Prepared in cooperation with the Office of Repository Development of the U.S. Department of Energy, under Interagency Agreement DE-AI08-02RW12167

Selected Ground-Water Data for Yucca Mountain Region, Southern Nevada and Eastern California, January–December 2003

Open-File Report 2005-1286

U.S. Department of the Interior
U.S. Geological Survey

(Back of Cover)

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Gale A. Norton, Secretary

U.S. Geological Survey
P. Patrick Leahy, Acting Director

U.S. Geological Survey, Carson City, Nevada, 2005

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CONVERSION FACTORS AND VERTICAL DATUM

Multiply	By	To obtain
acre	4,047	square meter
acre-foot (acre-ft)	1,233	cubic meter
foot (ft)	0.3048	meter
inch (in.)	2.54	centimeter
mile (mi)	1.609	kilometer
gallon (gal)	0.00378	cubic meter
million gallons (Mgal)	3,785	cubic meter
gallon per minute (gal/min)	0.06309	liter per second
pound per square inch (lb/in^2)	6.895	kilopascal

Temperature: Degrees Celsius (^oC) can be converted to degrees Fahrenheit (^oF) by using the formula $^oF = [1.8(^oC)]+32$. Degrees Fahrenheit can be converted to degrees Celsius by using the formula $^oC = 0.556(^oF-32)$.

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, Office of Repository Development, collects, compiles, and summarizes hydrologic data in the Yucca Mountain region. These data are collected to allow assessments of ground-water resources during activities to determine the potential suitability or development of Yucca Mountain for storing high-level nuclear waste.

Data on ground-water levels at 35 wells and a fissure (Devils Hole), ground-water discharge at 5 springs and a flowing well, and total reported ground-water withdrawals within Crater Flat, Jackass Flats, Mercury Valley, and the Amargosa Desert are tabulated from January through December 2003. Historical data that were revised from those published in previous reports on selected ground-water data for the Yucca Mountain region also are tabulated. Historical data on water levels, discharges, and withdrawals are presented graphically to indicate variations through time.

A statistical summary of ground-water levels at seven wells in Jackass Flats is presented for the period 1992–2003 to indicate potential effects of ground-water withdrawals associated with U.S. Department of Energy activities near Yucca Mountain. The statistical summary includes the annual number of measurements, maximum, minimum, and median water-level altitudes, and average deviation of measured water-level altitudes compared to the 1992–93 baseline period. At seven wells in Jackass Flats, median water levels for 2003 were slightly higher (0.4–2.8 feet) than their median water levels for 1992–93.

INTRODUCTION

Activities to determine the potential suitability or development of Yucca Mountain for storing high-level nuclear waste are in progress or planned. The U.S. Department of Energy (DOE) has declared that all facilities and investigations associated with such activities 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 DOE to develop a ground-water-resources monitoring program in the vicinity of Yucca Mountain. The purposes of the monitoring program are to (1) document the historical and current conditions of ground-water resources, (2) detect and document changes in those resources during activities at Yucca Mountain, and (3) provide a basis for analyzing and identifying potential adverse effects on ground-water resources resulting from investigations and activities at Yucca Mountain.

Purpose and Scope

This report presents and summarizes hydrologic data collected as part of the USGS Environmental-Monitoring Program. Included are data for calendar year 2003 on ground-water levels at 35 wells and a fissure (Devils Hole), ground-water discharge at 5 springs and a flowing well, and total reported ground-water withdrawals within Crater Flat, Jackass Flats, Mercury Valley, and Amargosa Desert. Data on ground-water levels, discharges, and withdrawals that have been revised from those previously reported and those collected by other agencies (or collected as part of other programs) at the sites also are included.

A discussion of ground-water data for Jackass Flats includes a statistical summary of those data to indicate potential effects of withdrawals from wells in Jackass Flats on water levels near Yucca Mountain. Effects of these withdrawals may be detected in Jackass Flats before they are detected elsewhere in the Yucca Mountain region.

This report is the tenth in a series of reports as part of the USGS Environmental-Monitoring Program (USGS-EMP). Hereafter, the first nine reports are referred to as previous reports on selected ground-water data for the Yucca Mountain region. The previous reports and the data they contain are:

Report (see references cited)	Data contained
La Camera and Westenburg (1994)	Earliest available data through 1992
Hale and Westenburg (1995)	Data collected in 1993
Westenburg and La Camera (1996)	Data collected in 1994
La Camera and others (1996)	Data collected in 1995
La Camera and Locke (1998)	Data collected in 1996
La Camera and others (1999)	Data collected in 1997
Locke (2001a)	Data collected in 1998
Locke (2001b)	Data collected in 1999
Locke and La Camera (2003)	Data collected in 2000 through 2002

Additional information for sites CF-2, JF-1, JF-2, JF-2a, J-13, J-11, and J-12 are included in Robison (1984), Robison and others (1988), Gemmell (1990), McKinley and others (1991), O'Brien (1991, 1993), Luckey and others (1993), Boucher (1994a), Lobmeyer and others (1995), O'Brien and others (1995), Graves and others (1996), Tucci and others (1996a, 1996b), Graves (1998), Graves and Goemaat (1998), Graves (2000), and Savard (2001).

Acknowledgments

Several organizations and programs contributed to this report. Specifically, data were provided by the Harry Reid Center for Environmental Studies (HRC) at the University of Nevada, Las Vegas; National Park Service (NPS); U.S. Fish and Wildlife Service (USFWS); Nevada Department of Conservation and Natural Resources, Division of Water Resources (NDWR); Nevada Department of Transportation; Bechtel Nevada; Bechtel SAIC Company, LLC; Fenix and Scisson, Inc.; Raytheon Services Nevada; Reynolds Electrical and Engineering Company; U.S. Borax Corp.; U.S. Nevada Gold Search; Barrick Bullfrog, Inc.; Cind-R-Lite Company; Sterling Gold Mining Corp.; USGS–Hydrologic Resources Management and Environmental Restoration Programs; and USGS–Yucca Mountain Project Branch studies of saturated-zone site hydrology and saturated-zone regional hydrology (USGS-SCP).

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

DESCRIPTION OF STUDY AREA

The study area is the Yucca Mountain region of southern Nevada and eastern California (fig. 1). The boundary of the Yucca Mountain region, for purposes of this report, roughly coincides with the northern parts of Crater Flat and Jackass Flats, eastern parts of Rock Valley, Mercury Valley, and Amargosa Desert, Nev., and Death Valley Junction and Furnace Creek, Calif., to the south and west. 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; Laczniak and others, 1996, p. 16 and pl. 1). Boundaries of the subbasins are defined on the basis of the location of recharge areas, discharge areas, low-permeability rocks, hydraulic gradients, and water chemistry. These boundaries are general indicators of restrictions on ground-water movement in the region.

The study area also is subdivided by hydrographic areas[1] (fig. 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 include Crater Flat, Jackass Flats, and Rock Valley, most of Mercury Valley and Amargosa Desert, and part of Death Valley (Rush, 1968; Harrill and others, 1988, sheet 2).

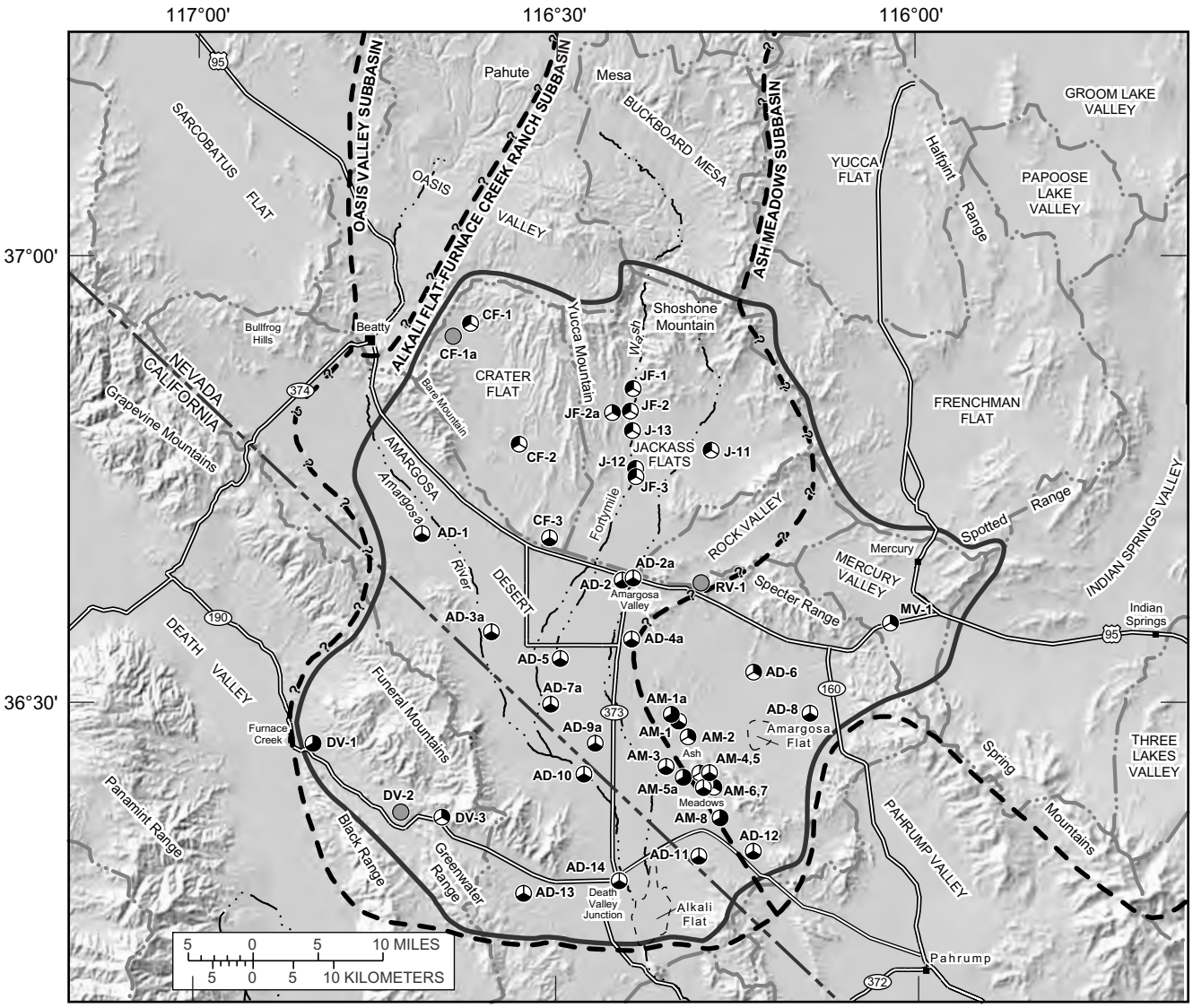
Alkali Flat–Furnace Creek Ranch Ground-Water Subbasin

Crater Flat and Jackass Flats (which include Yucca Mountain), most of Rock Valley, the west-central part of the Amargosa Desert, and part of Death Valley are in the Alkali Flat–Furnace Creek Ranch ground-water subbasin (fig. 1). Within this subbasin, sources of ground water principally are precipitation and subsurface inflow (Waddell and others, 1984, p. 36; Harrill and others, 1988, sheet 2; Laczniak and others, 1996, table 3). Precipitation occurs on the higher mesas and mountains within the subbasin and along the subbasin's north and northeast mountainous boundaries. Subsurface inflow into the subbasin occurs near Beatty from the Oasis Valley subbasin, near Ash Meadows from the Ash Meadows subbasin, and possibly from Cactus Flat (about 40 mi north of Beatty). Ground water discharges from springs in Death Valley and as evapotranspiration from Alkali Flat and Death Valley. Ground water generally flows to the south, southeast, or southwest (Kilroy, 1991, p. 9–13; Tucci and Burkhardt, 1995, p. 8; Laczniak and others, 1996, pl. 1).

Ash Meadows Ground-Water Subbasin

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

[1]The U.S. Geological Survey and Nevada Division of Water Resources delineated formal hydrographic areas in Nevada systematically in the late 1960's for scientific and administrative purposes (Rush, 1968; Cardinalli and others, 1968). The official hydrographic area names, numbers, and geographic boundaries continue to be used in Geological Survey scientific reports and Division of Water Resources administrative activities. Extensions of hydrographic areas from Nevada into California and selected hydrographic areas in California have been delineated also by Harrill and others (1988, sheet 2).



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

EXPLANATION

Study-area boundary

Ground-water subbasin boundary—From Laczniak and others (1996, pl. 1). Queried where location uncertain

Hydrographic-area boundary

Data-collection site—Site number (table 1) and primary contributing unit are indicated

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

Figure 1. Location of data-collection sites in theYucca Mountain region, southern Nevada and eastern California, 2003.

In the Ash Meadows ground-water subbasin, sources of ground water principally are precipitation and subsurface inflow (Laczniak and others, 1996, table 3). Precipitation occurs on the higher mountains within the subbasin and along the subbasin's north and northeast mountainous boundaries. Subsurface inflow possibly occurs from Railroad Valley and Pahranagat Valley along the basin's north and northeast boundaries (about 100 mi north of Ash Meadows; Winograd and Thordarson, 1975; Laczniak and others, 1996). Ground water discharges from springs and as evapotranspiration in the Ash Meadows area and possibly as underflow into the Alkali Flat–Furnace Creek Ranch ground-water subbasin. Ground water in the subbasin generally flows to the south, west, or southwest (Harrill and others, 1988, sheet 2; Laczniak and others, 1996, p. 16–18 and pl. 1).

DATA-COLLECTION SITES

Locations of data-collection sites are shown in figure 1. Information on site identification, site location, site owner, and type of data contained in this report are listed in table 1. The sequence of sites in table 1 is followed throughout the report. All sites are wells or springs except site AM-4 (Devils Hole), which is an open fissure that intersects the ground-water table. Well-construction data, source of well-construction data, and contributing lithologic units are listed in table 2. Excluded from table 2 are springs and a fissure for which construction data are not applicable.

Contributing units (table 2) are the principal saturated lithologic intervals at the sites that yield water to the well. For purposes of this report, contributing units are one or a combination of four general types: carbonate rock, valley fill, undifferentiated sedimentary rock, and volcanic rock. Wells characterized as having a contributing unit of carbonate or volcanic rock are wells with open intervals in those consolidated rocks. In and near the Amargosa Desert, wells characterized as having a contributing unit of valley fill are those with open intervals in unconsolidated valley-fill materials. Wells with open intervals in rocks that include argillite, limy sandstones and siltstones, or silty, sandy, and shaley limestones are characterized as having a contributing unit of undifferentiated sedimentary rock. Contributing units are identified by Dudley and Larson (1976), McKinley and others (1991), Robison and others (1988), Thordarson and others (1967), Winograd and Thordarson (1975), or were derived from drillers' logs or well-completion reports that describe geology in the boreholes, open intervals in the wells, and measurements of depth to water.

GROUND-WATER LEVELS

Ground-water levels are reported as depths to water and ground-water altitudes. Depth to water is the difference between land surface and the water level in a well. Ground-water altitude is the difference between the water level in a well and a common datum. The National Geodetic Vertical Datum of 1929 is the common datum in this report.

Depth to water is measured directly from a stable reference that is called the measuring point. Depth-to-water below a measuring point commonly is measured with a steel tape, an electric tape, or a pressure transducer. Measuring points typically are a notch in the well casing, but can be the top of a bolt as at Devils Hole (AM-4). Depth to water is computed by subtracting the height of a measuring point above land surface from the depth-to-water below a measuring point.

Ground-water altitude is the difference between altitude of the measuring point and depth-to-water below the measuring point. The altitudes of all measuring points were surveyed. Ground-water altitude is reported to indicate the general direction of ground-water flow.

Accuracy of depths to water and altitudes of the water surface contained in this report are variable. Inaccuracies are largely dependent on heights of measuring points above land surface and altitudes of benchmarks that are used as starting points for surveys. Deviations of boreholes from vertical also affect accuracy of measurements. Deviations from vertical were estimated to be about 0.4 ft at sites near Yucca Mountain (Boucher, 1994b).

Precision of depths to water, however, can be used to detect changing conditions through time and is indicated by repeatability of measurements. Data recorded in the field during 2003 indicate that repeatability ranges from 0.00 to 0.05 ft, but generally is less than or equal to 0.02 ft for calibrated electric tapes and steel tapes. Precision of data collected by other agencies using uncalibrated electric tapes was assumed to be comparable. Overall, precision of water levels contained in this report are estimated to be less than or equal to 0.05 ft.

Electric Tape

Electric tapes used by USGS-EMP personnel were marked with a unique identifier for quality-assurance purposes and calibrated using reference steel tapes (which served as accepted representations of depth to water below the measuring point). At depths greater than 500 ft, the electric tapes were calibrated using the HRC 2,800-ft reference steel tape or the USGS-EMP calibrated steel tape (chain #5). At depths less than 500 ft, the electric tapes were calibrated using a steel tape maintained by EMP personnel and identified as the 500-ft reference steel tape #1.

HRC 2,800-ft reference steel tape measurements are adjusted to account for mechanical stretch and thermal expansion of the tape. USGS-EMP chain #5 measurements are adjusted to account for differences between the HRC reference and USGS-EMP chain #5. No adjustments were necessary for the USGS-EMP 500-ft reference steel tape #1 because mechanical stretch and thermal expansion of the tape are considered negligible at the depths to water measured.

Table 1. Index to monitoring sites in Yucca Mountain region, 2003

Site number: Alphanumeric identifier used to identify sites on maps and tables. First part represents hydrographic area in which sites is located. Hydrographic areas: CF, Crater Flat; JF or J, Jackass Flats; RV, Rock Valley; MV, Mercury Valley; AD or AM, Amargosa Desert; DV, Death Valley. Second part is sequential numbering representing relative location of site within hydrographic area or Ash Meadows spring-discharge area; numbering order generally is north to south, then west to east. Sites J-13, J-11, and J-12 previously were numbered by Raytheon Services Nevada and herein were not renumbered.

U.S. Geological Survey site identification: Unique identification number for sites as stored in files and data bases of U.S. Geological Survey.

Latitude and longitude: Referenced to North American Datum of 1927.

Local site number: Alphanumeric identifier based on location of site within hydrographic areas and rectangular subdivisions of public lands. Referenced to Mount Diablo base line and meridian for sites in Nevada or San Bernardino base line and meridian for sites in California (U.S. Geological Survey, 1986a, b).

Owner: Acronyms listed for sites owned by Federal agencies: BLM, Bureau of Land Management; DOE, U.S. Department of Energy; NPS, National Park Service; 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.

