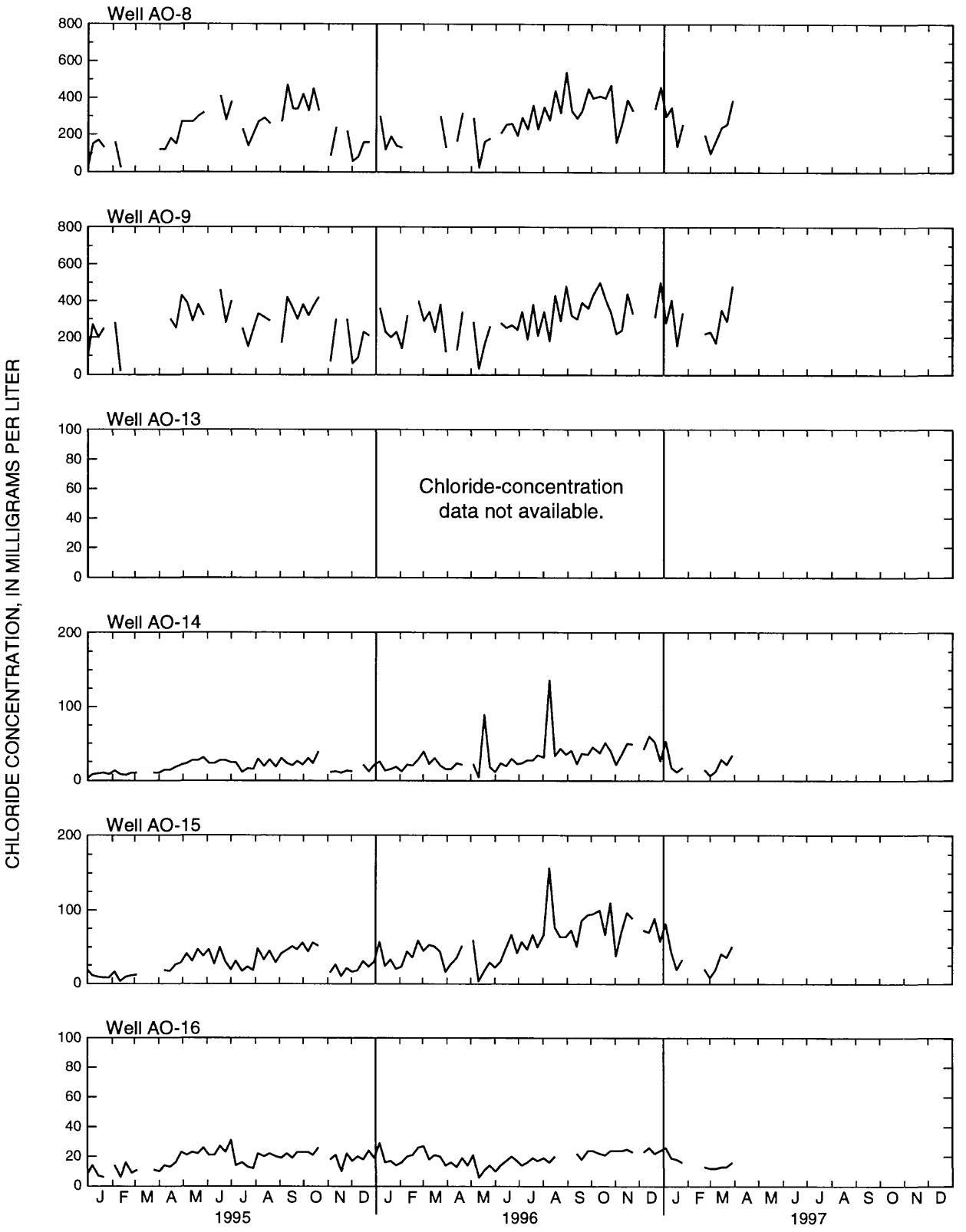


Figure C4. Chloride concentration of pumped water (sampled at weekly intervals) at wells AO-2 through AO-9 and wells AO-13 through AO-19 at Air Operations, Diego Garcia, January 1995 through March 1997. Water from well AO-13 has not been sampled since April 1993--Continued.

