SELECTED GROUND-WATER DATA FOR YUCCA MOUNTAIN REGION, SOUTHERN NEVADA AND EASTERN CALIFORNIA, CALENDAR YEAR 1993

U.S. GEOLOGICAL SURVEY

Open-File Report 95-158

Prepared in cooperation with the
NEVADA OPERATIONS OFFICE
U.S. DEPARTMENT OF ENERGY, under
(Interagency Agreement DE-AI08-92NV10874)

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by **Glenn S. Hale *and* Craig L. Westenburg**

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Carson City, Nevada
1995

U.S. DEPARTMENT OF THE INTERIOR
BRUCE BABBITT, Secretary

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CONVERSION FACTORS AND VERTICAL DATUM

Multiply	By	To obtain
acre-foot (acre-ft)	1,233	cubic meter
foot (ft)	0.3048	meter
gallon per minute (gal/min)	0.0631	liter per second
inch (in.)	2.540	centimeter
mile (mi)	1.609	kilometer
million gallons (Mgal)	3,785	cubic meter
pound per square inch (lb/in^2)	6.895	kilopascal

Sea level: In this report, "sea level" refers to the National Geodetic Vertical Datum of 1929 (NGVD of 1929, formerly called "Sea-Level Datum of 1929"), which is derived from a general adjustment of the first-order leveling networks of the United States and Canada.

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ABSTRACT

The U.S. Geological Survey, in support of the U.S. Department of Energy, Yucca Mountain Site Characterization Project, collects, compiles, and summarizes hydrologic data in the Yucca Mountain region. The data are collected to allow assessments of ground-water resources during studies to determine the potential suitability of Yucca Mountain for storing high-level nuclear waste.

Data on ground-water levels at 34 sites, ground-water discharge at 6 sites, and ground-water withdrawals within Jackass Flats, Mercury Valley, and Amargosa Desert are presented for calendar year 1993. Data on ground-water levels, discharges, and withdrawals collected by other agencies (or as part of other programs) are included to further indicate variations through time at selected monitoring locations.

A statistical summary of ground-water levels at seven wells in Jackass Flats is presented. The statistical summary includes the number of measurements, the maximum, minimum, and median or mean water-level altitudes, and the average or standard deviation of the water-level altitudes for selected baseline periods and for calendar years 1992 and 1993.

INTRODUCTION

Investigations are planned to determine the potential suitability of Yucca Mountain for storing high-level nuclear waste. The U.S. Department of Energy (USDOE) has declared that all facilities and activities associated with such investigations will be operated in a manner that maintains or protects environmental quality, and has established programs to allow assessments of environmental quality. In April 1989, the U.S. Geological Survey (USGS) began a cooperative program with USDOE to develop a monitoring program for water resources in the vicinity of Yucca Mountain. The purposes of the water-resources monitoring program are to (1) document the historical and current conditions of ground-water resources, (2) detect and document changes in those resources during the investigations of Yucca Mountain, and (3) provide a basis for analyzing and identifying potential adverse effects on water resources resulting from investigations of Yucca Mountain.

Purpose and Scope

This report presents and summarizes, in tabular and graphical form, data collected as part of the water-resources monitoring program. Included are 1993 data on ground-water levels at 34 sites, ground-water discharge at 6 sites, and ground-water withdrawals within Jackass Flats, Mercury Valley, and Amargosa Desert. Data on ground-water levels, discharges, and withdrawals collected by other agencies (or collected as part of other programs) are included to further indicate variations through time at selected monitoring locations. Historical depth-to-water data for site AD-1 included in this report were unavailable at the time the La Camera and Westenburg (1994) report was published. A discussion of ground-water data for Jackass Flats includes a statistical summary of the data. This report is one of a series of Yucca Mountain Site

Characterization Project reports of ground-water data. Parts of the text are taken from La Camera and Westenburg (1994).

Acknowledgments

Several organizations and programs contributed to this report. Specifically, data were provided by National Park Service; U.S. Fish and Wildlife Service; Nevada Department of Conservation and Natural Resources, Division of Water Resources; Nevada Department of Transportation; Raytheon Services Nevada; Reynolds Electrical and Engineering Company; Saga Exploration Company; U.S. Borax Corporation; U.S. Nevada Gold Search; USGS-Hydrologic Resources Management Program; and USGS-Yucca Mountain Project Branch studies of saturated-zone site hydrology and saturated-zone regional hydrology.

Additionally, the authors acknowledge the cooperation of the many individual property owners throughout the Amargosa Desert who allowed access to their property and the collection of hydrologic data.

DESCRIPTION OF STUDY AREA

The study area is the Yucca Mountain region of southern Nevada and eastern California (pl. 1). The Yucca Mountain region, as referred to in this report, is bounded approximately by latitudes 36°15' and 37°00' N. and longitudes 116°00' and 117°00' W. The region is within the Great Basin, a subdivision of the Basin and Range Physiographic Province (Fenneman, 1931, p. 328).

The study area is in the Death Valley ground-water flow system (Harrill and others, 1988, sheet 1) and, within that flow system, the Alkali Flat-Furnace Creek Ranch and Ash Meadows ground-water subbasins. Each ground-water subbasin is a zone consisting of ground-water recharge areas and flow paths to points of discharge at land surface (Waddell and others, 1984, p. 36 and pl. 3; Randell J. Laczniak, U.S. Geological Survey, written commun., 1993). Boundaries of the subbasins are defined on the basis of the location of low-permeability rocks, hydraulic gradients, and water chemistry. These boundaries are general indicators of restrictions on ground-water movement in the region.

Within the Alkali Flat-Furnace Creek Ranch and Ash Meadows subbasins, the study area is further subdivided by hydrographic areas (pl. 1). As defined by Rush (1968, p. 4), hydrographic areas generally consist of valleys (topographic lows) extending to their surrounding surface-water drainage divides (topographic highs). Hydrographic areas in the study area include Crater Flat, Jackass Flats, Rock Valley, most of Mercury Valley, and parts of Amargosa Desert and Death Valley (Rush, 1968; Harrill and others, 1983, plate 1).

Alkali Flat-Furnace Creek Ranch Ground-Water Subbasin

In the Alkali Flat-Furnace Creek Ranch ground-water subbasin, ground-water recharge results principally from subsurface interbasin inflow and precipitation on mesas and mountains north of the study area. Subsurface interbasin inflow also may occur near the Ash Meadows area in the Amargosa Desert (Waddell and others, 1984, p. 29-36; Harrill and others, 1988, sheet 2). Ground water discharges principally in Death Valley and at Alkali Flat about 5 mi southeast of Death Valley Junction (Waddell and others, 1984, p. 38).

In the part of the subbasin within the northern half of the study area, ground-water flow is generally to the south or southeast. In the part of the subbasin within the southern half of the study area, ground-water flow is to the southeast toward Alkali Flat or southwest toward Death Valley (Waddell and others, 1984, pl. 3; Kilroy, 1991, p. 9-10).

Crater Flat and Jackass Flats (which include Yucca Mountain), most of Rock Valley, and the west-central part of the Amargosa Desert hydrographic areas are within the Alkali Flat-Furnace Creek Ranch subbasin (pl. 1).

Ash Meadows Ground-Water Subbasin

In the Ash Meadows ground-water subbasin, ground-water recharge principally results from subsurface interbasin inflow and precipitation on mountains to the east and northeast of the study area (Waddell and others, 1984, p. 38; Harrill and others, 1988, sheet 2). Ground water discharges principally as springflow in the Ash Meadows area, and possibly as underflow into the Alkali Flat-Furnace Creek Ranch ground-water subbasin (Waddell and others, 1984, p. 36, 39).

Ground water in the subbasin generally flows to the west or southwest (Waddell and others, 1984, p. 29, 38, and pl. 3; Harrill and others, 1988, sheet 2).

Most of Mercury Valley and the eastern part of the Amargosa Desert hydrographic areas are within the Ash Meadows subbasin (pl. 1). The southeastern part of the Amargosa Desert includes the Ash Meadows spring-discharge area. The Ash Meadows spring-discharge area is the gently sloping land watered by numerous springs (Dudley and Larson, 1976, p. 5) at the southwestern edge of the subbasin.

DATA-COLLECTION SITES

Locations of data-collection sites are shown on plate 1. Table 1 includes information on site identification, site location, site owner, and the types of data contained in this report for each site. Table 2 includes information on site identification, well construction, source of well-construction data, and contributing lithologic units. Monitoring site MV-1 did not have water-level data available in 1993, but is included because it is a part of the monitoring program. All sites are wells or springs except site AM-4 (Devils Hole), which is an open fissure that intersects the ground-water table.

Site Number

Sites are identified on plate 1 and in table 1 by an alphanumeric number that also is used in tables, figures, and text of this report. The site number consists of two parts. The first part represents the hydrographic area in which the site is located: "CF" represents Crater Flat; "JF" or "J," Jackass Flats; "RV," Rock Valley; "MV," Mercury Valley; "AD" or "AM," Amargosa Desert; and "DV," Death Valley. "AM" further indicates that the site is located in the Ash Meadows spring-discharge area. The second part of the number represents the relative location of the site within the hydrographic area (or Ash Meadows spring-discharge area). Within each hydrographic area, sites generally are numbered sequentially in a north-to-south, then west-to-east order. Sites added subsequent to the initial numbering are assigned the number of a nearby site and given the suffix of "a." Exceptions are sites J-13, J-11, and J-12, which are or were water-supply wells and were previously numbered by Raytheon Services Nevada and were not renumbered for this report. The sequence of sites given in table 1 is used elsewhere throughout the report.

U.S. Geological Survey Site Identification

Sites are identified by the standard Geological Survey identification number, which is based on latitude and longitude. The site identification serves as a unique identification number in files and data bases of the USGS and indicates the approximate geographic location of each site. The identification consists of 15 digits: The first 6 denote the degrees, minutes, and seconds of latitude; the next 7 denote degrees, minutes, and seconds of longitude; and the last 2 digits (assigned sequentially) identify the site within a 1-second grid. For example, site 363530116021401 is at 36°35'30" latitude and 116°02'14" longitude, and it is the first site recorded in that 1-second grid. If a more precise latitude and longitude are determined, the unique identification number remains unchanged. Latitude and longitude shown for a site, therefore, are the most accurate locators.

Local Site Number

The local-number system (table 1) is based on an index of hydrographic areas (Rush, 1968; Harrill and others, 1983) and the rectangular subdivision of the public lands referenced to the Mount Diablo base line and meridian for sites in Nevada or San Bernadino base line and meridian for sites in California. Each site designation consists of four units separated by spaces: The first unit is the hydrographic area number. The second unit is the township, preceded by an N or S to indicate location north or south of the base line. The third unit is the range, preceded by an E to indicate location east of the meridian. The fourth unit consists of the section number and letters designating the quarter section, quarter-quarter section and so on (A, B, C, and D, indicate the northeast, northwest, southwest, and southeast quarters, respectively), followed by a number indicating the sequence in which the well was recorded. For example, site 230 S18 E51 34CB1 is in Amargosa Desert (hydrographic area 230) and is the first site recorded in the northwest quarter of the southwest quarter of section 34, Township 18 South, Range 51 East, Mount Diablo base line and meridian.

Table 1. Index to monitoring sites in Yucca Mountain region for calendar year 1993

Site number: Sites are grouped by hydrographic area and, within each area, are listed in general north-to-south, then west-to-east order. See text section titled "Site Number" for further discussion.
U.S. Geological Survey site identification: Unique identification number for sites as stored in files and data bases of U.S. Geological Survey.
Local site number: Alphanumeric number based on location of site within hydrographic areas and rectangular subdivisions of public lands.
Owner: Acronyms have been listed for sites owned by federal agencies. BLM, Bureau of Land Management; NPS, National Park Service; USDOE, U.S. Department of Energy; USFWS, U.S. Fish and Wildlife Service; USGS, U.S. Geological Survey.
Data type: Type of data included in this report. D, ground-water discharge; L, ground-water level; --, data not available for 1993.

Site number (plate 1)	U.S. Geological Survey site identification	Site name	Latitude (degrees, minutes, seconds)	Longitude (degrees, minutes, seconds)	Local site number	Owner	Data type
CF-1	365520116370301	Gexa Well 4	365520	1163703	229 S12 E48 04DBB1	U.S. Nevada Gold Search	L
CF-1a	365445116383901	Gexa Well 3	365445	1163839	229 S12 E48 07ADD1	U.S. Nevada Gold Search	L
CF-2	364732116330701	USW VH-1	364732	1163307	229 S13 E48 27C1	USDOE	L
JF-1	365116116233801	UE-25 WT 15	365116	1162338	227 S12 E50 33A1	USDOE	L
JF-2	364945116235001	UE-25 WT 13	364943	1162351	227 S13 E50 18B1	USDOE	L
JF-2a	364938116252102	UE-25p 1 PTH	364938	1162521	227 S13 E49 02D1	USDOE	L
J-13	364828116234001	J-13 WW	364828	1162340	227 S13 E50 19C1	USDOE	L
J-11	364706116170601	J-11 WW	364706	1161706	227 S13 E51 31B1	USDOE	L
J-12	364554116232401	J-12 WW	364554	1162324	227 S14 E50 06A1	USDOE	L
JF-3	364528116232201	JF-3 Well	364528	1162322	227 S14 E50 06D1	USDOE	L
RV- 1	363815116175901	TW-5	363815	1161759	226 S15 E50 24A1	USDOE	L
MV-1	363530116021401	Army 1 WW	363530	1160214	225 S16 E53 05ADA1	USDOE	--
AD-1	364141116351401	NA-6 Well BGMW-10	364130	1164112	230 S14 E47 32DA1	USGS	L
AD-2	363830116241401	Airport Well	363825	1162433	230 S15 E49 24ABB1	Doing, Warren	L
AD-2a	363835116234001	NDOT Well	363835	1162340	230 S15 E50 18CCDB1	NV Dept of Transportation	L
AD- 3	363434116354001	DeFir Well	363456	1163525	230 S16 E48 08BAAA1	DeFir, C.	L
AD- 4a	363428116234701	Cooks East Well	363428	1162347	230 S16 E50 07CABB1	Cook, Lewis C.	L
AD- 5	363310116294001	USBLM Well	363310	1162940	230 S16 E49 18DCCA1	BLM	L
AD- 6	363213116133800	Tracer Well 3	363213	1161338	230 S16 E51 27BAA3	USGS	L
AD- 7	363009116302701	Hallowell Well	363009	1163027	230 S17 E48 01AB 1	Hallowell, David	L
AD- 8	362929116085701	Cherry Patch Well	362929	1160857	230 S17 E52 08CDB1	Clark, Hershel, et al.	L
AD- 9	362848116264201	Gilgans North Well	362848	1162646	230 S17 E49 15BBBB1	Steelman, James C.	L
AD-10	362525116274301	NA-9 Well	362525	1162743	230 N26 E05 05BC1	USGS	L
AD-11	361954116181201	GS-3 Well	361957	1161752	230 S19 E50 01BBD1	USGS	L
AD-12	362014116133901	GS-1 Well	362021	1161330	230 S18 E51 34CBD1	USGS	L
AD-13	361724116324201	S-1 Well	361724	1163242	230 N25 E04 21CB1	USGS	L
AD-14	361817116244701	Death Valley Jct Well	361817	1162447	230 N25 E05 14CB1	Ettie, Lee	L
AM-1	362858116195301	Rogers Spring Well	362856	1161953	230 S17 E50 10CDD1	USFWS	L
AM-1a	362924116203001	Fairbanks Spring	362926	1162028	230 S17 E50 09AD1	USFWS	D
AM-2	362755116190401	Five Springs Well	362755	1161904	230 S17 E50 23BBCA1	USFWS	D,L
AM-3	362555116205301	Garners Well	362555	1162053	230 S17 E50 33CAAB1	Garner, George	L
AM-4	362532116172700	Devils Hole	362532	1161727	230 S18 E50 36DC1	NPS	L
AM-5	362529116171100	Devils Hole Well	362530	1161715	230 S17 E50 36DDC1	Nye County Land Co.	L
AM-5a	362502116192301	Crystal Pool	362513	1161927	230 S18 E50 03ADBA1	USFWS	D
AM-6	362432116165701	Point of Rocks North Well	362432	1161657	230 S18 E51 07BBBB1	USFWS	L
AM-7	362417116163600	Point of Rocks South Well	362420	1161637	230 S18 E51 07BDB1	USFWS	L
AM-8	362230116162001	Big Spring	362229	1161625	230 S18 E51 19ACB1	USFWS	D
DV-1	362728116501101	Texas Spring	362728	1165011	243 N27 E01 23ABB1	NPS	D
DV-2	362252116425301	Navel Spring	362252	1164253	243 N26 E02 13BD1	U.S. Borax & Chem. Corp.	D
DV-3	362230116392901	Travertine Point 1 Well	362230	1163929	243 N26 E03 21CA1	U.S. Borax & Chem. Corp.	L

Data Type

Data type (table 1) identifies the types of data (water level and discharge) presented for each site. Ground-water-level data are in tables 5-7 and ground-water-discharge data are in table 8.

Depth of Well

Depth of a well (table 2) is the accessible or measurable depth to the bottom of the hole. The drilled depth may be greater than the depth of the well due to modifications of the well or accumulation of sediment at the bottom of the hole. The depth of each well was measured by USGS (depths noted with "s") or was reported by other data sources. The USGS measured depths less than 1,000 ft by "sounding" the bottom of the well with weighted steel or electric tapes.

Top and Bottom of Open Interval

Open intervals (table 2) are parts of the borehole that are open to the surrounding lithologic intervals and may allow water to enter the well. An uncased section of a well is considered an open interval in this report.

Type of Opening

Type of opening (table 2) is a physical description of the open intervals of a borehole. The types of openings are perforated or slotted casing, screened casing, and open hole with no casing.

Data Source

Data sources (table 2) are organizations or publications that provided information on depth of the well, open interval, and type of opening. Drillers' logs or records are filed with the Nevada Division of Water Resources (NDWR) or maintained by the well owner. Reports are USGS publications written for USDOE as part of cooperative studies associated with weapons-testing hydrology programs (Thordarson and others, 1967; Johnston, 1968) or Yucca Mountain site-characterization studies (Robison and others, 1988; Luckey and others, 1993). Raytheon Services Nevada is a contractor for USDOE and maintains a summary of well-construction information.

Contributing Lithologic Units

Contributing units (table 2) are the lithologic intervals at the site that yield water to the well. Robison and others (1988) describe the saturated intervals at sites CF-2, JF-1, JF-2, JF-2a, and J-13. McKinley and others (1991) describe the contributing units for sites AD-5, AD-6, AD-8, AM-8, J-11, J-12, and MV-1. Dudley and Larson (1976) describe the contributing units for sites AM-2, AM-5, and AM-7. Contributing-unit data are not available from listed data sources for some wells; the contributing units indicated for those wells are based on geologic data derived from drillers' logs and depth-to-water data.

DATA-COLLECTION PROCEDURES AND EQUIPMENT

Data-collection procedures and equipment used by U.S. Geological Survey Environmental-Monitoring Program (USGS-EMP) are described by La Camera and Westenburg (1994, p. 7). Procedures and equipment used by other sources are described briefly by La Camera and Westenburg (1994, p. 11). Water-level and discharge data were compiled from available sources, from USGS files and data bases, and measurements made by USGS-EMP. Water-use data are compiled from available sources as described in the section "Ground-Water Withdrawal Data."

Periodic Water-Level Data

Periodic water-level measurements (table 5) are generally made during site visits, using one of the methods described in the section "Water-Level Measurements." An exception is data collected by the National Park Service at site AM-4 (Devils Hole), which represent a monthly average water level and are based on continually collected data (see "Monthly Average Water Level"). Supplemental information, including land-surface altitude, height of measurement point, depth to water, method of measurement, site status, and source of data, is listed also in table 5.

Table 2. Well-completion data for monitoring sites in Yucca Mountain region

Site number: Sites are grouped by hydrographic area and, within each area, are listed in general north-to-south, then west-to-east order. See text section titled "Site Number."
U.S. Geological Survey site identification: Unique identification number for site as stored in files and data bases of U.S. Geological Survey (USGS).
Accessible well depth: Well depths listed are as reported in sources listed in explanation for Data Source below or as measured by USGS personnel since September 1990 (noted with "s").
Casing diameter at land surface: Casing segment most prominent at land surface. Diameters have been rounded to nearest inch.
Top of open interval: Depth to top part of well that can receive ground water from lithologic interval. As reported in sources listed in explanation for Data Source, except for modifications to reflect most recent well-depth information or presence of uncased hole (designated open interval in this table). Open interval may be deeper than accessible well depth, which may reflect original drilled depth. U, unknown, no data.
Bottom of open interval: Depth to botom of lowermost part of well that can receive ground water from lithologic interval. As reported in sources listed in explanation for Data Source, except for modifications to reflect most recent well-depth information or presence of uncased hole (designated open interval in this table). Open interval may be deeper than accessible well depth, which may reflect original drilled depth. U, unknown, no data.
Diameter of open interval: Casing diameter has been rounded to nearest inch. Hole diameter is listed where no casing is present. U, unknown, no data.
Type of open interval: Description of open interval. P, perforated or slotted casing; S, screen, type not known; U, unknown, no data; X, open hole.
Data source: D, Nevada well driller's log or report, or Fenix & Scisson, Inc., or Raytheon Services Nevada hole-history data; J, Johnston (1968); L, Luckey and others (1993); M, no source, data not available; O, owner of well; R, Robison and others (1988); T, Thordarson and others (1967).
Contributing units: Saturated lithologic interval yielding water to well. C, carbonate rock; F, valley fill; S, undifferentiated sedimentary rock; V, volcanic rock.

Site number (plate 1)	U.S. Geological Survey site identification	Site Name	Accessible well depth (feet below land surface)	Casing diameter at land surface (inches)	Open interval				Data source	Contributing units
					Feet below land surface		Diameter (inches)	Type		
					Top	Bottom				
CF-1	365520116370301	Gexa Well 4	1,600	16	800	1,600	10	P	D	V
CF-1a	365445116383901	Gexa Well 3	700	7	208	313	6	P	D	S
					513	618	6	P		
					658	700	6	P		
CF-2	364732116330701	USW VH-1	2,501	10	911	2,501	6	X	R	V
JF-1	365116116233801	UE-25 WT 15	1,360	11	127	130	15	X	R	V
					130	1,360	9	X		
JF-2	364945116235001	UE-25 WT 13	1,160	11	222	224	15	X	L	V
					224	1,150	9	X		
					1,150	1,160	8	X		
JF-2a	364938116252102	UE-25p 1 PTH	5,923	24	4,256	4,279	10	X	L	C
					4,279	4,322	7	X		
					4,322	5,900	7	X		
					5,900	5,923	6	X		
J-13	364828116234001	J-13 WW	3,488	13	996	1,301	13	P	D	V
					1,301	1,386	12	P		
					2,690	3,312	5	P		
					3,385	3,488	8	X		
J-11	364706116170601	J-11 WW	1,327	13	1,077	1,095	13	P	T	V
					1,244	1,298	13	P		
J-12	364554116232401	J-12 WW	1,139	13	793	868	12	P	D	V
					887	1,139	12	X		
JF-3	364528116232201	JF-3 Well	1,138	9	735	1,138	9	P	D	V

Table 2. Well completion data for monitoring sites in Yucca Mountain region—Continued

Site number (plate 1)	U.S. Geological Survey site identification	Site name	Accessible well depth (feet below land surface)	Casing diameter at land surface (inches)	Open interval				Data source	Contributing units
					Feet below land surface		Diameter (inches)	Type		
					Top	Bottom				
RV-1	363815116175901	TW-5	800s	13	735	800	6	P	T	S
MV-1	363530116021401	Army 1 WW	1,953	11	800	1,050	11	P	D	C
					1,368	1,370	10	X		
					1,370	1,684	9	X		
					1,684	1,953	7	X		
AD-1	364141116351401	NA-6 Well BGMW-10	960	2	930	940	2	S	D	F
AD-2	363830116241401	Airport Well	750s	14	360	777	14	P	D	F
AD-2a	363835116234001	NDOT Well	495	7	395	495	8	P	D	F
AD-3	363434116354001	Defir Well	243s	12	100	250	12	P	D	F
AD-4a	363428116234701	Cooks East Well	269s	13	147	213	13	P	D	F
					238	269	13	P		
AD-5	363310116294001	USBLM Well	348s	12	U	U	U	U	M	F
AD-6	363213116133800	Tracer Well 3	678s	8	620	678	6	X	J	C
AD-7	363009116302701	Hallowell Well	112s	16	73	131	15	P	D	F
AD-8	362929116085701	Cherry Patch Well	215s	15	U	U	U	U	M	F
AD-9	362848116264201	Gilgans North Well	396s	12	60	90	12	P	D	F
					154	244	12	P		
					244	396	13	X		
AD-10	362525116274301	NA-9 Well	1,090	2	1,063	1,066	2	S	D	F
AD-11	361954116181201	GS-3 Well	2,000	2	1,969	1,979	2	S	D	F
AD-12	362014116133901	GS-1 Well	1,580	2	1,549	1,559	2	S	D	F
AD-13	361724116324201	S-1 Well	2,000	2	1,969	1,979	2	S	D	F
AD-14	361817116244701	Death Valley Jct Well	225s	12	160	200	12	S	D	F
AM-1	362858116195301	Rogers Spring Well	202s	15	100	240	12	P	D	F
AM-2	362755116190401	Five Springs Well	123s	13	0	100	14	P	D	C
AM-3	362555116205301	Garners Well	202s	9	140	180	10	P	O	F
AM-5	362529116171100	Devils Hole Well	200s	17	48	248	16	P	D	F
AM-6	362432116165701	Point of Rocks North Well	500	15	139	500	16	P	D	F
AM-7	362417116163600	Point of Rocks South Well	586s	17	132	467	14	P	D	C
					468	818	14	X		
DV-3	362230116392901	Travertine Point 1 Well	650s	4	100	970	5	X	D	C

Land-Surface Altitude and Height of Measurement Point

Land-surface altitude and height of the measurement point (MP) above (or depth below) land surface are included with periodically collected data in table 5. Land-surface altitude is a representative altitude of land at or near the site. An exception is site AM-4, where the land-surface altitude represents the altitude of the measurement point (a bolt fastened to the south wall of the fissure) that is not referenced to land surface. Land surveys were made by USGS personnel at the monitoring sites, except at site MV-1, to determine the altitudes of land surface or the MP.

Heights of MP's for sites in Amargosa Desert (except AM-4), Death Valley, and Rock Valley were determined by measuring the distance of the MP above (or depth below) a representative point on the land surface at or near the well. The altitude of the MP was determined during the USGS land survey, and land-surface altitude was computed by adding or subtracting the MP height from the surveyed MP altitude.

At sites JF-1, JF-2, JF-2a, and J-13, recent USGS land surveys verified previously reported land-surface and MP altitudes. At sites CF-2, J-11, and J-12, USGS land surveys verified the previously reported land-surface altitudes and determined the MP altitude. At sites CF-1 and CF-1a, USGS land surveys determined the land-surface and MP altitudes. The height of the MP is the difference between the MP altitude and land-surface altitude. Land-surface altitudes are reported to the nearest tenth of a foot.

Depth to Water and Altitude of Water Surface

Depth to water is the depth to water below land surface. It is computed as the measured depth to water below the MP minus the height of the MP (above land surface) at the well. An exception is site AM-4, where depth to water is measured below the MP, and the MP is not referenced to land surface. Where depth to water is negative (site AM-2), the water surface is above land surface.

The altitude of water surface is the depth to water subtracted from the altitude of land surface and is reported to the nearest tenth of a foot.

Water-Level Measurements

Periodic water-level measurements were made using the procedures and equipment described in the following sections.

Calibrated Electric Tape

USGS-EMP used six calibrated electric tapes during 1993. Each tape was marked with a unique identifier (YMP-1, YMP-2, YMP-3, YMP-4, YMP-5, and YMP-6) for quality-assurance purposes. Each tape was calibrated against either the U.S. Geological Survey Site Characterization Project (USGS-SCP) 2,800-ft reference steel tape or a 2,600-ft calibrated steel tape for depths to water greater than 500 feet or the USGS-EMP reference steel tape. Calibration data for the electric tapes for calendar year 1993 are summarized in table 3. For USGS-SCP tapes, the correction was that used by USGS-SCP at the time of measurement and is equal to the difference between the corrected and uncorrected readings. These corrections are applied to account for mechanical stretch and thermal expansion. The correction for the electric tapes is the difference between the corrected USGS-SCP measurement or USGS-EMP steel-tape measurement and the USGS-EMP uncorrected measurement.

A summary of correction factors applied to USGS-EMP electric tapes, based on calibration data, is listed in table 4. These correction factors were computed from the corrections determined during tape calibrations listed in table 3 and are primarily dependent on the depth to water, which affects mechanical stretch. The appropriate correction factor for electric-tape water-level measurements was determined by the date and depth to water listed in table 4. The correction factor used for a certain tape at a particular depth and time may represent the average of several corrections listed in table 3. For some measurement periods, the correction factor varied from the start of the period to the end of the period. The beginning and ending correction factors are shown in table 4 (represented by "to") and are evenly distributed with time through the measurement period. The measurement period represents the period in which those correction factors were used for the given depth-to-water range using a given electric tape.