Site number	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	Crater Flat 1	365520	1163703	229	S12 E48 04DBB1	Rayrock Mines, Inc.	L
CF-1a	365445116383901	Crater Flat 1a	365442	1163841	229	S12 E48 07ADD1	Rayrock Mines, Inc.	L
CF-2	364732116330701	USW VH-1	364732	1163307	229	S13 E48 27C1	DOE	L
CF-3	364105116302601	Crater Flat 3	364106	1163026	229	S14 E48 36DDD1	Cind-R-Lite Block Company	L
JF-1	365116116233801	UE-25 WT 15	365116	1162338	227A	S12 E50 33A1	DOE	L
JF-2	364945116235001	UE-25 WT 13	364943	1162351	227A	S13 E50 18B1	DOE	L
JF-2a	364938116252102	UE-25p 1 PTH	364938	1162521	227A	S13 E49 14A2	DOE	L
J-13	364828116234001	J-13 WW	364829	1162340	227A	S13 E50 19C1	DOE	L
J-11	364706116170601	J-11 WW	364706	1161706	227A	S13 E51 31B1	DOE	L
J-12	364554116232401	J-12 WW	364554	1162324	227A	S14 E50 06A2	DOE	L
JF-3	364528116232201	JF-3 Well	364528	1162322	227A	S14 E50 06D1	DOE	L
RV-1	363815116175901	TW-5	363815	1161759	226	S15 E50 24A1	DOE	L
MV-1	363530116021401	Army 1 WW	363530	1160214	225	S16 E53 05ADB1	DOE	L
AD-1	364141116351401	NA-6 Well BGMW-10	364131	1164114	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	1162358	230	S15 E50 18CCDB1	NV Dept. of Transportation	L
AD-3a	363521116352501	Amargosa Desert 3a	363525	1163530	230	S16 E48 05CAB1	Davidson, Robert	L
AD-4a	363428116234701	Amargosa Desert 4a	363430	1162345	230	S16 E50 07CABB1	Cook, Lewis C.	L
AD-5	363310116294001	USBLM Well	363325	1162945	230	S16 E49 18DCCA1	BLM	L
AD-6	363213116133800	Tracer Well 3	363213	1161338	230	S16 E51 27BAA3	USGS	L
AD-7a	363009116302702	Amargosa Desert 7a	363010	1163030	230	S17 E48 01AB3	Naxos Mining Company	L
AD-8	362929116085701	Amargosa Desert 8	362930	1160855	230	S17 E52 08CDB1	Clark, Hershel and others	L
AD-9a	362835116264102	Amargosa Desert 9a	362837	1162649	230	S17 E49 15BC 2	Gilgan, Michael	L
AD-10	362525116274301	NA-9 Well	362530	1162740	230	026N005E05E001S	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	361720	1163240	230	025N004E21M001S	USGS	L
AD-14	361817116244701	Death Valley Jct Well	361816	1162447	230	025N005E14M001S	Ettie, Lee	L
AM-1	362858116195301	Rogers Spring Well	362855	1161950	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	1161905	230	S17 E50 23BBCA1	USFWS	D,L
AM-3	362555116205301	Ash Meadows 3	362555	1162055	230	S17 E50 33CAAB1	Garner, George	L
AM-4	362532116172700	Devils Hole	362532	1161727	230	S17 E50 36DC1	NPS	L
AM-5	362529116171100	Devils Hole Well	362530	1161715	230	S17 E50 36DDC1	USFWS	L
AM-5a	362502116192301	Crystal Pool	362515	1161925	230	S18 E50 03ADBA1	USFWS	D
AM-6	362432116165701	Point of Rocks North Well	362430	1161655	230	S18 E51 07BBBB1	USFWS	L
AM-7	362417116163600	Point of Rocks South Well	362420	1161640	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	027N001E23BS01S	NPS	D
DV-2	362252116425301	Navel Spring	362252	1164253	243	026N002E13FS01S	U.S. Borax & Chem. Corp.	D
DV-3	362230116392901	Travertine Point 1 Well	362231	1163932	243	026N003E21L001S	U.S. Borax & Chem. Corp.	L

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

Site number: Alphanumeric identifier used to identify sites on maps and tables. First part represents hydrographic area in which site is located. Hydrographic areas: CF, Crater Flat; JF or J, Jackass Flats; RV, Rock Valley; MV, Mercury Valley; AD or AM, Amargosa Desert; DV, Death Valley. Second part is sequential numbering representing relative location of site within hydrographic area or Ash Meadows spring-discharge area; numbering order generally is north to south, then west to east. Sites J-13, J-11, and J-12 previously were numbered by Raytheon Services Nevada and herein were not renumbered.

U.S. Geological Survey site identification: Unique identification number for site as stored in files and databases of U.S. Geological Survey (USGS).

Accessible well depth: Well depths listed are as reported in sources listed in explanation for **Data source** (see below) or as measured by USGS personnel (noted with 's').

Casing diameter at land surface: Outside casing diameter of segment most prominent at land surface; rounded to nearest inch.

Top of open interval: Depth to top part(s) of well that can receive ground water from lithologic interval. Uncased borehole is designated open interval in this table. Open interval may be deeper than accessible well depth, which may reflect original drilled depth. As reported in sources listed in explanation for **Data source** (see below). U, unknown, no data.

Bottom of open interval: Depth to bottom part(s) of well that can receive ground water from lithologic interval. Uncased borehole is designated open interval in this table. Open interval may be deeper than accessible well depth, which may reflect original drilled depth. As reported in sources listed in explanation for **Data source** (see below). U, unknown, no data.

Diameter of open interval: Inside casing diameter; 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, screened casing, type not known; U, unknown, no data; X, uncased borehole.

Data source: Source of information on well depth and open intervals. D, Well-driller's log, well-completion report, or Fenix & Scisson, Inc., or Raytheon Services Nevada hole-history data; J, Johnston (1968); 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 (fig. 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	Crater Flat 1	1,600	15	800	1,600	10	P	D	V
CF-1a	365445116383901	Crater Flat 1a	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	912	9	X	R	V
					912	2,501	6	X		
CF-3	364105116302601	Crater Flat 3	460	9	320	460	8	P	D	F
JF-1	365116116233801	UE-25 WT 15	1,360	11	127	130	15	X	D	V
					130	1,360	9	X		
JF-2	364945116235001	UE-25 WT 13	1,160	11	222	224	15	X	D	V
					224	1,150	9	X		
					1,150	1,160	8	X		

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

Site number (fig. 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				
JF-2a	364938116252102	UE-25p 1 PTH	5,923	24	4,256	4,279	10	X	R	C
					4,279	5,900	7	X		
					5,900	5,923	6	X		
J-13	364828116234001	J -13 WW	3,488	13	996	1,301	13	P	T	V
					1,301	1,386	11	P		
					2,690	3,312	5	P		
					3,385	3,488	8	X		
J-11	364706116170601	J -11 WW	1,327	13	1,075	1,095	12	P	D	V
					1,242	1,298	12	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	8	P	D	V
RV-1	363815116175901	TW- 5	800 s	7	735	800	6	P	T	S
					800	916	U	X		
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	750 s	14	360	777	14	P	D	F
AD-2a	363835116234001	NDOT Well	495	9	395	495	8	P	D	F
AD-3a	363521116352501	Amargosa Desert 3a	240 s	16	120	250	15	P	D	F
AD-4a	363428116234701	Amargosa Desert 4a	269 s	13	147	213	12	P	D	F
					238	286	12	P		
AD-5	363310116294001	USBLM Well	348 s	12	U	U	U	U	M	F
AD-6	363213116133800	Tracer Well 3	678 s	9	620	807	6	X	J	C
AD-7a	363009116302702	Amargosa Desert 7a	210	7	U	U	U	U	O	F

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

Site number (fig. 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				
AD-8	362929116085701	Amargosa Desert 8	215 s	15	U	U	U	U	M	F
AD-9a	362835116264102	Amargosa Desert 9a	415	10	55 200	200 515	10 10	P X	D	F
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	225 s	12	160	200	12	S	D	F
AM-1	362858116195301	Rogers Spring Well	202 s	16	100 240	240 420	12 16	P X	D	F
AM-2	362755116190401	Five Springs Well	123 s	14	0 100	100 140	13 14	P X	D	C
AM-3	362555116205301	Ash Meadows 3	202 s	9	140	180	8	P	O	F
AM-5	362529116171100	Devils Hole Well	200 s	16	48	248	16	P	D	F
AM-6	362432116165701	Point of Rocks North Well	500	16	139	500	16	P	D	F
AM-7	362417116163600	Point of Rocks South Well	586 s	14	132 468	467 818	14 U	P X	D	C
DV-3	362230116392901	Travertine Point 1 Well	650 s	5	100	970	5	X	D	C

A correction factor is the difference between the reference steel-tape measurement and uncorrected electric-tape measurement (table 3). Differences exist between the reference steel tape and the electric tape because of mechanical stretch, shrinkage caused by decreased elasticity, shortening caused by the presence of kinks or twists in tape, and incorrect marking. Correction factors are computed using calibration data and, although changes in factors probably are not linear, linear interpolations with depth and time were made between successive calibrations.

Calibrated electric tapes were used at wells when frequent repetitive measurements were required due to fluctuating water levels, when depths to water were greater than 500 ft or when wet conditions inside a well prevented measurements using chalked steel tapes. At least two measurements are made during each site visit, and supplemental measurements are made if those two measured depths differ by more than 0.05 ft. If supplemental measurements indicate the difference is due to rapidly changing water levels, the initial measured depth and appropriate site status are recorded. Measurements using calibrated electric tapes are indicated by method “V” in table 5 (see Basic Data section of this report).

Personnel of the HRC also made water-level measurements using calibrated electric tapes at sites CF-2, JF-1, JF-2, JF-2a, J-13, J-11, and J-12. These data-collection activities are governed by formal, unpublished technical procedures associated with the Yucca Mountain Office of Repository Development. Water-level altitudes were provided by HRC personnel (H.S. Page, written communs., 2003, 2004) and converted to depth below land surface by subtracting those altitudes from altitude of the land surface.

Additionally, water-level measurements were made with various electric tapes by the USFWS at sites AM-5, AM-6, and AM-7 and by NDWR at site AD-7a. These measurements are indicated by method "T" in table 5.

Table 3. Electric-tape calibration data used to derive correction factors, 2003

Uncorrected depth to water: Measured depth to water below measuring point using electric tape.
Device: Electric tape used to measure depth to water.
Correction factor: Difference between depth to water measurements using reference steel tape and electric tape.

Date	Uncorrected depth to water, in feet	Device	Correction factor, in feet
01-17-2003	131.33	YMP-13	-0.03
10-14-2003	133.98	YMP-13	-0.04
01-23-2004	134.15	YMP-13	-0.04
01-23-2003	368.67	YMP-13	-0.07
10-14-2003	368.46	YMP-13	-0.13
01-23-2004	368.58	YMP-13	-0.13
08-13-2002	605.05	YMP-13	-0.15
01-23-2003	605.14	YMP-13	-0.16
10-08-2003	605.08	YMP-13	-0.21
02-04-2004	605.12	YMP-13	-0.26
08-14-2002	743.88	YMP-13	-0.24
01-22-2003	743.96	YMP-13	-0.23
10-07-2003	743.76	YMP-13	-0.33
02-04-2004	743.82	YMP-13	-0.35
01-22-2003	744.52	PRT-4	-0.79
02-04-2004	744.39	PRT-4	-0.92
01-21-2003	1,043.36	PRT-4	-1.11
10-08-2003	1,043.50	PRT-4	-1.18
02-05-2004	1,043.70	PRT-4	-1.23
01-22-2003	1,186.41	PRT-4	-1.20
10-07-2003	1,138.28	PRT-4	-1.22
02-05-2004	1,138.60	PRT-4	-1.29
01-22-2003	1,321.28	PRT-4	-1.16
10-07-2003	1,321.02	PRT-4	-1.26

Steel Tape

In 2003, USGS-EMP personnel used one uniquely marked 300-ft steel tape (ST-7) and two 500-ft steel tapes (ST-9, ST-10) for measurements. These steel tapes were checked against the USGS-EMP 500-ft reference steel tape #1 at several depths to water to verify their accuracy. No corrections were needed to the measurements made with these steel tapes.

USGS-EMP personnel make a minimum of two measurements during each site visit to verify the initial measurement. Supplemental measurements are made if the two measured depths differ by more than 0.05 ft. If supplemental measurements indicate the difference is due to fluctuating water levels, the initial measured depth and appropriate site status are recorded. Measurements using steel tapes are indicated by method “S” in table 5.

HRC personnel also made a water-level measurement using a steel tape at site CF-2. This data-collection activity is governed by a formal, unpublished technical procedure associated with the Yucca Mountain Office of Repository Development. Water-level altitude was provided by HRC personnel (H.S. Page, written commun., 2004) and converted to depth below land surface by subtracting that altitude from altitude of the land surface.

Pressure Sensor

Two sites, JF-3 and AD-6, are instrumented by USGS-EMP to continually record ground-water level and atmospheric pressure at 15-minute intervals. Instrumentation includes a vented 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, and daily average depth to water. (See tables 6 and 7 within Basic Data section of this report.) The pressure sensors at sites JF-3 and AD-6 transmit data to the data logger in units of pounds per square inch, which varies with the height of the water above the sensor.

The sensor is calibrated for a range of depths that spans the anticipated range of water-level fluctuations. Water-level fluctuations are simulated by raising and lowering the pressure sensor. Raising the sensor 1 ft will decrease the amount of submergence of the pressure sensor by 1 ft, thereby simulating a 1 ft increase in depth to water. Lowering the sensor 1 ft will increase the amount of submergence of the pressure sensor by 1 ft, thereby simulating a 1 ft decrease in depth to water. Upon completion of pressure-sensor calibration, another water-level measurement is made with a calibrated steel or electric tape to check for fluctuation of the water level during calibration of the sensor.

Data recorded while calibrating the sensor are used to develop a regression equation to convert pressure readings to water level below land surface. The pressure readings from the data logger and corresponding simulated depths are regressed using pressure, in pounds per square inch, as the independent variable and depth below land surface, in feet, as the dependent variable.

Water-level measurements are made with a calibrated steel or electric tape when a continual monitoring site is visited. The data logger records the pressure-sensor reading at the time of the measurement. The reading is converted to depth to water using the established regression equation and recorded on a field sheet as computed water level. The steel tape or electric tape water-level measurement is used as a reference measurement and is compared to the computed value. Any difference between the reference measurement and computed value is applied as a correction to the continual record. The correction is determined by linearly interpolating the difference with time between consecutive visits to account for drift in pressure-sensor output.

The applicable period for using a particular regression equation usually corresponds with calibrations at the beginning and ending of that period. If the applicable period for a regression equation does not correspond with successive calibrations, a period is selected that minimizes differences between reference measurements made during site visits and computed water levels at dates intermediate to the two calibrations. Listed in table 4 are equations developed from pressure-sensor calibration data and differences between reference and computed water levels.

Sites JF-2 and JF-2a also were instrumented to continually collect water-level data by HRC personnel in 2001 and 2003, respectively. Data collection and processing of these data are governed by formal, unpublished technical procedures associated with the Yucca Mountain Office of Repository Development.

Some data presented in this report (some data prior to 1999 at site AM-4) also are on the basis of continually collected water levels. Daily mean water levels were reported by the NPS. Daily mean data, for each month with a complete daily mean record, were used to compute monthly average water levels. Monthly averages are reported for the 15th of the month at that site and are noted with measurement method "A" (table 5) when instantaneous measurements of depth to water were unavailable during that month.

GROUND-WATER DISCHARGES

Ground-water data collected and compiled as part of USGS-EMP are shown in figures 7–9 and listed in table 8 within the Basic Data section of this report. The accuracy of the measurements are related directly to the operational conditions of the equipment and to the environmental conditions at the time of measurement. Ground-water discharges are reported to two significant figures and ranged from 0.82 gal/min at site DV-2 to 3,000 gal/min at site AM-5a (table 8).

The most commonly used method for measuring discharge was the vertical-axis current meter, indicated by a "C" in table 8. Accuracy of these measurements are estimated to be poor, or no better than 15 percent of actual flow (Rantz and others, 1982, p. 179–180).

Some discharge values were determined by measuring the depth of water inside a flume and comparing that depth to an applicable stage-discharge relation for the flume. Where an instrument has been installed to continually record stage in a flume, mean discharges can be computed for specific periods. This method is indicated by a "Z" in table 8 and was used for site DV-1, where monthly mean discharge (reported for the 15th of the month) was computed on the basis of daily data collected by NPS. Accuracy of these measurements is estimated to be fair or within 15 percent of actual flow (U.S. Geological Survey, 2003, p. 21).

The volumetric method, indicated by a "V"in table 8, was used for measuring ground-water discharge from sites AM-2 and DV-2. A 5-gal or 4-L container was used to collect all discharge from the sites while a stopwatch was used to determine the amount of time the discharge was collected. The discharge rate is the volume of discharge collected divided by the elapsed time of collection. This method was repeated a minimum of three times and an average rate was computed for each site visit. Accuracy of these measurements is estimated to be good or within 10 percent of actual flow (U.S. Geological Survey, 2003, p. 21).

GROUND-WATER WITHDRAWALS

Withdrawals were estimated from data provided by NDWR, DOE, and the USGS–Hydrologic Resources Management Program. The majority of data sources report data in gallons and for consistency all withdrawals presented in tables and figures in this report are converted to units of millions of gallons. Estimated annual ground-water withdrawals are based solely on available data. Years during which no withdrawals from a specific area are indicated may reflect the unavailability of data rather than the absence of withdrawals (table 9). In these instances, withdrawal may be underestimated.

Table 4. Summary of pressure-sensor calibrations and associated error at wells JF-3 and AD-6, 2003

[Symbol: >, greater than value indicated]

Site number (see fig. 1)	Date of collection	Regression equation[1], in feet below land surface	Coefficient of determination[2]	Number of points[3]	Equation applied		Differences between measured and computed water levels[4]			
					Begin date	End date	Minimum, in feet	Date	Maximum, in feet	Date
JF-3	01-15-2003	WL = (-2.323 x PSI) + 715.301	>0.99	11	01-01-2003	04-28-2003	-0.01	01-15-2003	-0.06	04-28-2003
	01-15-2004	WL = (-2.328 x PSI) + 715.224	>0.99	11	04-28-2003	12-31-2003	0.00	04-28-2003	-0.04	12-04-2003
AD-6	01-15-2003	WL = (-2.330 x PSI) + 48.912	>0.99	13	01-01-2003	08-28-2003	0.01	01-15-2003 and 02-06-2003	0.05	08-28-2003
	01-16-2004	WL = (-2.310 x PSI) + 48.921	>0.99	13	08-28-2003	12-31-2003	0.01	12-05-2003	-0.02	08-28-2003 and 09-16-2003

[1]Equation developed to convert pressure readings (PSI) recorded by onsite instrumentation to water level in feet below land surface (WL).

[2]Value representing variation in water level that can be explained by variation in pressure. A value of 1.00 implies all variations in water level can be explained by variations in pressure.

[3]Number of pressure-sensor depths used to develop regression equation during calibration procedure.

[4]Differences between periodic water levels determined using electric or steel tapes and computed water levels determined by use of regression equation.

Estimated ground-water withdrawals for calendar year 2003 are listed by hydrographic area (Amargosa Desert, Crater Flat, Jackass Flats, and Mercury Valley) within the Alkali Flat–Furnace Creek Ranch and the Ash Meadows ground-water subbasins. The Amargosa Desert spans both subbasins and is further subdivided into two areas within the Ash Meadows ground-water subbasin. Because of recently available information, withdrawals for some years prior to 2003 have been revised (Karl Eitenmiller, Nevada Department of Water Resources, written commun., 2004; U.S. Geological Survey, 2004).

Withdrawals for irrigation use account for the majority of pumpage in the study area. Those withdrawals commonly are estimated by multiplying irrigated acreages by water-application rates. Irrigated acreage in the Amargosa Desert during 2003, provided by the NDWR, was about 2,390 acres. The Amargosa Desert within the Alkali Flat–Furnace Creek Ranch subbasin has 2,388 acres and the Ash Meadows subbasin has 2 acres. Application rates used by the NDWR in 2003 averaged about 4 acre-ft/acre but estimates of application rates in the Amargosa Desert by Moreo and others (2003) ranged from 2 to 12 acre-ft/acre and averaged about 7 acre-ft/acre.

Withdrawals for domestic use account for the least pumpage in the study area. Reported domestic use is based on the number and location of wells drilled for domestic purposes (Robert Coache, Nevada Division of Water Resources, oral commun., 2004).

Ground-water withdrawal sites and general areas of ground-water withdrawals during 2003 are shown in figure 10. General areas of ground-water withdrawals are townships and ranges or are portions of townships and ranges in which the majority of ground-water withdrawals occurred.

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

Withdrawals from the Amargosa Desert hydrographic area within the Alkali Flat–Furnace Creek Ranch ground-water subbasin (4,405 Mgal) were recompiled from a ground-water pumpage inventory made by NDWR for the entire Amargosa Desert. The pumpage inventory in 2003 includes estimated withdrawals for irrigation, mining, quasi-municipal and commercial, and domestic uses. Most reported withdrawals for the Amargosa Desert are from the Alkali Flat–Furnace Creek Ranch ground-water subbasin. Within this subbasin, ground-water withdrawals in the Amargosa Desert were used for irrigation (77 percent), mining (9 percent), quasi-municipal or commercial (11 percent), and domestic use (3 percent).

Withdrawals from Crater Flat of about 14.4 Mgal in 2003 were determined from flowmeters at well USW VH-2 and at sites CF-2 and CF-3. Estimated withdrawals for well USW VH-2 (about 9 Mgal) and site CF-3 (about 5 Mgal) are from NDWR (Karl Eitenmiller, written commun., 2004). Total withdrawals in 2003 for site CF-2 (less than 1 Mgal) are from DOE (Karen Bull, Bechtel SAIC Company, LLC, written commun., 2004). Withdrawals from sites CF-1 and CF-1a during 2003 are estimated as zero based on observations during site visits. About 9 Mgal/yr were pumped from well USW VH-2 during 1996–2002 (Karl Eitenmiller, Nevada Department of Water Resources, written commun., 2004). This pumpage was not included in estimates of annual ground-water withdrawals from Crater Flat for 1996–2002 (La Camera and Locke, 1998; La Camera and others, 1999; Locke, 2001a, 2001b; Locke and La Camera, 2003). Annual ground-water withdrawals from Crater Flat are summarized and supersede all previously published estimates (table 9).