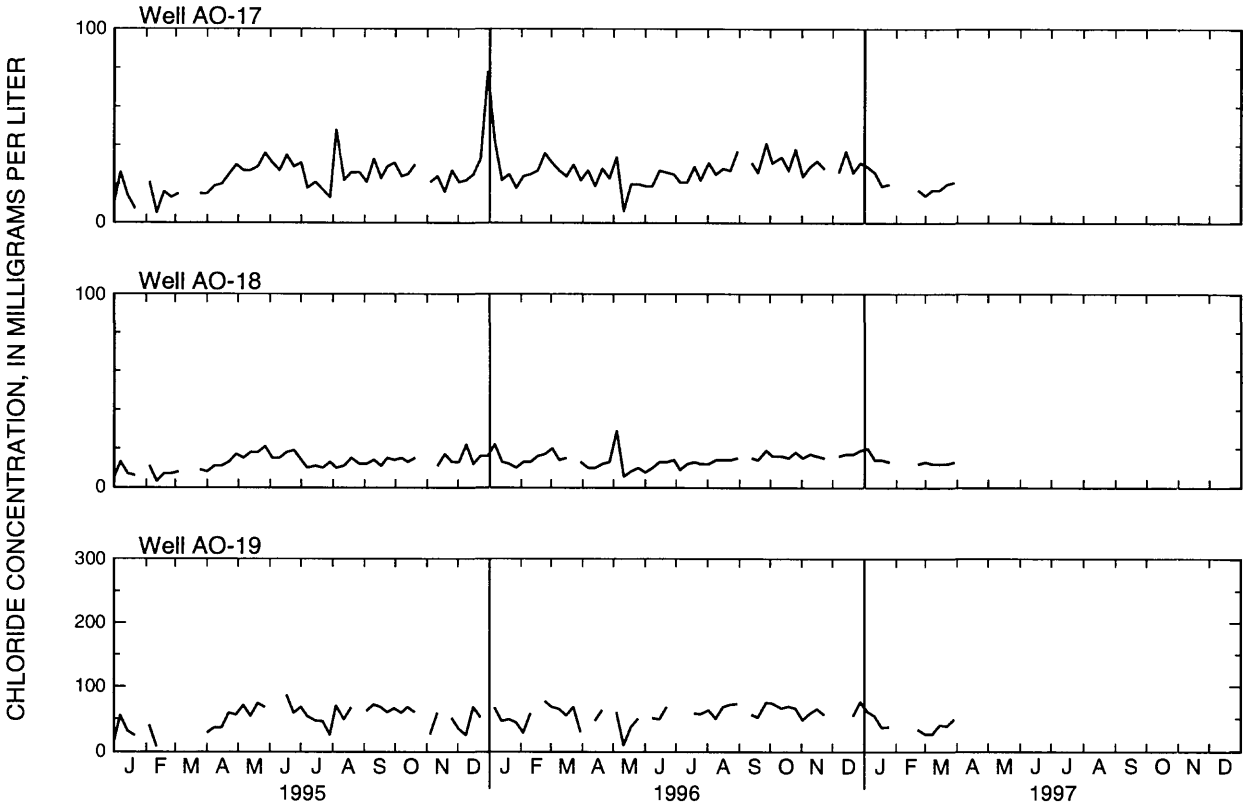


Figure C4. Chloride concentration of pumped water (sampled at weekly intervals) at wells AO-2 through AO-9 and wells AO-13 through AO-19 at Air Operations, Diego Garcia, January 1995 through March 1997. Water from well AO-13 has not been sampled since April 1993--Continued.

REFERENCES CITED

Torikai, J.D., 1995, Status of ground-water resources at U.S. Navy Support Facility, Diego Garcia: Summary of hydrologic and climatic data through September 1993; U.S. Geological Survey Open-File Report 94-306, 51 p.

U.S. Department of Commerce, 1968, World weather records, 1951-60: Washington, D.C., U.S. Government Printing Office, 6 vols.

_____, 1979, World weather records, 1961-70: Washington, D.C., U.S. Government Printing Office, 6 vols.

_____, 1995, International station meteorological climate summary (ISMCS), ver. 3.0 [CD-ROM]: Asheville, N.C., National Oceanic and Atmospheric Administration.

U.S. Environmental Protection Agency, 1991, Secondary maximum contaminant levels (section 143.3 of part 143, National secondary drinking water regulations): U.S. Code of Federal Regulations, Title 40, Parts 100 to 149, revised through July 1, 1991.

U.S. Navy, 1978, Station climatic summary, January 1951-December 1977: Asheville, N.C., Naval Weather Service Detachment, 4 p.