Calibrated electric tapes were used at all sites when frequent repetitive measurements were required due to fluctuating water levels or depths to water were greater than 500 feet. Electric-tape measurements are

Table 3. Electric-tape calibration data used to correct water-level data collected in calendar year 1993

Date	Location	Tape used	Depth below measuring point		
			Uncorrected (feet)	Corrected (feet)	Correction (feet)
12/11/92	AD-2a	USGS-EMP steel tape (ST)	342.50	342.50	0.00
		YMP-1	342.75	342.50	-.25
		YMP-2	342.65	342.50	-.15
	AD-5	USGS-EMP ST	119.03	119.03	.00
		YMP-1	119.12	119.03	-.09
		YMP-2	119.07	119.03	-.04
	AD-13	USGS-EMP ST	384.18	384.18	.00
		YMP-1	384.43	384.18	-.25
		YMP-2	384.31	384.18	-.13
12/17/92	AD-11	USGS-EMP ST	227.80	227.80	.00
		YMP-1	227.91	227.80	-.11
		YMP-2	227.83	227.80	-.03
03/31/93	J-12	USGS-SCP ST	745.16	745.13	-.03
		YMP-2	745.62	745.13	-.49
	JF-3	YMP-2	712.76	712.29	[1]-.47
		[2]YMP-1	712.86	712.29	-.57
04/22/93	CF-2	USGS-SCP ST	605.02	604.98	-.04
		YMP-2	605.43	604.98	-.45
		YMP-4	605.36	604.98	-.38
	TW-5	YMP-4	679.73	679.42	[3]-.31
		[2]YMP-1	679.95	679.42	-.53
04/28/93	J-12	USGS-SCP ST	745.17	745.14	-.03
		YMP-3	744.82	745.14	+.32
04/29/93	AD-2a	USGS-EMP ST	342.52	342.52	.00
		YMP-3	342.65	342.52	-.13
		YMP-4	342.92	342.52	-.40
	AD-5	USGS-EMP ST	118.58	118.58	.00
		YMP-3	118.76	118.58	-.18
		YMP-4	118.86	118.58	-.28
	AD-11	USGS-EMP ST	227.64	227.64	.00
		YMP-3	227.84	227.64	-.20
		YMP-4	228.04	227.64	-.40
	AD-13	USGS-EMP ST	384.12	384.12	.00
		YMP-3	384.27	384.12	-.15
		YMP-4	384.54	384.12	-.42
05/11/93	J-12	USGS-SCP ST	744.90	744.87	-.03
		YMP-1	745.52	744.87	-.65
		YMP-3	744.50	744.87	+.37
		YMP-4	744.95	744.87	-.08
	CF-2	USGS-SCP ST	605.00	604.96	-.04
		YMP-1	605.50	604.96	-.54
		YMP-3	604.74	604.96	+.22
		YMP-4	605.21	604.96	-.25
11/08/93	J-12	USGS-SCP ST	745.25	745.22	-.03
		YMP-1	745.83	745.22	-.61
		YMP-4	745.13	745.22	+.09
		YMP-5	744.93	745.22	+.29
		YMP-6	745.41	745.22	-.19
11/09/93	CF-2	USGS-SCP ST	605.35	605.31	-.04
		YMP-5	605.14	605.31	+.17
		YMP-6	605.56	605.31	-.25

Table 3. Electric-tape calibration data used to correct water-level data collected in calendar year 1993--Continued

Date	Location	Tape used	Depth below measuring point: Uncorrected (feet)	Depth below measuring point: Corrected (feet)	Correction (feet)
11/09/93	CF-2	USGS-SCP ST	605.35	605.31	-0.04
		YMP-5	605.14	605.31	+.17
		YMP-6	605.56	605.31	-.25
11/15/93	AD-11	USGS-EMP ST	226.79	226.79	.00
		YMP-5	226.84	226.79	-.05
		YMP-6	226.89	226.79	-.10
	AD-13	USGS-EMP ST	383.81	383.81	.00
		YMP-5	383.76	383.81	+.05
		YMP-6	383.91	383.81	-.10
11/18/93	AD-2a	USGS-EMP ST	342.64	342.64	.00
		YMP-5	342.60	342.64	+.04
		YMP-6	342.72	342.64	-.08
	AD-5	USGS-EMP ST	120.05	120.05	.00
		YMP-5	120.07	120.05	-.02
		YMP-6	120.11	120.05	-.06
5/4/94	J-12	USGS-SCP ST	745.12	745.09	-.03
		YMP-1	745.88	745.09	-.79
		YMP-5	744.65	745.09	+.44
	CF-2	USGS-SCP ST	605.08	605.04	-.04
		YMP-5	604.77	605.04	+.27

[1] Correction factor of -0.47 for YMP-2 is average of -0.49 correction factor (J-12, 3/31/93) and -0.45 correction factor (CF-2, 4/22/93).

[2] Calibrated against calibrated electric tape.

[3] Correction factor of -0.31 for YMP-4 is average of -0.38 correction factor (CF-2, 4/22/93) and -0.25 correction factor (CF-2, 5/11/93).

made by lowering the tape to the water surface until a light or buzzer is activated when the probe contacts the water. The tape is raised and lowered slowly until the exact point of contact is located. While holding the tape on the MP, the depth to water below the MP is read from markings on the tape. At least one additional reading of depth to water is recorded for every measurement made with a calibrated electric tape to verify the initial reading. An example of the calculation of depth to water below land surface, at a site, using USGS-EMP calibrated electric tape YMP-2 is shown below:

Location: JF-3
Date: March 31, 1993
Tape ID: YMP-2 Correction factor: -0.47 ft (for depths greater than 700 ft)

Depth below MP	712.81 ft
Correction factor	-.47 ft
Corrected depth below MP	712.34 ft
Height of MP above land surface	-2.27 ft
Depth to water below land surface	710.07 ft

Steel Tape

USGS-SCP made water-level measurements using calibrated steel tapes at sites CF-2, JF-1, J-13, J-11, and J-12. Descriptions of the steel tapes, applicable corrections, and procedures used by USGS-SCP for making steel-tape measurements are given by Robison and others (1988, p. 6-11), Gemmell (1990, p. 8-12), and O'Brien (1991, p. 8-13). USGS-SCP steel-tape measurements were compiled from the above sources or from information provided by USGS-SCP (Michelle S. Boucher, U.S. Geological Survey, written communs., 1992-93). Corrected depth-below-MP measurements were provided by USGS-SCP and converted to depth below land surface by USGS-EMP by subtracting the height of the MP above land surface.

Water-level measurements at other sites were made by the USGS or U.S. Fish and Wildlife Service (USFWS) using 300- or 500-ft reeled steel tapes. General procedures for using 300- and 500-ft reeled tapes are to (1) chalk the bottom section of the tape, (2) lower the tape into the well until part of the chalked section is below the water surface, (3) hold the tape on the MP

Table 4. Applied correction factors for electric tapes YMP-1 through YMP-6

[--, no measurements made for given depth-to-water range during period specified]

Tape	Measurement period		Depth to water (feet below measurement point)				
	Start	End	Less than 200 feet	200-300 feet	300-400 feet	500-700 feet	Greater than 700 feet
YMP-1	12/11/92	03/30/93	-0.10	-0.10	-0.25	-0.50	-0.50
	03/31/93	05/10/93	--	--	--	-.56	-.56
	05/11/93	11/07/93	--	--	--	-.54	-.63
	11/08/93	05/04/94	--	--	--	--	-.63 to -.79
YMP-2	12/11/92	03/30/93	-.04 to -.21	-.04 to -.21	-.14 to -.31	--	--
	03/31/93	12/31/93	--	--	--	-.47	-.47
YMP-3	04/28/93	06/10/93	-.19	-.19	-.14	.22	.34
YMP-4	04/22/93	05/10/93	--	--	--	-.38 to -.25	--
	04/29/93	12/31/93	-.28	-.41	-.41	--	--
	05/11/93	11/08/93	--	--	--	-.25	-.08 to .09
YMP-5	11/08/93	05/04/94	--	--	--	.17 to .27	.29 to .44
YMP-6	11/08/93	12/31/93	-.08	-.08	-.08	-.25	-.19

and record the "hold" reading, (4) raise the end of the tape to the surface, observing the "cut" (the top of the wet part of the chalked tape), (5) record the reading of the cut, (6) calculate the depth to water below the MP by subtracting the "cut" reading from the "hold" reading, and (7) calculate the depth to water below land surface by subtracting the height of the MP from the depth to water below MP.

USGS-EMP maintains one 500-ft tape as a reference tape and uses three field tapes (two 500-ft and one 300-ft) for routine measurements. All steel tapes are uniquely marked for identification purposes. The field tapes were checked against the reference tape at five sites during December 1992 at depths to water ranging from about 119 to 385 ft. All the steel-tape measurements were within 0.01 ft of the reference tape; as a result, no correction factor was used for water-level measurements made with USGS-EMP steel tapes. At least one additional reading of the depth to water is recorded for every measurement to verify the initial reading.

Monthly Average Water Level

A water-level recorder, operated by the National Park Service (NPS), at site AM-4 (Devils Hole) records the depth to water below an installed measurement point. The daily mean water levels for each month with a complete record are used to compute a monthly average water level. The monthly average water levels are listed in table 5 as periodic water-level data for the 15th of the month.

Other

Sites JF-2 (UE-25 WT 13) and JF-2a (UE-25p 1 PTH) were equipped with pressure transducers as part of site-characterization studies in February and March 1985, respectively (Luckey and others, 1993, p. 69-83, 116-127). USGS-SCP calibrates the pressure transducer, develops an equation to convert transducer voltage to depth to water below the MP, and records voltage of the transducer during each site visit. Owing to the small diameter of the access tubes, the transducer must be removed to provide access for measuring the water level with a steel tape. When a steel-tape measurement cannot be made, the depth to water can be computed using the USGS-SCP transducer voltage data and current conversion equation. Periodic water-level measurements at sites JF-2 and JF-2a, indicated with method "B" in table 5, are computed using this procedure. Installation, calibration, and operation of pressure transducers by USGS-SCP are described by Luckey and others (1993, p. 14-21).

Site AM-4 (Devils Hole) has a small metal bolt fastened to the south wall of the fissure and a staff plate fastened near the west edge of the pool. The bolt is the measurement point and depth-to-water measurements are the depth to water below the MP. The staff plate enables direct readings of water level and the 0.00-ft mark on the staff plate is level with the MP. A staff reading should be equivalent to a measurement made from the MP to the water surface with a ruled tape.

Methods of water-level measurement were not specified for some data provided by the Nevada Division of Water Resources. Measurements made using unknown methods are indicated by "Z" in table 5.

Continual Water-Level Data

Two sites, JF-3 and AD-6, are instrumented to continually record ground-water level, atmospheric pressure, and battery voltage at 15-minute intervals. Instrumentation includes a pressure sensor installed below the water surface, a barometer, and a data logger. Recorded data are processed to produce data on continual depth to water, atmospheric pressure, battery voltage, and daily mean depth to water. Sites JF-2 and JF-2a also are instrumented to continually record water-level data; those data are collected, processed, reviewed, and published by USGS-SCP.

The pressure sensors at sites JF-3 and AD-6 transmit data to the data logger in pounds per square inch, which varies with the height of the water above the sensor. The range of output is 0 to 5.000 lb/in^2, which corresponds to a theoretical range of 0 to 11.53 ft of water above the pressure sensor. The general steps for installing, calibrating, and processing pressure-sensor data are as follows:

1. Depth to water below MP is measured with a steel or calibrated electric tape and recorded. If a calibrated electric-tape measurement is made, a correction factor is applied. Depth to water below MP is used for pressure-sensor calibration because a fixed point of reference is required.

2. The pressure-sensor cable is connected to a data logger and the sensor is lowered down the well until a substantial change in readings indicates the water surface has been reached. These readings are recorded in the data logger.

3. The sensor is lowered to the set point and allowed to equilibrate. The set-point depth of the sensor is determined by adding the depth-to-water measurement to the depth at which the sensor is installed below the water surface. For example, if the depth-to-water is 710 ft below the MP and the sensor is installed 5 ft below the water surface, the set-point depth is 715 ft.

4. Water-level fluctuations are simulated by raising and lowering the pressure sensor. The sensor is raised to the water surface and the sensor cable is marked or tagged at the MP. The time, height of the sensor above the set point, and data logger reading are recorded. For example, if the set point is 715 ft below the MP and the sensor is raised 5 ft to the water surface, 5 ft would be recorded with the time and reading of the data logger. The sensor is then lowered at 1/2-, 1-, or 2-ft intervals. The sensor cable can be marked or tagged at the measured intervals. After the sensor output has stabilized at each interval, the time, data-logger reading (in pounds per square inch), and height of sensor above the set point are recorded. This procedure is repeated until a range of readings and depths that spans the anticipated range of water-level fluctuation is recorded.

5. Another water-level measurement is made with a steel or calibrated-electric tape to check for fluctuation of the water level during installation of the sensor.

6. Data collected while raising and lowering the sensor are used to develop a regression equation to convert pressure readings to water level below MP. Each height of the sensor above the set point (step 4) is added to the set point (step 3) to compute a simulated depth to water below the MP. If the sensor was lowered below the set point during the calibration, the depth of the sensor below the set point is subtracted from the set-point height to compute a simulated depth to water. For example, the set-point depth corresponds to a depth to water 710 ft below the MP (depth of submergence is 5 ft). The reading made when the sensor is raised 1 ft (depth of submergence is 4 ft) corresponds to a simulated depth to water below the MP of 711 ft (set point of 710+1=711 ft). Raising the sensor 1 ft simulates a lowering of the water-table level of 1 ft and a corresponding increase in the depth to water of 1 ft. Raising the sensor 2 ft (depth of submergence is 3 ft) simulates a lowering of the water-table level 2 ft and an increase in the depth to water of 2 ft (to 712 ft in this example).

7. The pressure readings from the data logger (step 4) and simulated depths below the MP (step 6) are regressed using pressure (in pounds per square inch) as the independent variable and depth below the MP (in feet) as the dependent variable. Typically, pressure readings are recorded at five simulated depths to water. The regression equation converts those readings to depth to water below the MP.

Water-level measurements are made with a steel or calibrated-electric tape when a continual monitoring site is visited. The pressure-sensor reading is recorded at the time of the measurement. The reading is converted to depth to water, using the established

regression equation, and recorded as predicted water level. The steel tape or calibrated electric tape water-level measurements are used as reference measurements and are compared to the predicted value. Any difference between the reference measurement and predicted value is applied as a correction to the continual record by linearly prorating the difference with time between consecutive visits to account for drift in pressure-sensor output.

Data are periodically retrieved from the data logger using a portable computer, transferred to the USGS National Water-Information System (NWIS), and processed using data-base programs to store pressure-sensor, barometer, and battery data. The pressure-sensor data are converted to depth below land surface and stored. Daily average data are computed from the continual data and stored in the data base. Daily average depth-to-water data are used to compute daily average water-level altitudes, which also are stored in the data base.

Pressure-Sensor System at Site JF-3

Instrumentation at JF-3 continually collects water-level data every 15 minutes. Equipment was calibrated on November 19, 1992, and a regression equation was developed: depth to water below land surface = (-2.332×pressure reading)+716.123. This equation is used to convert pressure readings stored in the data base to depth to water below land surface. Differences between reference measurements made with calibrated electric tapes and predicted water levels based on conversion of pressure readings ranged from 0.01 ft (December 15, 1992) to -0.03 ft (February 9, 1993). Another calibration was made on March 22, 1993, and a new regression equation was developed: depth below land surface=(-2.351×pressure reading)+715.960. Differences between measurements made with calibrated electric tapes and the predicted water levels ranged from 0.07 ft (March 22, 1993) to -0.06 ft (July 21, 1993). On August 12, 1993, another calibration was made and a new regression equation was developed: depth below land surface= (-2.741×pressure reading)+716.362. Differences between measurements made with calibrated electric tapes and the predicted water levels ranged from -0.05 ft (August 12, 1993) to 0.15 ft (December 31, 1993).

Depth-to-water measurements made with calibrated electric tapes during 1993 ranged from 709.63 ft (April 22) to 710.44 ft (October 20) below land surface. The daily average water levels ranged from 709.47 ft (October 28) to 710.58 ft (December 24) below land surface.

Pressure-Sensor System at Site AD-6

Instrumentation at AD-6 continually collects water-level data every 15 minutes. Equipment was calibrated on July 29, 1992, and a regression equation was developed: depth to water below land surface= (-2.316×pressure reading)+46.782. This equation is used to convert pressure readings stored in the data base to depth to water below land surface. Differences between reference measurements made with reeled steel tapes and predicted water levels based on conversion of pressure readings ranged from -0.03 ft (July 29, 1992) to -3.45 ft (February 16, 1993). (The transducer was temporarily displaced when it became entangled with the steel tape during a measurement, causing the difference of -3.45 ft.) The equipment was recalibrated on February 16, 1993, and a new regression equation was developed: depth to water below land surface= (-2.316×pressure reading)+46.752. Differences between reference measurements made with reeled steel tapes and predicted water levels based on conversion of pressure readings ranged from -0.04 ft (February 16, 1993) to 0.03 ft (May 6, 1993). On May 6, 1993, the equipment was recalibrated and a new regression equation was developed: depth to water below land surface=(-2.339×pressure reading)+46.730. Differences between reference measurements made with reeled steel tapes and predicted water levels based on conversion of pressure readings ranged from 0.03 ft (May 6, 1993) to -0.01 ft (October 6, 1993). The equipment was recalibrated again on October 6, 1993, and another regression equation was developed: depth to water below land surface=(-2.339×pressure reading)+46.720. Differences between reference measurements made with reeled steel tapes and predicted water levels based on conversion of pressure readings ranged from 0.0 ft (October 6, 1993) to 0.01 ft (December 31, 1993).

Depth-to-water measurements made with calibrated electric or reeled steel tapes during 1993 ranged from 41.26 ft (March 22) to 41.62 ft (October 27) below land surface. The daily average water levels ranged from 41.27 ft (January 8 and February 19) to 41.67 ft (December 23 and 24) below land surface.

Ground-Water Discharge Data

Measurements of ground-water discharge were collected and compiled for five springs and one flowing well. Four of the sites, AM-1a, AM-2, AM-5a, and AM-8, are in the Ash Meadows spring-discharge area of the Amargosa Desert. The other two sites, DV-1 and DV-2, are in Death Valley.

Discharge measurements were made by NPS, USFWS, and USGS. Periodic or monthly mean discharge data were determined by the use of current meters, flumes, and volumetric techniques. The most commonly used method for measuring discharge was the vertical-axis current meter. This method is used to determine the average velocity of a partial section within a channel cross section. The average velocity of the partial section times the area of the partial section equals discharge of the section. The summation of the discharges for all the partial sections is the total discharge in the channel. This method is described in more detail by Buchanan and Somers (1969).

Some instantaneous discharge values were determined by measuring the depth of water inside a flume. This depth, or stage, is compared to an applicable stage-discharge relation for the flume to determine discharge. Where a continuous-recording instrument has been installed on a flume, monthly mean discharges can be computed from data collected and processed for an extended period. This method was used for site DV-1, where monthly mean discharge was computed only for months with complete data and reported for the 15th of the month. Determining discharges by the use of flumes is further described by Kilpatrick and Schneider (1983).

The volumetric method was used for measuring ground-water discharge from sites AM-2 and DV-2. A container with markings indicating known volumes was used to collect all discharge from the site while a stopwatch was used to determine the amount of time the discharge was collected. The container was positioned to collect the discharge and the stopwatch was started simultaneously. The container was removed, before it was overfilled, and the stopwatch was stopped simultaneously. The volume collected and elapsed time were recorded. The discharge rate is the volume collected divided by the time. This procedure was repeated three times and an average rate was computed for each site visit.

The accuracy of the methods is directly related to the operational conditions of the equipment used and to the environmental conditions in which the equipment operated. Discharge values are reported to two significant figures. Discharge determined by all methods ranged from 1.6 gal/min at site DV-2 to 2,900 gal/min at site AM-5a for 1993 (table 8).

Ground-Water Withdrawal Data

Ground-water withdrawals were estimated from compiled data and are in table 9. Withdrawal data were supplied by public agencies including USDOE, USGS, and the Nevada Division of Water Resources (NDWR), and private organizations including Reynolds Electrical and Engineering Company. Estimated annual ground-water withdrawals are based solely on available data. Estimates for some years, therefore, reflect a lack of information for an entire area or underestimate total withdrawals within an area.

Withdrawals from Alkali Flat-Furnace Creek Ranch Ground-Water Subbasin

Withdrawals from the part of the Amargosa Desert within the subbasin were recompiled from ground-water pumpage inventories taken by NDWR (table 9). The pumpage inventories were for the entire Amargosa Desert hydrographic area during 1993. Included are withdrawals for irrigation, mining, industrial, commercial, quasi-municipal, and domestic use. All reported withdrawals for mining are from the Alkali Flat-Furnace Creek Ranch ground-water subbasin. All reported domestic use for the Amargosa Desert is included because data were not available to exclude the amount used in the Ash Meadows ground-water subbasin.

Withdrawals from Jackass Flats were compiled from data for sites J-12 and J-13 (David B. Wood, U.S. Geological Survey, written commun., 1994). Withdrawals from Rock Valley are considered negligible on the basis of knowledge of activities in that area.

Withdrawals from Ash Meadows Ground-Water Subbasin

Withdrawals from the part of the Amargosa Desert (excluding the Ash Meadows area) within the subbasin include withdrawals recompiled from

ground-water pumpage inventories taken by NDWR for 1993. Reported withdrawals were from irrigation, commercial, quasi-municipal and domestic sources.

Withdrawals from Mercury Valley were compiled from data for MV-1 (David B. Wood, U.S. Geological Survey, written commun., 1994). Water use is quasi-municipal.

Quality Assurance

Stringent quality assurance is required for all work pertaining to Yucca Mountain studies to establish adequate confidence in the reliability of data collection, processing, and reporting. In the context of this data-collection program, quality assurance is defined as all planned or systematic actions designed to provide data and records of a desired quality. A variety of quality-control procedures, which are the operational techniques and activities used to meet the required quality objectives, have been implemented.

The numerous management and administrative procedures that control processing, record keeping, and reporting of data by USGS-EMP are not detailed in this report. Generally, data such as location, date and time of measurements, and field measurements are recorded onsite. Those data are reviewed for completeness and accuracy, stored in project files and data bases, and are subsequently included in publications by the USGS. Following publication, data are stored in a comprehensive record-keeping facility maintained by contractors for USDOE.

In addition to standard USGS practices and the procedures previously described, formal unpublished technical procedures associated with the Yucca Mountain Site Characterization Project have been developed for the collection of water-level and discharge data. Those technical procedures include equipment tests and calibrations, in addition to measurement techniques, to ensure that necessary and expected precision and accuracy are attained. The principal technical procedures that control the collection of data by project personnel are listed by La Camera and Westenburg (1994, p. 17).

PRESENTATION OF GROUND-WATER DATA

Tables included in this report list only the 1993 ground-water data, except for site AD-1, whereas the figures show data for the period of record to illustrate the trend in the ground-water levels through time. Below is a description of the content of the tables and figures presented in this report.

Tables 5-9 list ground-water data that have been collected and compiled in the Yucca Mountain region as part of this study; they are included at the back of report. Figures 1-14 are hydrographs and other graphical representations of selected data from the tables in this report and La Camera and Westenburg (1994).

Pumping of water from or injecting water into a well or nearby well may cause transient water levels to differ from long-term or sustained ground-water levels. Observations about such activities (noted by field personnel during site visits) and corresponding water levels, which may represent transient conditions, are included in data tables. Those data, however, are excluded from the figures showing variations in water level over time.

Table 5 lists periodic measurements of depth to water and water-level altitude at 34 sites for 1993. Historical depth-to-water data for AD-1 included in table 5 were not available when the La Camera and Westenburg (1994) report was published. Periodically collected data generally are from manual onsite measurements of depth to water. However data at site AM-4 (Devils Hole), reported as data source "NPS," are monthly average water levels, and are based on daily water levels recorded by instrumentation at the site. Data collected by other agencies or programs are subject to revision upon further review by that agency or program.

Figures 1-4 show water-level altitude listed in table 2 of La Camera and Westenburg (1994) and in table 5 of this report. Data for wells with primary contributing units of carbonate rock, volcanic rock, valley fill, and sedimentary rock are presented.

Tables 6 and 7 list measurements of daily average water levels at sites JF-3 and AD-6, respectively for 1993. The daily average water levels are based on continually collected data at the sites, which are measurements of water levels recorded by instrumentation at 15-minute intervals.

Figures 5 and 6 show measurements of daily average depth to water and water-level altitude on the basis of continually collected data listed in tables 6 and 7 for sites JF-3 and AD-6, respectively for 1993.

Table 8 lists periodic measurements of ground-water discharge at six sites for 1993. The data for site DV-1 (Texas Spring), reported data source "NPS," represent monthly average discharge.

Figure 7 shows measurements of ground-water discharge at sites AM-1a, AM-5a, and AM-8 through 1993, listed in table 5 of La Camera and Westenburg (1994) and in table 8 of this report. **Figures 8 and 9** show measurements of ground-water discharge at sites AM-2 and DV-2, and DV-1, respectively, through 1993 listed in table 5 of La Camera and Westenburg (1994) and table 8 of this report.

Table 9 shows estimates of annual ground-water withdrawals from wells in the Yucca Mountain region for 1993. Estimated annual ground-water withdrawals are based solely on available data. Ground-water withdrawals, in millions of gallons and in acre-feet, from water-supply wells are grouped by ground-water subbasin and totaled by hydrographic area (or part of a hydrographic area) for calendar year 1993.

Figures 10 and 11 show estimates of annual ground-water withdrawals, listed in table 6 of La Camera and Westenburg (1994) and in table 9 of this report, for areas with available data within the Alkali Flat-Furnace Creek Ranch and Ash Meadows ground-water subbasins, respectively, through 1993.

DISCUSSION OF GROUND-WATER LEVELS AND GROUND-WATER WITHDRAWALS IN JACKASS FLATS

In Jackass Flats, ground water is withdrawn to support several USDOE activities (including site characterization); if those withdrawals affect ground-water levels, the effects may be detected in Jackass Flats before they are detected elsewhere adjacent to the Yucca Mountain region. Therefore, the following section discusses data on ground-water levels and ground-water withdrawals in Jackass Flats.

Figure 12 shows water-level altitudes for six wells in Jackass Flats from 1983 through 1993, and shows estimated annual ground-water withdrawals in Jackass Flats from 1983 through 1993. Water-level altitudes are listed in table 2 of La Camera and Westenburg (1994) and in table 5 of this report. Ground-water withdrawals consist of combined pumpage from water-supply wells J-13 and J-12. Withdrawals from 1983 through 1992 are listed in table 6 of La Camera and Westenburg (1994), and withdrawals for 1993 are in table 9 of this report.

Data on ground-water withdrawals prior to 1983, which generally represent only the withdrawals from well J-12, rather than total withdrawals from Jackass Flats, are excluded from figure 12. For greater consistency and comparability of data on water-level altitudes, water levels in wells J-13, J-12, and JF-3 that may have been affected by pumping or recent pumping of the well are excluded from figure 12.

Table 10 lists selected statistics for water-level altitudes in Jackass Flats. Data from wells JF-1, JF-2, JF-2a, J-13, J-11, and J-12, are summarized for the baseline period and for calendar years 1992 and 1993. A statistical summary of water-level altitudes in well JF-3 for the baseline period 1992-93 is listed also. The table shows the number of measurements, the minimum, maximum, and central tendency of (representative) water-level altitudes, and the variability of measured water-level altitudes about the central tendency for each period. The mean of continual daily average water levels are listed for JF-3. Values for central tendency represent the most typical ground-water condition at a site.

To minimize effects of variability in measurement frequency on medians calculated for the period prior to 1992, the selection of a baseline period for each site was based on (1) the maximum number of consecutive years for which water-level measurements are available and (2) consecutive years containing approximately similar frequencies of water-level measurement. For consistency, the baseline period selected at instrumented wells JF-2 and JF-2a was the period following installation of continual recorders. The baseline period for JF-3 was based solely on the daily average water levels from the continual data recorders from half of calendar year 1992 and all 1993. These baseline periods will be the standard to which all following years will be compared.

For all sites except JF-3, the average deviation was used to indicate the variability of the individual measurements in a specific period about the median value. It is the sum of the absolute differences between

individual measurements and the median, divided by the number of individual measurements. For JF-3, the standard deviation was used to indicate the variability of the daily average water levels about the mean. The average or standard deviation indicates how well the median or mean approximates an average value for withdrawals or water-level measurements during the period.

Median annual ground-water withdrawal in Jackass Flats was about 52 Mgal/yr for 1983 through 1991 (La Camera and Westenburg, 1994). The average deviation for that period is 5.5 Mgal. Median withdrawal was about 68 Mgal/yr for 1983 and 1984, and decreased to about 51 Mgal/yr for 1985 through 1991. Total 1992 withdrawal in Jackass Flats was about 39 Mgal, a decrease of about 13 Mgal from the median withdrawal for 1983 through 1991. Total 1993 withdrawal in Jackass Flats was about 67 Mgal, an increase of 15 Mgal from the median withdrawal for 1983 through 1991.

Median water-level altitudes in water-supply wells J-13 and J-12 were 2,390.0 and 2,388.3 ft above sea level, respectively, during the baseline period (table 10). Median water-level altitude in well J-13 was 2,389.9 ft above sea level during 1992 and 1993. This altitude is 0.1 ft lower than that for the baseline period. This difference is less than the average deviation of water-level altitude for the baseline period and equal to that for 1992 and 1993. The median water-level altitude in well J-12 during 1993 was identical to that for the baseline period and for 1992. The average deviation of water-level altitude for well J-12 during 1993 is 0.1 ft higher than average deviation of water-level altitude for the baseline period and for 1992.

Median water-level altitudes in wells JF-1 and JF-2, which are north of the water-supply wells and penetrate volcanic rock, were 2,392.5 and 2,392.1 ft above sea level, respectively, during the baseline period. Median water-level altitude in well JF-1 was 2,392.4 ft above sea level during 1992. The 0.1-ft difference between median water levels during the two periods at well JF-1 is less than the average deviation for the baseline period but equal to that for 1992. The median water-level altitude in well JF-1 was 2,392.5 ft above sea level during 1993. This altitude is equal to the median water-level altitude for the baseline period and is 0.1 ft higher than that for 1992. This 0.1-ft difference is equal to the average deviation of water-level altitudes for 1992, but is less than those for the baseline period and for 1993.

Owing to the limited number of measurements available in well JF-2 for 1992 and 1993, median water-level altitudes for 1992 and 1993 were not determined. Periodic measurements in the well during 1992, however, were within 0.1 ft of the median water level at that site during the baseline period. Differences between measured water levels in 1992 and 1993 and the median water level during the baseline period are less than the historical variability of individual measurements for the baseline period.

Median water-level altitude in well JF-2a, which is northwest of the supply wells and penetrates carbonate rock, was 2,468.7 ft above sea level during the baseline period prior to 1992. Median water level in the well during 1992 was 2,468.4 ft above sea level, a decrease of 0.3 ft between the two periods. This difference is the same as the average deviation for the baseline period, and is less than that for 1992 (0.5 ft). During 1993, the median water-level in JF-2a was 2,468.8 ft above sea level, 0.1 ft higher than that for the baseline period. This 0.1-ft difference is equal to the average deviation for 1993, but less than for the baseline period and for 1992. The median water-level in JF-2a is 0.4 ft higher in 1993 than in 1992.