Withdrawals from Jackass Flats were determined from flowmeters at sites J-13 and J-12 during 2003. Ground-water withdrawals from site J-12 accounted for about 95 percent of the roughly 13.5 Mgal total withdrawals from Jackass Flats. Withdrawals for 2003 at these sites were recompiled from flowmeter readings provided by Bechtel Nevada as part of the USGS–Hydrologic Resources Management Program. Some previously published estimates of annual ground-water withdrawals from Jackass Flats (1959, 1960, 1962–67, and 1978–82) have been revised after further review by personnel associated with that program (U.S. Geological Survey, 2004). Annual ground-water withdrawals from Jackass Flats are summarized and supersede all previously published estimates (table 9).

Withdrawals from Rock Valley are considered negligible. The valley is mostly within the Nevada Test Site, which limits public access and use. Within the valley, no known DOE water supply wells exist, no pumpage is reported by DOE, and only one well that is not pumped (site RV-1) is present in USGS or DOE data bases.

Withdrawals from Ash Meadows Ground-Water Subbasin

Withdrawals from Mercury Valley of about 51 Mgal in 2003 were recompiled from flowmeter readings for site MV-1 and provided by Bechtel Nevada as part of the USGS–Hydrologic Resources Management Program. Some previously published estimates of annual ground-water withdrawals from Mercury Valley (1964, 1972–82, and 1999) have been revised after further review by personnel associated with that program (U.S. Geological Survey, 2004). Annual ground-water withdrawals from Mercury Valley are summarized and supersede all previously published estimates (table 9).

Withdrawals from the Amargosa Desert hydrographic area within the Ash Meadows ground-water subbasin also were recompiled from the ground-water pumpage inventory made by NDWR for the entire Amargosa Desert. In 2003, about 22 Mgal were withdrawn from the Amargosa Desert within the Ash Meadows ground-water subbasin. The Amargosa Desert within this subbasin has been divided into two areas to provide information on withdrawals in the immediate vicinity of the environmentally sensitive Ash Meadows area. These areas are identified in table 9 and figure 12 as the Amargosa Desert (excluding Ash Meadows area) and the Amargosa Desert (Ash Meadows

area). No withdrawals for mining use (greater than 0.3 Mgal), and only minor withdrawals for irrigation use (less than 1 Mgal) or quasi-municipal use (less than 1 Mgal) were reported from these two areas. During 2003, withdrawals in the Amargosa Desert (excluding Ash Meadows area) include irrigation and quasi-municipal withdrawals from three wells in T. 17 S., R. 52 E. Also during 2003, withdrawals for quasi-municipal and commercial uses from the Amargosa Desert (Ash Meadows area) include withdrawals from two wells in T. 18 S., R. 50 E. Within Ash Meadows subbasin, withdrawals for domestic use in 2003 from the two areas were minor, about 13 and 2 percent, respectively, in comparison to total withdrawals for domestic use in the Amargosa Desert hydrographic area.

PRESENTATION OF GROUND-WATER DATA

Ground-water data listed in tables 5–9 have been collected and compiled in the Yucca Mountain region as part of this study and are shown in figures 2–9 and 11–12. The graphical ground-water data was selected from the tables in this and previously published reports for the Yucca Mountain region. Pumping water from or injecting water into a well or nearby well may result in short-term variations in water levels that differ from long-term or sustained ground-water levels. Such short-term variations are excluded from the figures showing variations in water levels through time. Observed differences among measurements could result from differing accuracies of equipment used, inaccurate readings of equipment, inaccurate reporting of measurements, or changes in personnel making measurements.

Table 5 lists periodic measurements of depth to water and water-level altitude for 2003 and figures 2–5 show measurements of water levels from the earliest available information through 2003. Periodic data usually are from manual onsite measurements of depth to water. Exceptions are water-level data noted with data source "HRC" or "NTS" and method "F," and water-level data noted with data source "NPS" and method "A" in table 5. These data were derived from measurements by onsite instrumentation. Table 5 also includes revised water-surface altitudes at Devils Hole (site AM-4) for May 20, 1992 through 2002. These altitudes followed replacement of the bolt on May 20, 1992, that serves as a measurement point and are on the basis of surveyed altitudes of the new measurement point during 1992–2002. All water-level data collected by other agencies or programs are subject to revision upon further review by that agency or program.

Listed in tables 6 and 7 are daily average water levels for sites JF-3 and AD-6, respectively, for 2003. Figure 6 shows daily average water levels at sites JF-3 and AD-6 as listed in this and previous reports on selected ground-water data for the Yucca Mountain region.

Table 8 lists measurements of ground-water discharge for 2003 and figures 7–9 show measurements of ground-water discharge from the earliest available information through 2003. Discharge measured at site AM-2 represents a combination of flow directly through slotted casing at land surface and leakage through the casing's annular space. The increased discharge at site AM-2 probably is attributable to clearing the uppermost portion of annular space surrounding the casing. Data for site DV-1 reported with data source "NPS" represent monthly average discharge collected from instrumentation operated by the NPS. Discharge data collected by other agencies or programs are subject to revision upon further review by that agency or program.

Table 9 lists estimates of ground-water withdrawals from wells in the Yucca Mountain region for 2003. Estimates of historical withdrawals in the region that are in addition to or have been revised are footnoted. Figure 10 shows general locations of ground-water withdrawals during 2003 and figures 11–12 show estimated withdrawals from wells from the earliest available information through 2003. Total bar heights shown in figures 11 and 12 equal the sum of withdrawals from all areas shown within the subbasin for a given year. Information on withdrawals provided by other agencies or programs is subject to revision upon further review by that agency or program.

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

Figure 13 shows water-level altitudes for seven wells and estimated annual ground-water withdrawals in Jackass Flats from 1983 through 2003. For greater consistency and comparability of data, a water level in well J-12 that may have been affected by pumping ("P" in table 5) was excluded because it may reflect a short-term condition. Annual ground-water withdrawals in Jackass Flats prior to 1983 are excluded because those data generally represent only the withdrawals from well J-12 rather than total withdrawals from Jackass Flats.

Water-level altitudes (fig. 13) are based on periodic measurements contained in this and previously published reports or are daily average water levels provided by USGS-SCP personnel. Lines are dashed when no data were available.

Ground-water withdrawals in Jackass Flats decreased from 17.7 Mgal in 2002 to 13.5 Mgal in 2003 and consisted of combined pumpage from water-supply wells J-13 and J-12. Withdrawals during 2003 were about 24 percent less than withdrawals in 2002 and about 74 percent less than the median withdrawal of 52 Mgal for the period 1983–91 (La Camera and Westenburg, 1994, p. 30). Median water-level altitudes in Jackass Flats usually corresponded with increases or decreases in withdrawals, although changes in water levels may be due to changes in recharge to the ground-water system rather than withdrawals (Fenelon and Moreo, 2002, p. 54–58). Ground-water withdrawals from well J-13 decreased from about 10.2 Mgal in 2002 to about 0.7 Mgal in 2003. Ground-water withdrawals from well J-12 increased from about 7.5 Mgal in 2002 to 12.8 Mgal in 2003.

Table 10 contains selected statistics for water-level altitudes in Jackass Flats. Data for wells JF-1, JF-2, JF-2a, J-13, J-11, J-12, and JF-3 are summarized for a baseline period of 1992–93 and for subsequent calendar years through 2003. For each period, the table lists the number of measurements, minimum, maximum, and median water-level altitude, and the average deviation of water levels from the median water level. Only one measurement was available for site JF-2 in 2002, therefore, no statistics were determined for that year. Continual data for the period following 2001 that has been subsequently released can be obtained from HRC personnel. The period 1992–93 was selected as a baseline because it is the earliest period when data were available for all sites and data-collection frequency was roughly equivalent at any particular site during that time.

Median water-level altitudes indicate a statistically representative ground-water level for a particular time. Median water-level measurements are listed because the calculated median is less affected by a few high or low values than is the arithmetic mean.

The average deviation indicates the dispersion of individual measurements about the median; it provides an indication of how representative of a typical water-level altitude the median is during a particular period. The average deviation equals the sum of the absolute differences between individual measurements and the median, divided by the number of individual measurements. This measure of dispersion was selected rather than standard deviation because it can be used to describe dispersion about a median value rather than dispersion about an arithmetic mean.

Figure 14 shows the median water-level altitudes and the average deviation of the water levels for wells JF-1, JF-2, JF-2a, J-13, J-11, J-12, and JF-3 for 1992–93 and for subsequent years through 2003. Median annual ground-water withdrawal in Jackass Flats for 1992–93 and estimated annual withdrawals for subsequent years through 2003 also are included.

From 2002 to 2003, median water-level altitudes in six of seven wells in Jackass Flats increased from 0.1 to 0.5 ft. At one well in Jackass Flats (JF-2) a median water-level altitude was not calculated for 2002 because sufficient data were unavailable; from 2001 to 2003 the median water level decreased 0.2 ft. The median water-level altitudes at all monitoring wells in Jackass Flats in 2003 were greater (0.4–2.8 ft) than their altitudes for the baseline period in 1992–93. These increases in median water-level altitudes exceeded historical variability in water levels exhibited during their baseline periods. Changes exceeding historical variability could be due to changes in monitoring instrumentation or frequency, limited lengths of historical baseline periods, withdrawals or recharge that differed from those during baseline periods, or a combination of effects.

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Basic Data

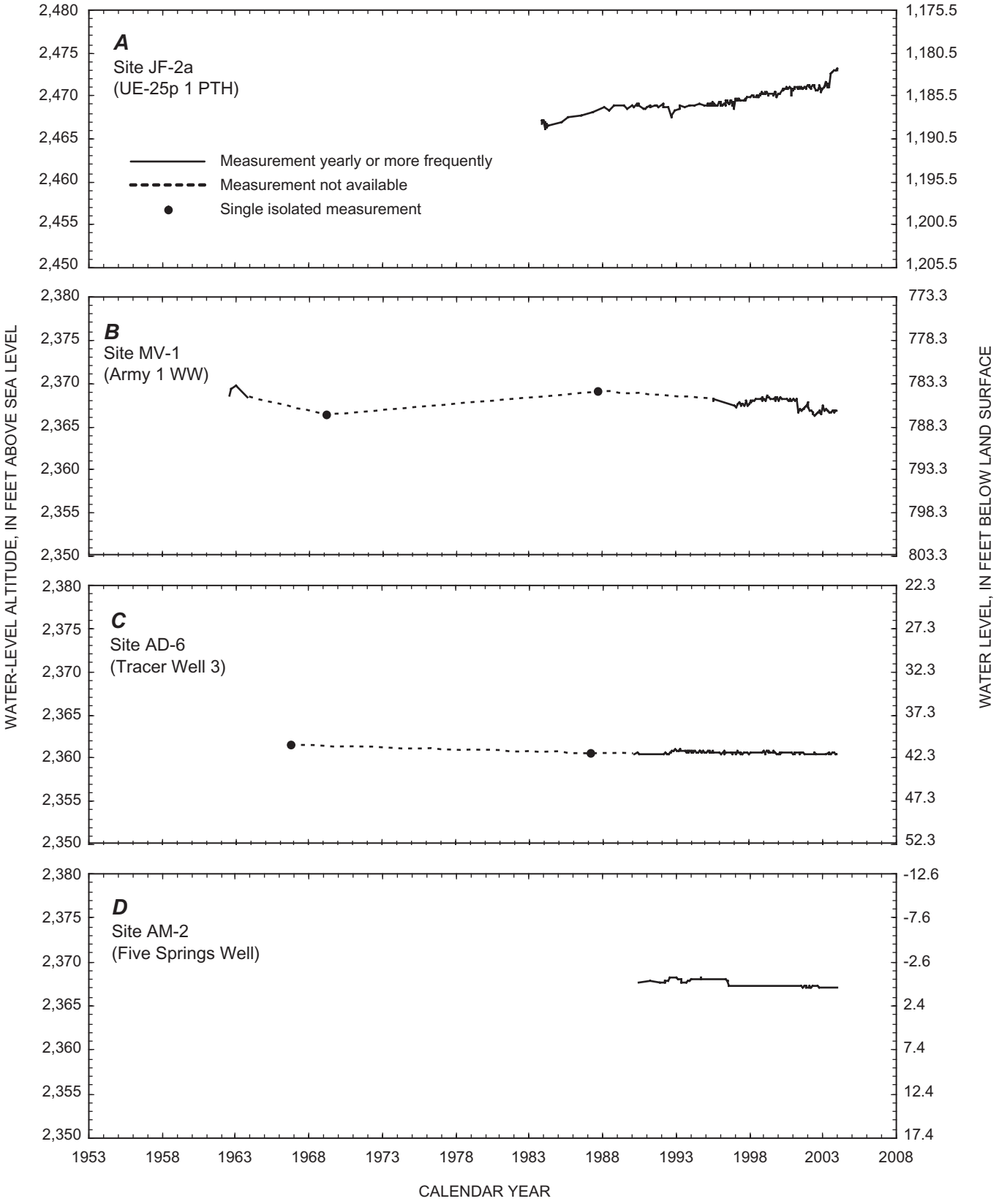
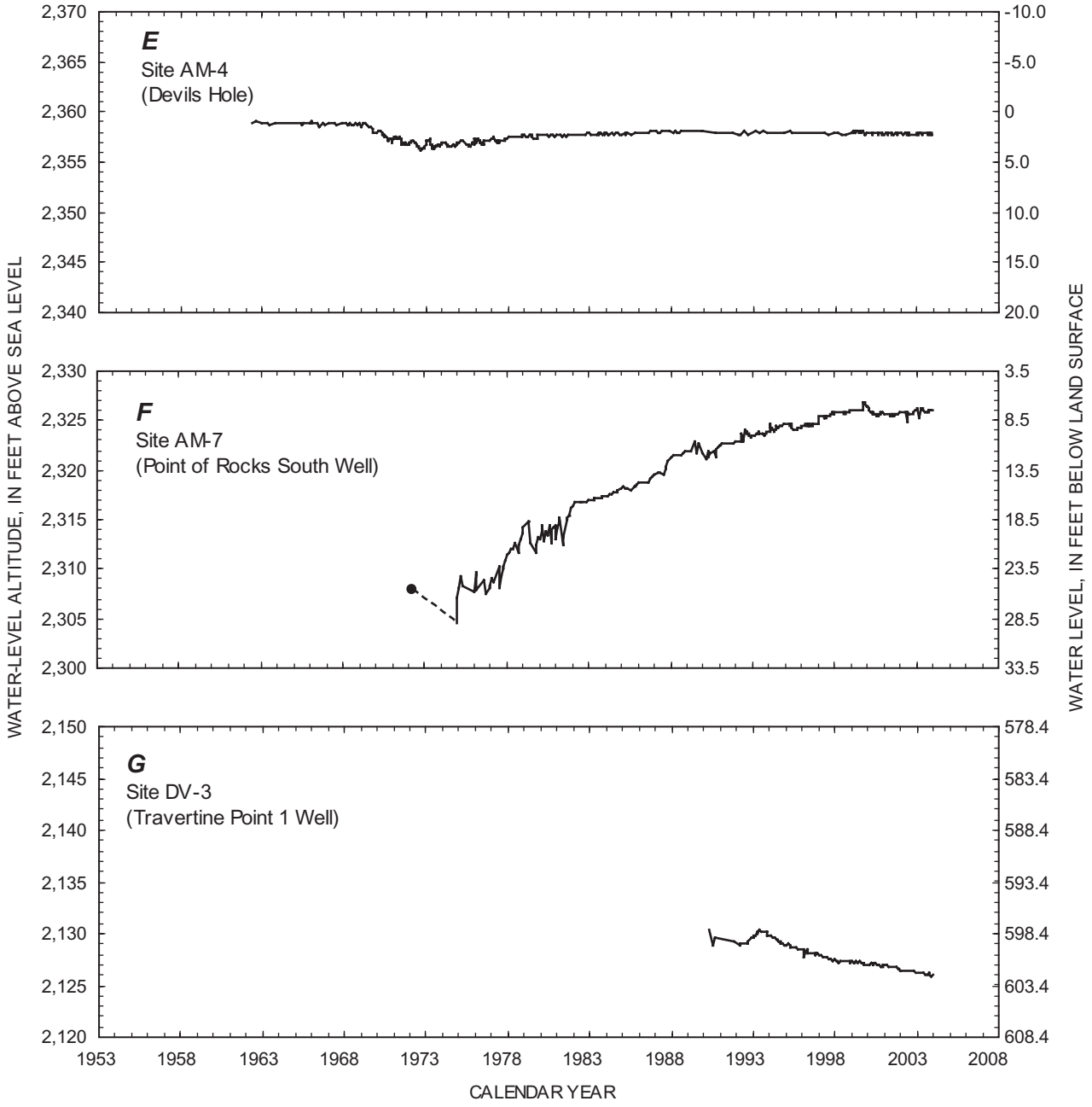


Figure 2. Periodic water levels for selected sites through 2003 at which primary contributing units are carbonate rock.