Median water-level altitude in well J-11, which is east of water-supply wells J-13 and J-12 and penetrates volcanic rock, was 2,402.2 ft above sea level during the baseline period. Median water-level altitude in well J-11 during 1992 was identical to the baseline period. The median water-level altitude in well J-11 during 1993 was 2,402.2 ft above sea level, identical to the baseline period and 1992. The average deviation of water-level altitudes in well J-11 was 0.2 ft for 1993, which is 0.1 ft greater than those for the baseline period and for 1992.

Statistical data shown in table 10 for the baseline period for JF-3 are comprised of water-level data collected from May 1992 through December 1993. This is the period when monitoring began at JF-3. The statistical mean and standard deviation of the daily average water-level altitude during 1992-93 are 2,388.3 and 0.2, respectively.

Figure 13 shows the median water-level altitudes and the average deviation of the water levels for wells JF-1, JF-2, JF-2a, J-11, J-12, and J-13 and the mean of the daily average water-level altitudes and the standard deviation for well JF-3.

REFERENCES CITED

Buchanan, T.J., and Somers, W.P., 1969, Discharge measurements at gaging stations: U.S. Geological Survey Techniques of Water-Resources Investigations, Book 3, Chapter A8, 65 p. (NNA.940106.0099).

Dudley, W.W., Jr., and Larson, J.D., 1976, Effect of irrigation pumping on desert pupfish habitats in Ash Meadows, Nye County, Nevada: U.S. Geological Survey Professional Paper 927, 52 p. (NNA.870518.0076).

Fenneman, N.M, 1931, Physiography of western United States: New York, McGraw-Hill, 534 p. (NNA.870406.0080).

Gemmell, J.M., 1990, Water levels in periodically measured wells in the Yucca Mountain area, Nevada, 1988: U.S. Geological Survey Open-File Report 90-113, 47 p. (NNA.900221.0001).

Harrill, J.R., Gates, J.S., and Thomas, J.M., 1988, Major ground-water flow systems in the Great Basin region of Nevada, Utah, and adjacent states: U.S. Geological Survey Hydrologic Investigations Atlas HA-694-C, 2 sheets. (NNA.940427.0183).

Harrill, J.R., Welch, A.H., Prudic, D.E., Thomas, J.M., Carman, R.L., Plume, R.W., Gates, J.S., and Mason, J.L., 1983, Aquifer systems in the Great Basin region of Nevada, Utah, and adjacent states—A study plan: U.S. Geological Survey Open-File Report 82-445, 49 p.
TEXT: MOL.19950504.0001
MAP: MOL.19950504.0002.

Johnston, R.H., 1968, U.S. Geological Survey tracer study, Amargosa Desert, Nye County, Nevada, Part 1, Exploratory drilling, tracer well construction and testing, and preliminary findings: U.S. Geological Survey Report USGS-474-98, 64 p. Available only from National Technical Information Service, U.S. Department of Commerce, Springfield, VA 22161. (NNA.900227.0055).

Kilpatrick, F.A., and Schneider, V.R., 1983, Use of flumes in measuring discharge: U.S. Geological Survey Techniques of Water-Resources Investigations, Book 3, Chap. A14, 46 p. (NNA.940427.0184).

Kilroy, K.C., 1991, Ground-water conditions in Amargosa Desert, Nevada-California, 1952-87: U.S. Geological Survey Water-Resources Investigations Report 89-4101, 93 p. (NNA. 930602.0003-0007).

La Camera, R.J., and Westenburg, C.L., 1994, Selected ground-water data for Yucca Mountain region, southern Nevada and eastern California, through December 1992: U.S. Geological Survey Open-File Report 94-54, 161 p. (NNA.940523.0064).

Luckey, R.R., Lobmeyer, D.H., and Burkhardt, D.J., 1993, Water levels in continuously monitored wells in the Yucca Mountain area, Nevada, 1985-88: U.S. Geological Survey Open-File Report 91-493, 225 p. (NNA.310611.0014).

McKinley, P.W., Long, M.P., and Benson, L.V., 1991, Chemical analysis of water from selected wells and springs in the Yucca Mountain area, Nevada and southeastern California: U.S. Geological Survey Open-File Report 90-355, 47 p. (NNA.901031.0004).

O'Brien, G.M., 1991, Water levels in periodically measured wells in the Yucca Mountain area, Nevada, 1989: U.S. Geological Survey Open-File Report 91-178, 51 p. (NNA.910708.0041).

Robison, J.H., Stephens, D.M., Luckey, R.R., and Baldwin, D.A., 1988, Water levels in periodically measured wells in the Yucca Mountain area, Nevada, 1981-87: U.S. Geological Survey Open-File Report 88-468, 132 p. (NAA.890306.0113).

Rush, F.E., 1968, Index of hydrographic areas in Nevada: Nevada Division of Water Resources, Information Report 6, 38 p. (HQS.880517.1833).

Thordarson, William, Young, R.A., and Winograd, I.J., 1967, Records of wells and test holes in the Nevada Test Site and vicinity (through December 1966): U.S. Geological Survey Open-File Report TEI-872, 26 p. (HQS.880517.1851).

Waddell, R.K., Robison, J.H., and Blankennagel, R.K., 1984, Hydrology of Yucca Mountain and vicinity, Nevada-California—Investigative results through mid-1983: U.S. Geological Survey Water-Resources Investigations Report 84-4267, 72 p. (NNA.900618.0074).

Note: Parenthetical numbers following each cited reference are for U.S. Department of Energy Office of Civilian Radioactive Waste Management (OCRWM) records-management purposes only and should not be used when ordering the publication.

BASIC DATA

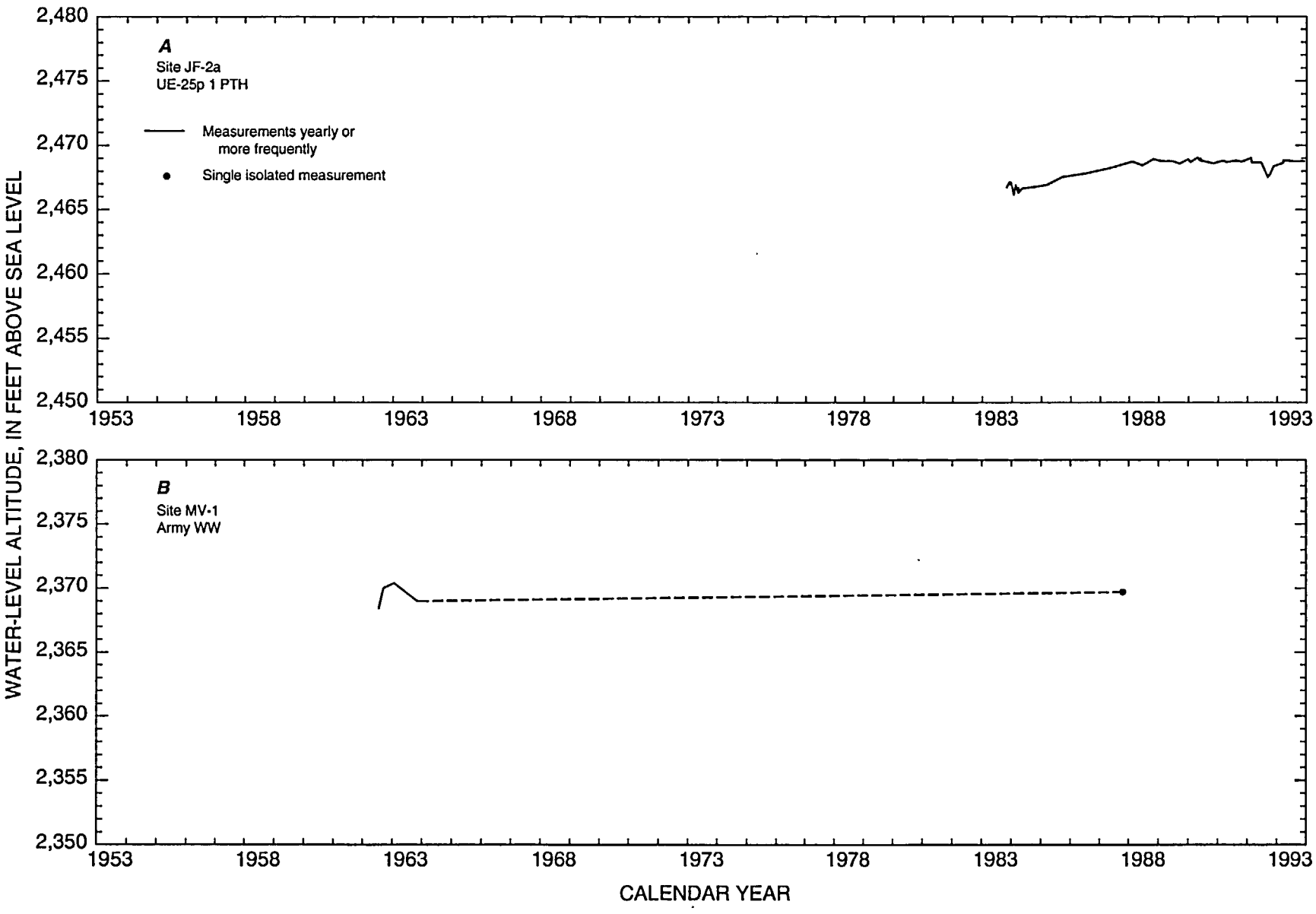
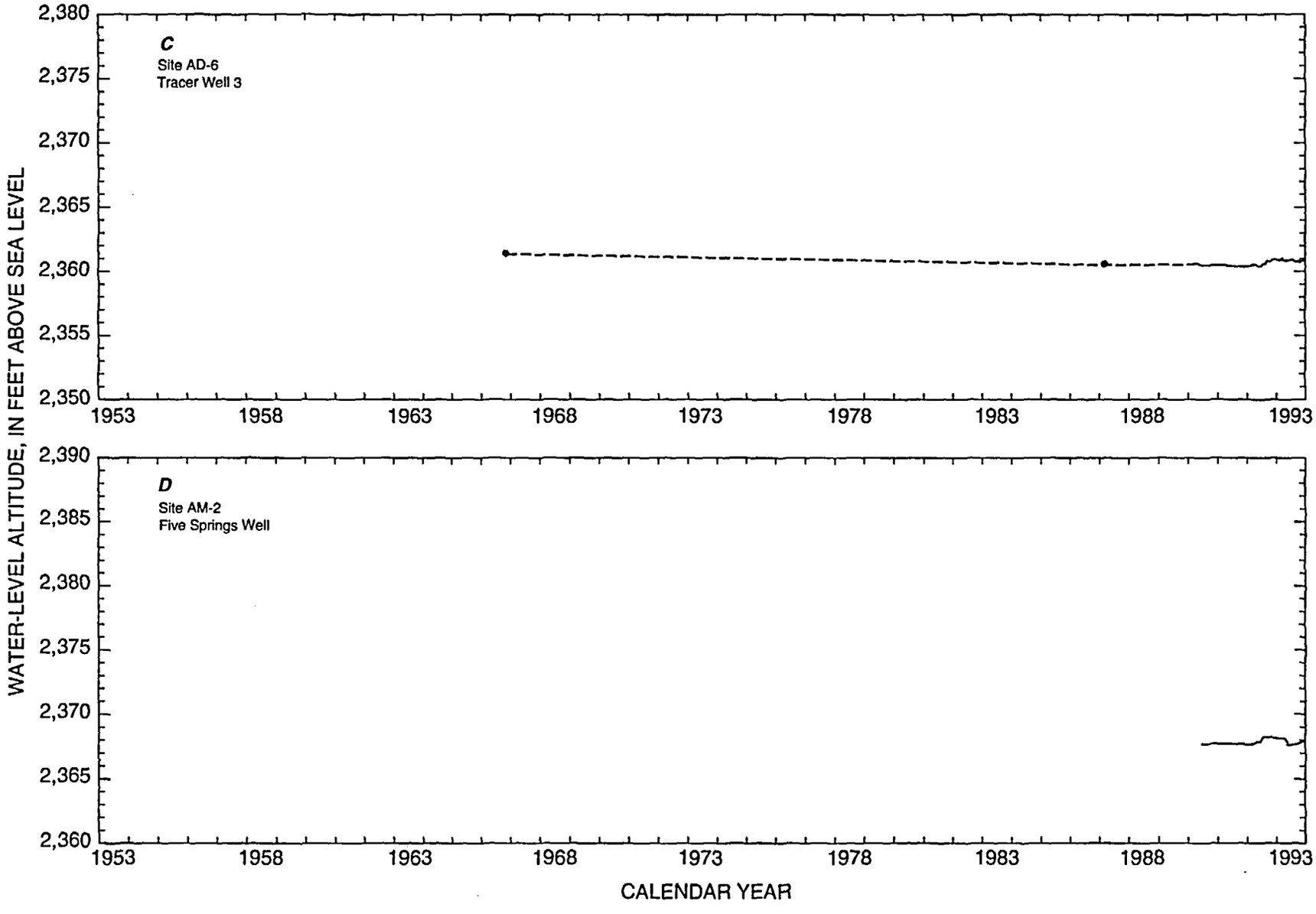


Figure 1. Water-level altitude through 1993 for wells at which primary contributing units are carbonate rock. Lines connect discrete data listed in table 2 of La Camera and Westenburg (1994) and in table 5 of this report, and are dashed where measurements were not available for consecutive calendar years. Data that may represent transient conditions at a site have been excluded (see section titled "Presentation of Ground-Water Data").



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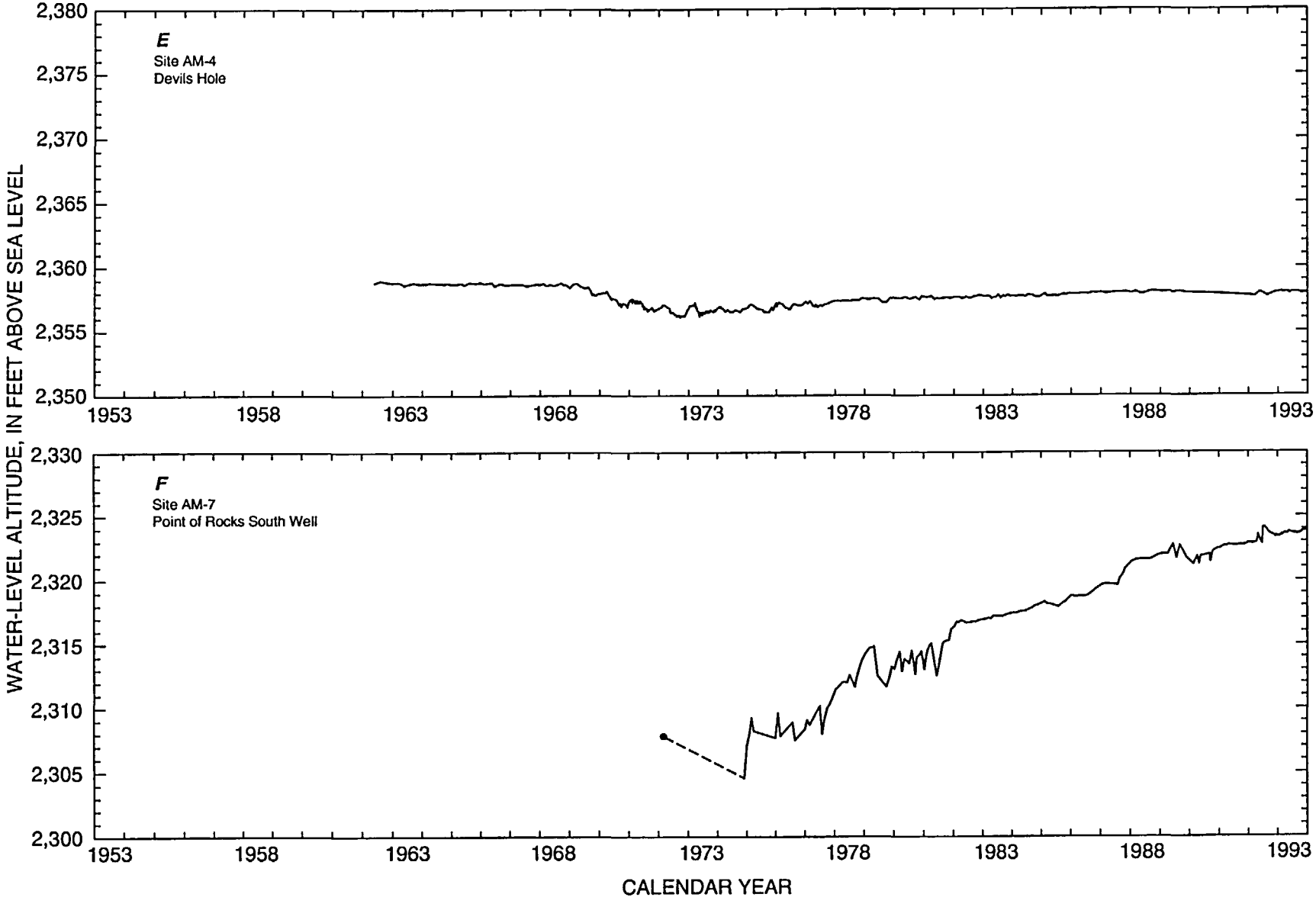

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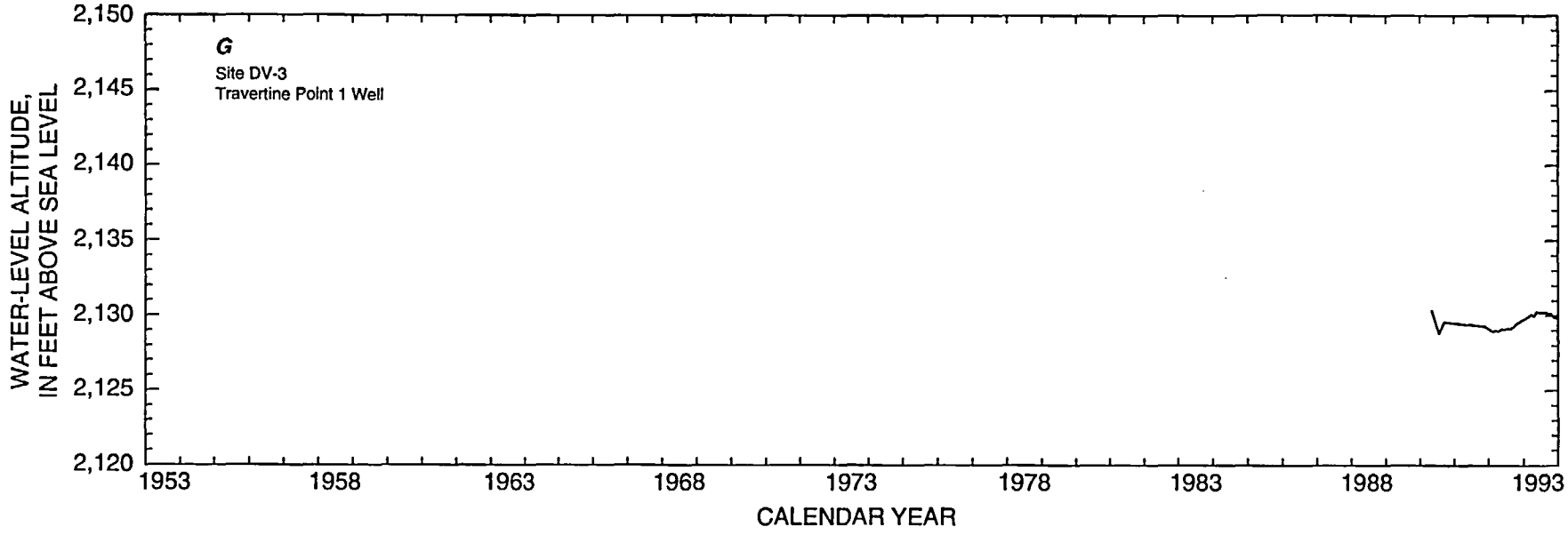

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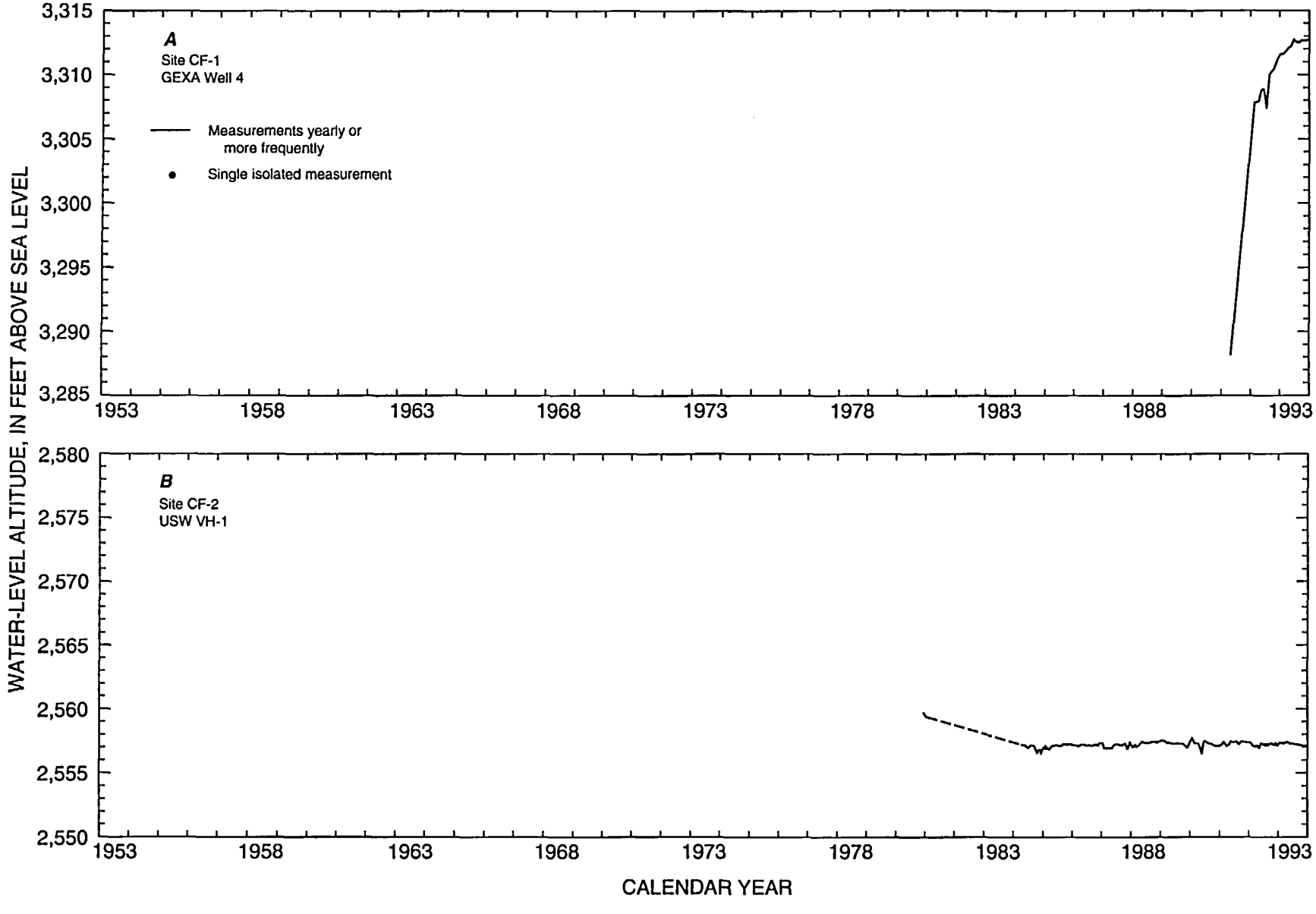
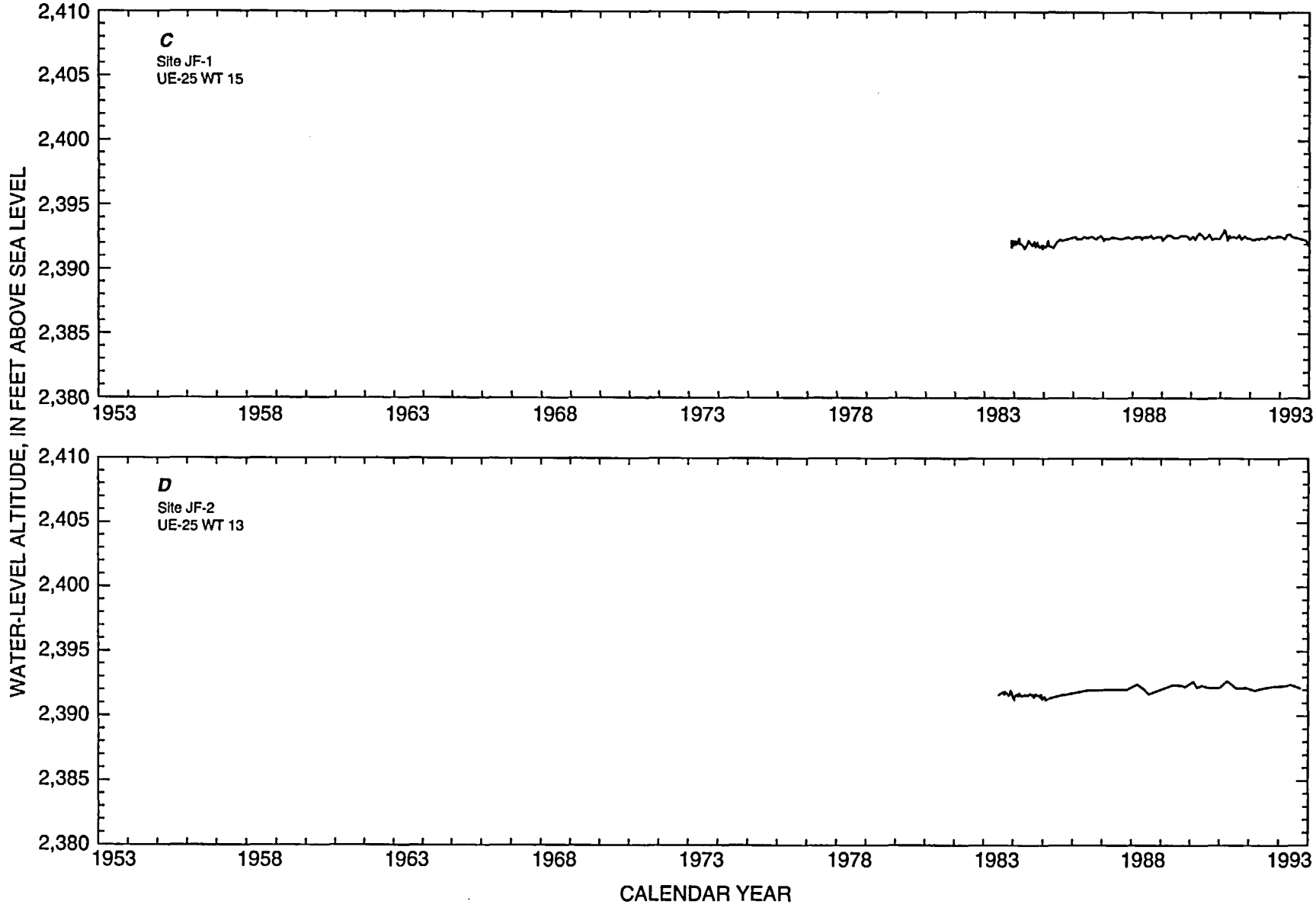


Figure 2. Water-level altitude through 1993 for wells at which primary contributing units are volcanic rock. Lines connect discrete data listed in table 2 of La Camera and Westenburg (1994) and in table 5 of this report, and are dashed where measurements were not available for consecutive calendar years. Data that may represent transient conditions at a site have been excluded (see section titled "Presentation of Ground-Water Data").