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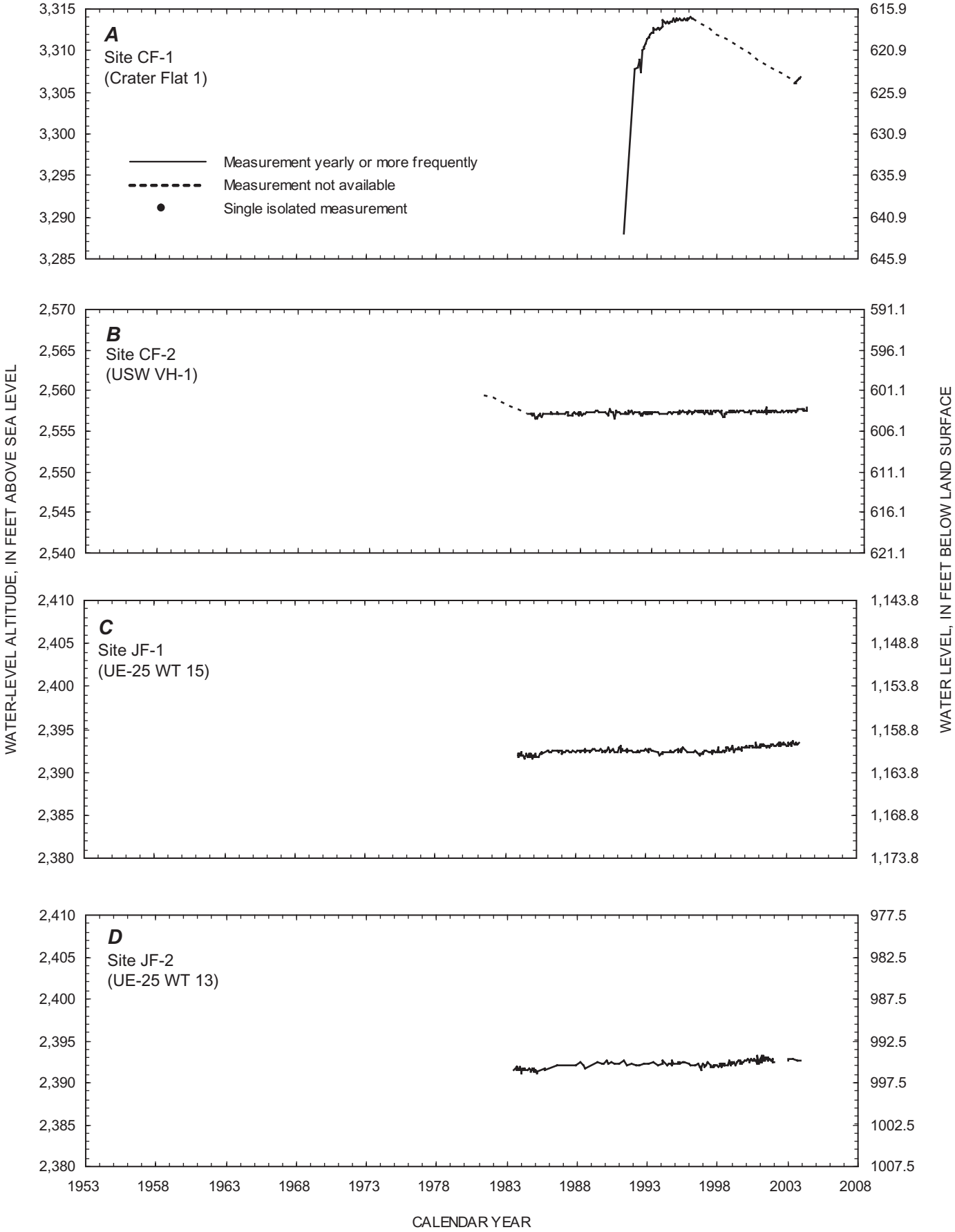
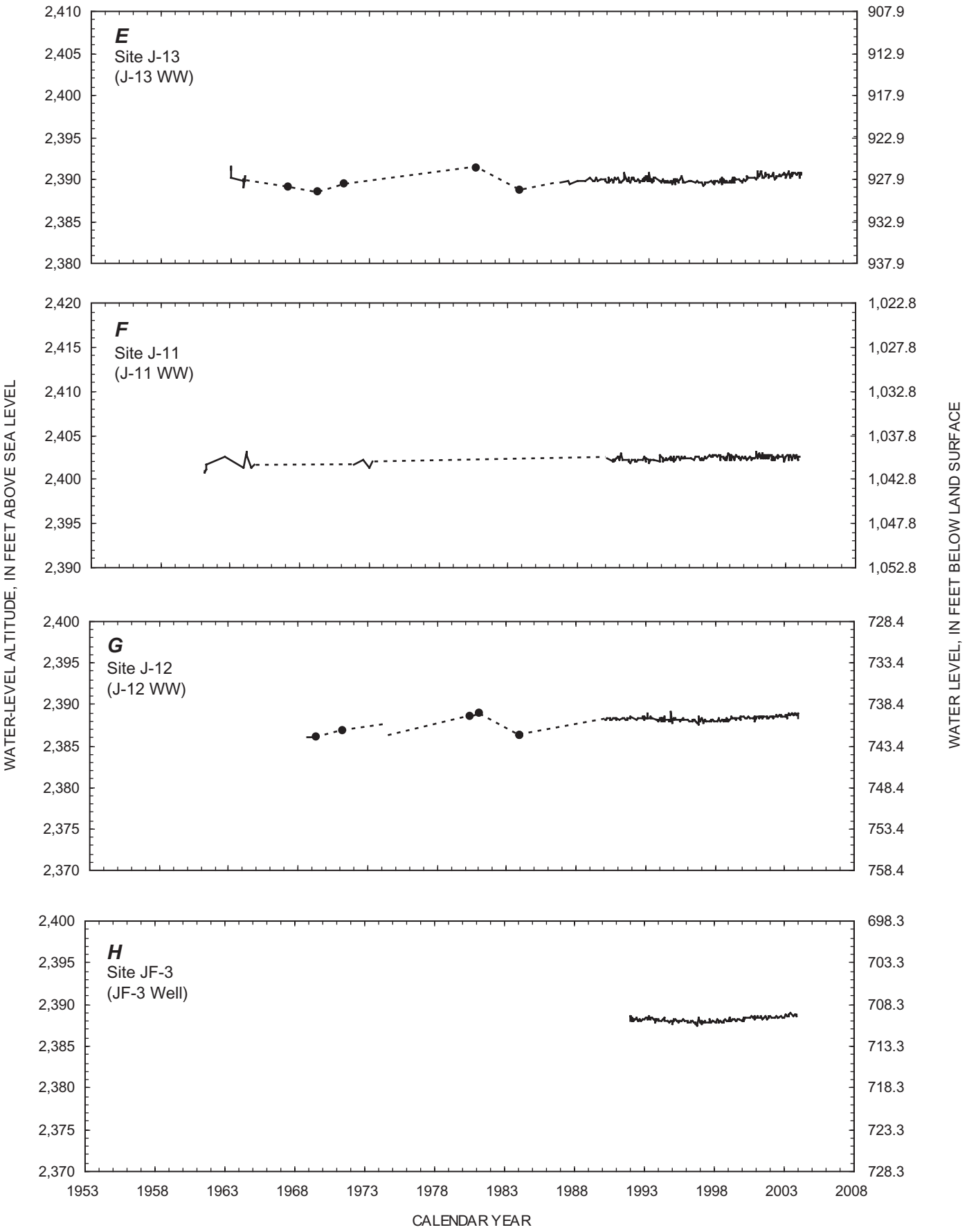


Figure 3. Periodic water levels for selected sites through 2003 at which primary contributing units are volcanic rock.



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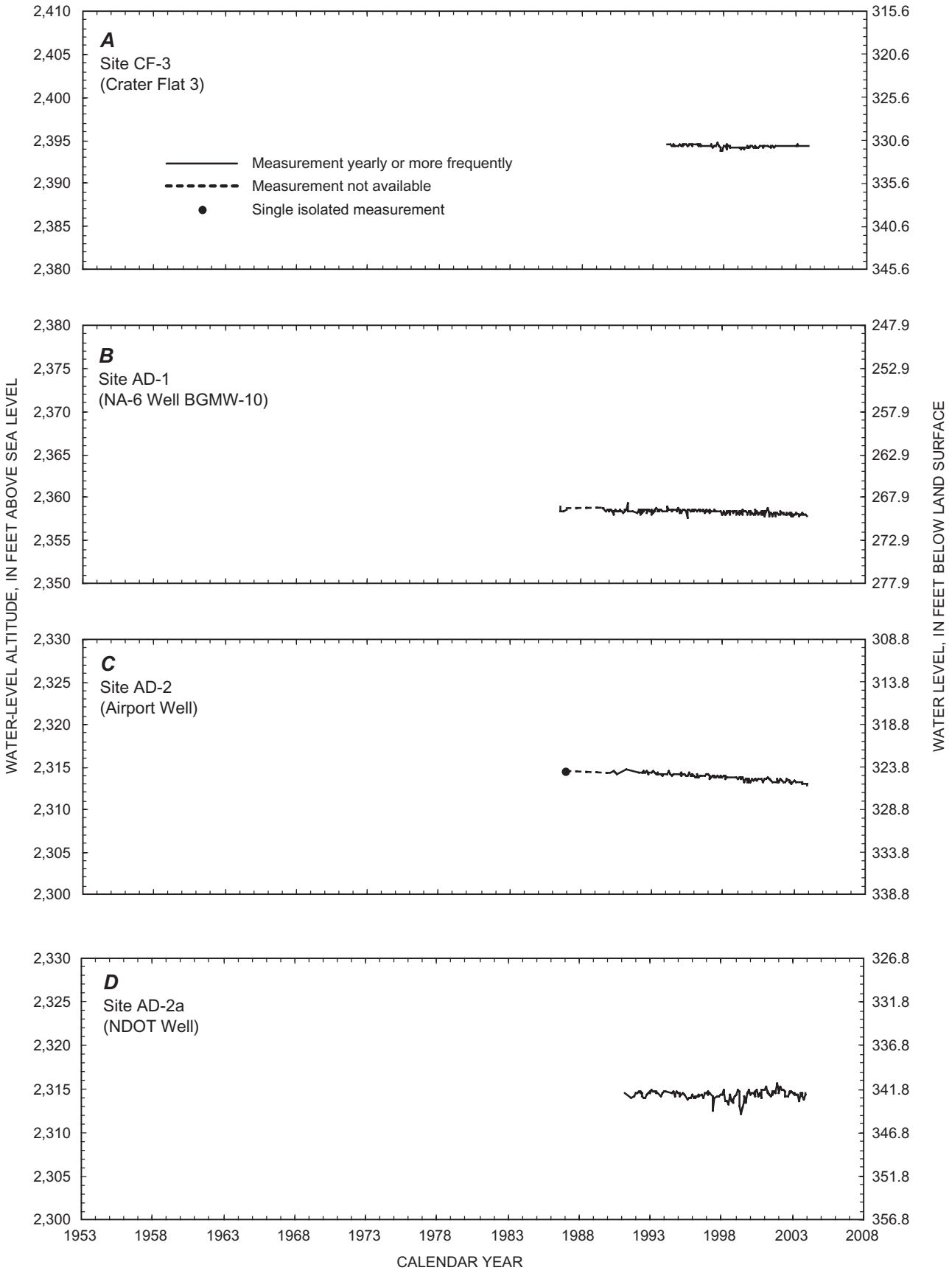
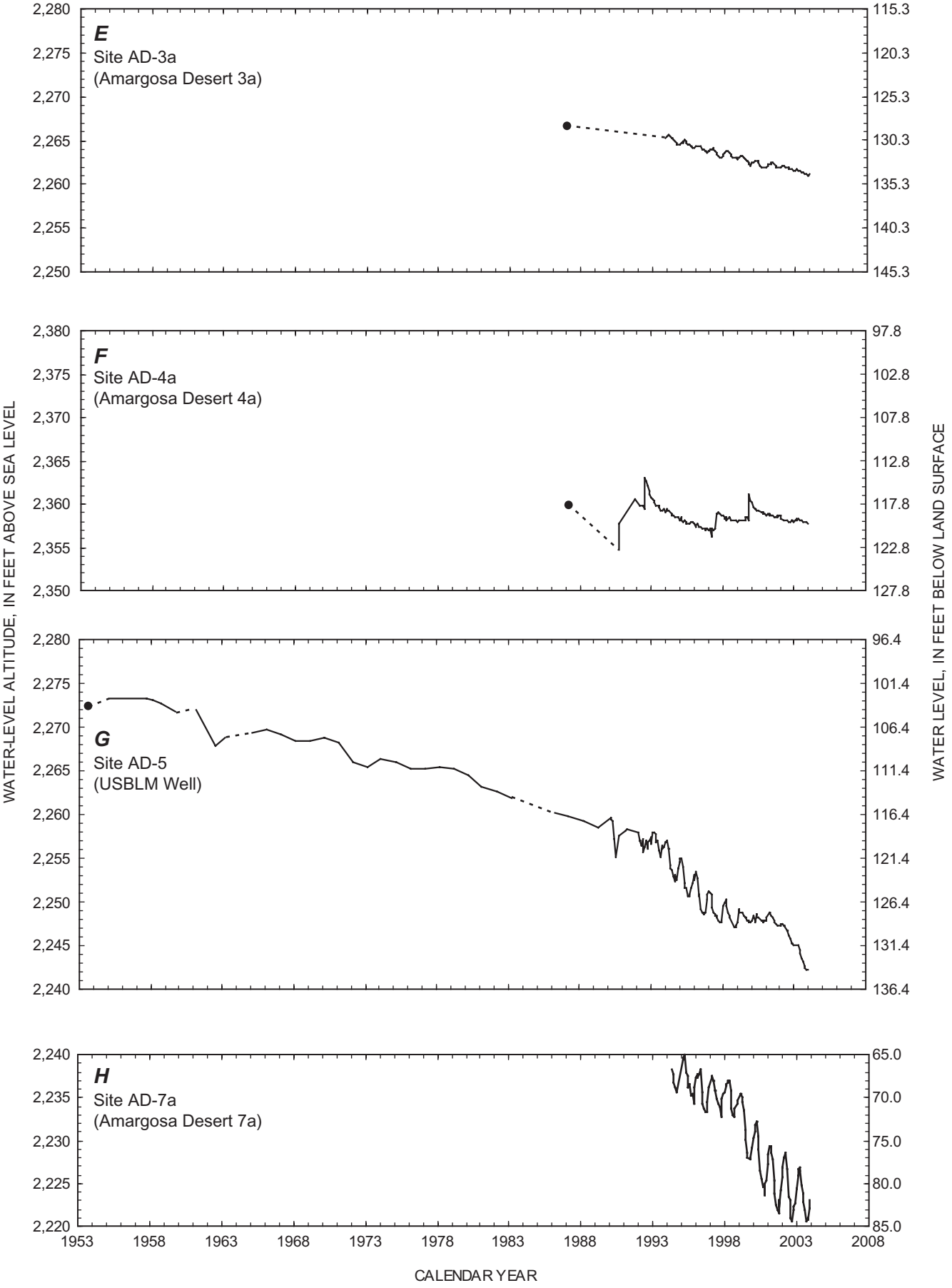


Figure 4. Periodic water levels for selected sites through 2003 at which primary contributing units are valley fill.



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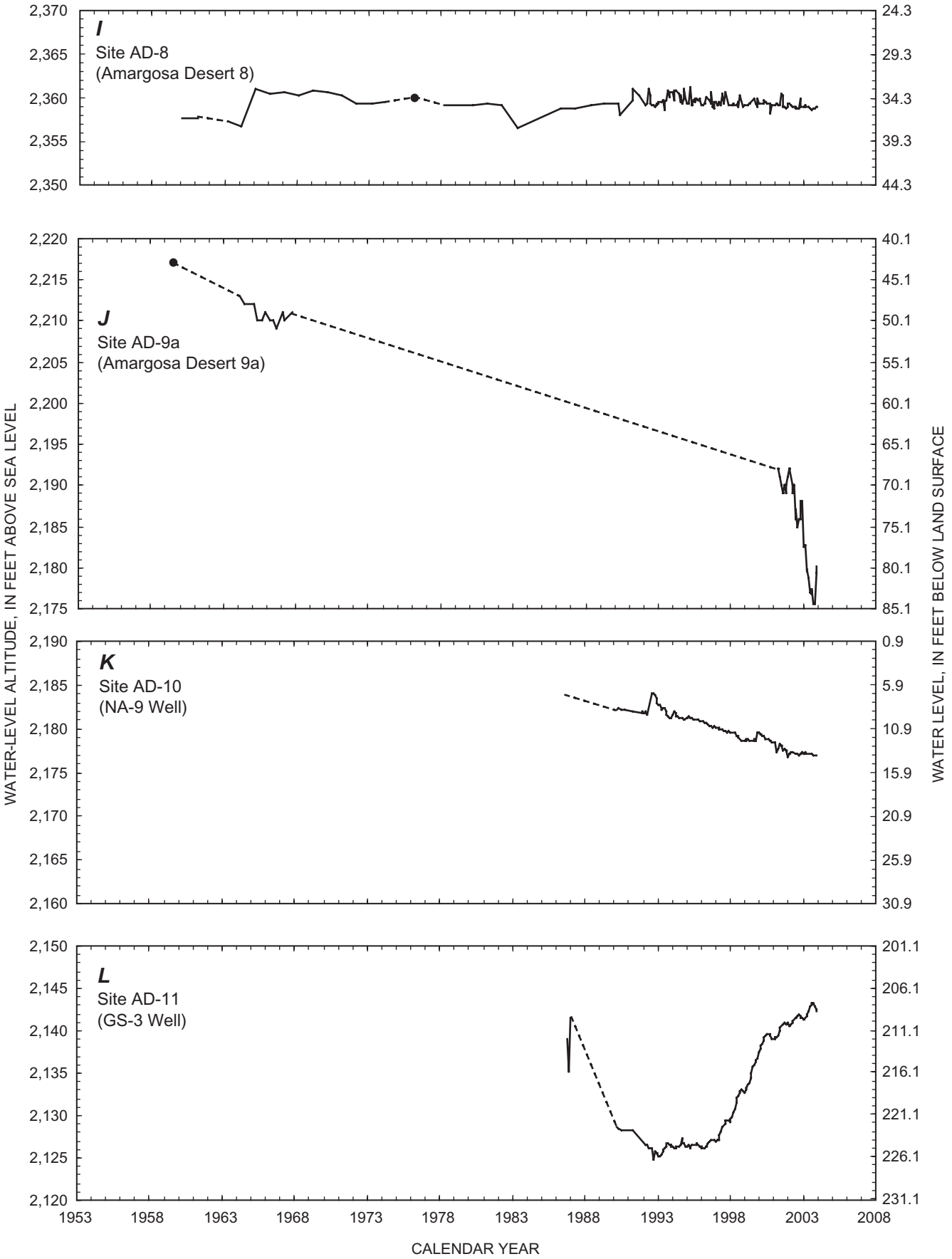

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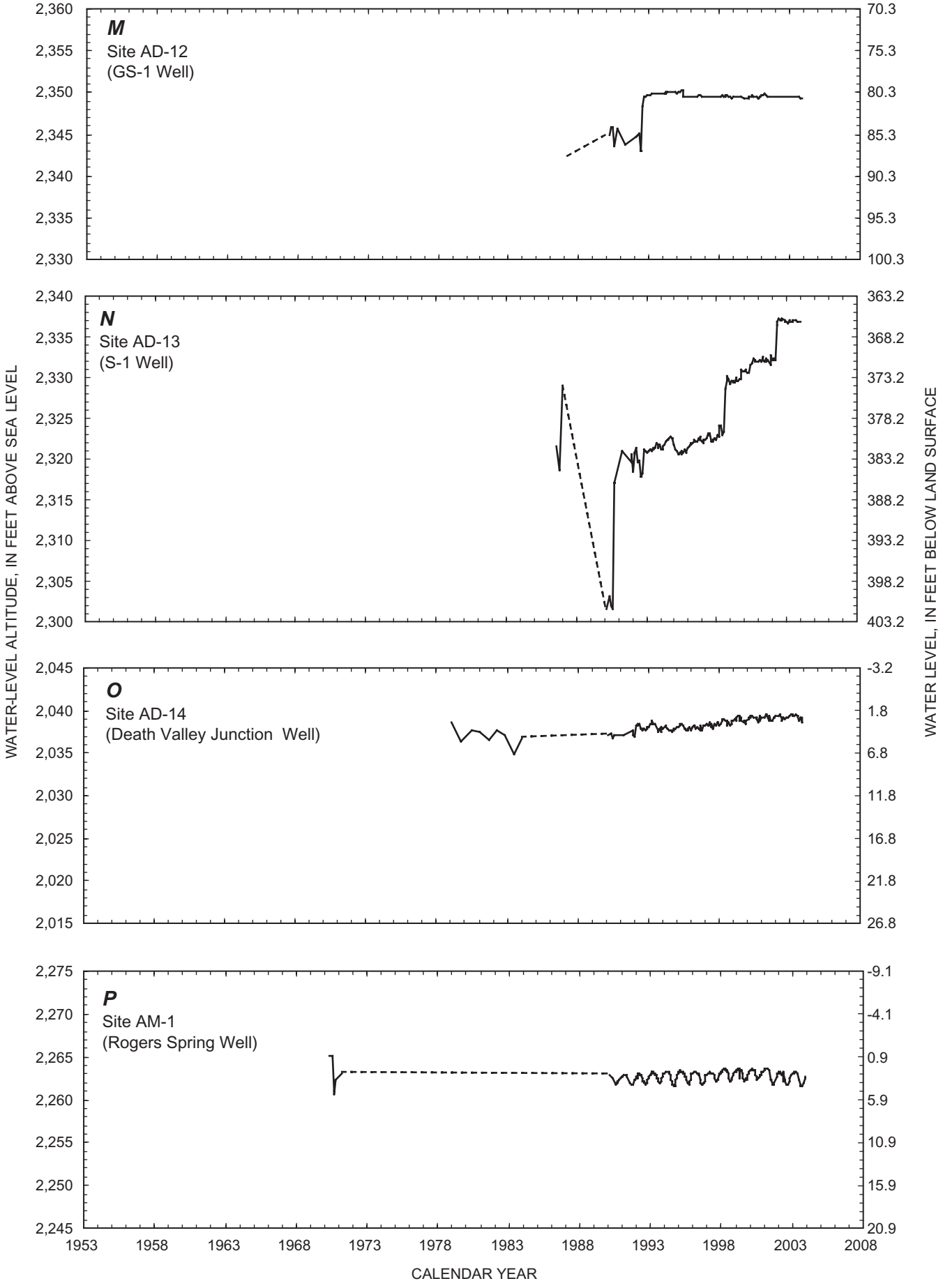