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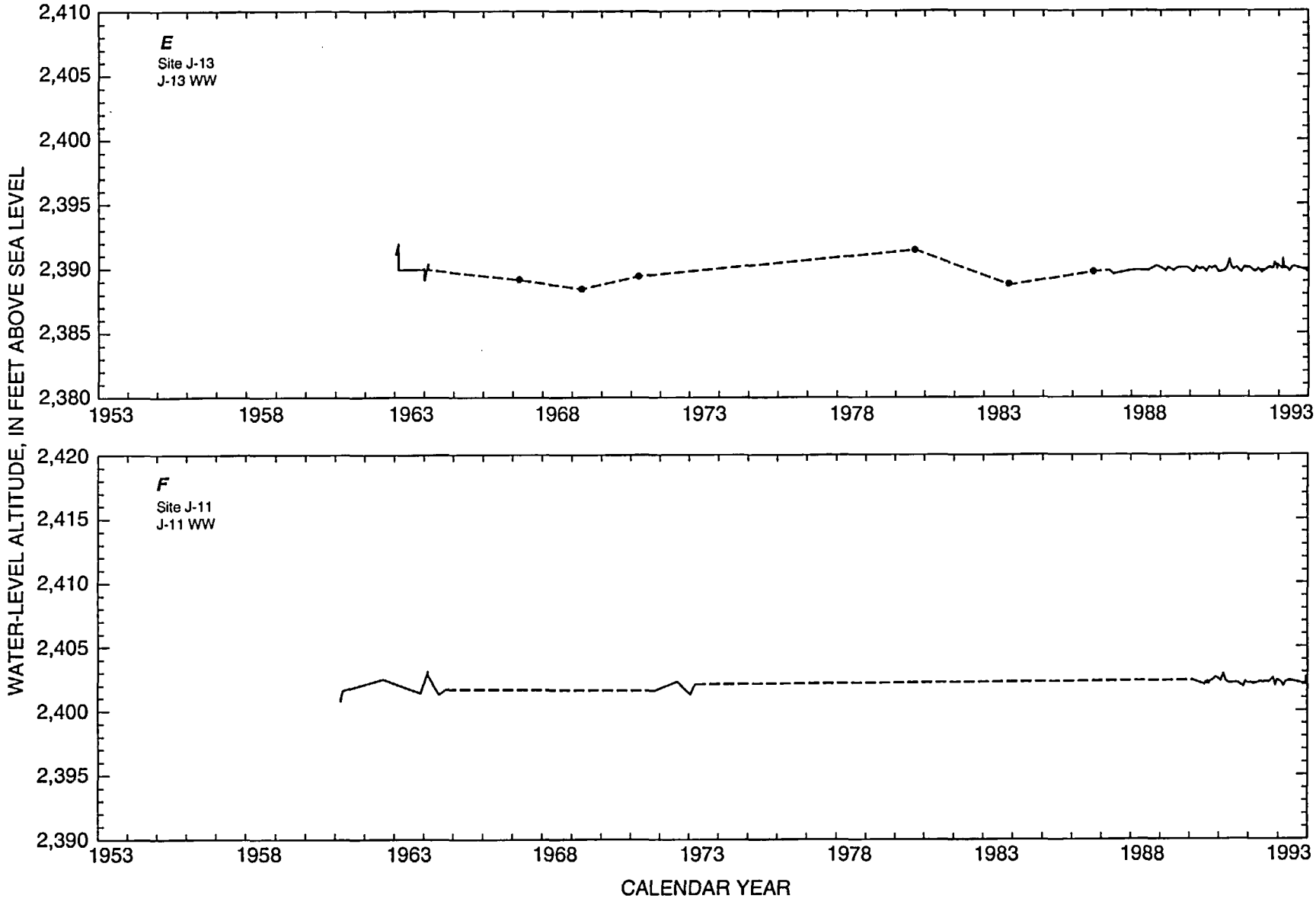

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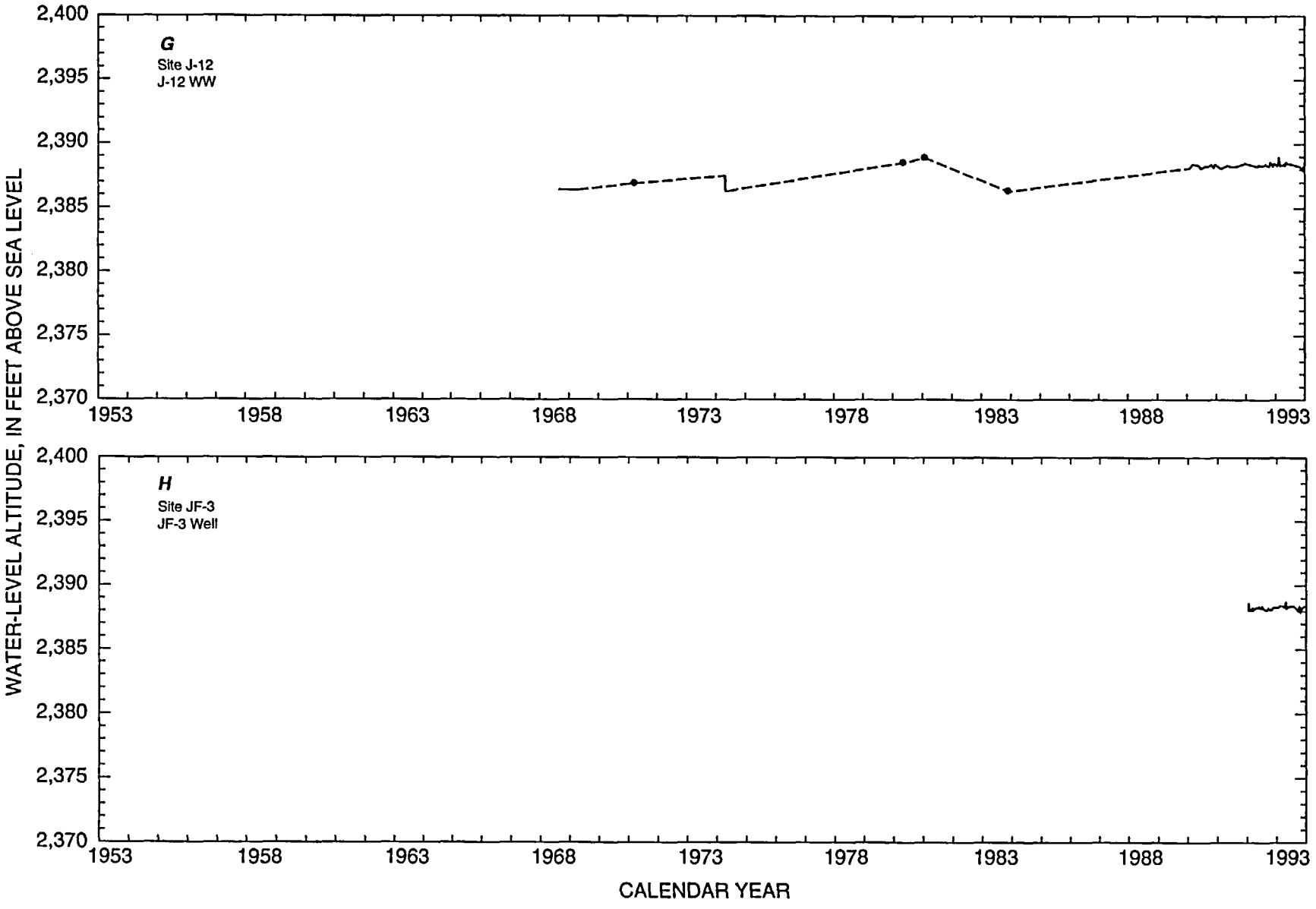

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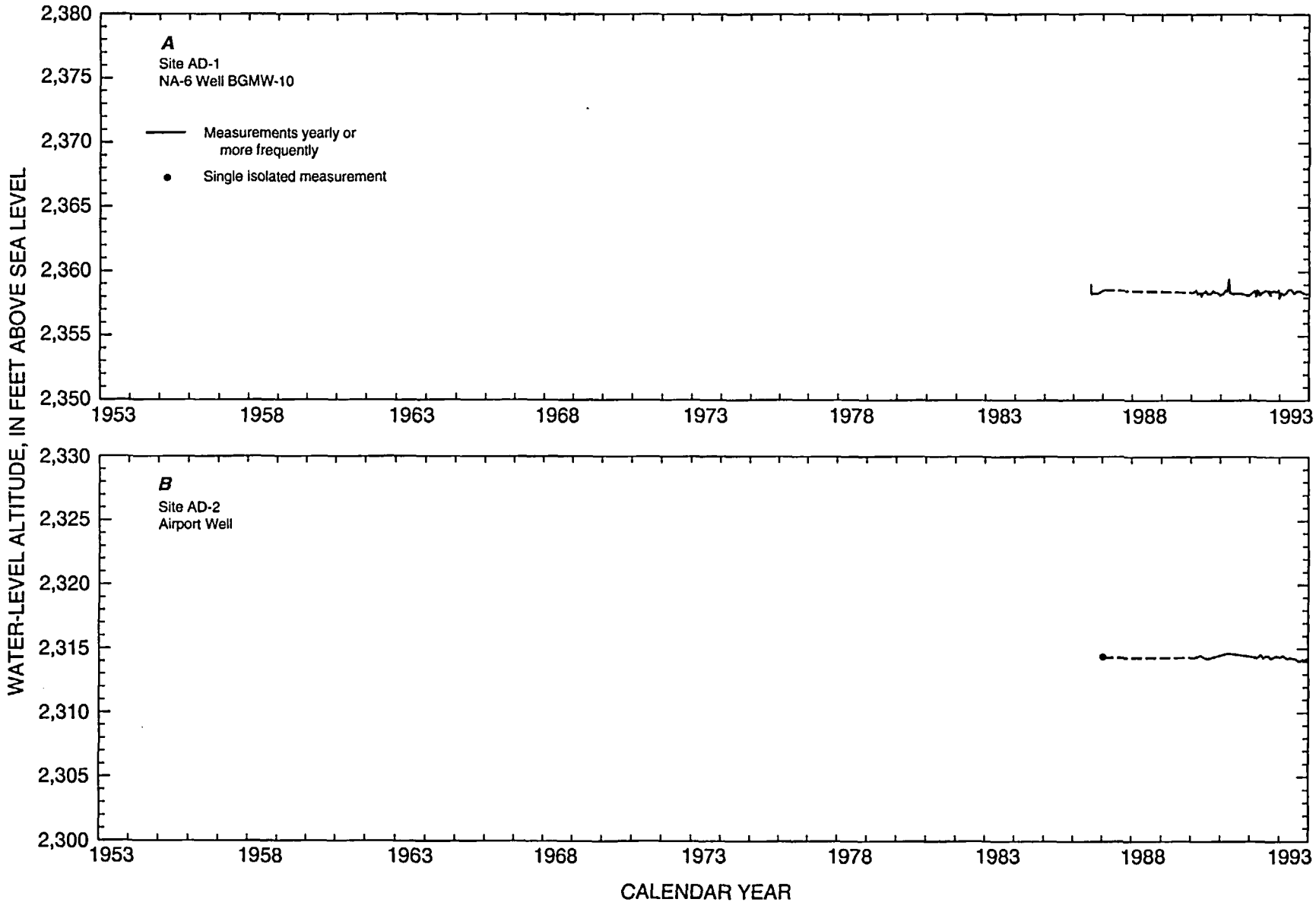
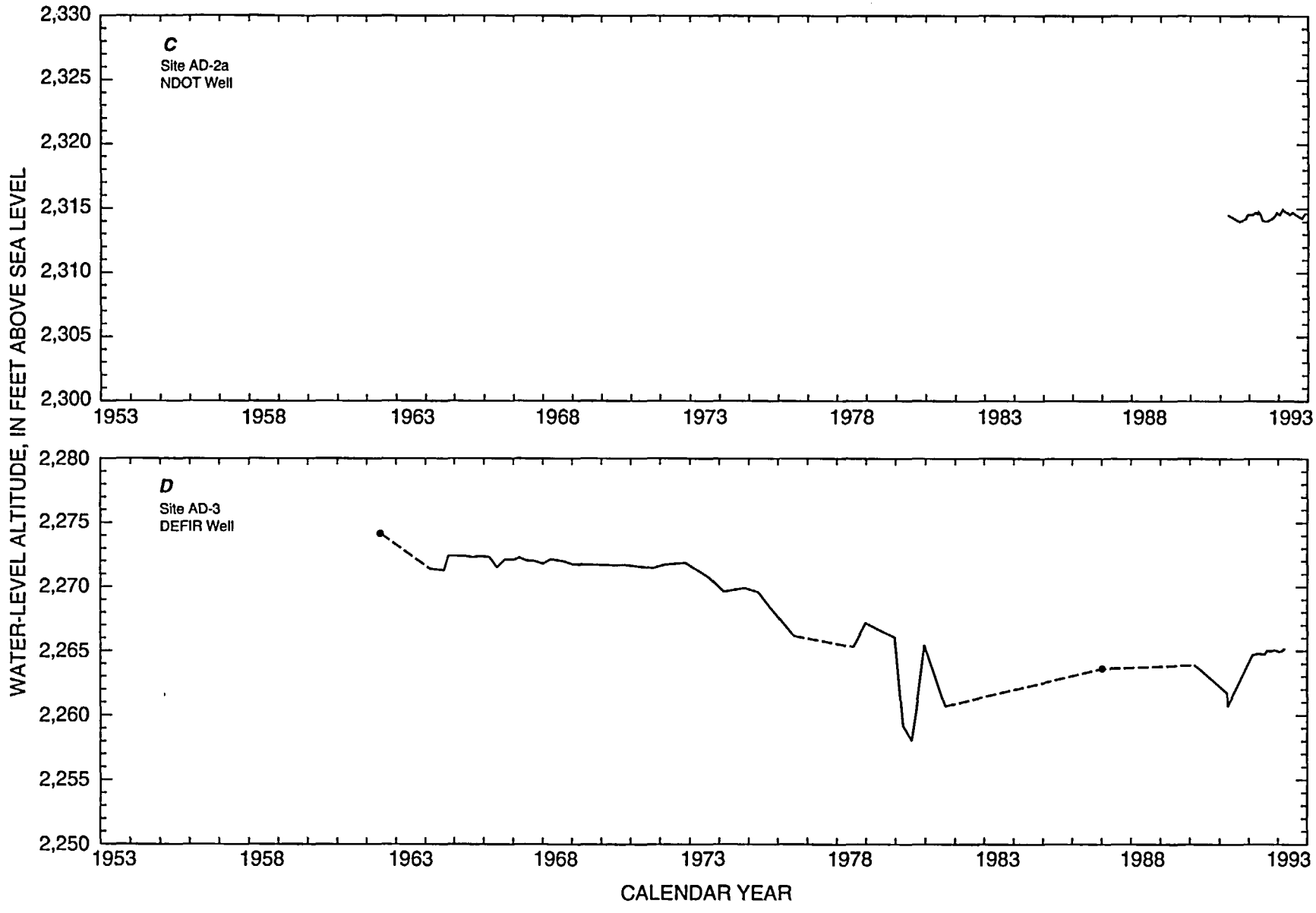


Figure 3. *Water-level altitude through 1993 for wells at which primary contributing units are valley fill.* Lines connect discrete data listed in table 2 of La Camera and Westenburg (1994) and in table 5 of this report, and are dashed where measurements were not available for consecutive calendar years. Data noted with water-level status of P, R, S, and I have been excluded, as those data may represent transient conditions at a site (see section titled "Presentation of Ground-Water Data").



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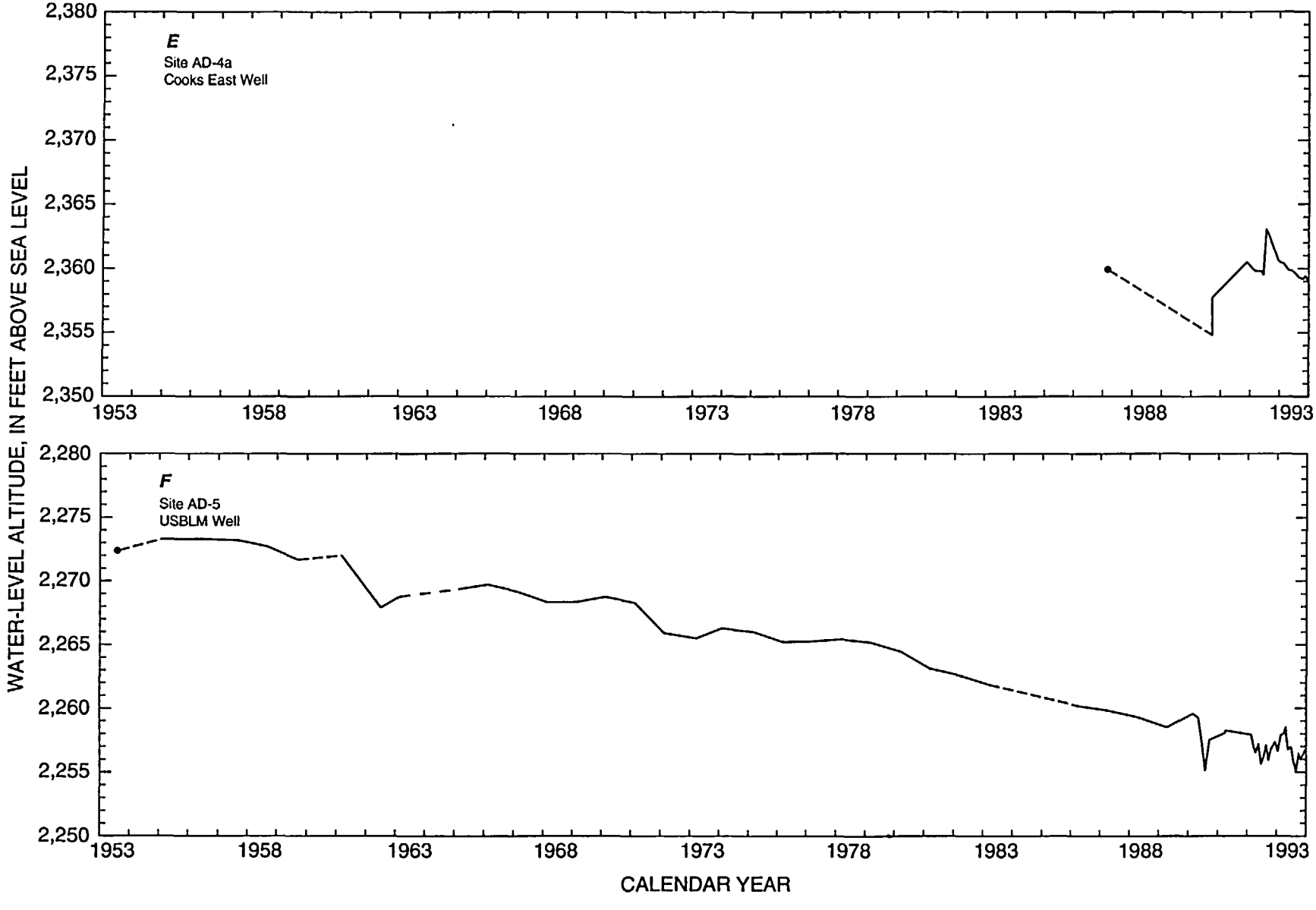

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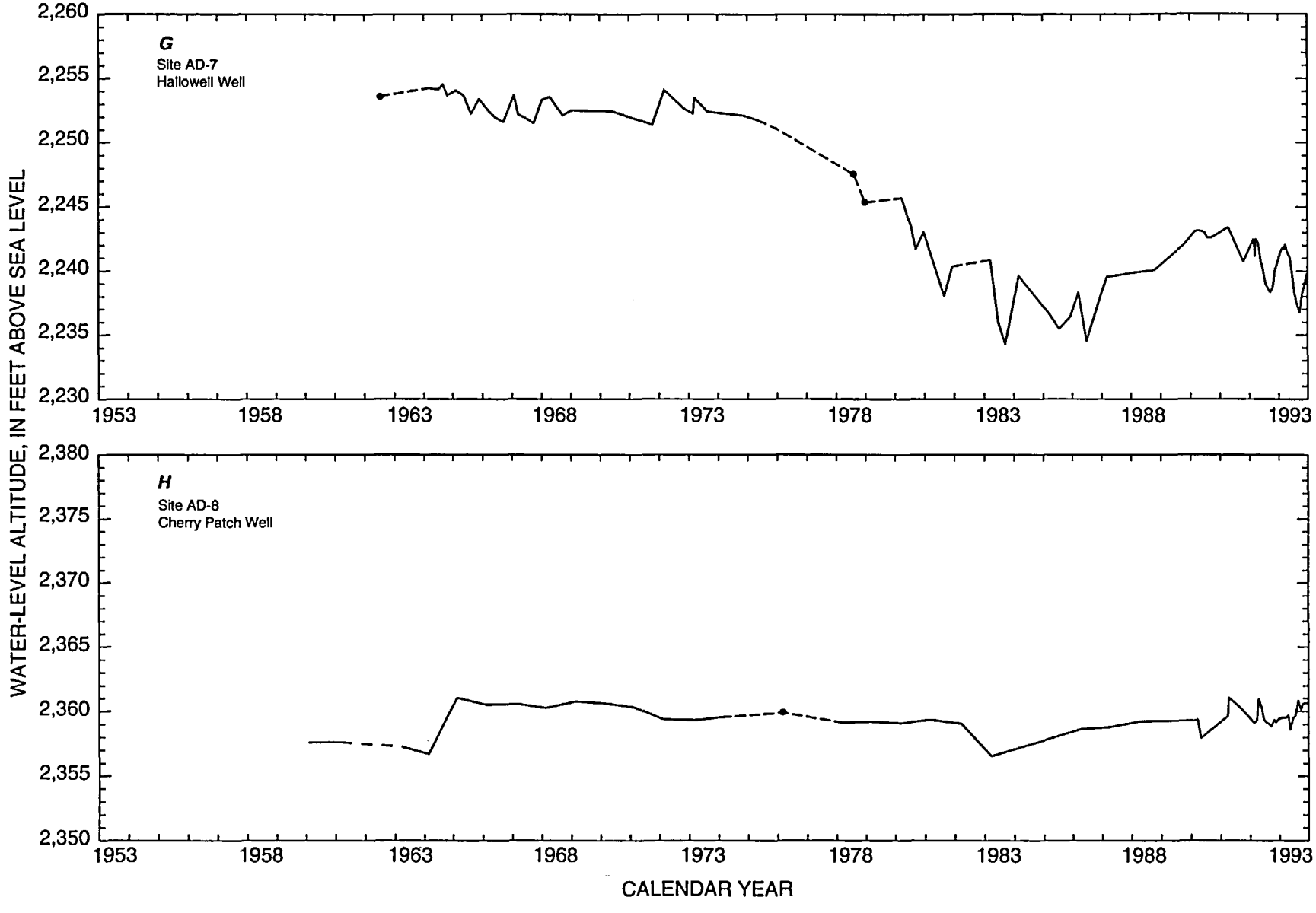

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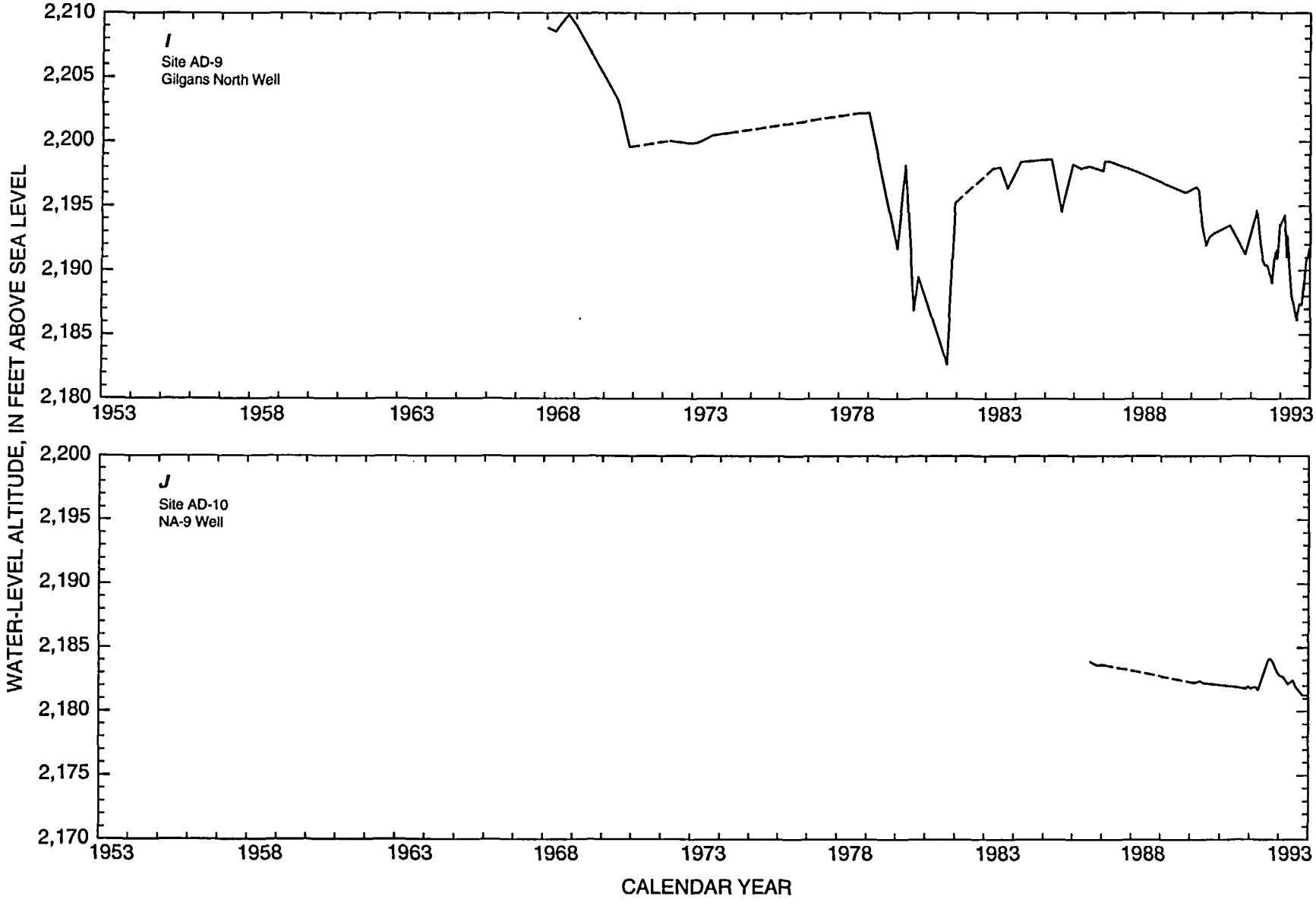

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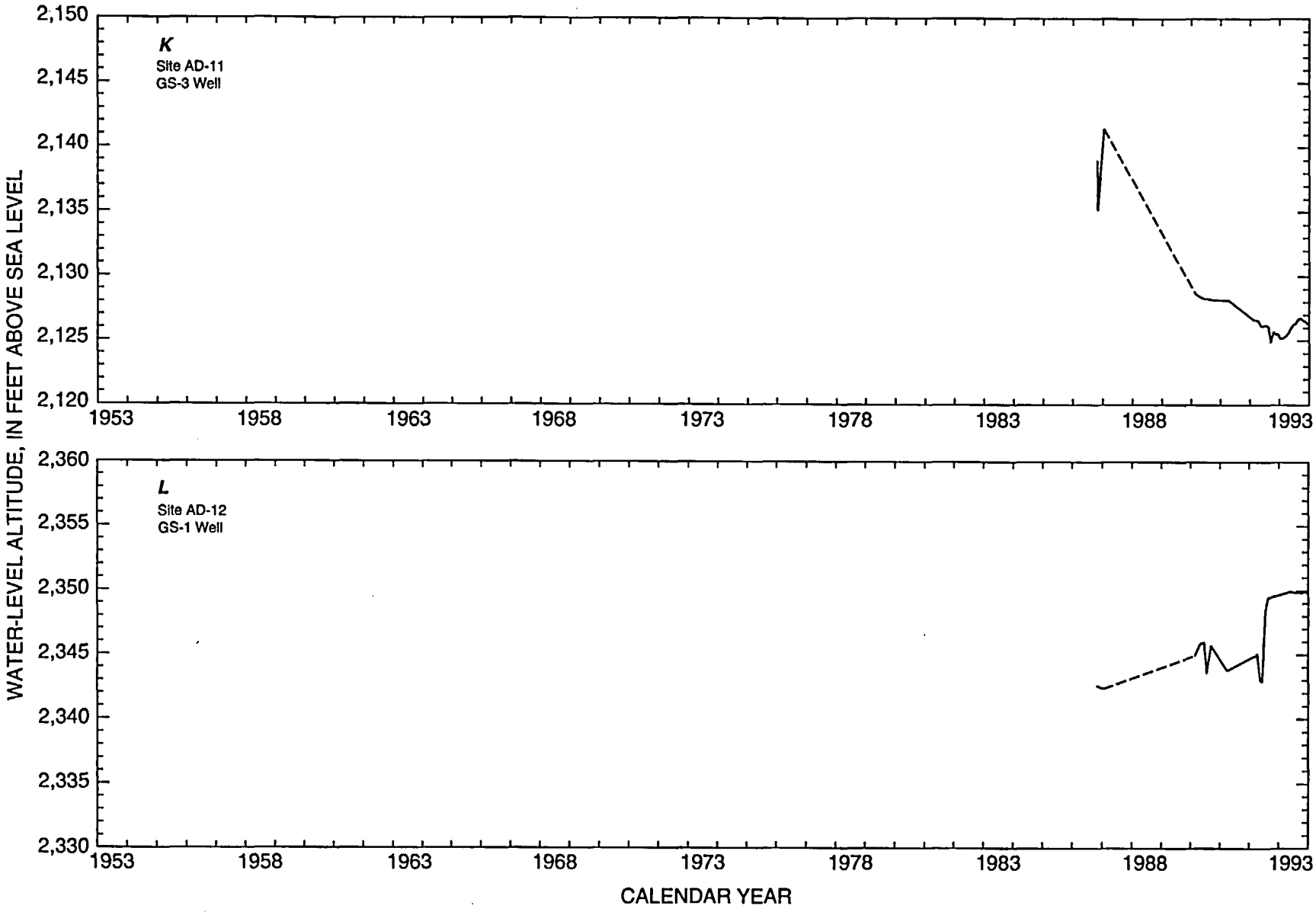

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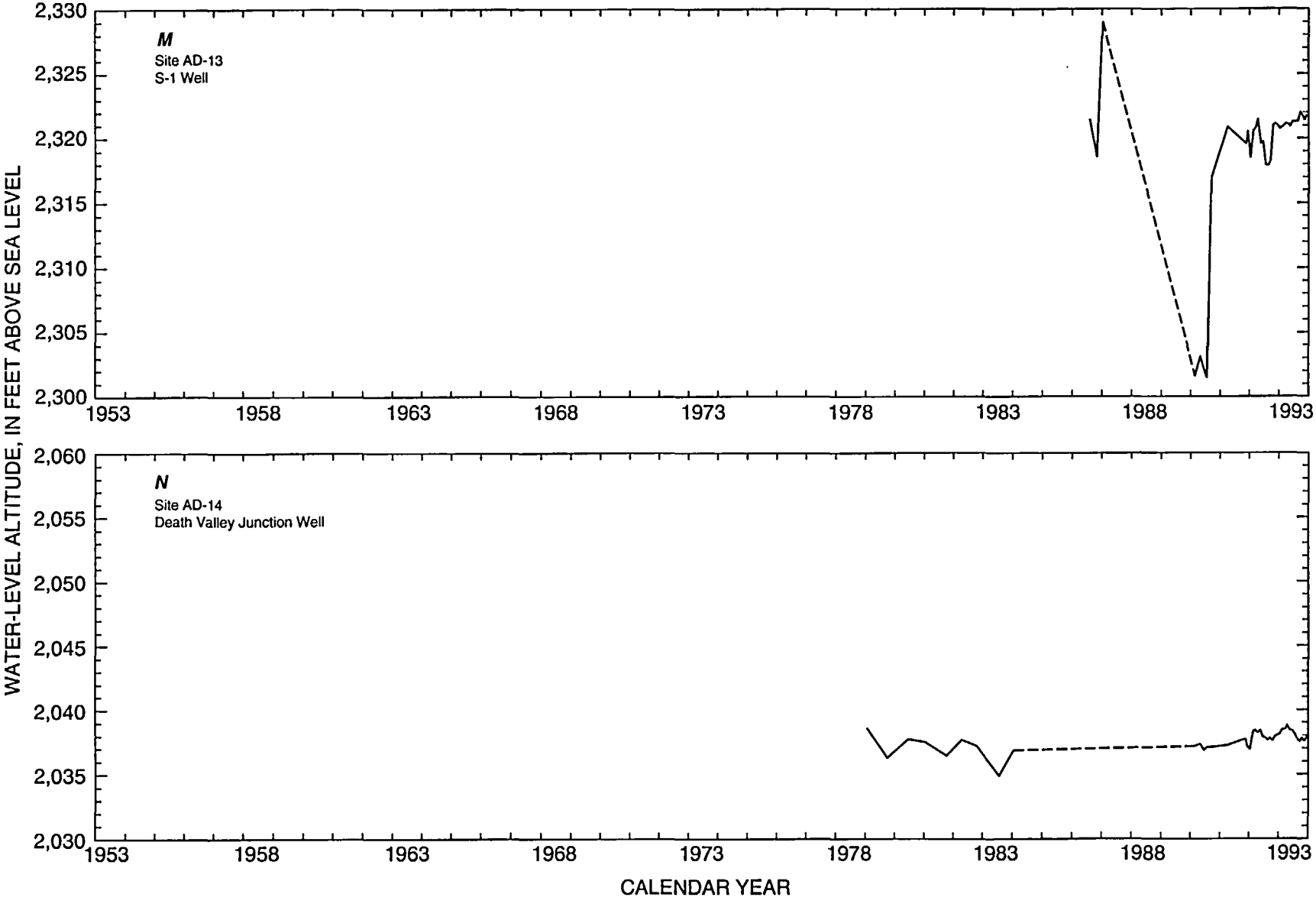

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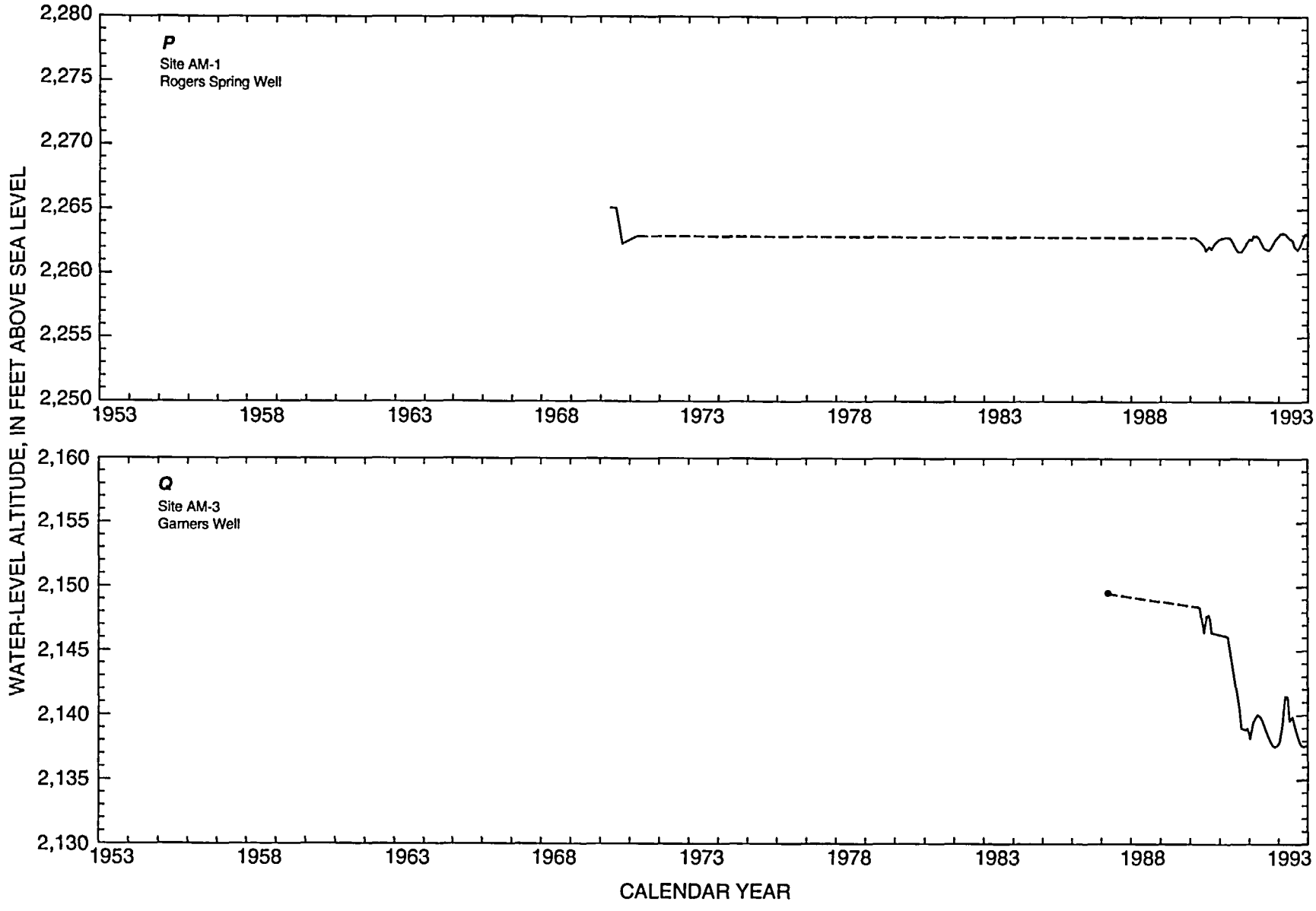

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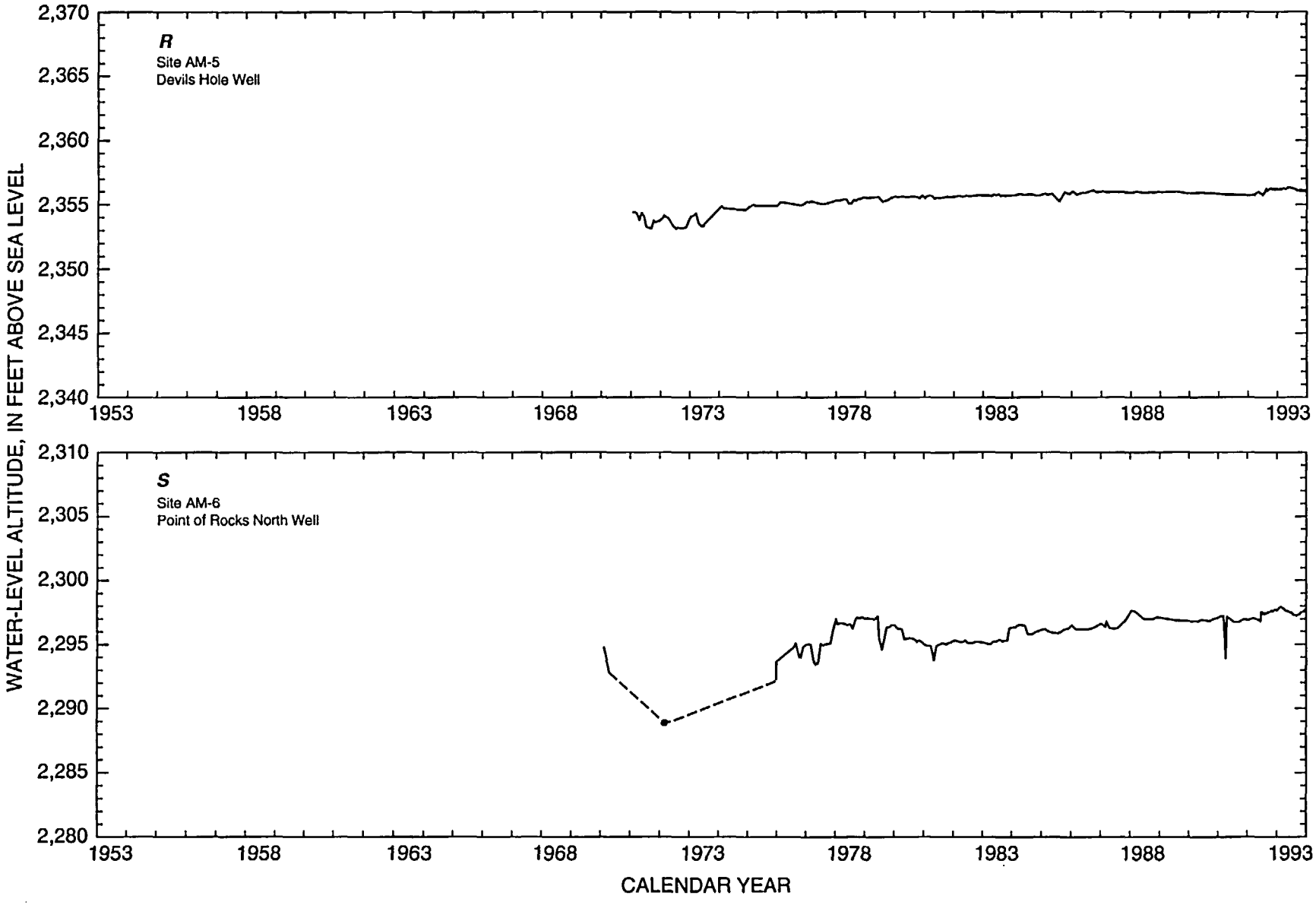

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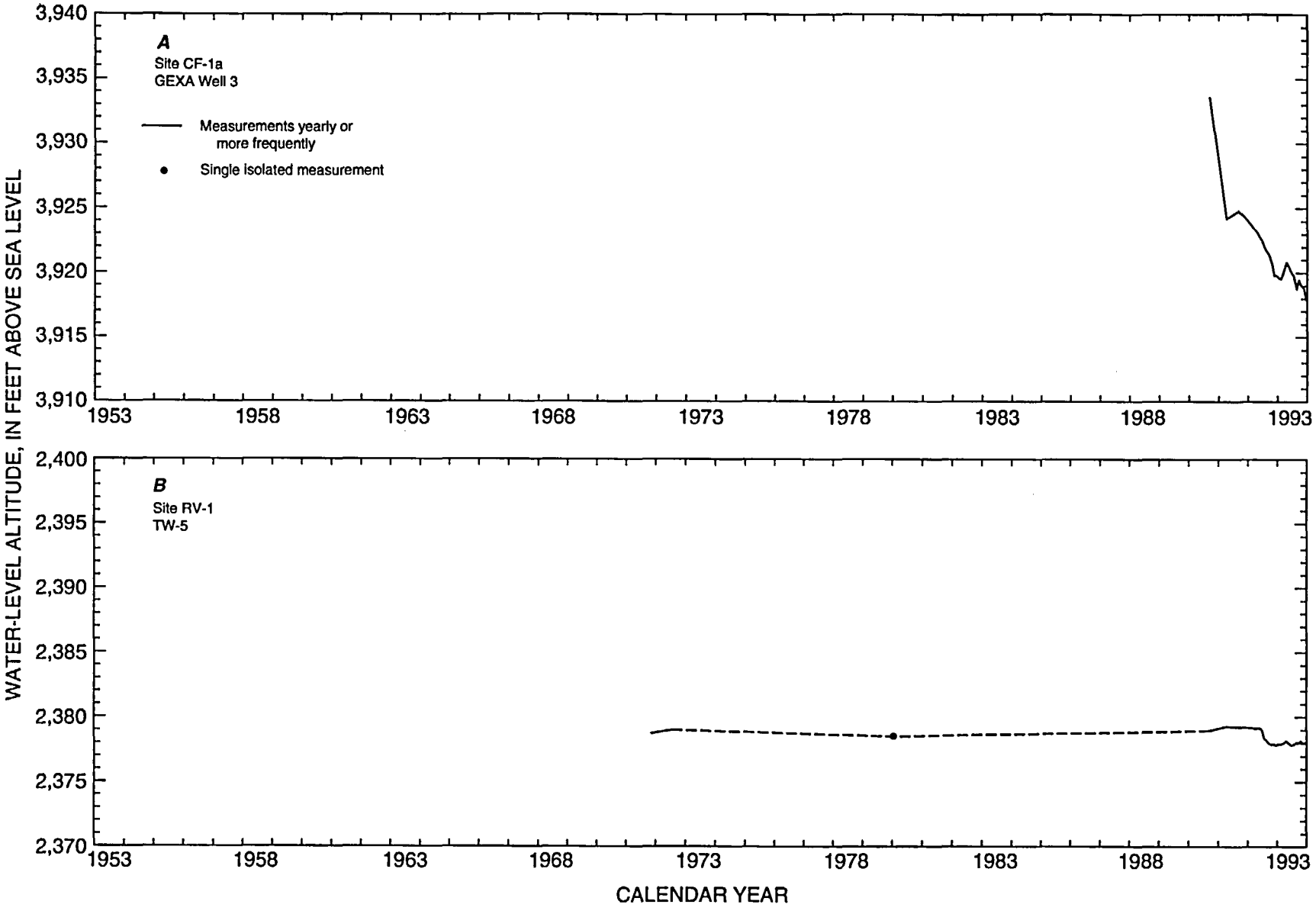

Figure 4. Water-level altitude through 1993 for wells at which primary contributing units are sedimentary rock. Lines connect discrete data listed in table 2 of La Camera and Westenburg (1994) and in table 5 of this report, and are dashed where measurements were not available for consecutive calendar years. Data that may represent transient conditions at a site have been excluded (see section titled "Presentation of Ground-Water Data.")

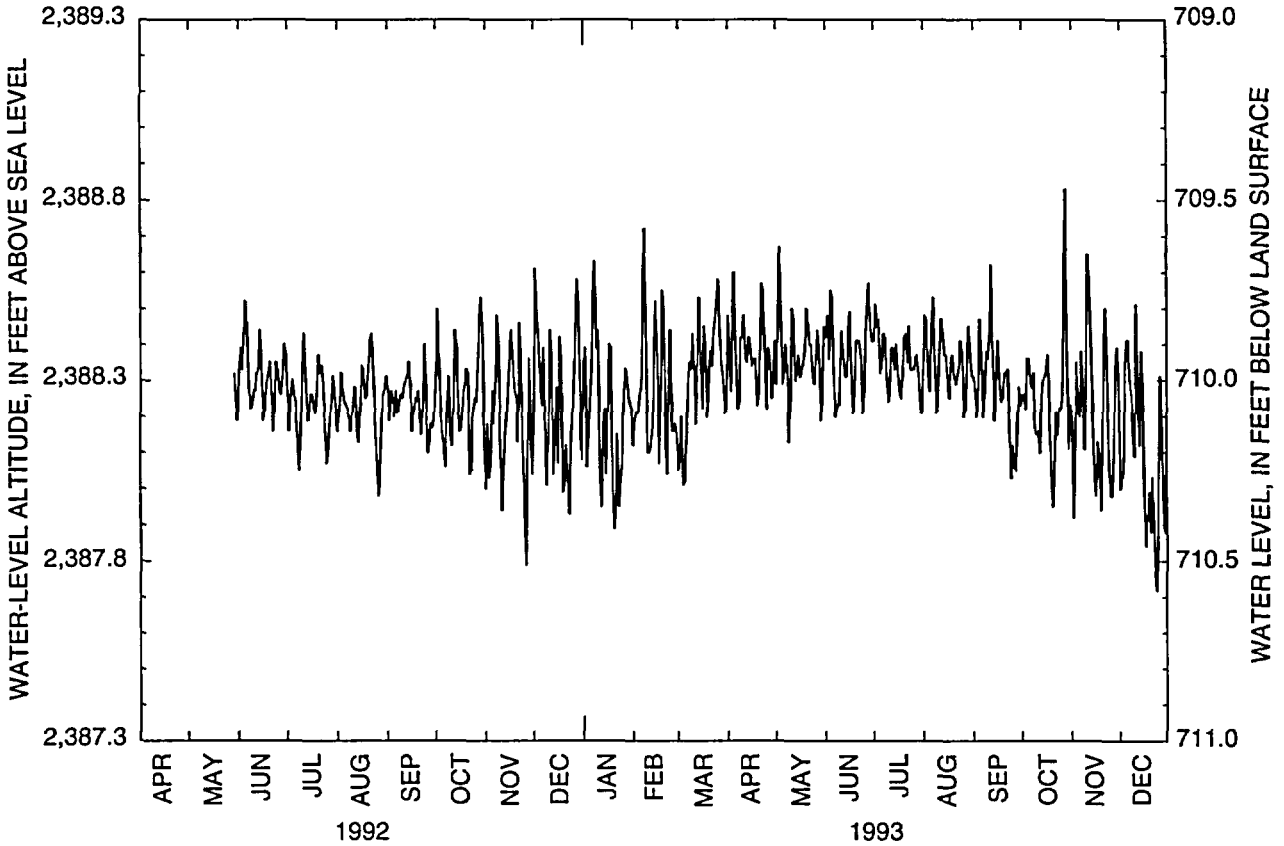

Figure 5. Daily average water level in well JF-3, May 1992 through December 1993

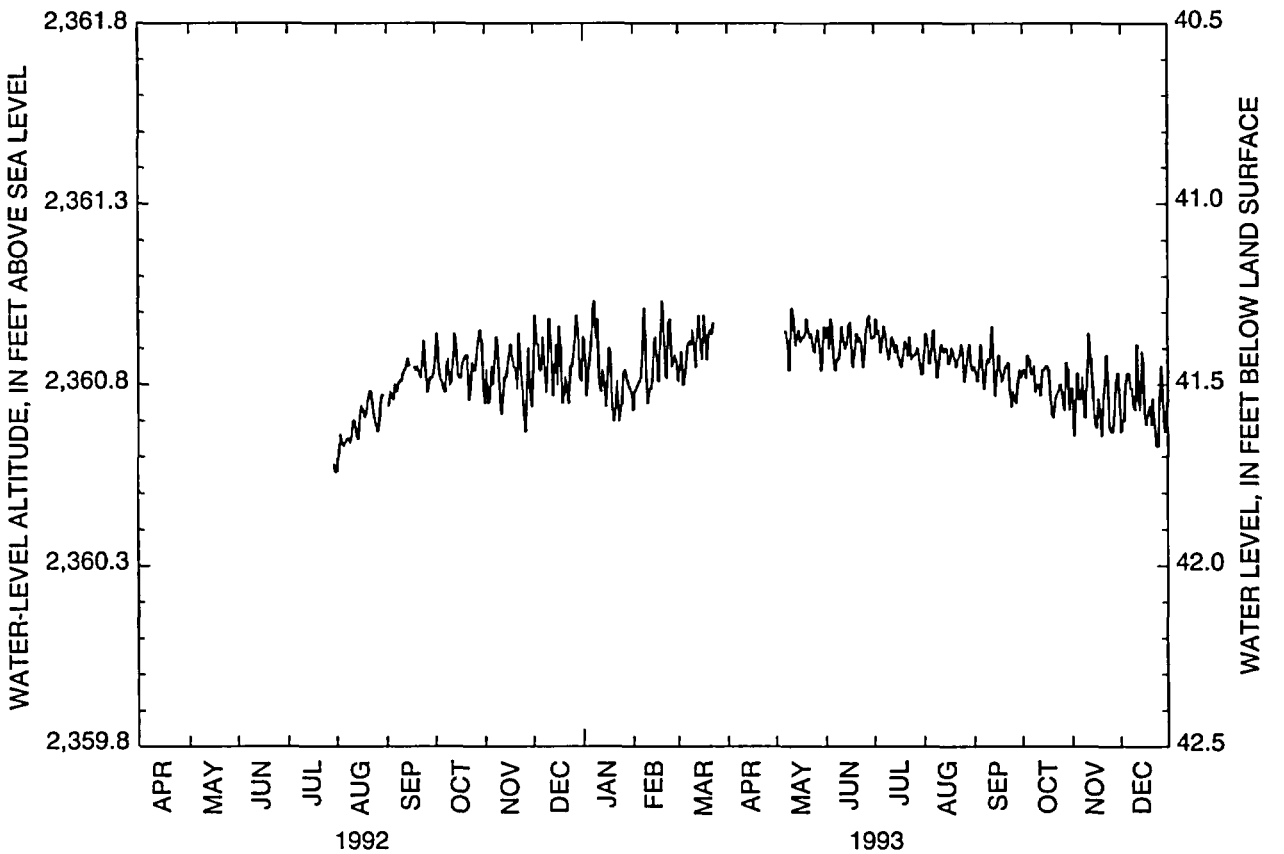

Figure 6. Daily average water level in well AD-6, July 1992 through December 1993

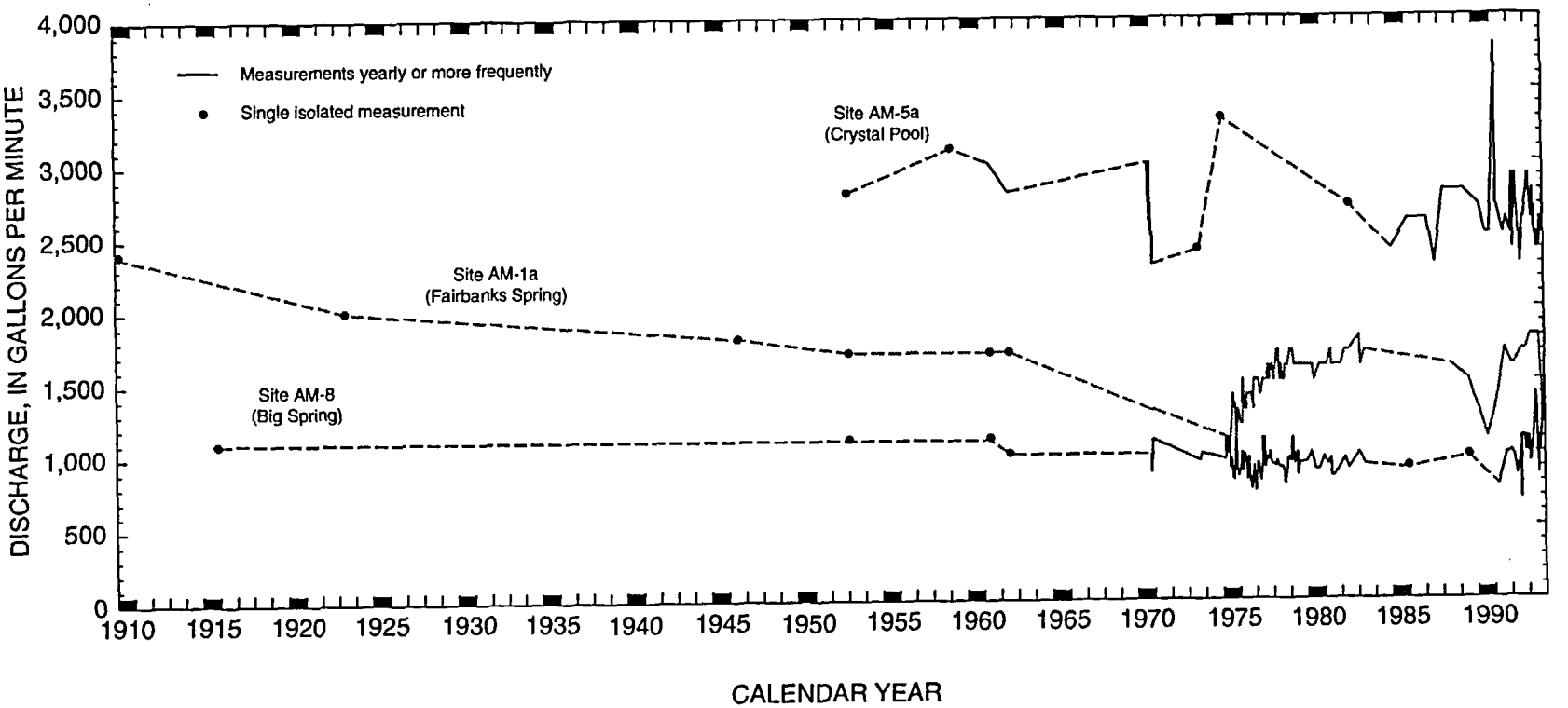

Figure 7. Discharge at sites AM-1a (Fairbanks Spring), AM-5a (Crystal Pool), and AM-8 (Big Spring) through 1993. Lines connect discrete data listed in table 5 of La Camera and Westenburg (1994) and table 8 in this report, and are dashed where measurements were not available for consecutive calendar years.

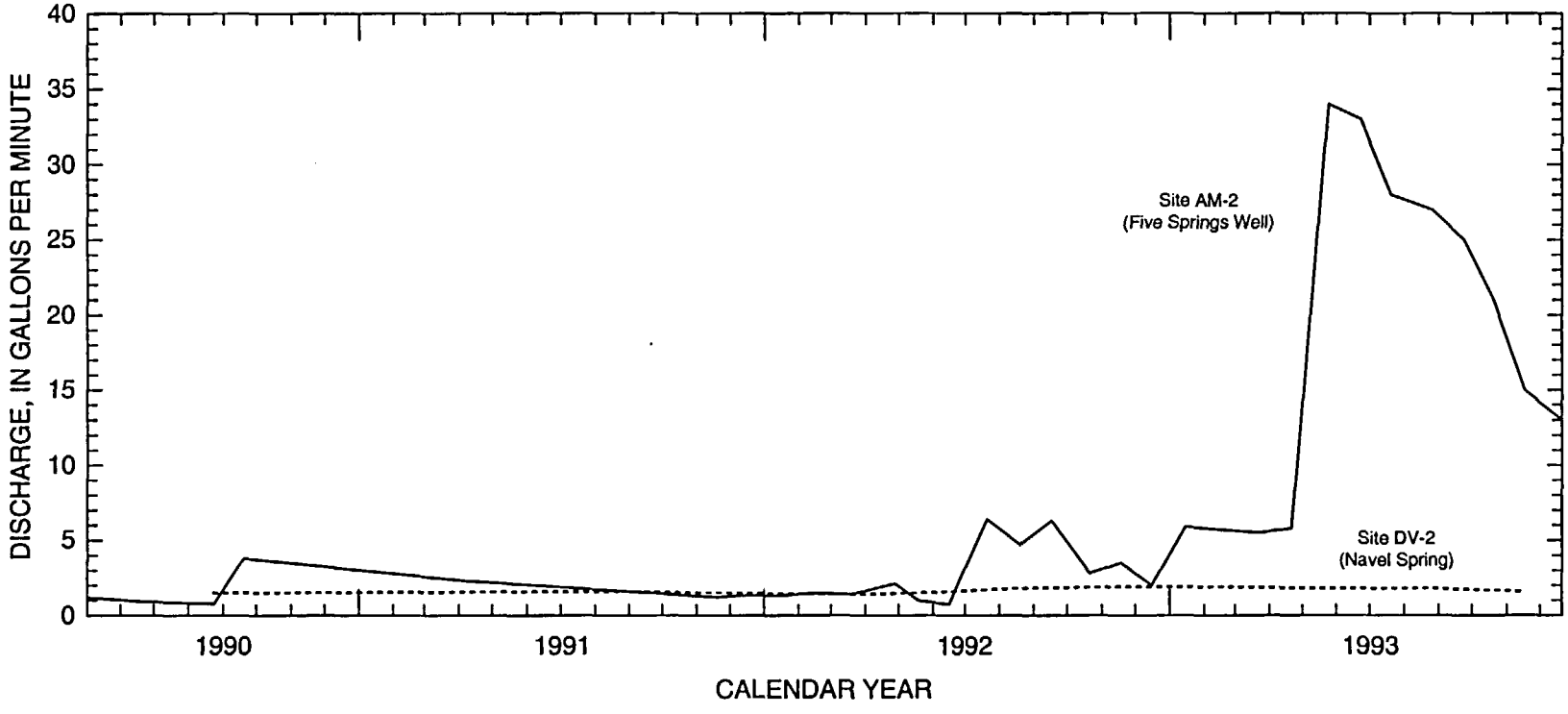

Figure 8. Discharge at sites AM-2 (Five Springs Well) and DV-2 (Navel Spring), 1990 through 1993. Lines connect discrete data listed in table 5 of La Camera and Westenburg (1994) and table 8 in this report.

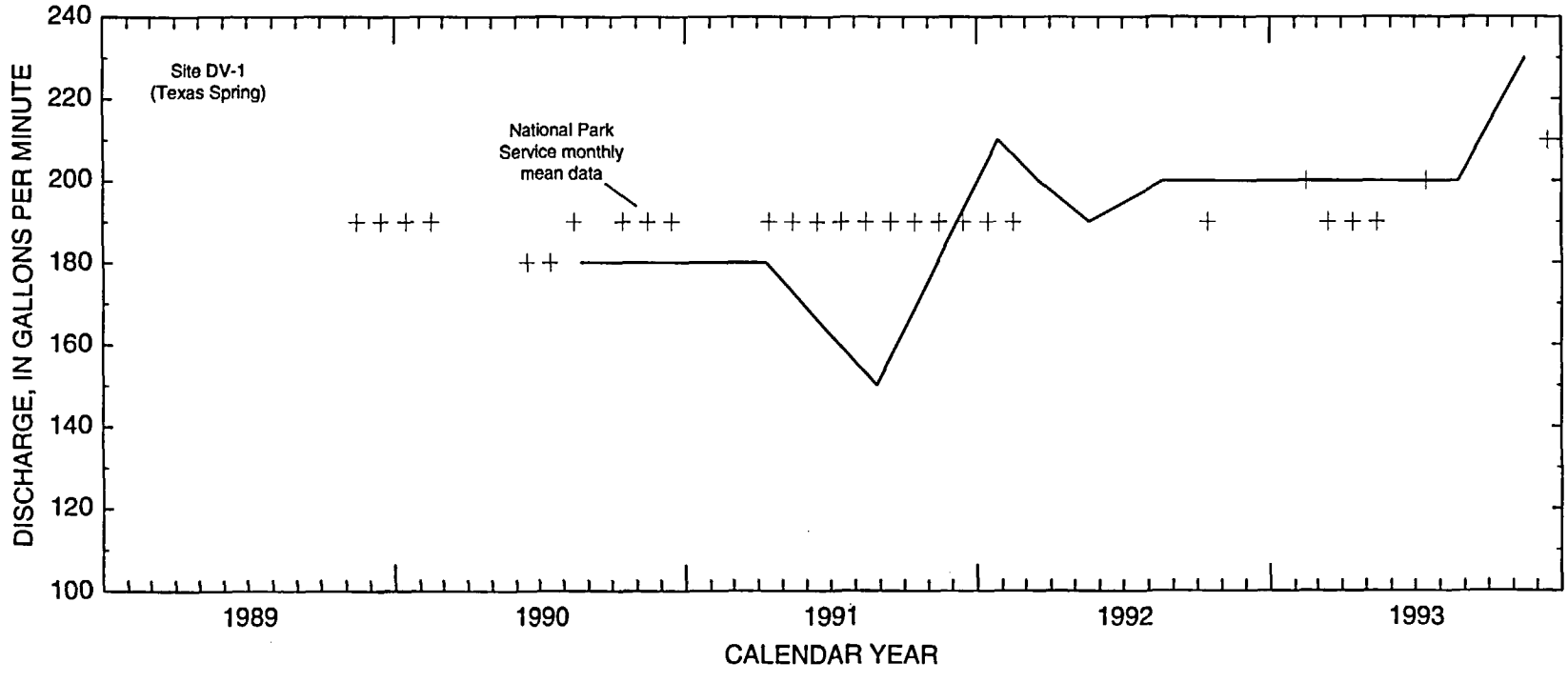

Figure 9. Discharge at site DV-1 (Texas Spring), 1989 through 1993. Solid line connects discrete measurements listed in table 5 of La Camera and Westenburg (1994), which have been revised to reflect previously unaccounted water at the site, and table 8 in this report. The plus symbol represents the National Park Service monthly mean data for any given month.