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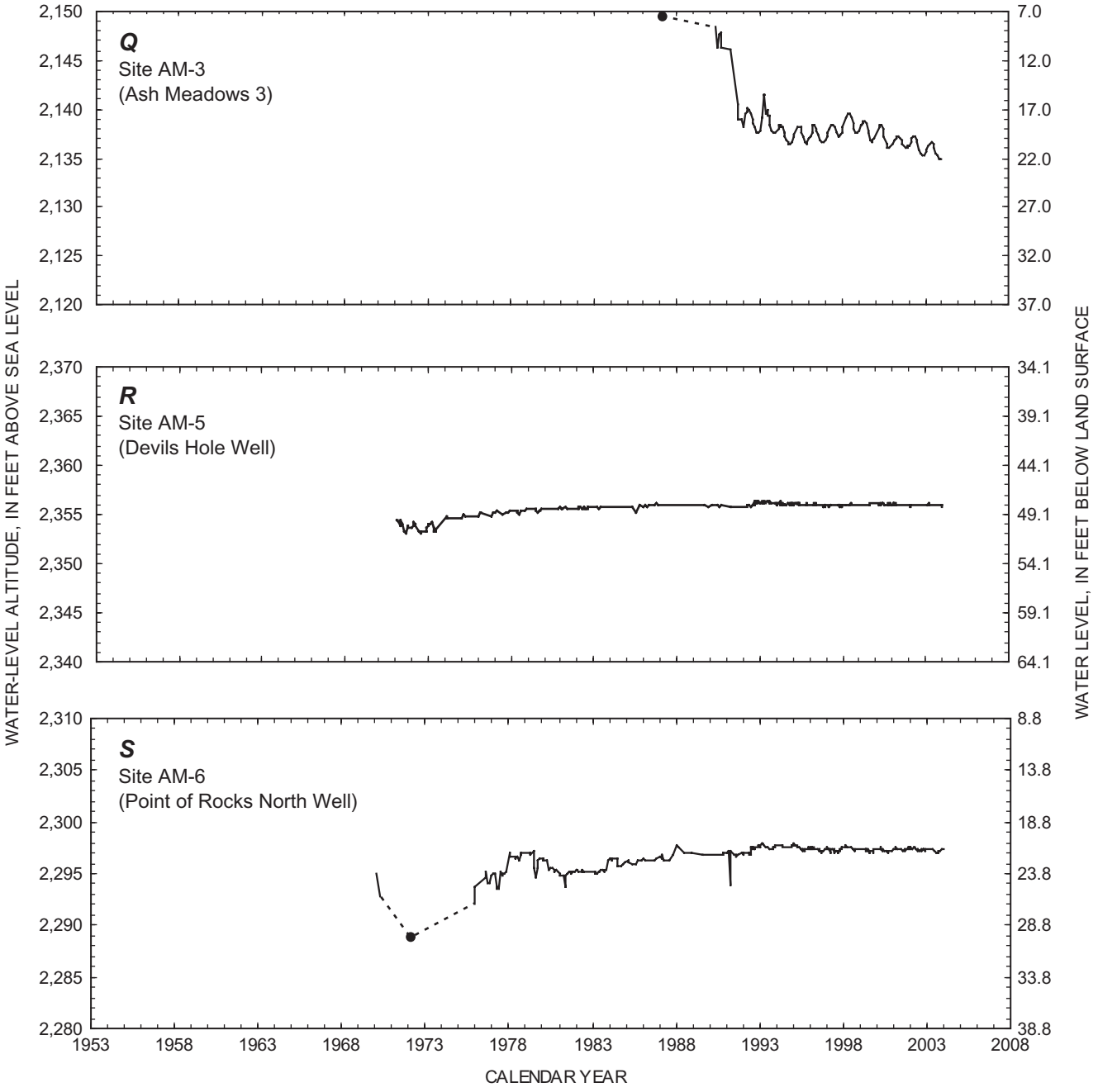

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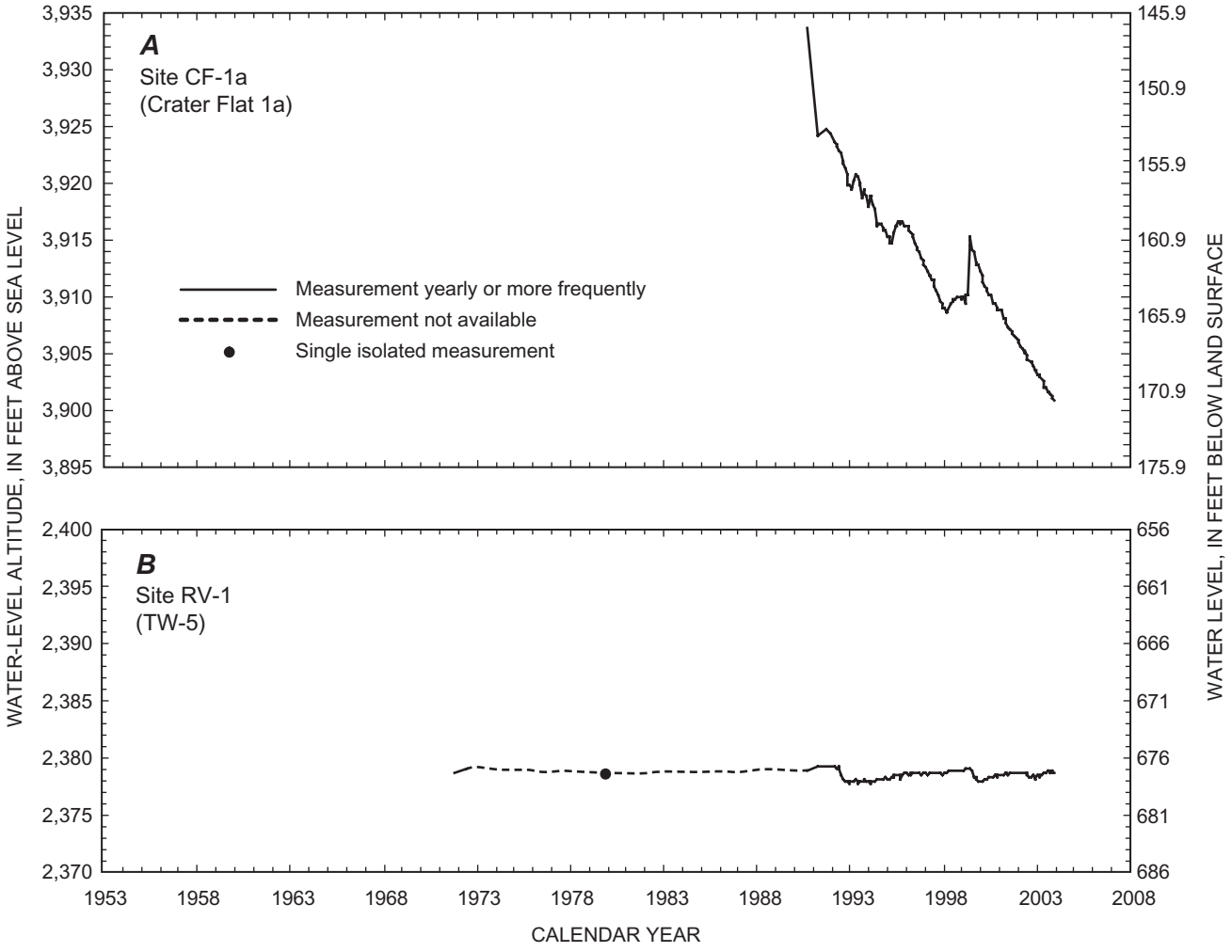


Figure 5. Periodic water levels for selected sites through 2003 at which primary contributing units are undifferentiated sedimentary rock.

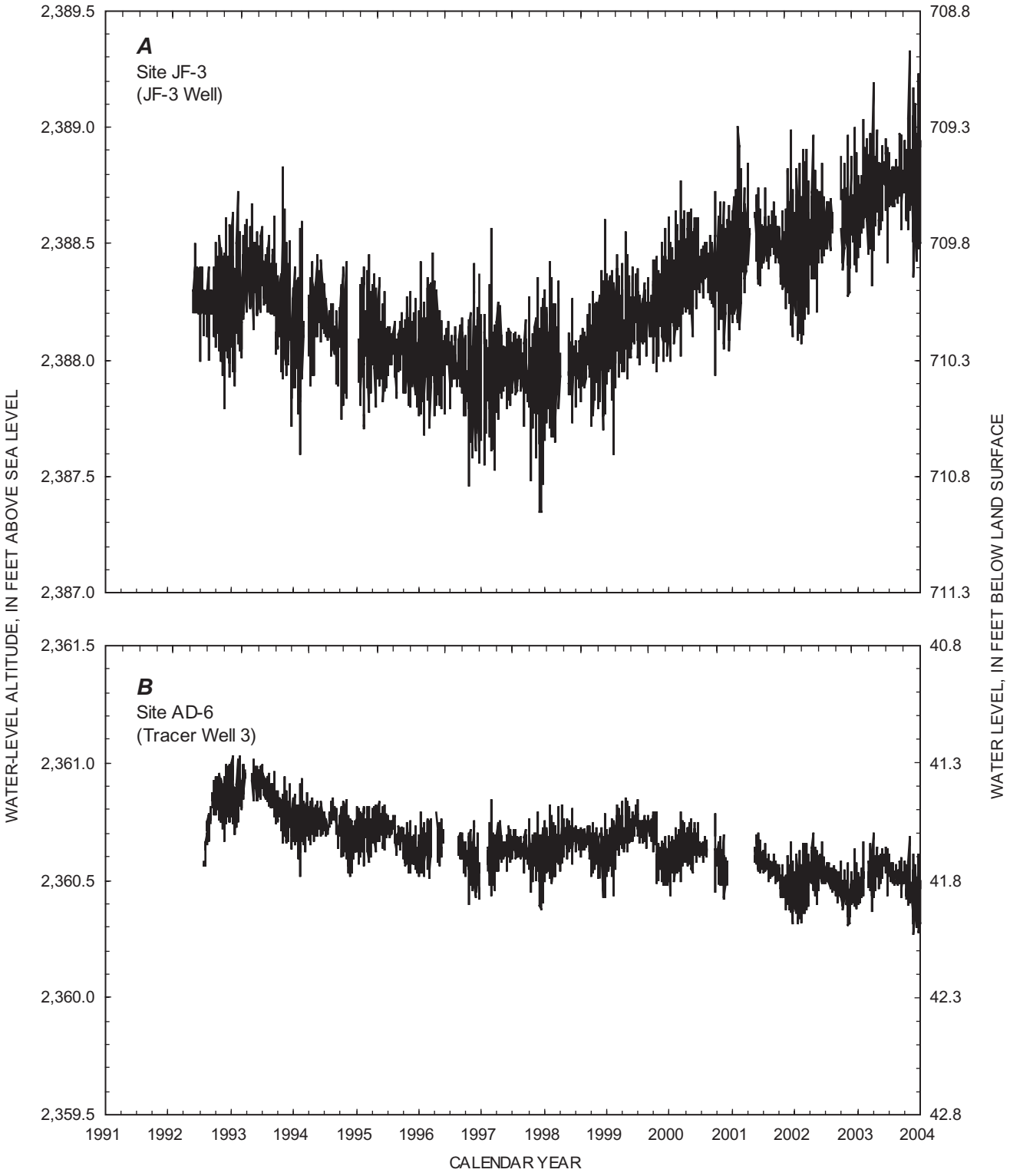


Figure 6. Daily average water levels in well JF-3, May 1992–December 2003 and in well AD-6, July 1992–December 2003.

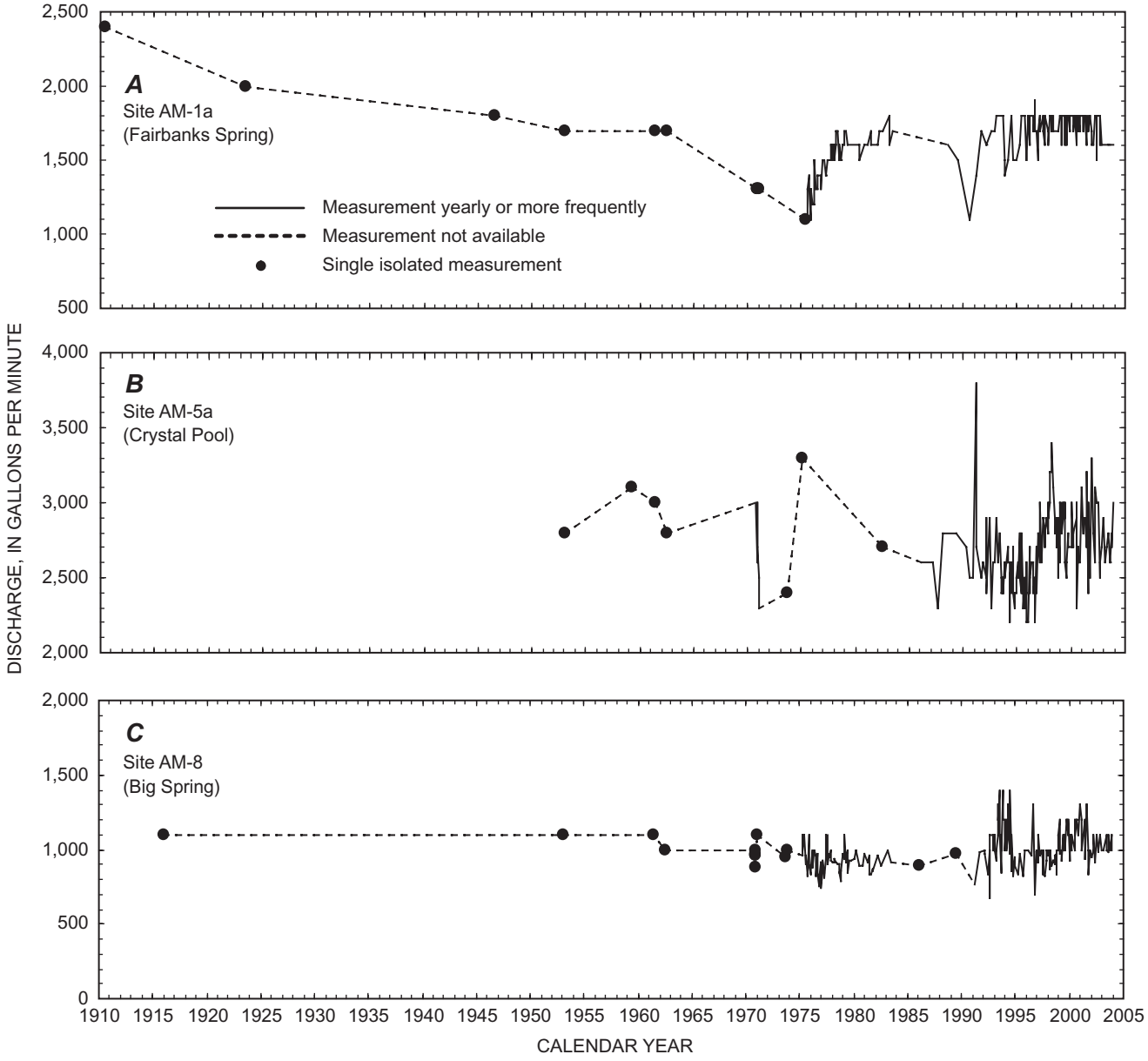


Figure 7. Discharge at sites AM-1a (Fairbanks Spring), AM-5a (Crystal Pool), and AM-8 (Big Spring), 1910–2003.

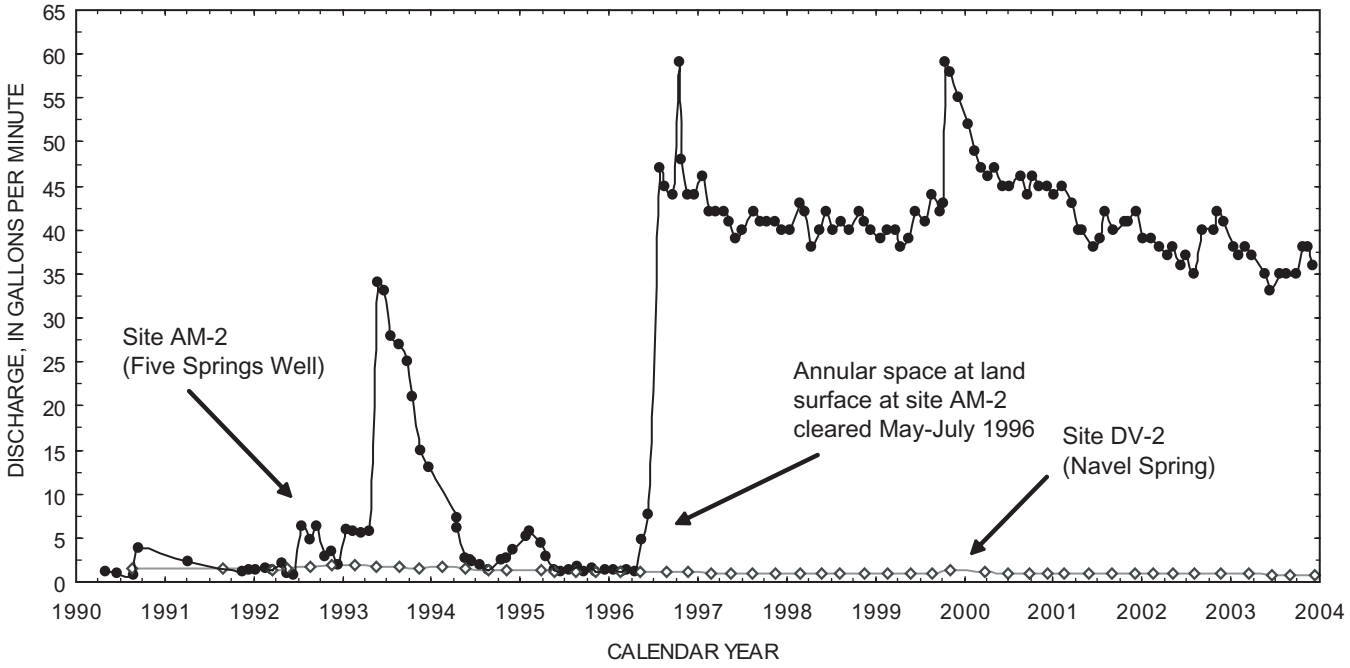


Figure 8. Discharge at sites AM-2 (Five Springs Well) and DV-2 (Navel Spring), 1990–2003.