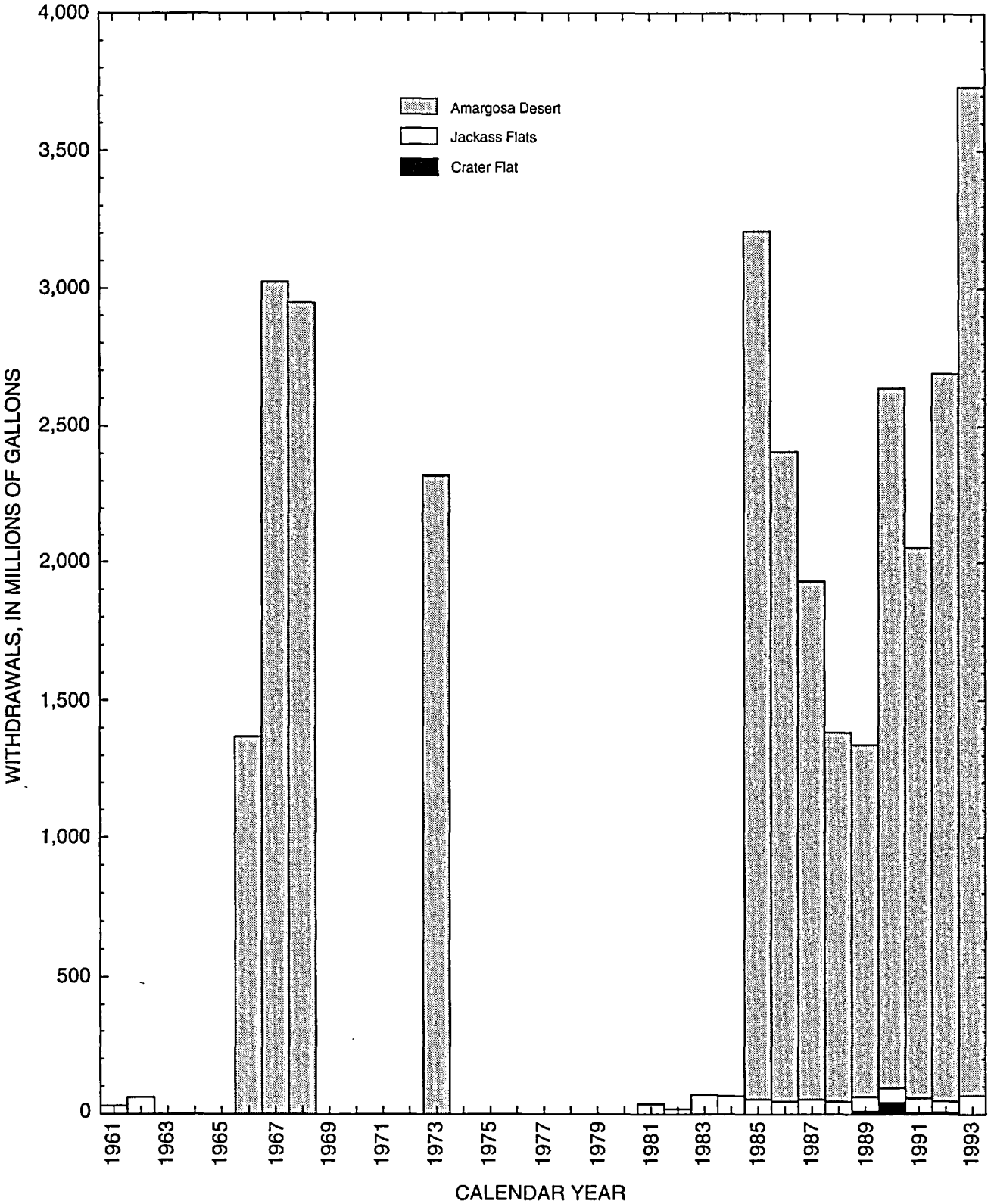

Figure 10. Available estimates of annual ground-water withdrawals for selected areas within Alkali Flat-Furnace Creek Ranch ground-water subbasin, 1961 through 1993. In each hydrographic area, ground water may have been withdrawn in years for which no estimates are available. Total bar height equals the approximate sum of withdrawals from all areas within subbasin for given year.

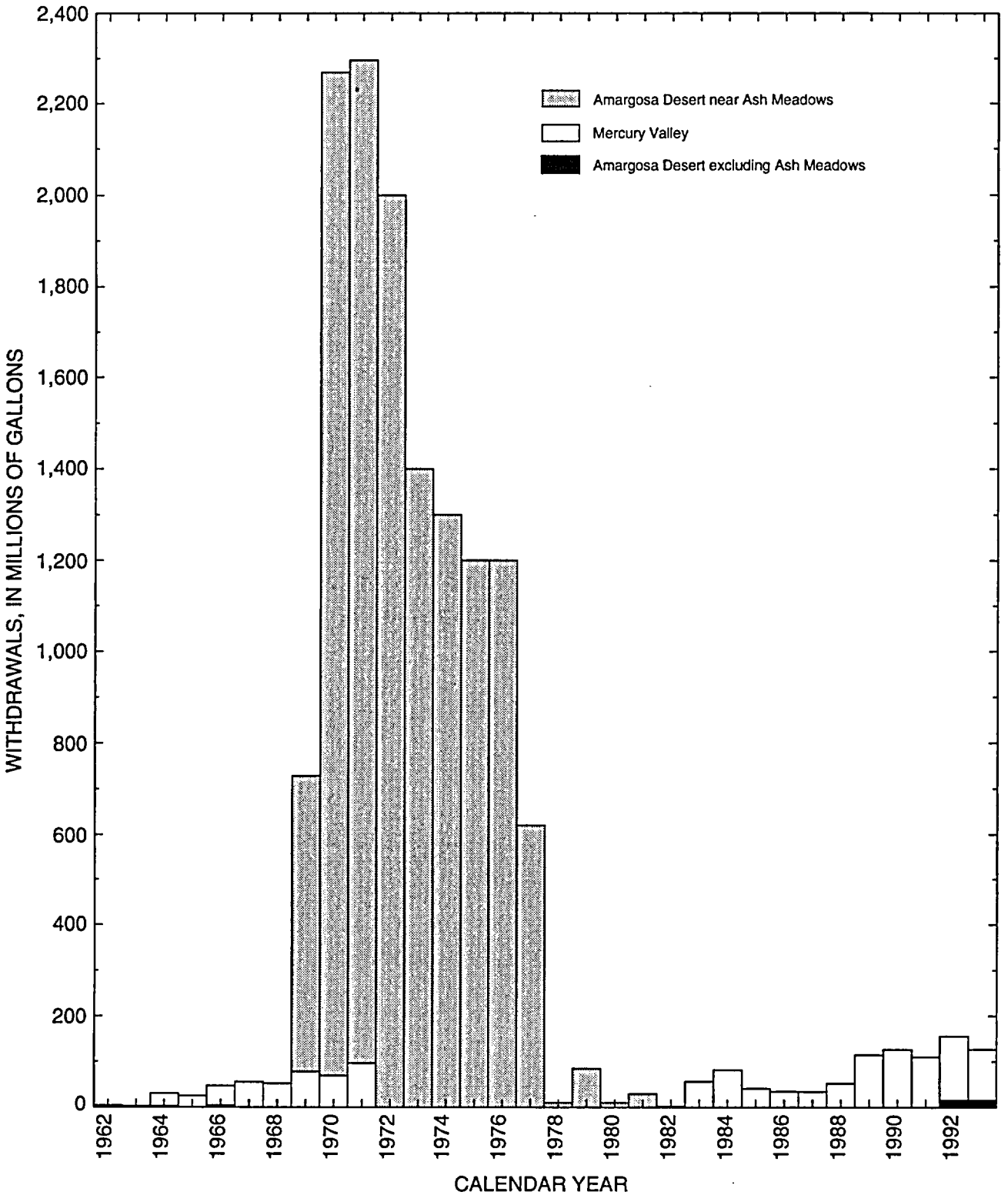

Figure 11. Available estimates of annual ground-water withdrawals for selected areas within Ash Meadows ground-water subbasin, 1962 through 1993. In each hydrographic area, ground water may have been withdrawn in years for which no estimates are available. Total bar height equals the approximate sum of withdrawals from all areas within subbasin for given year.

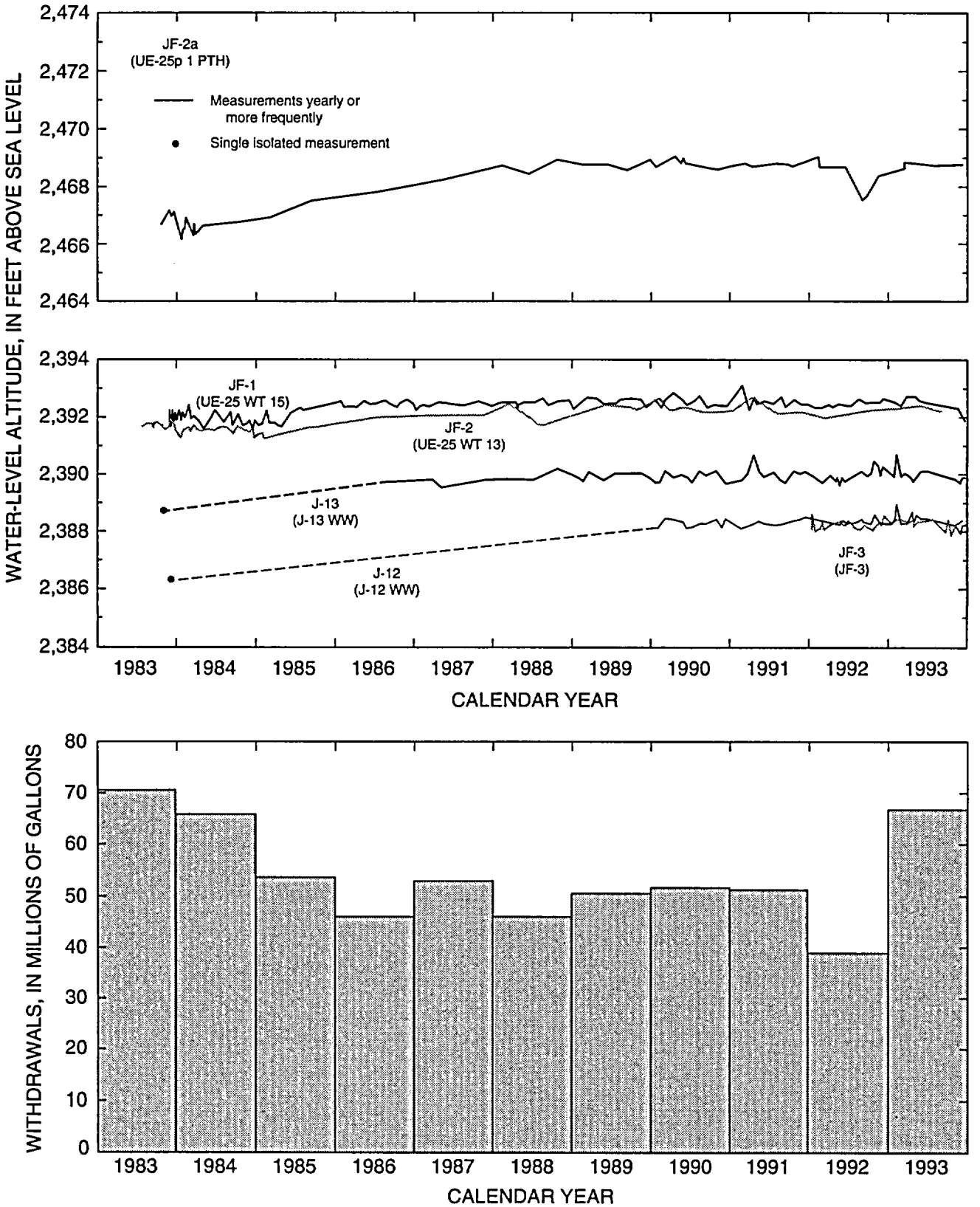

Figure 12. Water-level altitudes in wells JF-1, JF-2, J-13, J-12, JF-3, and JF-2a, 1983 through 1993. Lines connect discrete water-level altitudes listed in table 2 of La Camera and Westenburg (1994) and table 5 in this report, and are dashed where no measurements were available for consecutive calendar years. Data that may represent transient conditions at a site have been excluded (see section titled "Presentation of Ground-Water Data"). A single measurement in JF-2a (November 7, 1983) has been excluded, as that measurement may represent transient conditions at the site. Estimated ground-water withdrawals from Jackass Flats, 1983 through 1993. Bar height equals sum of withdrawals from water-supply wells J-12 and J-13.

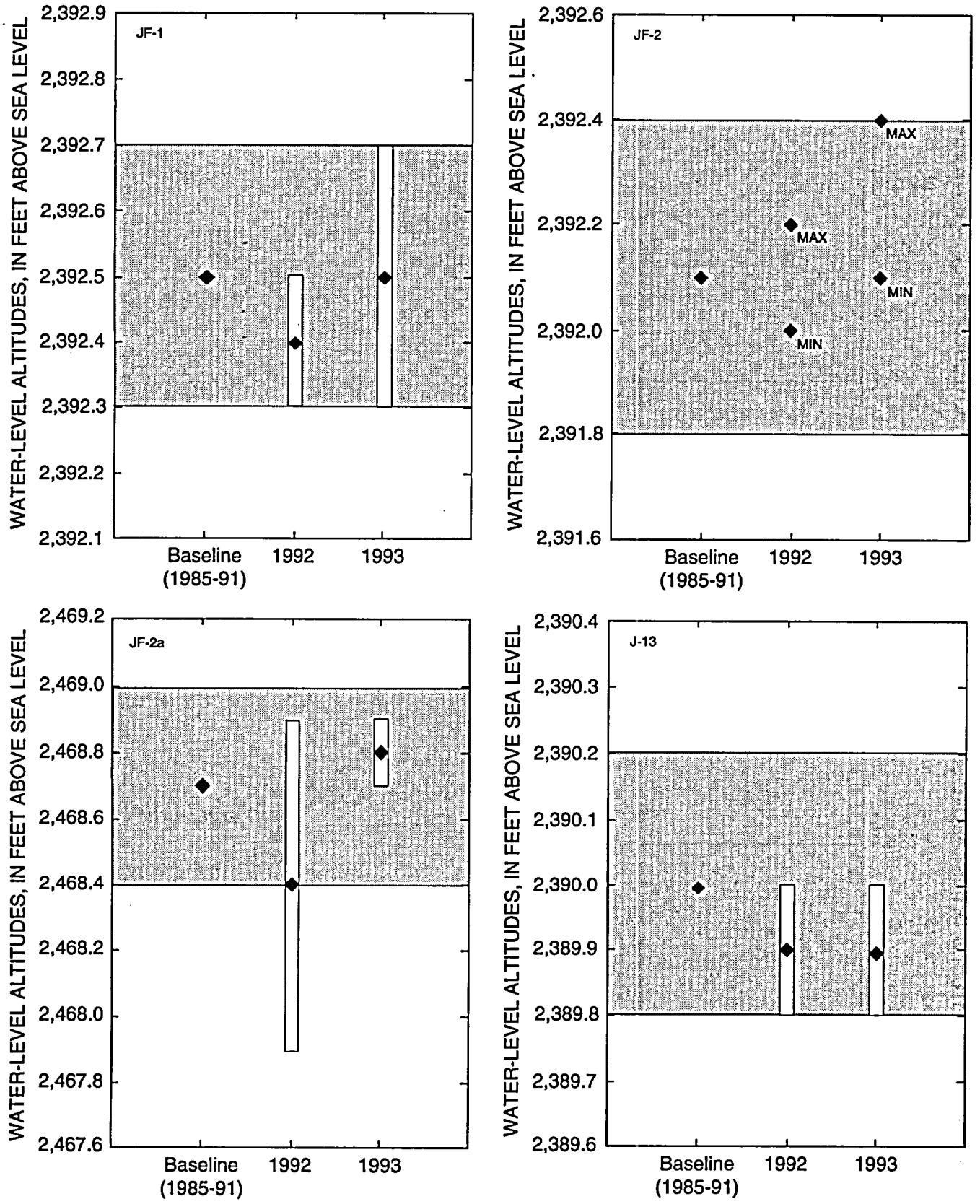

Figure 13. Median water-level altitudes and average deviation of water levels for wells JF-1, JF-2, JF-2a, J-11, J-12, and J-13 and mean water-level altitudes and standard deviation for well JF-3 for baseline periods (1985-91, except 1990-91 for J-11 and J-12, and May 29, 1992 through December 31, 1993 for JF-3), 1992, and 1993. For well JF-2, only the maximum and minimum water-level altitudes are available for 1992 and 1993.

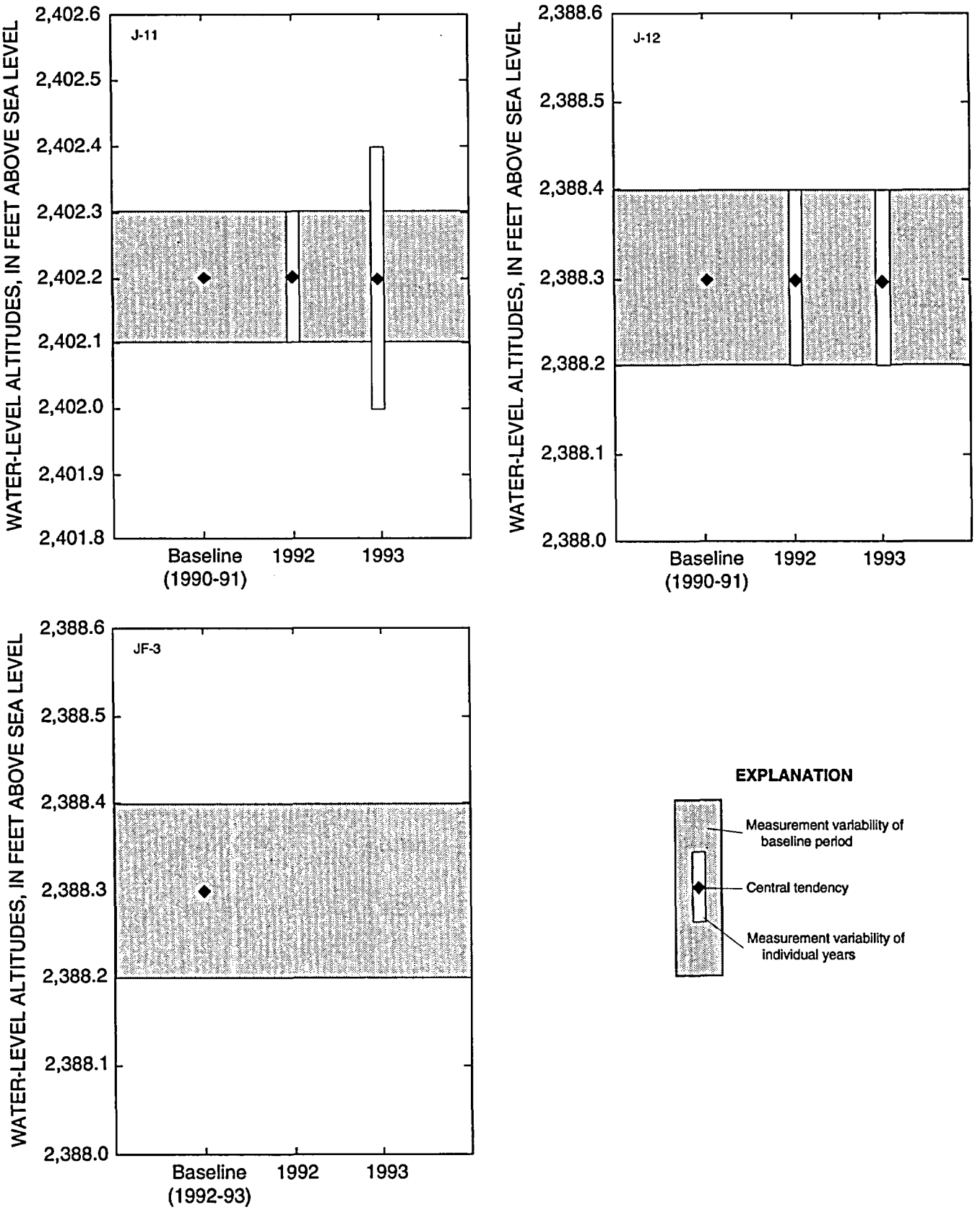

Figure 13. Continued.

Table 5. Periodic measurements of water levels at monitoring sites in Yucca Mountain region for calendar year 1993

Site Number: Sites are grouped by hydrographic area and, within each area, are listed in general north-to-south, then west-to-east order. See text section titled "Site Number" for further discussion.
U.S. Geological Survey site identification: Unique identification number for site as stored in files and data bases of U.S. Geological Survey (USGS).
Land-surface altitude: Altitude of land surface in vicinity of site. Exception is altitude for site AM-4, which is altitude of bolt that serves as measurement point. Altitudes are reported to nearest 0.1 foot and were derived from USGS land surveys, except site MV-1 (for which data is available to nearest foot only).
Height of measurement point: Height of measurement point (MP) most recently used. MP is stable, recoverable point from which periodic measurements to depth of water are made. MP at site AM-4 is bolt fastened to south wall of fissure, and is not referenced to land surface. Negative number indicates MP is below land surface.
Depth to water: Depths listed generally represent water level below land surface. Exceptions are site AM-4, where data represent water level below measurement point, and site AM-2, where negative numbers represent water levels above land surface. Site AM-2 is flowing well with water standing above land surface in casing. Apparent differences in depth to water at sites that list data from several sources may result from differing estimates of distance from land surface to measurement point used.
Method: Method used to measure depth to water. A, average monthly water level, reported for 15th of month; B, depth to water calculated from millivolt output of transducer installed in well and most recent calibration of instrumentation; N, depth to water is read from permanently installed staff or measured below measurement point; S, steel tape; V, calibrated electric-tape; Z, measurement method unknown.
Site status: Known conditions at site that may have affected measured depth to water. F, flowing; R, well recently pumped.
Data source: EMP, Environmental-Monitoring Program (USGS); NDWR, Nevada Division of Water Resources; NPS, National Park Service; PVT, private owner measurement; SCP, Site Characterization Project (USGS); NTS, Environmental Restoration Program (USGS); USFWS, U.S. Fish and Wildlife Service; USGS-NV, other Nevada District Programs.

Site number (plate 1)	U.S. Geological Survey site identification	Site name	Land-surface altitude (feet above sea level)	Height of measurement point (feet above land surface)	Water-level measurement						
					Date	Time	Depth to water (feet below land surface)	Altitude of water surface (feet above sea level)	Method	Site status	Data source
CF-1	365520116370301	Gexa Well 4	3,930.9	1.82	01-14-1993	1245	619.29	3,311.6	V	-	EMP
					02-10-1993	1335	619.31	3,311.6	V	-	EMP
					03-25-1993	1145	619.01	3,311.9	V	-	EMP
					04-23-1993	0930	618.80	3,312.1	V	-	EMP
					05-18-1993	1420	618.71	3,312.2	V	-	EMP
					06-24-1993	0815	618.14	3,312.8	V	-	EMP
					07-22-1993	1030	618.37	3,312.5	V	-	EMP
					08-27-1993	1145	618.38	3,312.5	V	-	EMP
					09-23-1993	1240	618.22	3,312.7	V	-	EMP
					10-19-1993	0810	618.23	3,312.7	V	-	EMP
					11-19-1993	0825	618.27	3,312.6	V	-	EMP
					12-22-1993	1030	618.14	3,312.8	V	-	EMP
CF-1a	365445116383901	Gexa Well 3	4,080.9	1.68	01-14-1993	1110	161.30	3,919.6	S	-	EMP
					02-10-1993	1227	161.40	3,919.5	S	-	EMP
					03-25-1993	1100	160.61	3,920.3	S	-	EMP
					04-23-1993	0807	160.07	3,920.8	S	-	EMP
					05-18-1993	1350	160.39	3,920.5	S	-	EMP
					06-24-1993	0750	160.90	3,920.0	S	-	EMP
					07-22-1993	1000	161.11	3,919.8	S	-	EMP
					08-27-1993	1125	162.16	3,918.7	S	-	EMP
					09-23-1993	1205	161.45	3,919.4	S	-	EMP
					10-19-1993	0750	161.90	3,919.0	S	-	EMP

Table 5. Periodic measurements of water levels at monitoring sites in Yucca Mountain region for calendar year 1993—Continued

Site number (plate 1)	U.S. Geological Survey site identification	Site name	Land-surface altitude (feet above sea level)	Height of measurement point (feet above land surface)	Water-level measurement						
					Date	Time	Depth to water (feet below land surface)	Altitude of water surface (feet above sea level)	Method	Site status	Data source
CF-1a	365445116383901	Gexa Well 3	4,080.9	1.68	11-19-1993	0800	162.02	3,918.9	S	-	EMP
					12-22-1993	1000	163.02	3,917.9	S	-	EMP
CF-2	364732116330701	USW VH-1	3,161.1	1.17	01-13-1993	1147	603.76	2,557.3	S	-	SCP
					02-04-1993	1516	603.75	2,557.4	S	-	SCP
					02-18-1993	0927	603.74	2,557.4	S	-	SCP
					03-02-1993	1615	603.82	2,557.3	S	-	SCP
					03-26-1993	1145	603.72	2,557.4	S	-	SCP
					04-09-1993	0929	603.77	2,557.3	S	-	SCP
					04-22-1993	1030	603.65	2,557.4	S	-	SCP
					05-11-1993	1202	603.75	2,557.4	S	-	SCP
					05-28-1993	1154	603.83	2,557.3	S	-	SCP
					06-14-1993	1157	603.80	2,557.3	S	-	SCP
					06-25-1993	1028	603.81	2,557.3	S	-	SCP
					07-16-1993	1236	603.85	2,557.2	S	-	SCP
					11-09-1993	0835	603.98	2,557.1	V	-	EMP
					11-09-1993	0858	603.98	2,557.1	S	-	SCP
					12-23-1993	1136	604.04	2,557.1	S	-	SCP
JF-1	365116116233801	UE-25 WT 15	3,553.8	0.18	02-01-1993	1238	1,161.27	2,392.5	S	-	SCP
					03-01-1993	1029	1,161.40	2,392.4	S	-	SCP
					03-29-1993	1355	1,161.07	2,392.7	S	-	SCP
					05-05-1993	1325	1,161.07	2,392.7	S	-	SCP
					05-24-1993	0951	1,161.22	2,392.6	S	-	SCP
					06-21-1993	1038	1,161.28	2,392.5	S	-	SCP
					11-18-1993	1428	1,161.49	2,392.3	S	-	SCP
					12-22-1993	1455	1,161.94	2,391.9	S	-	SCP
JF-2	364945116235001	UE-25 WT 13	3,387.5	1.00	02-15-1993	1139	995.20	2,392.3	B	-	SCP
					06-02-1993	1243	995.13	2,392.4	B	-	SCP
					09-30-1993	0848	995.36	2,392.1	B	-	SCP

Table 5. Periodic measurements of water levels at monitoring sites in Yucca Mountain region for calendar year 1993—Continued

Site number (plate 1)	U.S. Geological Survey site identification	Site name	Land-surface altitude (feet above sea level)	Height of measure-ment point (feet above land surface)	Water-level measurement						
					Date	Time	Depth to water (feet below land surface)	Altitude of water surface (feet above sea level)	Method	Site status	Data source
JF-2a	364938116252102	UE-25p 1 PTH	3,655.5	0.56	03-16-1993	0938	1,186.87	2,468.6	B	-	SCP
					03-17-1993	1011	1,186.65	2,468.9	B	-	SCP
					04-13-1993	1243	1,186.67	2,468.8	B	-	SCP
					08-02-1993	1023	1,186.76	2,468.7	B	-	SCP
					12-12-1993	1005	1,186.73	2,468.8	B	-	SCP
J-13	364828116234001	J-13 WW	3,317.9	1.11	01-19-1993	1358	927.90	2,390.0	S	-	SCP
					02-01-1993	1119	927.98	2,389.9	S	-	SCP
					02-08-1993	1304	927.21	2,390.7	S	-	SCP
					03-01-1993	1205	927.96	2,389.9	S	-	SCP
					03-15-1993	1140	927.87	2,390.0	S	-	SCP
					03-30-1993	1044	927.92	2,390.0	S	-	SCP
					04-21-1993	1134	928.06	2,389.8	S	-	SCP
					04-28-1993	0948	928.16	2,389.7	S	-	SCP
					05-14-1993	1002	928.02	2,389.9	S	-	SCP
					06-01-1993	0958	927.82	2,390.1	S	-	SCP
					06-11-1993	1406	927.85	2,390.0	S	-	SCP
					06-29-1993	1041	927.80	2,390.1	S	-	SCP
					11-08-1993	1048	928.07	2,389.8	S	-	SCP
					12-01-1993	1053	928.19	2,389.7	S	-	SCP
					12-10-1993	1358	928.01	2,389.9	S	-	SCP
					12-30-1993	1025	928.00	2,389.9	S	-	SCP
J-11	364706116170601	J-11 WW	3,442.8	2.11	02-02-1993	1307	1,040.57	2,402.2	S	-	SCP
					03-04-1993	1042	1,040.87	2,401.9	S	-	SCP
					03-30-1993	1118	1,040.60	2,402.2	S	-	SCP
					05-05-1993	1126	1,040.47	2,402.3	S	-	SCP
					06-01-1993	1108	1,040.47	2,402.3	S	-	SCP
					06-21-1993	1152	1,040.50	2,402.3	S	-	SCP
					12-01-1993	1129	1,040.72	2,402.1	S	-	SCP
					12-15-1993	1003	1,040.14	2,402.7	S	-	SCP
J-12	364554116232401	J-12 WW	3,128.4	5.04	01-19-1993	1324	740.13	2,388.3	S	-	SCP
					02-01-1993	1041	739.98	2,388.4	S	-	SCP
					02-08-1993	1232	739.44	2,389.0	S	-	SCP
					03-01-1993	1252	740.13	2,388.3	S	-	SCP
					03-08-1993	1216	740.01	2,388.4	S	-	SCP