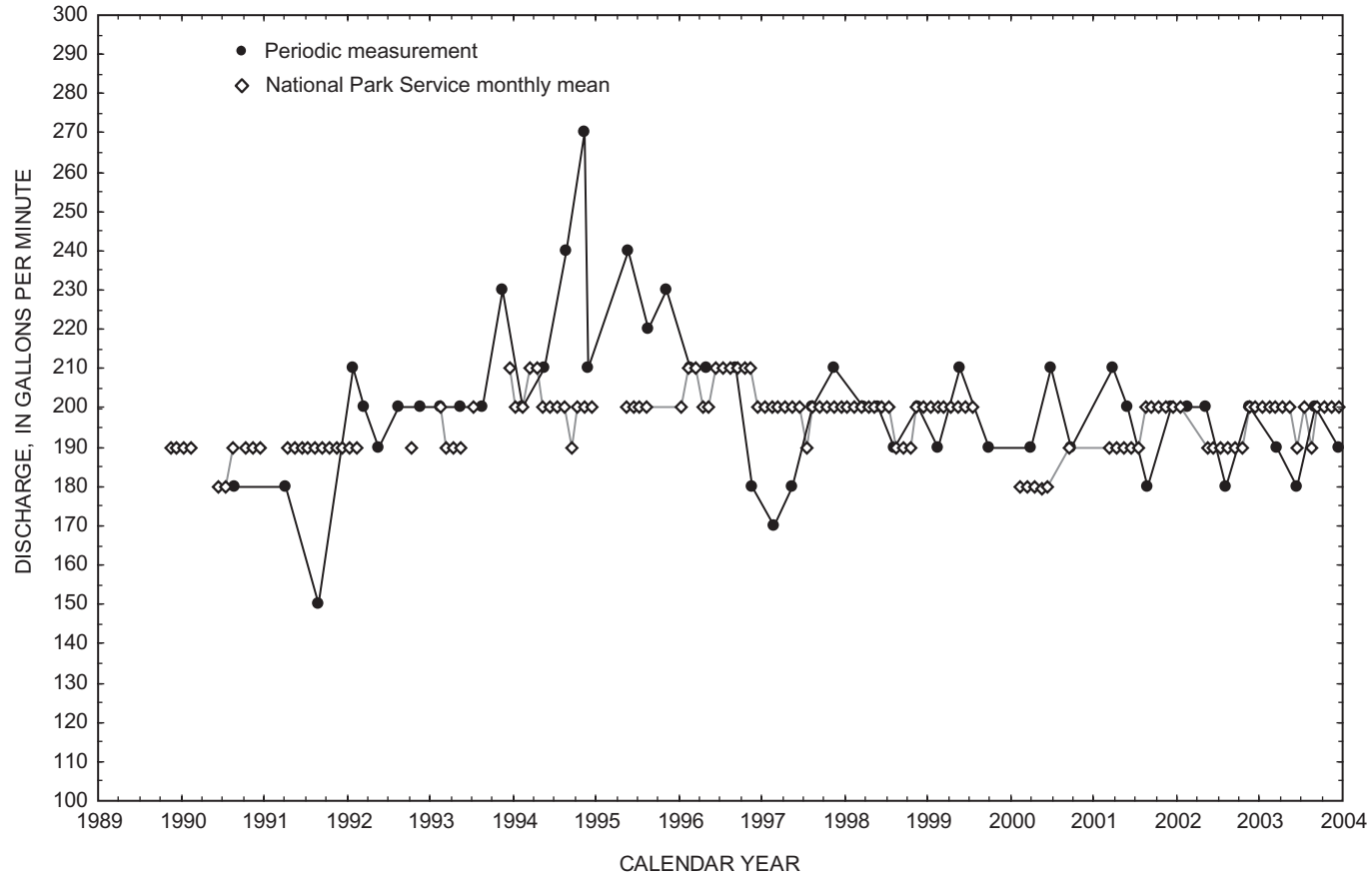
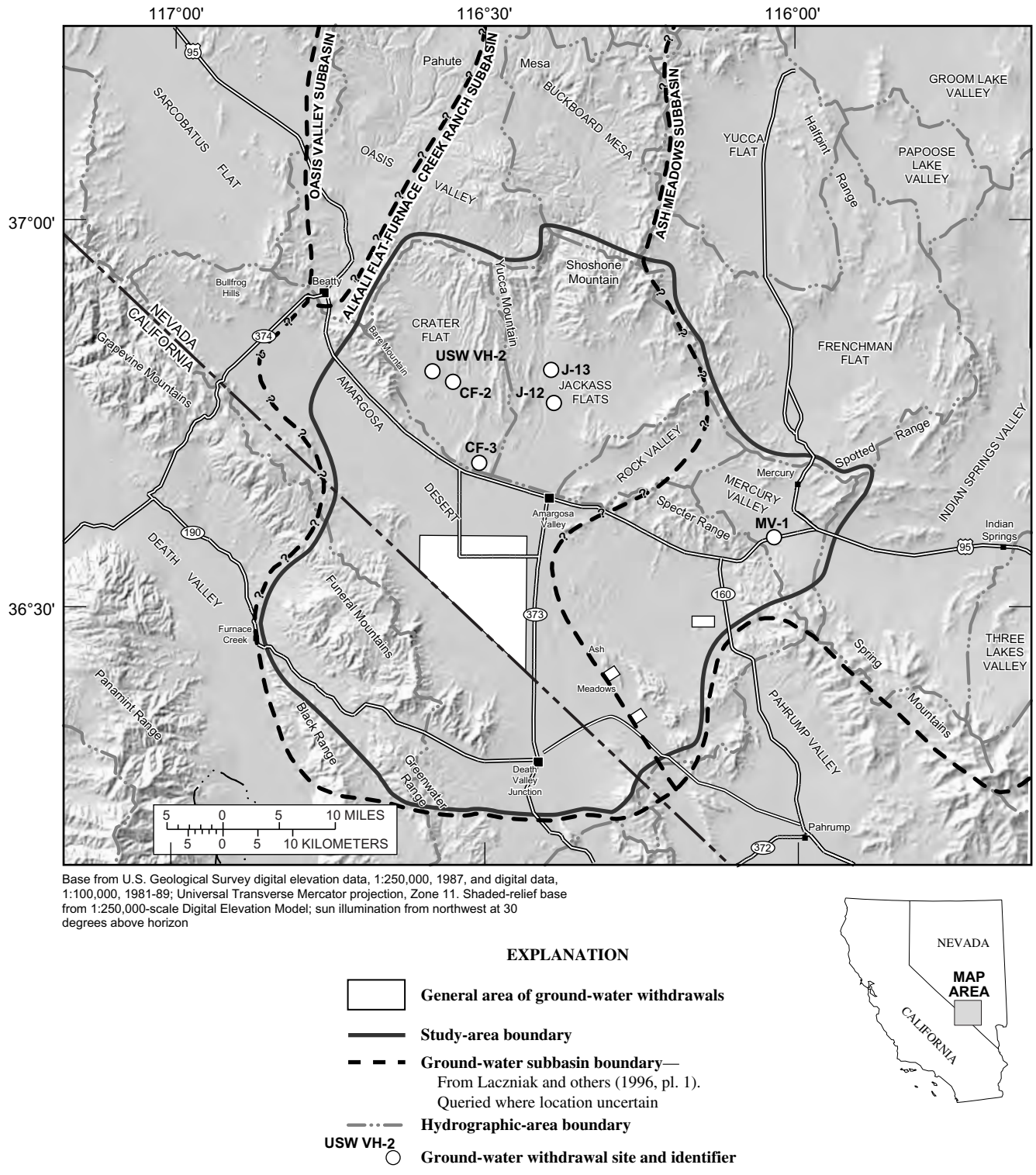


Figure 9. Discharge at site DV-1 (Texas Spring), 1989–2003.



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

EXPLANATION

General area of ground-water withdrawals

Study-area boundary

Ground-water subbasin boundary—
From Laczniak and others (1996, pl. 1).
Queried where location uncertain

Hydrographic-area boundary

USW VH-2
Ground-water withdrawal site and identifier

Figure 10. Location of ground-water withdrawal sites and general areas of ground-water withdrawals in the Yucca Mountain region of southern Nevada and eastern California, January–December 2003.

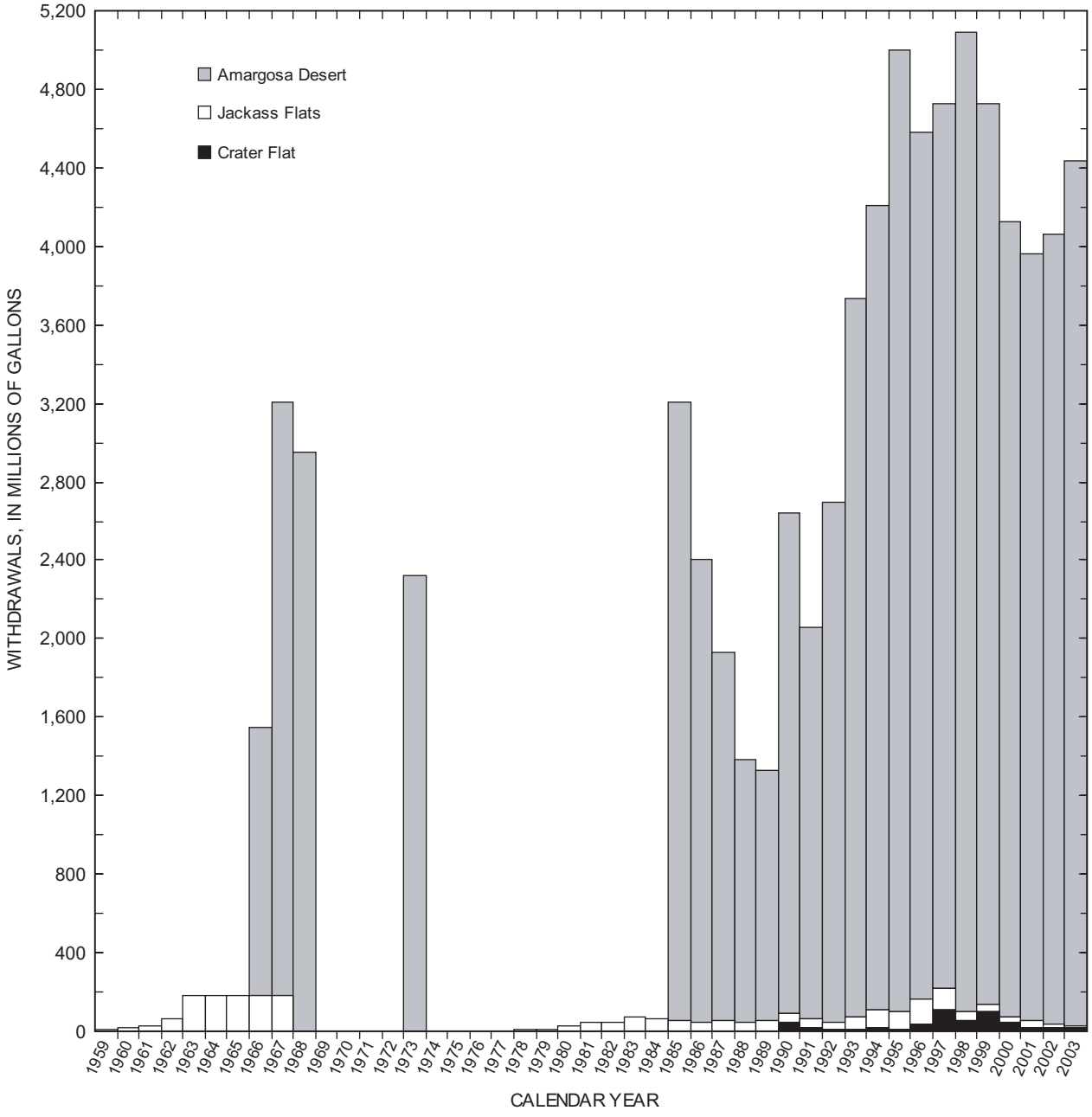


Figure 11. Available estimates of annual ground-water withdrawals for selected areas within Alkali Flat–Furnace Creek Ranch ground-water subbasin, 1959–2003.

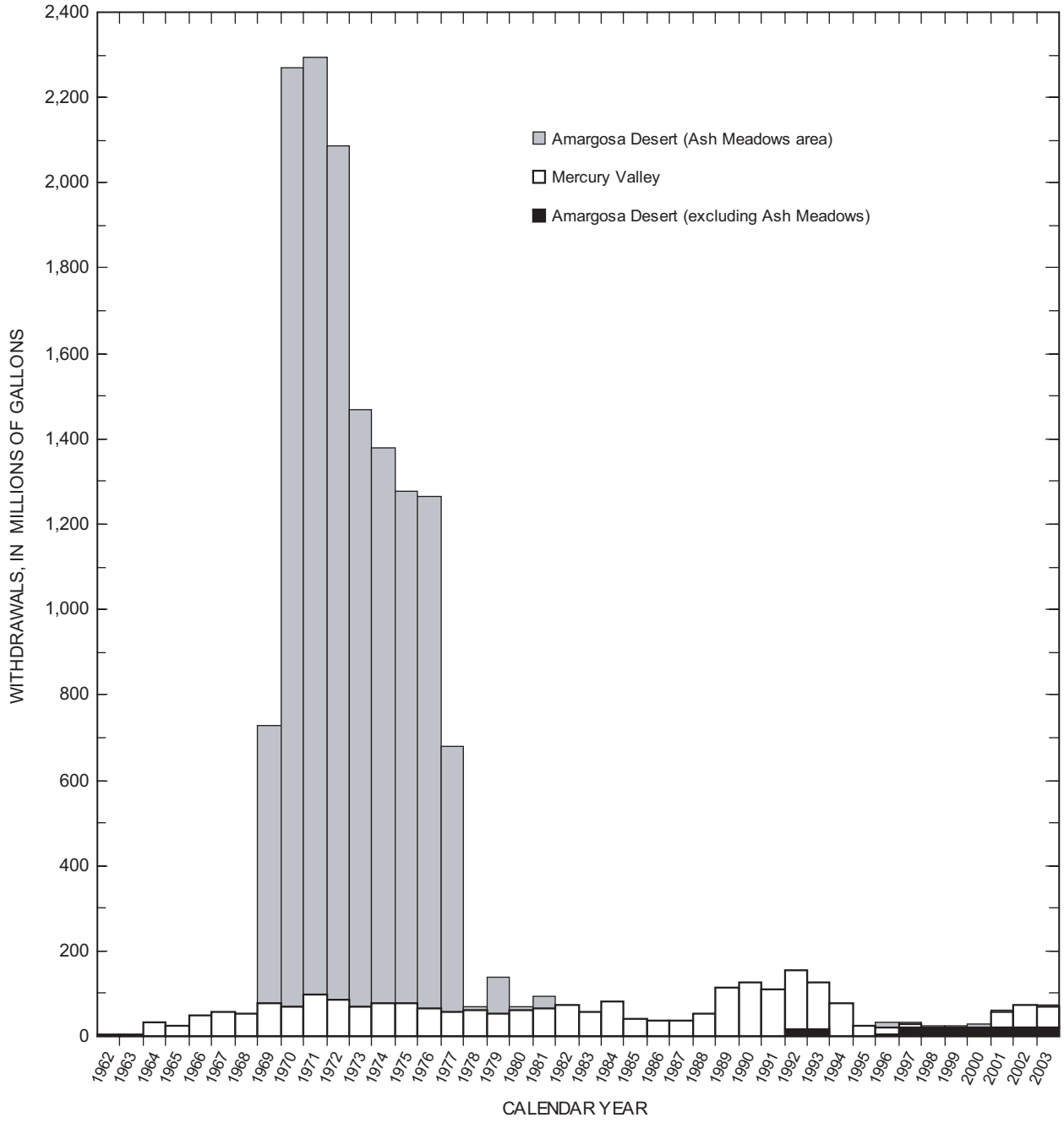


Figure 12. Available estimates of annual ground-water withdrawals for selected areas within Ash Meadows ground-water subbasin, 1962–2003.

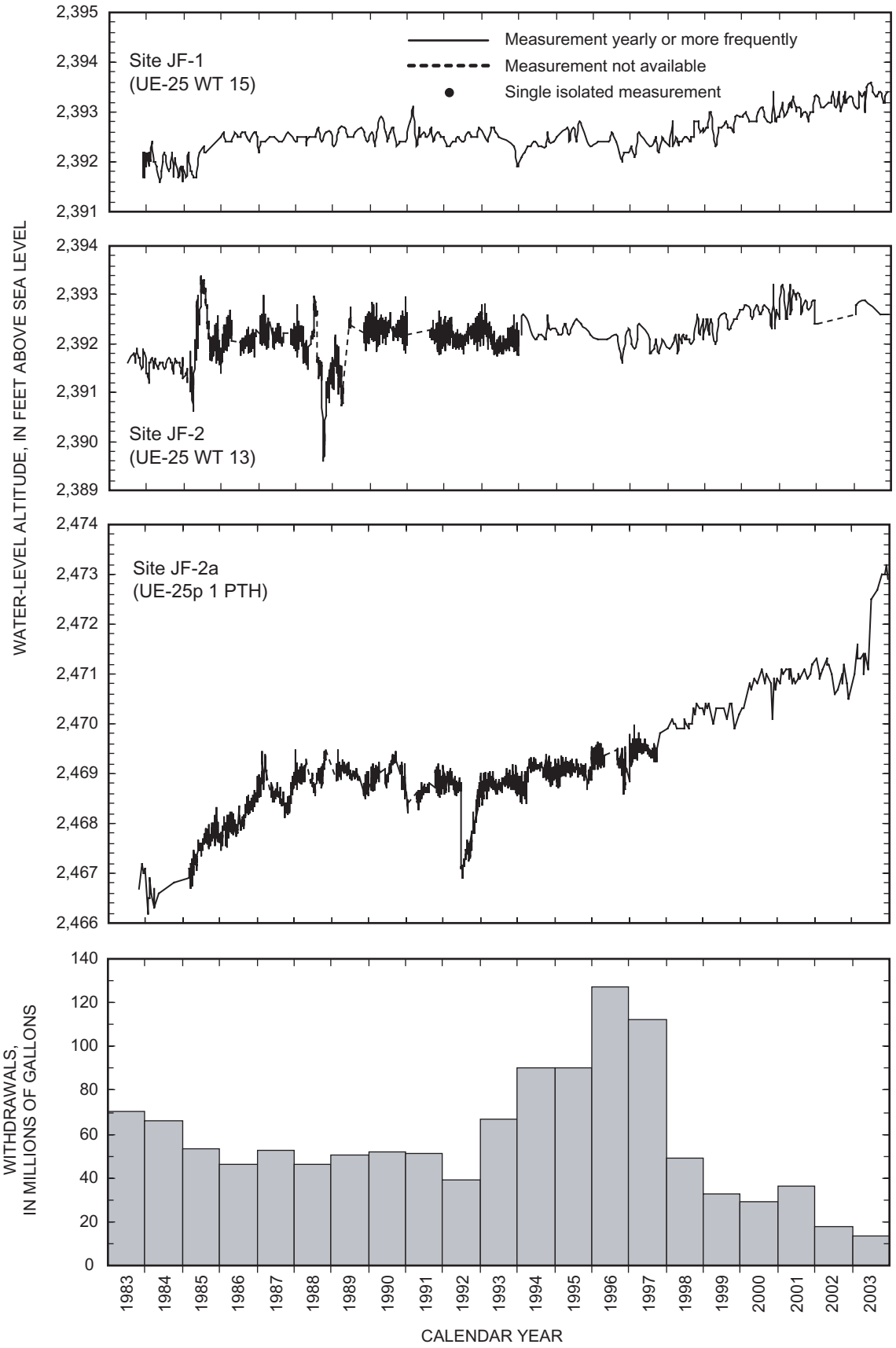
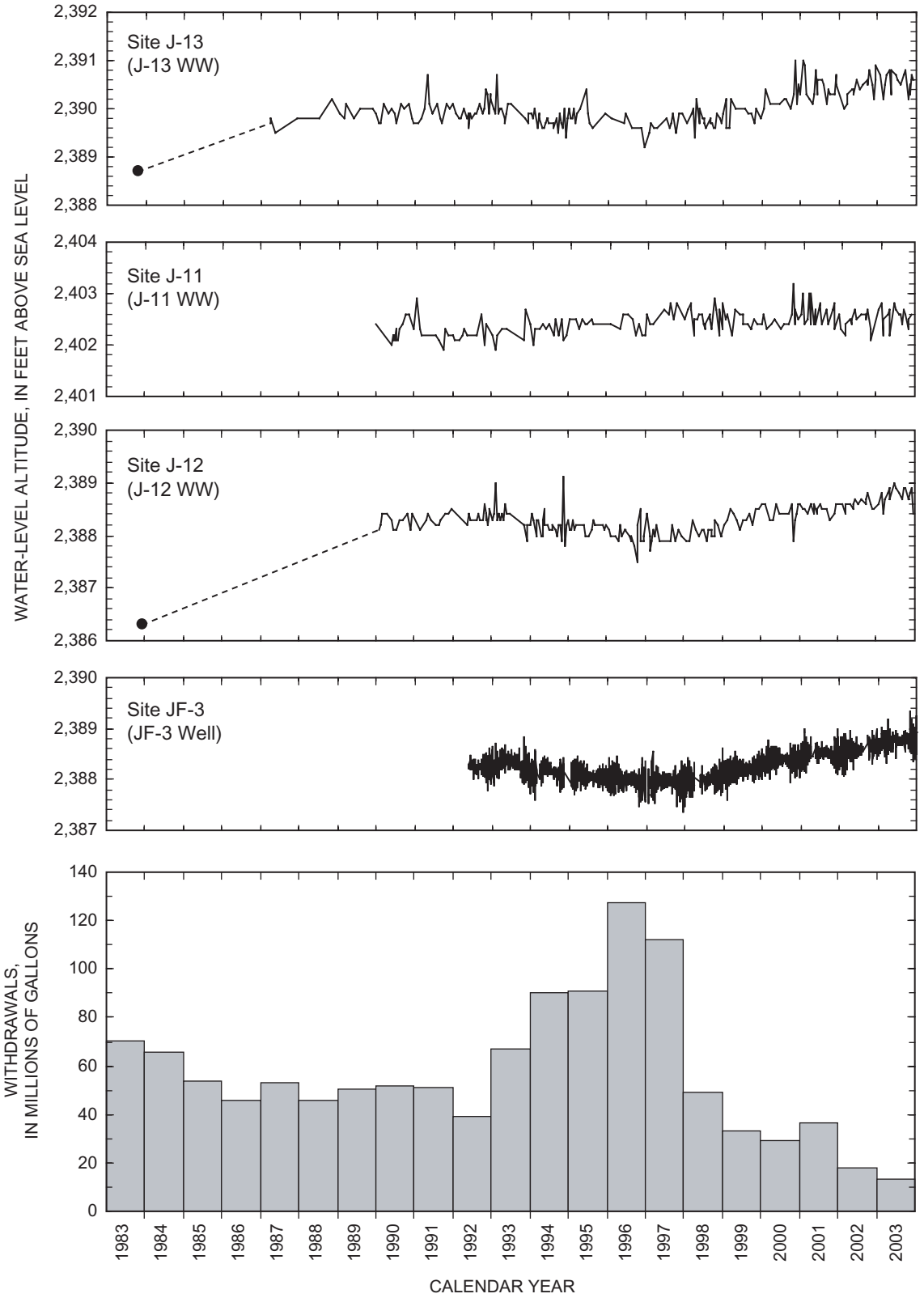


Figure 13. Water-level altitudes in wells JF-1, JF-2, JF-2a, J-13, J-11, J-12, and JF-3 and estimated annual ground-water withdrawals from Jackass Flats, 1983–2003.



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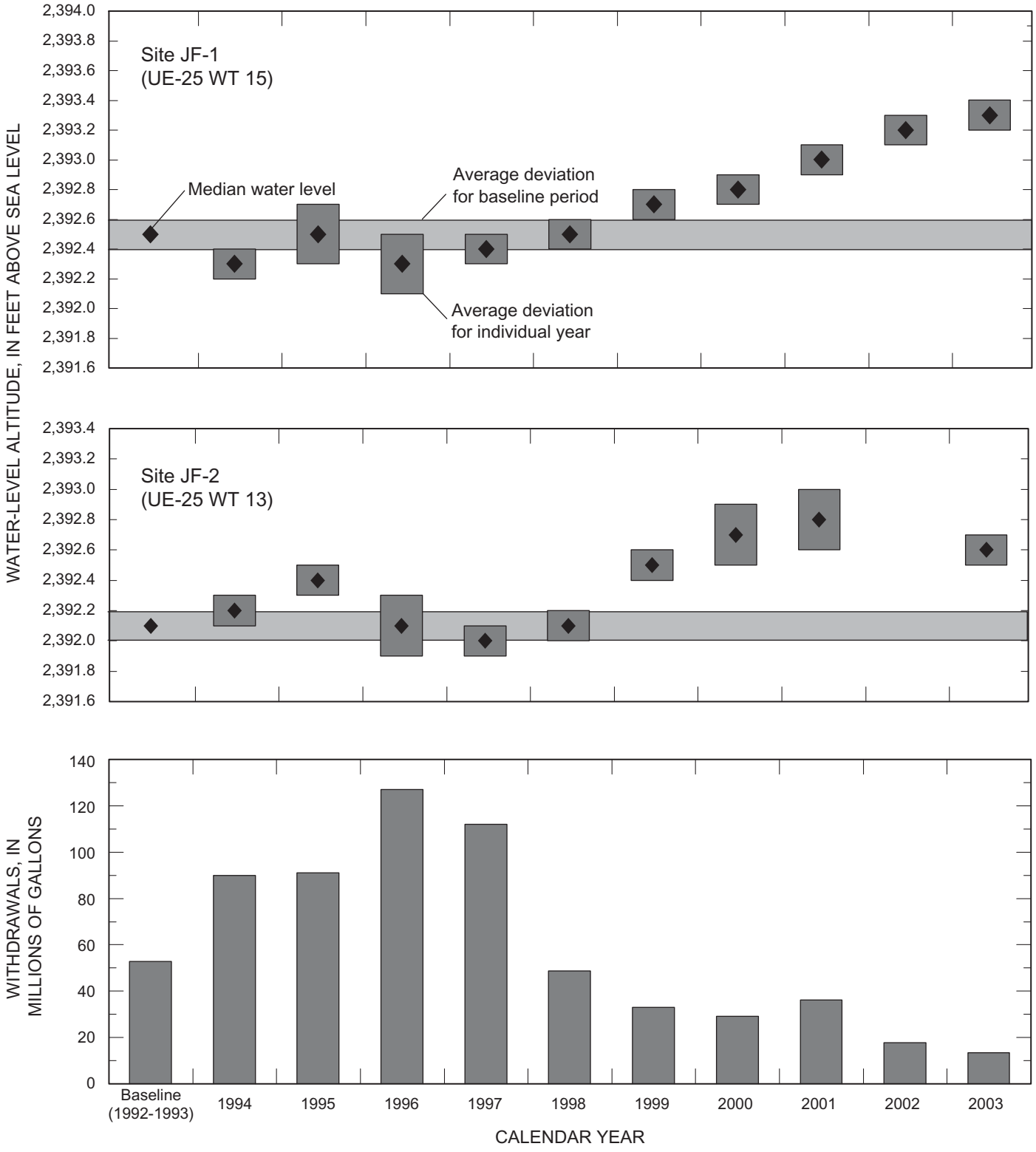

Figure 14. Median water-level altitutdes and average deviation of water levels for wells JF-1, JF-2, JF-2a, J-13, J-11, J-12, and JF-3, and estimated annual ground-water withdrawals from Jackass Flats, for 1992–93 baseline period and for 1994–2003.

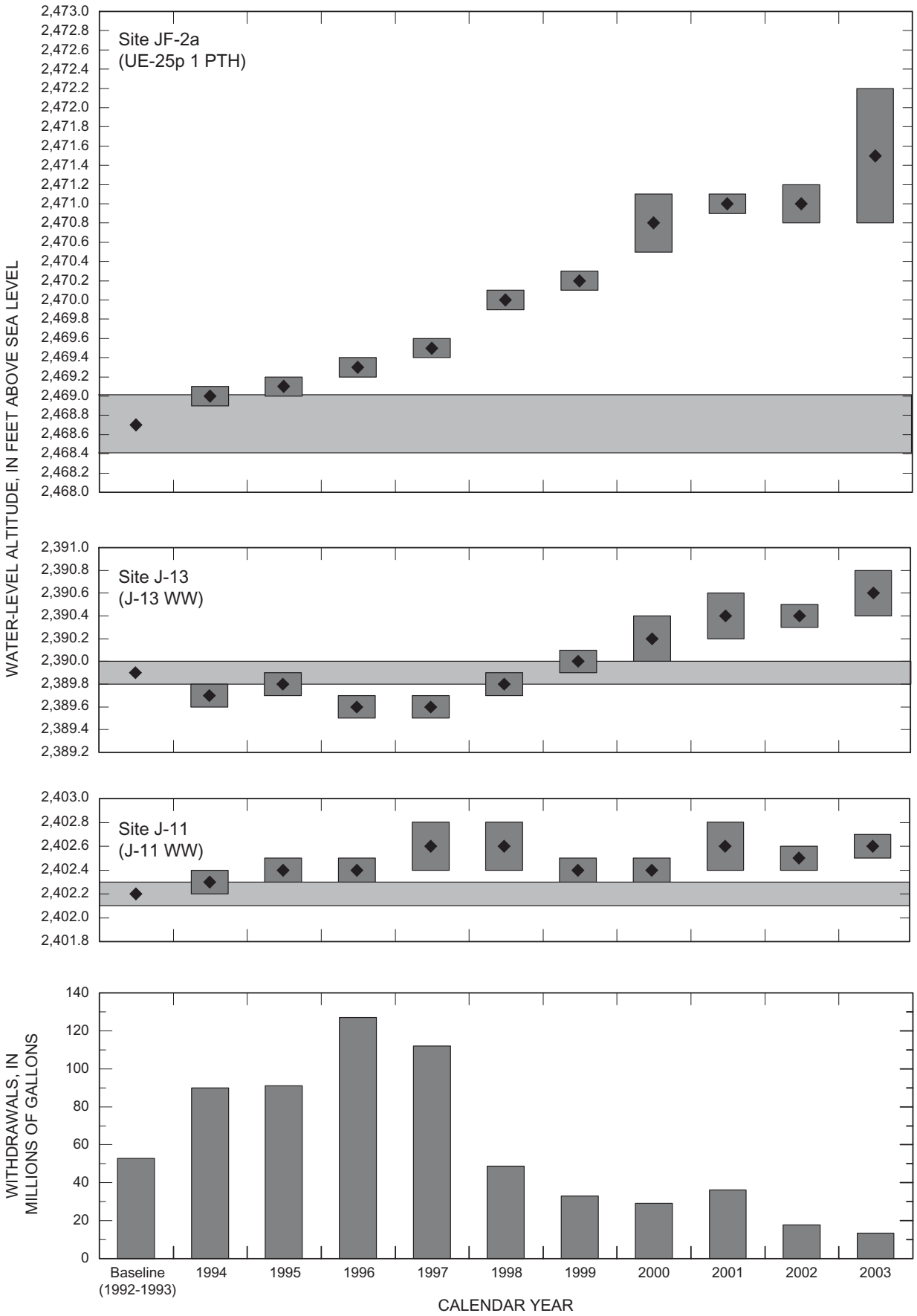

Figure 14. Continued

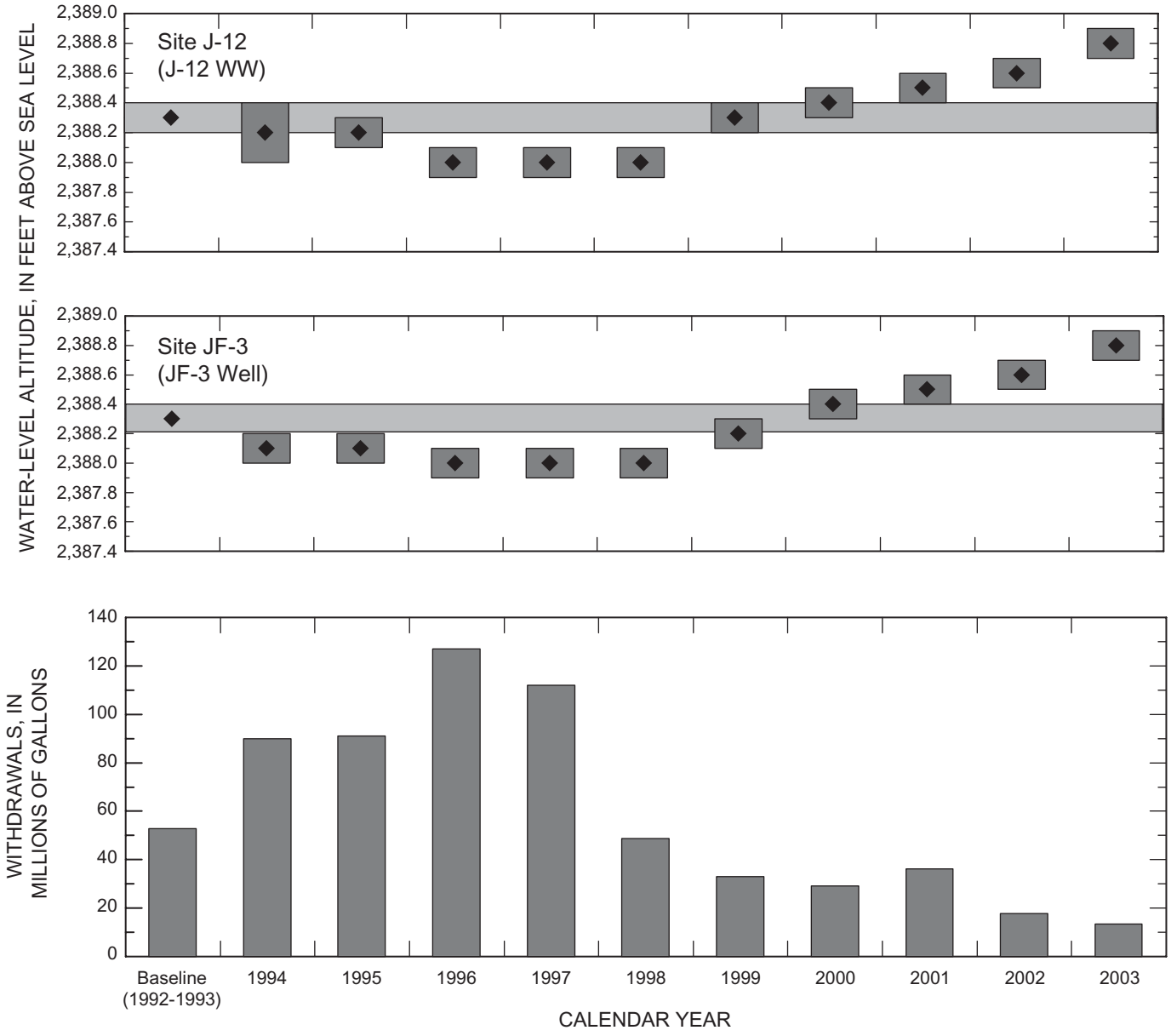

Figure 14. Continued.

Table 5. Periodic water-level data at monitoring sites in Yucca Mountain region, 2003

Site Number: Alphanumeric identifier used to identify sites on maps and tables. First part represents hydrographic area in which site is located. Hydrographic areas: CF, Crater Flat; JF or J, Jackass Flats; RV, Rock Valley; MV, Mercury Valley; AD or AM, Amargosa Desert; DV, Death Valley. Second part is sequential numbering representing relative location of site within hydrographic area or Ash Meadows spring-discharge area; numbering order generally is north to south, then west to east. Sites J-13, J-11, and J-12 previously were numbered by Raytheon Services Nevada and herein were not renumbered.

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: Referenced to the National Geodetic Vertical Datum of 1929. Representative 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 land surveys.

Height of measurement point: Height of measurement point (MP) used. MP is stable, recoverable point from which periodic measurements of depth to 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. An exception is site AM-4, where data represent water levels below measurement point. 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.

Altitude of water surface: Referenced to the National Geodetic Vertical Datum of 1929. Land-surface altitude minus depth to water, reported to nearest 0.1 foot.

Method: Method used to measure depth to water. A, average monthly water level (reported for the 15th of the month); F, pressure transducer; N, ruled tape; R, reported (measurement method unknown); S, steel tape; T, electric tape; V, calibrated electric tape.

Site status: Known conditions at site that may have affected measured depth to water. F, flowing; P, pumping; R, well recently pumped; Z, measurement made in pump-discharge column.

Data source: EMP, Environmental-Monitoring Program (USGS); HRC, Harry Reid Center for Environmental Studies (University of Nevada, Las Vegas); NDWR, Nevada Division of Water Resources; NPS, National Park Service; NTS, Nevada Test Site USGS/Department of Energy Cooperative Program; USFWS, U.S. Fish and Wildlife Service.

Site number (fig. 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	Crater Flat 1	3,930.9	1.77	06-26-2003	1755	624.89	3,306.0	V	-	EMP
					07-28-2003	1321	624.79	3,306.1	V	-	EMP
					08-12-2003	1556	624.56	3,306.3	V	-	EMP
					09-25-2003	0945	624.41	3,306.5	V	-	EMP
					10-23-2003	1658	624.25	3,306.6	V	-	EMP
					11-07-2003	1057	624.17	3,306.7	V	-	EMP
					12-08-2003	1544	623.98	3,306.9	V	-	EMP
CF-1a	365445116383901	Crater Flat 1a	4,080.9	1.68	01-28-2003	0808	177.72	3,903.2	S	-	EMP
					02-07-2003	1123	177.79	3,903.1	S	-	EMP
					03-07-2003	0938	178.00	3,902.9	S	-	EMP
					04-23-2003	1623	178.31	3,902.6	S	-	EMP
					05-27-2003	1013	178.79	3,902.1	S	-	EMP
					06-17-2003	0706	178.77	3,902.1	S	-	EMP
					07-28-2003	1254	179.17	3,901.7	S	-	EMP
					08-12-2003	1518	179.20	3,901.7	S	-	EMP
					09-25-2003	0914	179.55	3,901.4	S	-	EMP
					10-23-2003	1614	179.65	3,901.2	S	-	EMP
					11-07-2003	1144	179.87	3,901.0	S	-	EMP
					12-08-2003	1619	180.01	3,900.9	S	-	EMP

Table 5. Periodic water-level data at monitoring sites in Yucca Mountain region, 2003—Continued

Site number (fig. 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
CF-2	364732116330701	USW VH-1	3,161.1	1.17	01-23-2003	0757	603.64	2,557.5	S	-	EMP
					02-21-2003	--	603.69	2,557.4	V	-	HRC
					02-21-2003	1024	603.69	2,557.4	V	-	EMP
					03-27-2003	0821	603.59	2,557.5	V	-	EMP
					04-25-2003	--	603.57	2,557.5	V	-	HRC
					04-29-2003	0816	603.62	2,557.5	V	-	EMP
					05-06-2003	1741	603.33	2,557.8	V	-	EMP
					06-23-2003	1554	603.30	2,557.8	V	-	EMP
					07-28-2003	1426	603.43	2,557.7	V	-	EMP
					08-12-2003	1717	603.39	2,557.7	V	-	EMP
					09-19-2003	1114	603.52	2,557.6	S	-	HRC
					09-25-2003	0804	603.35	2,557.8	V	-	EMP
					10-08-2003	0745	603.54	2,557.6	S	-	EMP
					11-07-2003	0938	603.53	2,557.6	V	-	EMP
					12-08-2003	1433	603.62	2,557.5	V	-	EMP
					12-10-2003	1355	603.20	2,557.9	V	-	HRC
CF-3	364105116302601	Crater Flat 3	2,725.6	-3.20	01-28-2003	0638	331.21	2,394.4	S	-	EMP
					02-24-2003	1531	331.11	2,394.5	S	-	EMP
					03-12-2003	0636	331.23	2,394.4	S	-	EMP
					04-28-2003	1526	331.68	2,393.9	V	P	EMP
					04-28-2003	1556	331.15	2,394.4	V	-	EMP
					05-22-2003	0620	331.67	2,393.9	V	P	EMP
					05-22-2003	0646	331.18	2,394.4	V	-	EMP
					06-17-2003	0601	331.16	2,394.4	S	-	EMP
					07-24-2003	0555	331.18	2,394.4	S	-	EMP
					08-20-2003	0630	331.20	2,394.4	S	-	EMP
					09-25-2003	0625	331.19	2,394.4	S	-	EMP
					10-24-2003	0642	331.72	2,393.9	V	P	EMP
					11-18-2003	0616	331.24	2,394.4	V	-	EMP
					12-19-2003	0840	331.16	2,394.4	V	-	EMP

Table 5. Periodic water-level data at monitoring sites in Yucca Mountain region, 2003—Continued

Site number (fig. 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-1	365116116233801	UE-25 WT 15	3,553.8	0.18	01-22-2003	1005	1,160.69	2,393.1	S	-	EMP
					02-19-2003	--	1,160.68	2,393.1	V	-	HRC
					02-20-2003	1248	1,160.38	2,393.4	V	-	EMP
					03-21-2003	0845	1,160.54	2,393.3	V	-	EMP
					04-28-2003	0835	1,160.38	2,393.4	V	-	EMP
					04-30-2003	--	1,160.83	2,393.0	V	-	HRC
					05-06-2003	1452	1,160.31	2,393.5	V	-	EMP
					06-23-2003	1027	1,160.23	2,393.6	V	-	EMP
					07-07-2003	1245	1,160.39	2,393.4	V	-	EMP
					08-13-2003	0840	1,160.47	2,393.3	V	-	EMP
					08-28-2003	1237	1,160.48	2,393.3	V	-	HRC
					09-24-2003	1439	1,160.38	2,393.4	V	-	EMP
					10-27-2003	1030	1,160.61	2,393.2	V	-	EMP
					11-04-2003	1201	1,160.59	2,393.2	V	-	HRC
					11-06-2003	1509	1,160.51	2,393.3	V	-	EMP
					12-04-2003	1440	1,160.42	2,393.4	V	-	EMP
JF-2	364945116235001	UE-25 WT 13	3,387.5	1.00	01-23-2003	--	994.92	2,392.6	V	-	HRC
					01-31-2003	1606	994.75	2,392.8	F	-	HRC
					02-01-2003	1606	994.75	2,392.8	F	-	HRC
					04-30-2003	1306	994.62	2,392.9	F	-	HRC
					09-17-2003	1120	994.91	2,392.6	F	-	HRC
					09-23-2003	1120	994.89	2,392.6	F	-	HRC
					10-15-2003	1120	994.95	2,392.6	F	-	HRC
					11-15-2003	1020	994.94	2,392.6	F	-	HRC
					12-10-2003	1020	994.87	2,392.6	F	-	HRC
					12-15-2003	1020	994.91	2,392.6	F	-	HRC

Table 5. Periodic water-level data at monitoring sites in Yucca Mountain region, 2003—Continued

Site number (fig. 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	0.63	01-22-2003	1445	1,184.49	2,471.0	S	-	EMP
					02-24-2003	0916	1,183.91	2,471.6	V	-	EMP
					02-25-2003	--	1,184.17	2,471.3	V	-	HRC
					03-20-2003	1158	1,184.24	2,471.3	V	-	EMP
					04-28-2003	1211	1,184.11	2,471.4	V	-	EMP
					04-30-2003	--	1,184.51	2,471.0	V	-	HRC
					05-06-2003	1529	1,184.07	2,471.4	V	-	EMP
					06-05-2003	1135	1,184.37	2,471.1	F	-	HRC
					07-15-2003	1035	1,182.99	2,472.5	F	-	HRC
					09-10-2003	1135	1,182.79	2,472.7	F	-	HRC
					10-15-2003	1135	1,182.52	2,473.0	F	-	HRC
					11-15-2003	1035	1,182.45	2,473.0	F	-	HRC
					12-10-2003	1035	1,182.35	2,473.2	F	-	HRC
					12-15-2003	1035	1,182.59	2,472.9	F	-	HRC

Table 5. Periodic water-level data at monitoring sites in Yucca Mountain region, 2003—Continued