Table 5. Periodic measurements of water levels at monitoring sites in Yucca Mountain region for calendar year 1993—Continued

Site number (plate 1)	U.S. Geological Survey site identification	Site name	Land-surface altitude (feet above sea level)	Height of measure-ment point (feet above land surface)	Water-level measurement						
					Date	Time	Depth to water (feet below land surface)	Altitude of water surface (feet above sea level)	Method	Site status	Data source
J-12	364554116232401	J-12 WW	3,128.4	5.04	03-30-1993	1016	740.08	2,388.3	S	-	SCP
					03-31-1993	1034	740.09	2,388.3	S	-	SCP
					03-31-1993	1051	740.09	2,388.3	V	-	EMP
					04-12-1993	1402	739.98	2,388.4	S	-	SCP
					04-28-1993	0900	740.11	2,388.3	S	-	SCP
					05-11-1993	1007	739.83	2,388.6	S	-	SCP
					06-01-1993	1033	739.96	2,388.4	S	-	SCP
					06-11-1993	1336	739.95	2,388.4	S	-	SCP
					06-29-1993	1113	739.96	2,388.4	S	-	SCP
					11-08-1993	1018	740.18	2,388.2	S	-	SCP
					11-08-1993	1038	740.18	2,388.2	V	-	EMP
					12-01-1993	1007	740.46	2,387.9	S	-	SCP
					12-10-1993	1325	740.20	2,388.2	S	-	SCP
					12-30-1993	0959	740.17	2,388.2	S	-	SCP
JF-3	364528116232201	JF-3	3,098.3	2.27	01-14-1993	0810	710.02	2,388.3	V	-	EMP
					02-09-1993	1615	709.88	2,388.4	V	-	EMP
					03-22-1993	1600	709.92	2,388.4	V	-	EMP
					03-31-1993	1155	710.07	2,388.2	V	-	EMP
					04-22-1993	1622	709.63	2,388.7	V	-	EMP
					04-28-1993	0955	710.13	2,388.2	V	-	EMP
					05-19-1993	1020	709.99	2,388.3	V	-	EMP
					06-23-1993	0720	709.97	2,388.3	V	-	EMP
					06-30-1993	1110	709.94	2,388.4	V	-	EMP
					07-21-1993	1135	709.91	2,388.4	V	-	EMP
					08-27-1993	0935	710.14	2,388.2	V	-	EMP
					09-24-1993	0925	710.35	2,388.0	V	-	EMP
					10-06-1993	1452	709.97	2,388.3	V	-	EMP
					10-20-1993	0853	710.44	2,387.9	V	-	EMP
					11-08-1993	1212	710.09	2,388.2	V	-	EMP
					11-08-1993	1225	710.07	2,388.2	V	-	EMP
					11-08-1993	1435	710.08	2,388.2	V	-	EMP
					11-08-1993	1500	710.07	2,388.2	V	-	EMP
					12-14-1993	1255	709.94	2,388.4	V	-	EMP

Table 5. Periodic measurements of water levels at monitoring sites in Yucca Mountain region for calendar year 1993—Continued

Site number (plate 1)	U.S. Geological Survey site identification	Site name	Land-surface altitude (feet above sea level)	Height of measure-ment point (feet above land surface)	Water-level measurement						
					Date	Time	Depth to water (feet below land surface)	Altitude of water surface (feet above sea level)	Method	Site status	Data source
RV-1	363815116175901	TW-5	3,056.0	1.60	01-13-1993	1015	678.07	2,377.9	V	-	EMP
					02-10-1993	0920	678.10	2,377.9	V	-	EMP
					03-25-1993	0830	677.99	2,378.0	V	-	EMP
					04-22-1993	1500	677.82	2,378.2	V	-	EMP
					05-27-1993	1220	678.02	2,378.0	V	-	EMP
					06-24-1993	0500	678.18	2,377.8	V	-	EMP
					07-22-1993	0800	678.14	2,377.9	V	-	EMP
					08-27-1993	0720	677.98	2,378.0	V	-	EMP
					09-27-1993	1135	677.97	2,378.0	V	-	EMP
					10-20-1993	0710	677.85	2,378.2	V	-	EMP
					11-19-1993	1105	678.00	2,378.0	V	-	EMP
					12-22-1993	0757	677.97	2,378.0	V	-	EMP
AD-1	364141116351401	NA-6 Well BGMW-10	2,627.9	1.70	01-10-1990	-	269.5	2,358.4	Z	-	PVT[a]
					02-07-1990	-	269.4	2,358.5	Z	-	PVT
					03-14-1990	-	269.6	2,358.3	Z	-	PVT
					04-11-1990	-	269.5	2,358.4	Z	-	PVT
					05-11-1990	-	269.5	2,358.4	Z	-	PVT
					06-14-1990	-	269.5	2,358.4	Z	-	PVT
					07-13-1990	-	269.6	2,358.3	Z	-	PVT
					08-15-1990	-	269.6	2,358.3	Z	-	PVT
					09-07-1990	-	269.5	2,358.4	Z	-	PVT
					10-16-1990	-	269.5	2,358.4	Z	-	PVT
					11-13-1990	-	269.5	2,358.4	Z	-	PVT
					12-17-1990	-	269.7	2,358.2	Z	-	PVT
					01-27-1991	-	269.6	2,358.3	Z	-	PVT
					02-27-1991	-	269.3	2,358.6	Z	-	PVT
					03-15-1991	-	269.4	2,358.5	Z	-	PVT
					04-22-1991	-	269.5	2,358.4	Z	-	PVT
					05-24-1991	-	269.6	2,358.3	Z	-	PVT
					08-21-1991	-	269.55	2,358.4	Z	-	PVT
					12-09-1991	-	269.75	2,358.2	Z	-	PVT
					03-10-1992	-	269.8	2,358.1	Z	-	PVT

Table 5. Periodic measurements of water levels at monitoring sites in Yucca Mountain region for calendar year 1993—Continued

Site number (plate 1)	U.S. Geological Survey site identification	Site name	Land-surface altitude (feet above sea level)	Height of measurement point (feet above land surface)	Water-level measurement						
					Date	Time	Depth to water (feet below land surface)	Altitude of water surface (feet above sea level)	Method	Site status	Data source
AD-1	364141116351401	NA-6 Well BGMW-10	2,627.9	1.70	04-24-1992	-	269.7	2,358.2	Z	-	PVT
					09-03-1992	-	269.7	2,358.2	Z	-	PVT
					12-23-1992	-	269.9	2,358.0	Z	-	PVT
					01-15-1993	1430	269.48	2,358.4	V	-	EMP
					02-10-1993	1125	269.66	2,358.2	S	-	EMP
					03-22-1993	-	269.50	2,358.4	Z	-	PVT
					03-25-1993	0940	269.42	2,358.5	V	-	EMP
					04-22-1993	1204	269.25	2,358.6	S	-	EMP
					05-18-1993	1605	269.26	2,358.6	V	-	EMP
					06-24-1993	1005	269.57	2,358.3	V	-	EMP
					07-22-1993	1130	269.43	2,358.5	V	-	EMP
					08-27-1993	1309	269.37	2,358.5	V	-	EMP
					09-23-1993	1404	269.46	2,358.4	V	-	EMP
					10-19-1993	0955	269.53	2,358.4	V	-	EMP
					11-19-1993	0925	269.64	2,358.3	V	-	EMP
					12-22-1993	1130	269.58	2,358.3	V	-	EMP
AD-2	363830116241401	Airport Well	2,638.8	1.05	01-13-1993	1200	324.45	2,314.4	V	-	EMP
					02-19-1993	0810	324.31	2,314.5	V	-	EMP
					03-24-1993	1120	324.49	2,314.3	V	-	EMP
					04-21-1993	1140	324.57	2,314.2	V	-	EMP
					05-18-1993	1230	324.50	2,314.3	V	-	EMP
					06-22-1993	1320	324.55	2,314.2	V	-	EMP
					07-21-1993	1015	324.58	2,314.2	V	-	EMP
					08-26-1993	0945	324.74	2,314.1	V	-	EMP
					09-24-1993	0830	324.76	2,314.0	V	-	EMP
					10-19-1993	1105	324.64	2,314.2	V	-	EMP
					11-18-1993	0925	324.67	2,314.1	V	-	EMP
					12-21-1993	0700	324.58	2,314.2	V	-	EMP
AD-2a	363835116234001	NDOT Well	2,656.8	0.40	01-13-1993	1115	342.29	2,314.5	V	-	EMP
					02-19-1993	0745	341.85	2,315.0	V	-	EMP
					03-24-1993	1135	342.02	2,314.8	V	-	EMP
					04-29-1993	0935	342.13	2,314.7	S	-	EMP
					05-18-1993	1215	342.26	2,314.5	V	-	EMP

Table 5. Periodic measurements of water levels at monitoring sites in Yucca Mountain region for calendar year 1993—Continued

Site number (plate 1)	U.S. Geological Survey site identification	Site name	Land-surface altitude (feet above sea level)	Height of measure-ment point (feet above land surface)	Water-level measurement						
					Date	Time	Depth to water (feet below land surface)	Altitude of water surface (feet above sea level)	Method	Site status	Data source
AD-2a	363835116234001	NDOT Well	2,656.8	0.40	06-23-1993	0800	342.11	2,314.7	V		EMP
					07-21-1993	0950	343.03	2,313.8	V	R	EMP
					08-27-1993	0845	343.21	2,313.6	V	R	EMP
					09-24-1993	0815	343.56	2,313.2	V	R	EMP
					10-19-1993	1050	342.56	2,314.2	V	-	EMP
					11-18-1993	1030	342.24	2,314.6	S	-	EMP
					12-09-1993	1520	342.13	2,314.7	S	-	EMP
AD-3	363434116354001	Defir Well	2,385.4	0.60	01-13-1993	1315	120.48	2,264.9	V	-	EMP
					02-19-1993	0930	120.42	2,265.0	V	-	EMP
					03-24-1993	0955	120.23	2,265.2	V	-	EMP
AD-4a	363428116234701	Cooks East Well	2,477.8	1.00	01-13-1993	1225	117.31	2,360.5	V	-	EMP
					02-19-1993	0840	117.39	2,360.4	V	-	EMP
					03-24-1993	1030	117.64	2,360.2	V	-	EMP
					04-21-1993	1115	117.89	2,359.9	V	-	EMP
					05-19-1993	1110	117.94	2,359.9	V	-	EMP
					06-22-1993	1300	118.03	2,359.8	V	-	EMP
					07-21-1993	1035	118.21	2,359.6	V	-	EMP
					08-26-1993	0925	118.47	2,359.3	V	-	EMP
					09-24-1993	1015	118.55	2,359.2	V	-	EMP
					10-19-1993	1120	118.63	2,359.2	V	-	EMP
					11-18-1993	0908	118.35	2,359.4	V	-	EMP
					12-21-1993	0721	118.74	2,359.1	V	-	EMP
AD-5	363310116294001	USBLM Well	2,376.4	0.00	01-13-1993	1250	119.76	2,256.6	S	-	EMP
					02-19-1993	0906	118.52	2,257.9	S	-	EMP
					03-24-1993	0930	118.42	2,258.0	S	-	EMP
					04-22-1993	1143	117.91	2,258.5	S	-	USGS-NV
					04-29-1993	1125	118.58	2,257.8	S	-	EMP
					05-19-1993	1140	119.63	2,256.8	S	-	EMP
					06-22-1993	0723	119.45	2,257.0	S	-	EMP
					07-20-1993	1330	120.52	2,255.9	S	-	EMP
					08-24-1993	1255	121.29	2,255.1	S	-	EMP
					09-24-1993	1035	119.95	2,256.4	S	-	EMP

Table 5. Periodic measurements of water levels at monitoring sites in Yucca Mountain region for calendar year 1993—Continued

Site number (plate 1)	U.S. Geological Survey site identification	Site name	Land-surface altitude (feet above sea level)	Height of measurement point (feet above land surface)	Water-level measurement						
					Date	Time	Depth to water (feet below land surface)	Altitude of water surface (feet above sea level)	Method	Site status	Data source
AD-5	363310116294001	USBLM Well	2,376.4	0.00	10-19-1993	1147	120.40	2,256.0	S	-	EMP
					11-18-1993	0720	120.05	2,256.4	S	-	EMP
					12-21-1993	0750	119.64	2,256.8	S	-	EMP
AD-6	363213116133800	Tracer Well 3	2,402.3	0.40	01-13-1993	0830	41.40	2,360.9	S	-	EMP
					02-16-1993	2100	41.48	2,360.8	S	-	EMP
					03-22-1993	1740	41.26	2,361.0	V	-	EMP
					03-24-1993	1305	41.39	2,360.9	S	-	EMP
					04-21-1993	1251	41.43	2,360.9	S	-	EMP
					05-06-1993	1345	41.46	2,360.8	S	-	EMP
					05-18-1993	1008	41.46	2,360.8	S	-	EMP
					06-23-1993	0505	41.38	2,360.9	S	-	EMP
					07-21-1993	0805	41.37	2,360.9	S	-	EMP
					08-26-1993	1311	41.52	2,360.8	S	-	EMP
					09-23-1993	0855	41.56	2,360.7	S	-	EMP
					09-23-1993	1008	41.56	2,360.7	S	-	EMP
					10-06-1993	1130	41.48	2,360.8	S	-	EMP
					10-19-1993	1443	41.55	2,360.8	S	-	EMP
					10-27-1993	1020	41.62	2,360.7	S	-	EMP
					10-28-1993	0940	41.47	2,360.8	S	-	EMP
					11-09-1993	1530	41.53	2,360.8	S	-	EMP
					12-14-1993	1017	41.43	2,360.9	S	-	EMP
AD-7	363009116302701	Hallowell Well	2,305.0	0.20	01-13-1993	1345	63.64	2,241.4	S	-	EMP
					02-19-1993	1005	63.13	2,241.9	S	-	EMP
					03-11-1993	--	63.28	2,241.7	Z	-	NDWR
					03-24-1993	0910	62.94	2,242.1	S	-	EMP
					04-21-1993	1011	63.56	2,241.4	S	-	EMP
					05-19-1993	1300	63.90	2,241.1	S	-	EMP
					06-22-1993	0704	65.41	2,239.6	S	-	EMP
					07-20-1993	1305	66.75	2,238.2	S	-	EMP
					08-24-1993	1230	67.68	2,237.3	S	-	EMP
					09-24-1993	1100	68.24	2,236.8	S	-	EMP
					10-19-1993	1220	66.85	2,238.2	S	-	EMP
					11-16-1993	1600	66.23	2,238.8	S	-	EMP
					12-21-1993	0814	65.22	2,239.8	S	-	EMP

Table 5. Periodic measurements of water levels at monitoring sites in Yucca Mountain region for calendar year 1993—Continued

Site number (plate 1)	U.S. Geological Survey site identification	Site name	Land-surface altitude (feet above sea level)	Height of measure-ment point (feet above land surface)	Water-level measurement						
					Date	Time	Depth to water (feet below land surface)	Altitude of water surface (feet above sea level)	Method	Site status	Data source
AD-8	362929116085701	Cherry Patch Well	2,394.3	0.60	01-12-1993	0930	34.82	2,359.5	S	-	EMP
					02-19-1993	0640	34.73	2,359.6	S	-	EMP
					03-23-1993	0925	34.78	2,359.5	S	-	EMP
					04-20-1993	0921	34.60	2,359.7	S	-	EMP
					04-22-1993	1040	34.65	2,359.6	S	-	USGS-NV
					05-18-1993	0910	35.67	2,358.6	S	-	EMP
					06-21-1993	1042	34.80	2,359.5	S	-	EMP
					07-19-1993	1120	34.65	2,359.6	S	-	EMP
					08-26-1993	1210	33.46	2,360.8	S	-	EMP
					09-27-1993	1020	34.22	2,360.1	S	-	EMP
					10-18-1993	1039	33.74	2,360.6	S	-	EMP
					11-15-1993	1035	33.66	2,360.6	S	-	EMP
					12-20-1993	0955	33.65	2,360.6	S	-	EMP
AD-9	362848116264201	Gilgans North Well	2,264.8	0.10	01-13-1993	1415	70.98	2,193.8	S	-	EMP
					02-19-1993	1034	70.53	2,194.3	S	-	EMP
					03-11-1993	--	73.76	2,191.0	Z	-	NDWR
					03-24-1993	0845	72.12	2,192.7	S	-	EMP
					04-21-1993	0930	74.35	2,190.4	S	-	EMP
					05-19-1993	1320	76.80	2,188.0	S	-	EMP
					06-22-1993	0644	77.64	2,187.2	S	-	EMP
					07-20-1993	1245	78.66	2,186.1	S	-	EMP
					08-23-1993	1505	77.43	2,187.4	S	-	EMP
					09-24-1993	1115	77.50	2,187.3	S	-	EMP
					10-19-1993	1245	75.80	2,189.0	S	-	EMP
					10-19-1993	1400	76.30	2,188.5	Z	-	NDWR
					11-16-1993	1540	74.13	2,190.7	S	-	EMP
					12-21-1993	0830	73.04	2,191.8	S	-	EMP
AD-10	362525116274301	NA-9 Well	2,190.9	1.30	01-13-1993	1440	8.09	2,182.8	S	-	EMP
					02-19-1993	1100	8.20	2,182.7	S	-	EMP
					03-23-1993	1515	8.48	2,182.4	S	-	EMP
					04-20-1993	1420	8.75	2,182.2	S	-	EMP
					05-19-1993	1425	8.63	2,182.3	S	-	EMP

Table 5. *Periodic measurements of water levels at monitoring sites in Yucca Mountain region for calendar year 1993—Continued*

Site number (plate 1)	U.S. Geological Survey site identification	Site name	Land-surface altitude (feet above sea level)	Height of measurement point (feet above land surface)	Water-level measurement						
					Date	Time	Depth to water (feet below land surface)	Altitude of water surface (feet above sea level)	Method	Site status	Data source
AD-10	362525116274301	NA-9 Well	2,190.9	1.30	06-21-1993	1418	8.46	2,182.4	S	-	EMP
					07-19-1993	1525	8.90	2,182.0	S	-	EMP
					08-23-1993	1425	9.18	2,181.7	S	-	EMP
					09-24-1993	1200	9.42	2,181.5	S	-	EMP
					10-19-1993	1305	9.62	2,181.3	S	-	EMP
					11-16-1993	1515	9.63	2,181.3	S	-	EMP
					12-21-1993	0900	9.65	2,181.2	S	-	EMP
AD-11	361954116181201	GS-3 Well	2,351.3	2.00	01-12-1993	1120	226.12	2,125.2	S	-	EMP
					02-25-1993	1015	226.08	2,125.2	S	-	EMP
					03-23-1993	1110	225.92	2,125.4	S	-	EMP
					04-29-1993	1525	225.65	2,125.6	S	-	EMP
					05-21-1993	1505	225.36	2,125.9	S	-	EMP
					06-21-1993	1240	225.07	2,126.2	S	-	EMP
					07-19-1993	1315	224.95	2,126.4	S	-	EMP
					08-23-1993	1215	224.64	2,126.7	S	-	EMP
					08-23-1993	1217	224.63	2,126.7	S	-	NTS
					09-22-1993	1350	224.55	2,126.8	S	-	EMP
					10-18-1993	1235	224.70	2,126.6	S	-	EMP
					11-15-1993	1220	224.79	2,126.5	S	-	EMP
					12-20-1993	1202	225.03	2,126.3	S	-	EMP
AD-12	362014116133901	GS-1 Well	2,430.3	2.00	01-12-1993	1040	80.65	2,349.6	S	-	EMP
					02-19-1993	1345	80.57	2,349.7	S	-	EMP
					03-23-1993	1030	80.52	2,349.8	S	-	EMP
					04-20-1993	1025	80.46	2,349.8	S	-	EMP
					05-21-1993	1435	80.40	2,349.9	S	-	EMP
					06-21-1993	1154	80.38	2,349.9	S	-	EMP
					07-19-1993	1215	80.46	2,349.8	S	-	EMP
					08-23-1993	1110	80.45	2,349.8	S	-	EMP
					08-23-1993	1127	80.47	2,349.8	S	-	NTS
					09-22-1993	1315	80.45	2,349.8	S	-	EMP
					10-18-1993	1200	80.51	2,349.8	S	-	EMP
					11-15-1993	1130	80.42	2,349.9	S	-	EMP
					12-20-1993	1120	80.47	2,349.8	S	-	EMP

Table 5. Periodic measurements of water levels at monitoring sites in Yucca Mountain region for calendar year 1993—Continued

Site number (plate 1)	U.S. Geological Survey site identification	Site name	Land-surface altitude (feet above sea level)	Height of measure-ment point (feet above land surface)	Water-level measurement						
					Date	Time	Depth to water (feet below land surface)	Altitude of water surface (feet above sea level)	Method	Site status	Data source
AD-13	361724116324201	S-1 Well	2,703.2	2.00	01-12-1993	1350	382.44	2,320.8	S	-	EMP
					02-18-1993	1600	382.30	2,320.9	V	-	EMP
					03-25-1993	1425	382.06	2,321.1	V	-	EMP
					04-29-1993	1350	382.13	2,321.1	S	-	EMP
					05-20-1993	1600	382.29	2,320.9	V	-	EMP
					06-22-1993	1115	381.90	2,321.3	V	-	EMP
					07-19-1993	1415	381.96	2,321.2	V	-	EMP
					08-23-1993	1330	381.87	2,321.3	V	-	EMP
					09-22-1993	1455	381.18	2,322.0	V	-	EMP
					10-18-1993	1335	381.42	2,321.8	V	-	EMP
					11-15-1993	1440	381.81	2,321.4	S	-	EMP
					12-09-1993	1225	381.40	2,321.8	S	-	EMP
AD-14	361817116244701	Death Valley Jct Well	2,041.8	0.70	01-12-1993	1230	3.71	2,038.1	S	-	EMP
					02-18-1993	1634	3.35	2,038.4	S	-	EMP
					03-25-1993	1145	3.33	2,038.5	S	-	EMP
					04-20-1993	1108	3.03	2,038.8	S	-	EMP
					05-20-1993	0625	3.38	2,038.4	S	-	EMP
					06-21-1993	1318	3.44	2,038.4	S	-	EMP
					07-19-1993	1400	3.70	2,038.1	S	-	EMP
					08-23-1993	1305	4.09	2,037.7	S	-	EMP
					09-22-1993	1430	4.29	2,037.5	S	-	EMP
					10-18-1993	1314	4.00	2,037.8	S	-	EMP
					11-15-1993	1335	4.27	2,037.5	S	-	EMP
					12-20-1993	1235	3.85	2,038.0	S	-	EMP
AM-1	362858116195301	Roger Spring Well	2,265.9	0.10	01-21-1993	1045	2.75	2,263.2	S	-	EMP
					01-26-1993	--	2.78	2,263.1	S	-	USFWS
					02-16-1993	1813	2.75	2,263.2	S	-	EMP
					02-25-1993	--	2.70	2,263.2	S	-	USFWS
					03-23-1993	1725	2.79	2,263.1	S	-	EMP
					03-29-1993	--	2.78	2,263.1	S	-	USFWS
					04-21-1993	0720	2.95	2,263.0	S	-	EMP
					04-29-1993	--	3.02	2,262.9	S	-	USFWS
					05-21-1993	1350	3.15	2,262.8	S	-	EMP
					05-27-1993	--	3.18	2,262.7	S	-	USFWS

Table 5. Periodic measurements of water levels at monitoring sites in Yucca Mountain region for calendar year 1993—Continued

Site number (plate 1)	U.S. Geological Survey site identification	Site name	Land-surface altitude (feet above sea level)	Height of measurement point (feet above land surface)	Water-level measurement						
					Date	Time	Depth to water (feet below land surface)	Altitude of water surface (feet above sea level)	Method	Site status	Data source
AM-1	362858116195301	Roger Spring Well	2,265.9	0.10	06-23-1993	1050	3.30	2,262.6	S	-	EMP
					06-29-1993	--	3.42	2,262.5	S	-	USFWS
					07-20-1993	1040	3.78	2,262.1	S	-	EMP
					07-22-1993	1442	3.79	2,262.1	S	-	NTS
					07-26-1993	1000	3.80	2,262.1	S	-	USFWS
					08-26-1993	0635	4.03	2,261.9	S	-	EMP
					08-30-1993	1350	3.95	2,262.0	S	-	USFWS
					09-24-1993	1255	3.79	2,262.1	S	-	EMP
					09-29-1993	1412	3.68	2,262.2	S	-	USFWS
					10-20-1993	1100	3.38	2,262.5	S	-	EMP
					10-27-1993	1415	3.23	2,262.7	S	-	USFWS
					11-17-1993	0715	2.98	2,262.9	S	-	EMP
					11-29-1993	1608	2.82	2,263.1	S	-	USFWS
					12-21-1993	0955	2.78	2,263.1	S	-	EMP
					12-28-1993	0924	2.77	2,263.1	S	-	USFWS
AM-2	362755116190401	Five Springs Well	2,367.4	1.17	01-15-1993	1230	-0.75	2,368.2	S	F	EMP
					02-16-1993	1745	-.72	2,368.1	S	F	EMP
					03-23-1993	1700	-.72	2,368.1	S	F	EMP
					04-21-1993	0640	-.72	2,368.1	S	F	EMP
					05-21-1993	1330	-.44	2,367.8	S	F	EMP
					05-25-1993	1530	-.23	2,367.6	S	F	EMP
					06-23-1993	1015	-.22	2,367.6	S	F	EMP
					07-14-1993	1527	-.22	2,367.6	S	F	NTS
					07-20-1993	1100	-.23	2,367.6	S	F	EMP
					07-28-1993	1603	-.25	2,367.6	S	F	NTS
					08-26-1993	0700	-.24	2,367.6	S	F	EMP
					09-24-1993	1300	-.28	2,367.7	S	F	EMP
					10-20-1993	1110	-.36	2,367.8	S	F	EMP
					11-17-1993	0725	-.48	2,367.9	S	F	EMP
					12-21-1993	1100	-.52	2,367.9	S	F	EMP
AM-3	362555116205301	Garners Well	2,157.0	1.15	01-14-1993	1450	19.05	2,138.0	S	-	EMP
					02-19-1993	1150	17.78	2,139.2	S	-	EMP
					03-23-1993	1635	15.54	2,141.5	S	-	EMP
					04-20-1993	1521	15.59	2,141.4	S	-	EMP
					05-19-1993	1541	17.45	2,139.6	S	-	EMP

Table 5. Periodic measurements of water levels at monitoring sites in Yucca Mountain region for calendar year 1993—Continued

Site number (plate 1)	U.S. Geological Survey site identification	Site name	Land-surface altitude (feet above sea level)	Height of measure-ment point (feet above land surface)	Water-level measurement						
					Date	Time	Depth to water (feet below land surface)	Altitude of water surface (feet above sea level)	Method	Site status	Data source
AM-3	362555116205301	Garners Well	2,157.0	1.15	06-23-1993	0840	17.12	2,139.9	S	-	EMP
					07-14-1993	0652	17.64	2,139.4	S	-	NTS
					07-20-1993	0720	17.74	2,139.3	S	-	EMP
					08-25-1993	0610	18.57	2,138.4	S	-	EMP
					09-24-1993	1230	19.11	2,137.9	S	-	EMP
					10-20-1993	1040	19.36	2,137.6	S	-	EMP
					11-17-1993	0645	19.43	2,137.6	S	-	EMP
					12-21-1993	0930	19.34	2,137.7	S	-	EMP
AM-4	362532116172700	Devils Hole	2,359.9	--	02-15-1993	--	1.94	2,358.0	A	-	NPS
					02-16-1993	1613	1.86	2,358.0	N	-	EMP
					03-15-1993	--	1.90	2,358.0	A	-	NPS
					04-15-1993	--	1.88	2,358.0	A	-	NPS
					05-15-1993	--	1.87	2,358.0	A		NPS
					05-21-1993	--	2.01	2,357.9	N	-	EMP
					06-15-1993	--	1.87	2,358.0	A	-	NPS
					08-15-1993	--	1.89	2,358.0	A	-	NPS
					08-25-1993	0830	1.90	2,358.0	N	-	EMP
					09-15-1993	--	1.95	2,358.0	A	-	NPS
					10-15-1993	--	1.97	2,357.9	A	-	NPS
					11-15-1993	--	2.00	2,357.9	A	-	NPS
					11-17-1993	1148	1.95	2,358.0	N	-	EMP
					12-15-1993	--	2.02	2,357.9	A	-	NPS
AM-5	362529116171100	Devils Hole Well	2,404.1	0.9	01-14-1993	1505	47.90	2,356.2	S	-	EMP
					01-26-1993	1115	47.94	2,356.2	S	-	USFWS
					02-16-1993	1623	47.84	2,356.3	S	-	EMP
					02-25-1993	1536	47.90	2,356.2	S	-	USFWS
					03-24-1993	0715	47.81	2,356.3	S	-	EMP
					03-29-1993	1128	47.87	2,356.2	S	-	USFWS
					04-21-1993	0750	47.89	2,356.2	S	-	EMP
					04-29-1993	1148	47.87	2,356.2	S	-	USFWS
					05-19-1993	1600	47.76	2,356.3	S	-	EMP
					05-27-1993	--	47.77	2,356.3	S	-	USFWS

Table 5. Periodic measurements of water levels at monitoring sites in Yucca Mountain region for calendar year 1993—Continued

Site number (plate 1)	U.S. Geological Survey site identification	Site name	Land-surface altitude (feet above sea level)	Height of measurement point (feet above land surface)	Water-level measurement						
					Date	Time	Depth to water (feet below land surface)	Altitude of water surface (feet above sea level)	Method	Site status	Data source
AM-5	362529116171100	Devils Hole Well	2,404.1	0.9	06-23-1993	0900	47.81	2,356.3	S	-	EMP
					06-29-1993	1228	47.83	2,356.3	S	-	USFWS
					07-12-1993	1326	47.87	2,356.2	S	-	NTS
					07-20-1993	0740	47.84	2,356.3	S	-	EMP
					07-26-1993	1234	47.84	2,356.3	S	-	USFWS
					08-25-1993	0625	47.94	2,356.2	S	-	EMP
					08-30-1993	1100	47.99	2,356.1	S	-	USFWS
					08-31-1993	1220	47.96	2,356.1	S	-	NTS
					09-22-1993	1019	47.90	2,356.2	S	-	NTS
					09-24-1993	1340	47.98	2,356.1	S	-	EMP
					09-29-1993	1055	48.00	2,356.1	S	-	NTS
					09-29-1993	1219	47.98	2,356.1	S	-	USFWS
					10-08-1993	1114	47.88	2,356.2	S	-	NTS
					10-20-1993	1200	48.03	2,356.1	S	-	EMP
					10-21-1993	0838	48.01	2,356.1	S	-	NTS
					10-21-1993	1611	47.96	2,356.1	S	-	NTS
					10-27-1993	1515	47.96	2,356.1	S	-	USFWS
					11-17-1993	1003	48.00	2,356.1	S	-	EMP
					11-23-1993	1525	47.93	2,356.2	S	-	NTS
					11-29-1993	1020	48.00	2,356.1	S	-	USFWS
					12-16-1993	0940	47.98	2,356.1	S	-	NTS
					12-21-1993	1145	48.00	2,356.1	S	-	EMP
					12-22-1993	1331	48.06	2,356.0	S	-	NTS
					12-28-1993	1442	48.04	2,356.1	S	-	USFWS
AM-6	362432116165701	Point of Rocks North Well	2,318.8	0.0	01-14-1993	1530	21.10	2,297.7	S	-	EMP
					01-26-1993	1130	21.01	2,297.8	S	-	USFWS
					02-19-1993	1235	20.88	2,297.9	S	-	EMP
					02-25-1993	1415	20.86	2,297.9	S	-	USFWS
					03-24-1993	0745	20.98	2,297.8	S	-	EMP
					03-29-1993	1250	20.99	2,297.8	S	-	USFWS
					04-21-1993	0820	21.13	2,297.7	S	-	EMP
					04-29-1993	1243	21.18	2,297.6	S	-	USFWS
					05-21-1993	0745	21.20	2,297.6	S	-	EMP
					05-27-1993	--	21.25	2,297.6	S	-	USFWS

Table 5. Periodic measurements of water levels at monitoring sites in Yucca Mountain region for calendar year 1993—Continued

Site number (plate 1)	U.S. Geological Survey site identification	Site name	Land-surface altitude (feet above sea level)	Height of measure-ment point (feet above land surface)	Water-level measurement						
					Date	Time	Depth to water (feet below land surface)	Altitude of water surface (feet above sea level)	Method	Site status	Data source
AM-6	362432116165701	Point of Rocks North Well	2,318.8	0.0	06-23-1993	0930	21.32	2,297.5	S	-	EMP
					06-29-1993	1405	21.34	2,297.5	S	-	USFWS
					07-12-1993	1603	21.32	2,297.5	S	-	NTS
					07-20-1993	0925	21.43	2,297.4	S	-	EMP
					07-26-1993	1407	21.50	2,297.3	S	-	USFWS
					08-25-1993	0655	21.50	2,297.3	S	-	EMP
					08-30-1993	0825	21.53	2,297.3	S	-	USFWS
					09-24-1993	1410	21.50	2,297.3	S	-	EMP
					09-29-1993	0831	21.48	2,297.3	S	-	USFWS
					10-20-1993	1220	21.43	2,297.4	S	-	EMP
					10-27-1993	1605	21.31	2,297.5	S	-	USFWS
					11-17-1993	1035	21.27	2,297.5	S	-	EMP
					11-29-1993	0835	21.25	2,297.6	S	-	USFWS
					12-21-1993	1215	21.10	2,297.7	S	-	EMP
					12-28-1993	1317	21.10	2,297.7	S	-	USFWS
AM-7	362417116163600	Point of Rocks South Well	2,333.5	0.8	01-14-1993	1600	10.13	2,323.4	S	-	EMP
					01-26-1993	1325	10.09	2,323.4	S	-	USFWS
					02-19-1993	1305	9.96	2,323.5	S	-	EMP
					02-25-1993	1427	10.05	2,323.4	S	-	USFWS
					03-24-1993	0805	9.86	2,323.6	S	-	EMP
					03-29-1993	1323	9.86	2,323.6	S	-	USFWS
					04-21-1993	0840	9.91	2,323.6	S	-	EMP
					04-29-1993	1310	9.90	2,323.6	S	-	USFWS
					05-21-1993	0800	9.74	2,323.8	S	-	EMP
					05-27-1993	--	9.78	2,323.7	S	-	USFWS
					06-23-1993	0950	9.83	2,323.7	S	-	EMP
					06-29-1993	1338	9.85	2,323.6	S	-	USFWS
					07-12-1993	1522	9.85	2,323.6	S	-	NTS
					07-20-1993	1000	9.88	2,323.6	S	-	EMP
					07-26-1993	1345	9.87	2,323.6	S	-	USFWS
					08-25-1993	0720	9.89	2,323.6	S	-	EMP
					08-30-1993	0900	9.96	2,323.5	S	-	USFWS
					09-16-1993	1210	9.90	2,323.6	S	-	NTS
					09-24-1993	1435	9.87	2,323.6	S	-	EMP
					09-29-1993	0912	9.85	2,323.6	S	-	NTS

Table 5. Periodic measurements of water levels at monitoring sites in Yucca Mountain region for calendar year 1993—Continued

Site number (plate 1)	U.S. Geological Survey site identification	Site name	Land-surface altitude (feet above sea level)	Height of measurement point (feet above land surface)	Water-level measurement						
					Date	Time	Depth to water (feet below land surface)	Altitude of water surface (feet above sea level)	Method	Site status	Data source
AM-7	362417116163600	Point of Rocks South Well	2,333.5	0.8	09-29-1993	1418	9.86	2,323.6	S	-	USFWS
					10-08-1993	0926	9.86	2,323.6	S	-	NTS
					10-20-1993	1245	9.80	2,323.7	S	-	EMP
					10-21-1993	0947	9.83	2,323.7	S	-	NTS
					10-21-1993	1024	9.83	2,323.7	S	-	NTS
					10-28-1993	1130	9.72	2,323.8	S	-	USFWS
					11-17-1993	1100	9.68	2,323.8	S	-	EMP
					11-23-1993	0813	9.71	2,323.8	S	-	NTS
					11-29-1993	0910	9.66	2,323.8	S	-	USFWS
					12-16-1993	0844	9.64	2,323.9	S	-	NTS
					12-21-1993	1245	9.60	2,323.9	S	-	EMP
					12-28-1993	1350	9.64	2,323.9	S	-	USFWS
DV-3	362230116392901	Travertine Point 1 Well	2,728.4	2.0	01-12-1993	1450	598.62	2,129.8	V	-	EMP
					02-18-1993	1520	598.47	2,129.9	V	-	EMP
					03-25-1993	1235	598.31	2,130.1	V	-	EMP
					04-20-1993	1155	598.43	2,130.0	V	-	EMP
					05-20-1993	0715	598.14	2,130.3	V	-	EMP
					06-22-1993	0925	598.17	2,130.2	V	-	EMP
					07-20-1993	0600	598.17	2,130.2	V	-	EMP
					08-24-1993	0635	598.18	2,130.2	V	-	EMP
					09-27-1993	1325	598.33	2,130.1	V	-	EMP
					10-18-1993	1440	598.25	2,130.2	V	-	EMP
					11-16-1993	0815	598.51	2,129.9	V	-	EMP
					12-20-1993	1325	598.58	2,129.8	V	-	EMP

[a] Depth-to-water values reported from private well owner. Calculated water-level altitudes are based on U.S. Geological Survey land-surface altitude and height of measurement point.

Table 6. Daily average water level in well JF-3 for calendar year 1993

	Water level, in feet below land surface											
Day	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
1	709.95	710.18	710.25	709.82	710.01	709.88	709.89	709.97	709.99	710.04	710.09	710.30
2	709.91	710.11	710.22	709.96	709.87	709.82	709.79	709.82	710.03	710.04	710.38	710.27
3	710.24	710.09	710.10	710.03	709.63	709.94	709.85	709.83	710.10	710.08	710.17	710.25
4	710.16	710.09	710.29	709.78	709.77	709.75	709.83	710.00	710.00	709.94	709.95	709.97
5	710.05	710.04	710.28	709.70	710.01	709.77	709.98	710.03	709.83	709.94	710.09	709.89
6	709.97	710.02	710.17	709.95	709.98	710.00	709.96	709.85	709.93	710.00	710.10	709.89
7	709.76	709.80	710.02	710.08	709.90	710.10	709.87	709.77	710.10	710.02	709.92	710.00
8	709.67	709.58	709.95	710.06	709.96	710.07	709.88	709.96	710.02	709.98	710.07	710.04
9	709.91	709.85	709.97	709.88	710.17	710.07	709.99	710.09	709.92	710.14	710.19	710.17
10	709.86	710.20	709.87	709.88	710.05	709.97	710.06	710.03	709.94	710.15	709.92	710.21
11	710.24	710.20	709.97	709.82	709.80	709.86	710.03	709.90	709.87	710.14	709.65	709.79
12	710.35	710.18	710.12	709.94	709.83	709.93	709.91	709.83	709.68	710.20	709.71	710.07
13	710.14	710.13	709.89	709.95	710.00	709.99	709.91	709.87	709.93	710.05	709.89	710.18
14	710.08	709.89	709.77	709.88	709.98	709.99	709.97	709.93	710.11	710.00	710.09	709.92
15	710.26	709.78	709.97	709.90	709.93	709.87	709.90	709.93	710.01	709.99	710.29	710.01
16	710.10	709.95	710.08	709.96	709.99	709.81	709.97	710.02	709.89	709.97	710.32	710.36
17	709.90	710.23	709.85	709.94	709.97	710.01	710.03	710.05	709.99	709.93	710.17	710.46
18	709.91	710.05	709.91	709.94	709.95	710.09	710.05	709.94	710.06	710.09	710.21	710.37
19	710.28	709.75	710.10	710.07	709.92	710.01	709.98	709.93	710.05	710.27	710.36	710.31
20	710.41	709.79	709.98	710.04	709.80	709.89	709.88	709.99	709.98	710.35	710.18	710.42
21	710.34	710.18	709.92	709.93	709.84	709.89	709.87	710.01	709.98	710.24	709.94	710.27
22	710.15	710.26	709.96	709.73	709.90	709.89	709.95	709.99	709.97	710.09	709.80	710.43
23	710.35	709.93	709.88	709.75	709.90	709.94	709.85	709.96	710.12	710.15	709.96	710.55
24	710.28	709.86	709.83	709.96	710.00	710.09	709.97	709.89	710.27	710.08	710.25	710.58
25	710.23	710.14	709.78	710.08	710.01	710.01	709.97	709.92	710.18	710.08	710.32	710.25
26	710.04	710.14	709.72	709.91	709.94	709.87	709.97	710.10	710.24	710.05	710.32	709.99
27	709.97	710.12	709.87	709.92	709.86	709.77	709.94	710.08	710.25	709.74	710.19	710.13
28	709.99	710.14	709.95	710.05	709.93	709.73	709.93	709.95	710.12	709.47	709.98	710.40
29	710.05		710.00	710.01	710.11	709.86	709.99	709.85	710.02	709.94	709.91	710.42
30	710.07		710.09	709.89	710.03	709.89	710.08	709.93	710.07	710.19	709.99	710.21
31	710.08		710.02		709.85		710.09	709.99		710.07		710.17
MEAN	710.09	710.02	709.99	709.93	709.93	709.93	709.95	709.95	710.02	710.05	710.08	710.20
MAXIMUM	710.41	710.26	710.29	710.08	710.17	710.10	710.09	710.10	710.27	710.35	710.38	710.58
MINIMUM	709.67	709.58	709.72	709.70	709.63	709.73	709.79	709.77	709.68	709.47	709.65	709.79

(Annual summary: Mean 710.01; Maximum 710.58; Minimum 709.47)

Table 7. Daily average water level in well AD-6 for calendar year 1993

[--, data not available]

Day	Water level, in feet below land surface											
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
1	41.37	41.57	41.49	--	--	41.37	41.37	41.41	41.45	41.46	41.51	41.63
2	41.38	41.52	41.45	--	--	41.34	41.32	41.36	41.47	41.46	41.64	41.60
3	41.53	41.51	41.41	--	--	41.40	41.36	41.37	41.49	41.48	41.55	41.60
4	41.48	41.50	41.50	--	--	41.32	41.35	41.44	41.45	41.42	41.47	41.49
5	41.43	41.49	41.48	--	--	41.34	41.41	41.44	41.39	41.43	41.54	41.47
6	41.39	41.48	41.44	--	--	41.44	41.38	41.37	41.45	41.47	41.54	41.47
7	41.30	41.39	41.39	--	41.35	41.46	41.34	41.35	41.51	41.47	41.48	41.51
8	41.27	41.29	41.38	--	41.38	41.43	41.36	41.43	41.47	41.45	41.55	41.51
9	41.37	41.42	41.39	--	41.46	41.43	41.40	41.48	41.43	41.52	41.59	41.56
10	41.32	41.55	41.35	--	41.40	41.39	41.43	41.45	41.44	41.50	41.46	41.57
11	41.50	41.52	41.39	--	41.29	41.34	41.41	41.40	41.41	41.50	41.36	41.39
12	41.52	41.51	41.45	--	41.32	41.38	41.37	41.39	41.34	41.53	41.41	41.54
13	41.46	41.49	41.35	--	41.39	41.40	41.38	41.41	41.46	41.46	41.47	41.57
14	41.48	41.39	41.31	--	41.37	41.39	41.41	41.40	41.53	41.46	41.55	41.41
15	41.56	41.37	41.40	--	41.35	41.34	41.39	41.40	41.46	41.45	41.61	41.45
16	41.48	41.44	41.43	--	41.38	41.33	41.42	41.44	41.42	41.45	41.62	41.59
17	41.40	41.49	41.31	--	41.37	41.43	41.44	41.44	41.46	41.46	41.54	41.61
18	41.41	41.39	41.36	--	41.37	41.45	41.45	41.40	41.49	41.52	41.57	41.57
19	41.57	41.27	41.43	--	41.36	41.40	41.42	41.41	41.48	41.58	41.64	41.56
20	41.60	41.32	41.36	--	41.32	41.36	41.38	41.43	41.45	41.59	41.56	41.61
21	41.56	41.47	41.35	--	41.35	41.38	41.39	41.45	41.45	41.55	41.48	41.54
22	41.49	41.48	41.36	--	41.37	41.37	41.42	41.43	41.44	41.53	41.42	41.62
23	41.60	41.33	41.33	--	41.36	41.39	41.37	41.42	41.51	41.52	41.50	41.67
24	41.57	41.32	--	--	41.40	41.45	41.43	41.39	41.56	41.50	41.62	41.67
25	41.55	41.45	--	--	41.41	41.41	41.42	41.41	41.52	41.50	41.63	41.54
26	41.47	41.44	--	--	41.37	41.35	41.42	41.49	41.54	41.55	41.63	41.45
27	41.46	41.42	--	--	41.35	41.32	41.41	41.46	41.55	41.57	41.58	41.53
28	41.48	41.44	--	--	41.39	41.31	41.40	41.41	41.49	41.44	41.49	41.63
29	41.50		--	--	41.46	41.37	41.43	41.39	41.46	41.46	41.47	41.62
30	41.51		--	--	41.41	41.37	41.47	41.44	41.48	41.57	41.51	41.54
31	41.52		--		41.34		41.47	41.46		41.51		41.54
MEAN	41.47	41.44	--	--	--	41.38	41.40	41.42	41.47	41.50	41.53	41.55
MAXIMUM	41.60	41.57	--	--	--	41.46	41.47	41.49	41.56	41.59	41.64	41.67
MINIMUM	41.27	41.27	--	--	--	41.31	41.32	41.35	41.34	41.42	41.36	41.39

Table 8. Ground-water-discharge data in Yucca Mountain region for calendar year 1993

Site number: Sites are grouped by hydrographic area and, within each area, are listed in general north-to-south, then west-to-east order. See text section titled "Site Number" for further discussion.
U.S. Geological Survey site identification: Unique identification number for site as stored in files and data bases of U.S. Geological Survey.
Time: Time measurement was made, in military time; --, measurement time unknown.
Discharge: Reported to two significant figures.
Method: Method used to measure discharge. C, current meter; F, depth of water measured in flume and converted to discharge, on basis of applicable discharge table for Parshall flume; V, volumetric; Z, discharge represents monthly mean discharge.
Data source: EMP, Environmental-Monitoring Program (U.S. Geological Survey); NPS, National Park Service; USFWS, U.S. Fish and Wildlife Service; USGS-NV, other Nevada District programs (U.S. Geological Survey)

Site number (plate 1)	U.S.Geological Survey site identification	Site name	Discharge measurement				
			Date	Time	Discharge (gallons per minute)	Method	Data source
AM-1a	362924116203001	Fairbanks Spring	02-16-1993	1900	1,800	F	EMP
			05-20-1993	1700	1,800	F	EMP
			08-26-1993	0848	1,800	F	EMP
			10-14-1993	1530	1,500	C	EMP
			11-09-1993	1415	1,400	C	EMP
AM-2	362755116190401	Five Springs Well	01-15-1993	1230	5.9	V	EMP
			02-16-1993	1745	5.7	V	EMP
			03-23-1993	1700	5.5	V	EMP
			04-21-1993	0640	5.8	V	EMP
			05-25-1993	1530	34	V	EMP
			06-23-1993	1015	33	V	EMP
			07-20-1993	1100	28	V	EMP
			08-26-1993	0700	27	V	EMP
			09-24-1993	1300	25	V	EMP
			10-20-1993	1111	21	V	EMP
			11-17-1993	0726	15	V	EMP
			12-21-1993	1100	12	V	EMP
AM-5a	362502116192301	Crystal Pool	02-16-1993	1702	2,900	C	EMP
			04-21-1993	--	2,600	--	USGS-NV
			05-21-1993	1207	2,800	C	EMP
			06-28-1993	--	2,500	C	USFWS
			07-27-1993	--	2,400	C	USFWS
			08-25-1993	--	2,400	C	EMP
			08-31-1993	1303	2,500	C	USFWS
			09-30-1993	--	2,400	C	USFWS
			10-29-1993	--	2,600	C	USFWS
			11-17-1993	1415	2,600	C	EMP
			11-30-1993	1120	2,500	C	USFWS
			12-28-1993	1100	2,600	C	USFWS
AM-8	362230116162001	Big Spring	01-26-1993	--	1,100	C	USFWS
			02-16-1993	1350	1,000	C	EMP
			02-25-1993	--	930	C	USFWS
			03-29-1993	--	1,000	C	USFWS
			04-29-1993	--	1,100	C	USFWS
			05-21-1993	0856	1,300	C	EMP
			05-27-1993	--	1,200	C	USFWS
			06-30-1993	--	1,400	C	USFWS
			07-27-1993	--	1,100	C	USFWS
			08-25-1993	0810	850	C	EMP
			08-31-1993	--	1,100	C	USFWS
			09-30-1993	--	1,000	C	USFWS
			11-17-1993	1215	1,400	C	EMP
			11-30-1993	--	1,200	C	USFWS
			12-28-1993	--	1,200	C	USFWS

Table 8. Ground-water-discharge data in Yucca Mountain region for calendar year 1993—Continued

Site number (plate 1)	U.S.Geological Survey site identification	Site name	Discharge measurement				
			Date	Time	Discharge (gallons per minute)	Method	Data source
DV- 1	362728116501101	Texas Spring	02-15-1993	--	200	Z	NPS
			02-18-1993	1110	200	C	EMP
			03-15-1993	--	190	Z	NPS
			04-15-1993	--	190	Z	NPS
			05-15-1993	--	190	Z	NPS
			05-20-1993	1400	200	C	EMP
			07-15-1993	--	200	Z	NPS
			08-24-1993	0845	200	C	EMP
			11-16-1993	1100	230	C	EMP
			12-15-1993	--	210	Z	NPS
DV- 2	362252116425301	Navel Spring	02-18-1993	1237	1.9	V	EMP
			05-20-1993	1530	1.8	V	EMP
			08-24-1993	1045	1.8	V	EMP
			11-16-1993	1245	1.6	V	EMP

Table 9. Estimated annual ground-water withdrawals from wells in Yucca Mountain region for calendar year 1993

Ground-water subbasin	Hydrographic area	Ground-water withdrawals[1]	
		Millions of gallons	Acre-feet
Alkali Flat-Furnace Creek Ranch	Amargosa Desert[2]	3,666	11,250
	Jackass Flats[3]	66.8	205
Ash Meadows	Amargosa Desert[2] (excluding Ash Meadows area)	16	50
	Mercury Valley[3]	110.2	338

[1] See section "Ground-Water Withdrawals" for discussion of data sources.

[2] Data for this part of Amargosa Desert recompiled from ground-water pumpage inventories for entire Amargosa, listed to nearest acre-foot. Conversions to millions of gallons are rounded to nearest 1 million gallons.

[3] Data recompiled from flowmeter readings listed to nearest 0.1 million gallons. Conversions to acre-feet are rounded to nearest acre-foot.

Table 10. Minimum, maximum, and central tendency of water-level altitudes, and variability of measurements, at wells in Jackass Flats for baseline periods, 1992, and 1993. Excludes water-level altitudes noted with water-level status of "R" or "P" to minimize effects of possible transient conditions at site

Calendar years: Years for which measurements were used for computed summary statistics.
Number: Number of water-level measurements for years specified; for JF-3, value represents number of daily average water levels.
Water level: Discrete water-level measurements made during site visits (table 5), except for JF-3, which represents daily average water levels collected from continual data recorders (table 6).
Minimum: Minimum water-level altitude measured for year(s) specified.
Maximum: Maximum water-level altitude measured for year(s) specified.
Central tendency: Statistically representative water-level altitude for year(s) specified. Value represents median water level based on discrete measurements at site, except value for site JF-3, which represents the mean of daily average water levels.
Measurement variability: Average deviation is equal to sum of absolute differences between measured water levels and median, divided by number of measurements, except value for JF-3, which represents standard deviation.
Change in central tendency: Differences between central tendency for calendar years 1992 and 1993 compared with baseline period. Minus sign indicates that median water-level altitude was lower for specified year compared with baseline period.
[Abbreviations and symbols: I, insufficient data; N/A, not applicable (data field is not related to referenced data set)]

Site number (plate 1)	Calendar years	Number	Water level (feet above sea level)			Measurement variability (feet)	Change in central tendency (feet)
			Minimum	Maximum	Central tendency		
			Baseline period				
JF-1	1985-91	86	2,391.7	2,393.1	2,392.5	0.2	N/A
JF-2	1985-91	25	2,391.2	2,392.7	2,392.1	.3	N/A
JF-2a	1985-91	24	2,466.9	2,469.0	2,468.7	.3	N/A
J-13	1989-91	32	2,389.7	2,390.7	2,390.0	.2	N/A
J-11	1990-91	25	2,401.9	2,402.9	2,402.2	.1	N/A
J-12	1990-91	22	2,388.1	2,388.5	2,388.3	.1	N/A
JF-3	1992-93	582	2,387.7	2,388.8	2,388.3	.2	N/A
JF-1	1992	12	2,392.3	2,392.6	2,392.4	0.1	-0.1
JF-2	1992	3	2,392.0	2,392.2	I	I	I
JF-2a	1992	7	2,467.5	2,469.0	2,468.4	.5	-.3
J-13	1992	21	2,389.6	2,390.4	2,389.9	.1	-.1
J-11	1992	12	2,402.0	2,402.6	2,402.2	.1	0.0
J-12	1992	17	2,388.2	2,388.6	2,388.3	.1	0.0
JF-1	1993	8	2,391.9	2,392.7	2,392.5	0.2	0.0
JF-2	1993	3	2,392.1	2,392.4	I	I	I
JF-2a	1993	5	2,468.6	2,468.9	2,468.8	.1	.1
J-13	1993	16	2,389.7	2,390.7	2,389.9	.1	-.1
J-11	1993	8	2,401.9	2,402.7	2,402.2	.2	0.0
J-12	1993	19	2,387.9	2,389.0	2,388.3	.1	0.0

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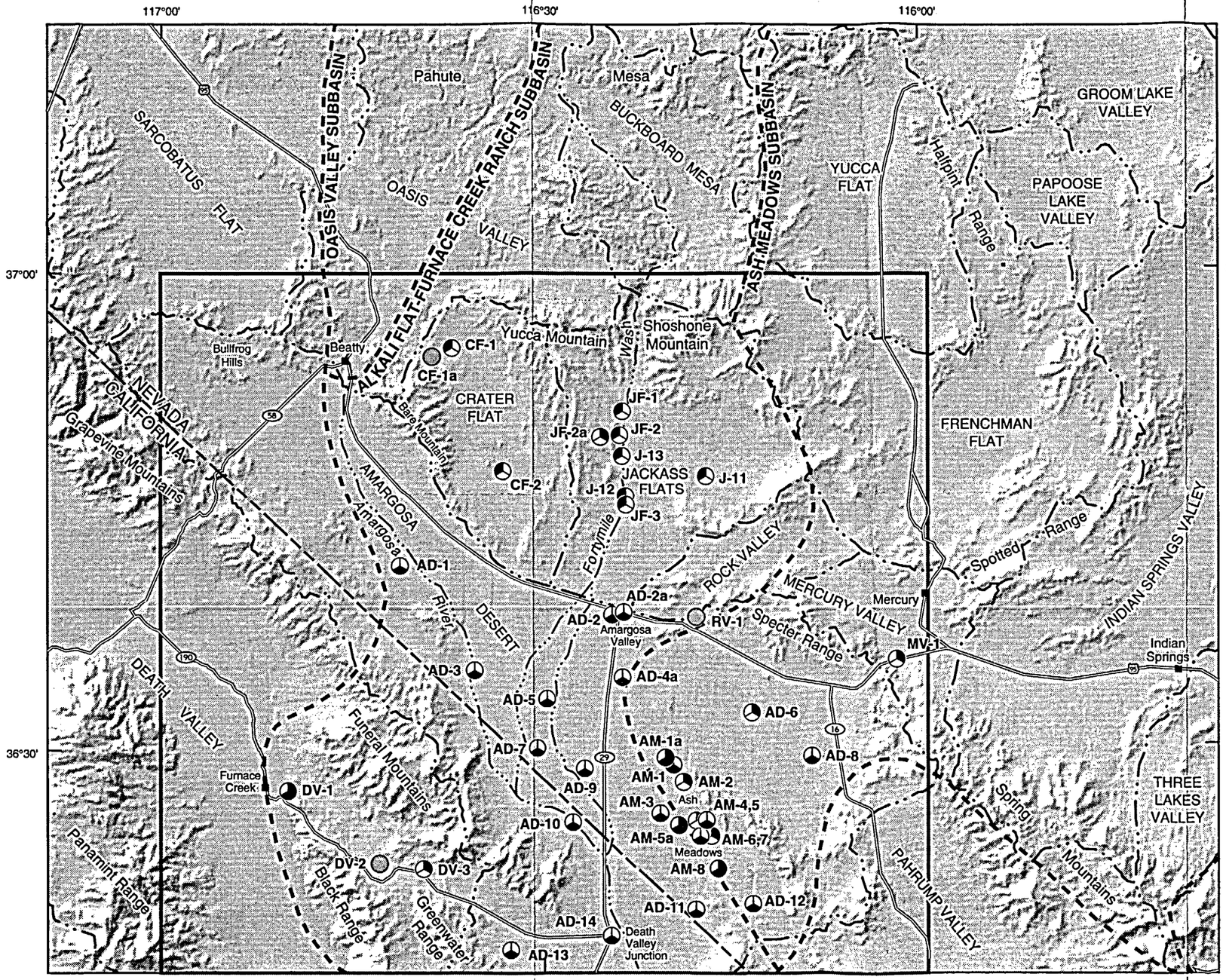
U.S. DEPARTMENT OF THE INTERIOR
U.S. GEOLOGICAL SURVEY

PREPARED IN COOPERATION WITH
U.S. DEPARTMENT OF ENERGY

OPEN-FILE REPORT 95-158
Study area map—PLATE 1
Hale, G.S., and Westenburg, C.L., 1995,
Selected ground-water data for Yucca Mountain region,
southern Nevada and eastern California, for calendar year 1993



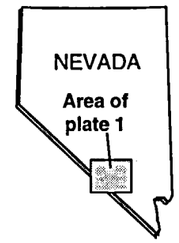
Base from U.S. Geological Survey digital elevation data, 1:250,000, 1987, and digital data, 1:100,000, 1981-89; Universal Transverse Mercator projection, Zone 11. Shaded-relief base from 1:250,000-scale Digital Elevation Model; sun illumination from northwest at 30 degrees above horizon

5 0 5 10 Statute Miles
5 0 5 10 Kilometers

EXPLANATION

- **Study-area boundary**
- **Ground-water subbasin boundary**—From Waddell and others (1984, pl. 3) and R.J. Laczniak (U.S. Geological Survey, written commun., 1993)
- **Hydrographic-area boundary**
- **Data-collection site**—Site number (table 1) and primary contributing unit are indicated

AD-6	Carbonate rock
CF-1	Volcanic rock
AD-1	Valley fill
DV-2	Undifferentiated sedimentary rock
DV-1	Combined carbonate rock and valley fill



MAP SHOWING LOCATION OF DATA-COLLECTION SITES FOR CALENDAR YEAR 1993, YUCCA MOUNTAIN REGION OF SOUTHERN NEVADA AND EASTERN CALIFORNIA

by

Glenn S. Hale and Craig L. Westenburg

1995