Site number (fig. 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-13	364828116234001	J-13 WW	3,317.9	1.08	01-27-2003	1556	927.04	2,390.9	V	-	EMP
					02-20-2003	1336	927.17	2,390.7	V	-	EMP
					03-06-2003	--	927.69	2,390.2	V	-	HRC
					03-20-2003	0932	927.41	2,390.5	V	-	EMP
					04-28-2003	0917	927.23	2,390.7	V	-	EMP
					05-06-2003	1408	927.15	2,390.8	V	-	EMP
					05-15-2003	--	927.62	2,390.3	V	-	HRC
					06-23-2003	1110	927.06	2,390.8	V	-	EMP
					07-07-2003	1322	927.17	2,390.7	V	-	EMP
					08-13-2003	0919	927.25	2,390.6	V	-	EMP
					09-10-2003	1159	927.37	2,390.5	V	-	HRC
				0.56	09-24-2003	1525	927.16	2,390.7	V	-	EMP
				0.98	10-28-2003	1012	927.15	2,390.8	V	-	EMP
					11-06-2003	0953	927.72	2,390.2	V	-	HRC
					11-06-2003	1419	927.39	2,390.5	V	-	EMP
					11-13-2003	1028	927.63	2,390.3	V	-	NTS
					12-11-2003	0924	927.24	2,390.7	F	-	NTS
					12-23-2003	1305	927.28	2,390.6	F	-	NTS
					12-31-2003	1039	927.33	2,390.6	F	-	NTS

Table 5. Periodic water-level data at monitoring sites in Yucca Mountain region, 2003—Continued

Site number (fig. 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-11	364706116170601	J-11 WW	3,442.8	2.11	01-21-2003	1409	1,040.14	2,402.7	S	-	EMP
					02-24-2003	1000	1,039.98	2,402.8	V	-	EMP
					03-19-2003	--	1,040.64	2,402.2	V	-	HRC
					03-20-2003	1109	1,040.29	2,402.5	V	-	EMP
					04-28-2003	1117	1,040.15	2,402.6	V	-	EMP
					05-06-2003	1205	1,040.13	2,402.7	V	-	EMP
					05-15-2003	--	1,040.59	2,402.2	V	-	HRC
					06-23-2003	1314	1,039.95	2,402.8	V	-	EMP
					07-07-2003	1526	1,040.10	2,402.7	V	-	EMP
					08-13-2003	1135	1,040.25	2,402.6	V	-	EMP
					08-28-2003	1432	1,040.16	2,402.6	V	-	EMP
					09-10-2003	1245	1,040.41	2,402.4	V	-	HRC
					09-24-2003	1740	1,040.13	2,402.7	V	-	EMP
					10-08-2003	1105	1,040.21	2,402.6	S	-	EMP
					11-06-2003	1221	1,040.47	2,402.3	V	-	HRC
					11-06-2003	1322	1,040.31	2,402.5	V	-	EMP
					12-04-2003	1522	1,040.24	2,402.6	V	-	EMP

Table 5. Periodic water-level data at monitoring sites in Yucca Mountain region, 2003—Continued

Site number (fig. 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	3.95	01-22-2003	0803	739.78	2,388.6	S	-	EMP
					02-20-2003	1413	739.55	2,388.8	V	-	EMP
					03-06-2003	--	739.98	2,388.4	V	-	HRC
					03-20-2003	0959	739.74	2,388.7	V	-	EMP
					04-28-2003	0951	739.58	2,388.8	V	-	EMP
					05-06-2003	1324	739.47	2,388.9	V	-	EMP
					05-15-2003	--	739.76	2,388.7	V	-	HRC
					06-23-2003	1146	739.43	2,389.0	V	-	EMP
					07-07-2003	1400	739.49	2,388.9	V	-	EMP
					08-13-2003	1008	739.56	2,388.8	V	-	EMP
					09-10-2003	0949	739.67	2,388.7	V	-	HRC
					09-24-2003	1605	739.46	2,388.9	V	-	EMP
					10-07-2003	1033	739.46	2,388.9	S	-	EMP
					11-06-2003	1036	739.72	2,388.7	V	-	HRC
					11-06-2003	1122	739.66	2,388.7	V	-	EMP
					11-13-2003	1102	746.74	2,381.7	V	P	EMP
					11-13-2003	1214	739.57	2,388.8	V	-	EMP
					12-04-2003	1555	739.48	2,388.9	V	-	EMP
					12-15-2003	1114	740.05	2,388.4	V	-	NTS
JF-3	364528116232201	JF-3 Well	3,098.3	2.27	01-15-2003	1015	709.82	2,388.5	V	-	EMP
					02-20-2003	1430	709.54	2,388.8	V	-	EMP
					03-20-2003	1015	709.73	2,388.6	V	-	EMP
					04-28-2003	1015	709.57	2,388.7	V	-	EMP
					05-06-2003	1245	709.48	2,388.8	V	-	EMP
					06-23-2003	1215	709.41	2,388.9	V	-	EMP
					07-07-2003	1415	709.47	2,388.8	V	-	EMP
					08-13-2003	1030	709.58	2,388.7	V	-	EMP
					09-24-2003	1630	709.47	2,388.8	V	-	EMP
					10-27-2003	1130	709.55	2,388.8	V	-	EMP
					11-06-2003	1215	709.64	2,388.7	V	-	EMP
					12-04-2003	1615	709.46	2,388.8	V	-	EMP

Table 5. Periodic water-level data at monitoring sites in Yucca Mountain region, 2003—Continued

Site number (fig. 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	1.6	01-27-2003	0951	677.63	2,378.4	V	-	EMP
					02-07-2003	0725	677.66	2,378.3	V	-	EMP
					03-12-2003	0730	677.53	2,378.5	V	-	EMP
					04-04-2003	0812	677.46	2,378.5	V	-	EMP
					05-20-2003	1744	677.33	2,378.7	V	-	EMP
					06-16-2003	0930	677.38	2,378.6	V	-	EMP
					07-22-2003	1749	677.24	2,378.8	V	-	EMP
					08-28-2003	1725	677.24	2,378.8	V	-	EMP
					09-16-2003	0945	677.30	2,378.7	V	-	EMP
					10-24-2003	1347	677.24	2,378.8	V	-	EMP
					11-17-2003	1047	677.29	2,378.7	V	-	EMP
					12-08-2003	1014	677.37	2,378.6	V	-	EMP
MV-1	363530116021401	Army 1 WW	3,153.3	3.10	01-27-2003	0822	786.43	2,366.9	V	Z	EMP
					02-26-2003	0813	787.66	2,365.6	V	R	EMP
					03-17-2003	0822	786.30	2,367.0	V	Z	EMP
					04-21-2003	0820	786.43	2,366.9	V	Z	EMP
					05-27-2003	0810	786.72	2,366.6	V	Z	EMP
					06-23-2003	0802	786.56	2,366.7	V	Z	EMP
					07-28-2003	0827	786.64	2,366.7	V	Z	EMP
					08-25-2003	0815	786.52	2,366.8	V	Z	EMP
					09-29-2003	0820	786.47	2,366.8	V	Z	EMP
					10-27-2003	0817	786.66	2,366.6	V	Z	EMP
					11-17-2003	0819	786.53	2,366.8	V	Z	EMP
					12-08-2003	0812	786.46	2,366.8	V	Z	EMP

Table 5. Periodic water-level data at monitoring sites in Yucca Mountain region, 2003—Continued

Site number (fig. 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-1	364141116351401	NA-6 Well BGMW-10	2,627.9	1.7	01-28-2003	0942	269.82	2,358.1	S	-	EMP
					02-07-2003	1219	269.85	2,358.0	S	-	EMP
					03-07-2003	0759	269.81	2,358.1	S	-	EMP
					03-11-2003	--	269.73	2,358.2	R	-	NPS
					04-24-2003	0833	269.84	2,358.1	S	-	EMP
					05-27-2003	1143	269.98	2,357.9	S	-	EMP
					06-27-2003	1354	269.77	2,358.1	S	-	EMP
					07-28-2003	1148	269.83	2,358.1	S	-	EMP
					08-12-2003	1820	269.71	2,358.2	S	-	EMP
					09-25-2003	1110	269.95	2,358.0	S	-	EMP
					10-24-2003	0740	269.89	2,358.0	S	-	EMP
					11-07-2003	1307	269.81	2,358.1	S	-	EMP
					12-08-2003	1316	270.02	2,357.9	S	-	EMP
AD-2	363830116241401	Airport Well	2,638.8	1.15	01-27-2003	1057	325.40	2,313.4	S	-	EMP
					02-07-2003	1026	325.61	2,313.2	S	-	EMP
					03-07-2003	1045	325.53	2,313.3	S	-	EMP
					04-04-2003	1004	325.56	2,313.2	S	-	EMP
					05-21-2003	1421	325.55	2,313.2	S	-	EMP
					06-16-2003	1021	325.64	2,313.2	S	-	EMP
					07-23-2003	1422	325.65	2,313.2	S	-	EMP
					08-20-2003	0714	325.77	2,313.0	S	-	EMP
					09-25-2003	1312	325.69	2,313.1	S	-	EMP
					10-24-2003	1228	325.76	2,313.0	S	-	EMP
					11-18-2003	1524	325.80	2,313.0	S	-	EMP
					12-08-2003	1117	325.87	2,312.9	S	-	EMP

Table 5. Periodic water-level data at monitoring sites in Yucca Mountain region, 2003—Continued

Site number (fig. 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	0.4	01-16-2003	1523	342.19	2,314.6	S	-	EMP
					02-07-2003	1005	342.40	2,314.4	S	-	EMP
					03-07-2003	1142	342.25	2,314.6	S	-	EMP
					04-04-2003	1039	342.38	2,314.4	S	-	EMP
					05-21-2003	1500	342.38	2,314.4	S	-	EMP
					06-16-2003	1121	343.20	2,313.6	S	-	EMP
					07-22-2003	1706	342.33	2,314.5	S	-	EMP
					08-28-2003	1643	342.20	2,314.6	S	-	EMP
					09-25-2003	1357	342.63	2,314.2	S	-	EMP
					10-24-2003	1244	342.97	2,313.8	S	-	EMP
					11-18-2003	1541	342.46	2,314.3	S	-	EMP
					12-08-2003	1222	342.18	2,314.6	S	-	EMP
AD-3a	363521116352501	Amargosa Desert 3a	2,395.3	1.00	01-27-2003	1349	133.60	2,261.7	S	-	EMP
					02-21-2003	1137	133.71	2,261.6	S	-	EMP
					03-27-2003	1301	133.78	2,261.5	S	-	EMP
					04-04-2003	1120	133.78	2,261.5	S	-	EMP
					05-21-2003	1601	133.88	2,261.4	S	-	EMP
					06-16-2003	1228	133.97	2,261.3	S	-	EMP
					07-23-2003	1510	134.02	2,261.3	S	-	EMP
					08-20-2003	0904	134.18	2,261.1	S	-	EMP
					09-29-2003	1614	134.19	2,261.1	S	-	EMP
					10-24-2003	0905	134.30	2,261.0	S	-	EMP
					11-18-2003	0725	134.35	2,261.0	S	-	EMP
					12-09-2003	0815	134.24	2,261.1	S	-	EMP

Table 5. Periodic water-level data at monitoring sites in Yucca Mountain region, 2003—Continued

Site number (fig. 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-4a	363428116234701	Amargosa Desert 4a	2,477.8	1.0	01-27-2003	1121	119.58	2,358.2	S	-	EMP
					02-24-2003	1301	119.54	2,358.3	S	-	EMP
					03-07-2003	1215	119.63	2,358.2	S	-	EMP
					04-04-2003	1235	119.48	2,358.3	S	-	EMP
					05-21-2003	1356	119.64	2,358.2	S	-	EMP
					06-16-2003	1151	119.71	2,358.1	S	-	EMP
					07-23-2003	1343	119.73	2,358.1	S	-	EMP
					08-20-2003	0828	119.91	2,357.9	S	-	EMP
					09-25-2003	1337	119.79	2,358.0	S	-	EMP
					10-24-2003	0947	119.89	2,357.9	S	-	EMP
					11-17-2003	1356	119.76	2,358.0	S	-	EMP
					12-08-2003	1142	119.95	2,357.8	S	-	EMP
AD-5	363310116294001	USBLM Well	2,376.4	0.0	01-17-2003	0912	131.30	2,245.1	S	-	EMP
					02-21-2003	1215	131.29	2,245.1	S	-	EMP
					03-26-2003	1318	131.37	2,245.0	S	-	EMP
					04-04-2003	1200	131.44	2,245.0	S	-	EMP
					05-21-2003	1643	131.94	2,244.5	S	-	EMP
					06-16-2003	1306	132.29	2,244.1	S	-	EMP
					07-23-2003	1601	132.82	2,243.6	S	-	EMP
					08-20-2003	0755	133.19	2,243.2	S	-	EMP
					09-29-2003	1520	133.72	2,242.7	S	-	EMP
					10-14-2003	1559	133.95	2,242.4	S	-	EMP
					11-18-2003	0807	134.22	2,242.2	S	-	EMP
					12-09-2003	0845	134.25	2,242.2	S	-	EMP

Table 5. Periodic water-level data at monitoring sites in Yucca Mountain region, 2003—Continued

Site number (fig. 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-6	363213116133800	Tracer Well 3	2,402.3	0.4	01-15-2003	1330	41.84	2,360.5	S	-	EMP
					02-06-2003	1630	41.82	2,360.5	S	-	EMP
					03-06-2003	1630	41.77	2,360.5	S	-	EMP
					04-03-2003	1700	41.78	2,360.5	S	-	EMP
					05-22-2003	1215	41.74	2,360.6	S	-	EMP
					06-13-2003	1000	41.86	2,360.4	S	-	EMP
					07-24-2003	1000	41.81	2,360.5	S	-	EMP
					08-28-2003	1830	41.71	2,360.6	S	-	EMP
					09-16-2003	0800	41.75	2,360.6	S	-	EMP
					10-27-2003	1415	41.78	2,360.5	S	-	EMP
					11-07-2003	0800	41.87	2,360.4	S	-	EMP
					12-05-2003	0945	41.86	2,360.4	S	-	EMP
AD-7a	363009116302702	Amargosa Desert 7a	2,305.0	0.78	01-27-2003	1315	79.04	2,226.0	S	-	EMP
					02-21-2003	1242	78.31	2,226.7	S	-	EMP
					03-12-2003	0945	78.24	2,226.8	S	-	EMP
					03-27-2003	--	78.54	2,226.5	T	-	NDWR
					04-23-2003	1455	80.18	2,224.8	S	-	EMP
					05-21-2003	1335	81.22	2,223.8	S	-	EMP
					06-16-2003	1324	82.08	2,222.9	S	-	EMP
					07-23-2003	1253	83.11	2,221.9	S	-	EMP
					08-20-2003	0933	84.36	2,220.6	S	-	EMP
					09-29-2003	1434	84.14	2,220.9	S	-	EMP
					10-24-2003	1034	84.28	2,220.7	S	-	EMP
					11-18-2003	--	82.87	2,222.1	T	-	NDWR
					11-18-2003	1449	82.83	2,222.2	S	-	EMP
					12-09-2003	0909	81.90	2,223.1	S	-	EMP

Table 5. Periodic water-level data at monitoring sites in Yucca Mountain region, 2003—Continued

Site number (fig. 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	Amargosa Desert 8	2,394.3	0.60	01-27-2003	0901	35.30	2,359.0	S	-	EMP
					02-22-2003	0840	35.22	2,359.1	S	-	EMP
					03-12-2003	0838	35.32	2,359.0	S	-	EMP
					04-04-2003	0910	35.26	2,359.0	S	-	EMP
					05-27-2003	0847	35.34	2,359.0	S	-	EMP
					06-16-2003	0831	35.51	2,358.8	S	-	EMP
					07-24-2003	1110	35.68	2,358.6	S	-	EMP
					08-25-2003	0915	35.63	2,358.7	S	-	EMP
					09-29-2003	0916	35.52	2,358.8	S	-	EMP
					10-28-2003	1131	35.47	2,358.8	S	-	EMP
					11-17-2003	0930	35.39	2,358.9	S	-	EMP
					12-08-2003	0913	35.44	2,358.9	S	-	EMP
AD-9a	362835116264102	Amargosa Desert 9a	2,260.1	0.75	01-27-2003	1255	77.51	2,182.6	S	-	EMP
					02-21-2003	1346	77.36	2,182.7	S	-	EMP
				0.40	03-26-2003	1252	80.56	2,179.5	V	-	EMP
					04-16-2003	0933	80.34	2,179.8	V	-	EMP
					05-21-2003	1306	81.40	2,178.7	V	-	EMP
					06-27-2003	1600	83.17	2,176.9	V	-	EMP
					07-23-2003	1215	83.33	2,176.8	V	R	EMP
					08-20-2003	1004	82.82	2,177.3	V	-	EMP
					09-25-2003	1537	84.64	2,175.5	V	-	EMP
					10-24-2003	1130	84.60	2,175.5	V	-	EMP
					11-18-2003	1413	80.82	2,179.3	V	-	EMP
					12-09-2003	0940	80.01	2,180.1	V	-	EMP

Table 5. Periodic water-level data at monitoring sites in Yucca Mountain region, 2003—Continued

Site number (fig. 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-10	362525116274301	NA-9 Well	2,190.9	1.3	01-16-2003	1040	13.73	2,177.2	S	-	EMP
					02-24-2003	1407	13.58	2,177.3	S	-	EMP
					03-07-2003	1255	13.65	2,177.2	S	-	EMP
					04-03-2003	1604	13.66	2,177.2	S	-	EMP
					05-20-2003	1118	13.68	2,177.2	S	-	EMP
					06-16-2003	1510	13.71	2,177.2	S	-	EMP
					07-22-2003	1556	13.79	2,177.1	S	-	EMP
					08-12-2003	1346	13.84	2,177.1	S	-	EMP
					09-29-2003	1317	13.96	2,176.9	S	-	EMP
					10-23-2003	1434	13.99	2,176.9	S	-	EMP
					11-19-2003	0847	14.01	2,176.9	S	-	EMP
					12-09-2003	1035	13.95	2,177.0	S	-	EMP
AD-11	361954116181201	GS-3 Well	2,351.3	2.0	01-16-2003	0918	210.04	2,141.3	S	-	EMP
					02-06-2003	1214	209.91	2,141.4	S	-	EMP
					03-27-2003	1429	209.49	2,141.8	S	-	EMP
					04-04-2003	1350	209.43	2,141.9	S	-	EMP
					05-20-2003	1240	208.97	2,142.3	S	-	EMP
					06-12-2003	1658	208.48	2,142.8	S	-	EMP
					07-22-2003	1256	208.20	2,143.1	S	-	EMP
					08-12-2003	1232	208.12	2,143.2	S	-	EMP
					09-15-2003	1257	208.12	2,143.2	S	-	EMP
					10-23-2003	1246	208.46	2,142.8	S	-	EMP
					11-19-2003	0809	208.78	2,142.5	S	-	EMP
					12-09-2003	1415	208.87	2,142.4	S	-	EMP

Table 5. Periodic water-level data at monitoring sites in Yucca Mountain region, 2003—Continued

Site number (fig. 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-12	362014116133901	GS-1 Well	2,430.3	2.0	01-16-2003	0834	80.92	2,349.4	S	-	EMP
					02-07-2003	1348	80.88	2,349.4	S	-	EMP
					03-06-2003	1122	80.87	2,349.4	S	-	EMP
					04-03-2003	1118	80.87	2,349.4	S	-	EMP
					05-20-2003	1139	80.85	2,349.4	S	-	EMP
					06-12-2003	1217	80.85	2,349.4	S	-	EMP
					07-22-2003	1159	80.89	2,349.4	S	-	EMP
					08-12-2003	0845	80.95	2,349.4	S	-	EMP
					09-15-2003	1207	80.94	2,349.4	S	-	EMP
					10-23-2003	1150	81.00	2,349.3	S	-	EMP
					11-17-2003	1700	81.02	2,349.3	S	-	EMP
					12-05-2003	1452	80.99	2,349.3	S	-	EMP
AD-13	361724116324201	S-1 Well	2,703.2	2.0	01-23-2003	1225	366.61	2,336.6	S	-	EMP
					02-26-2003	1006	366.22	2,337.0	S	-	EMP
					03-12-2003	1057	366.34	2,336.9	S	-	EMP
					04-23-2003	1138	366.39	2,336.8	S	-	EMP
					05-20-2003	1353	366.38	2,336.8	S	-	EMP
					06-12-2003	1528	366.25	2,337.0	S	-	EMP
					07-22-2003	1412	366.23	2,337.0	S	-	EMP
					08-19-2003	1219	366.24	2,337.0	S	-	EMP
					09-15-2003	1406	366.14	2,337.1	S	-	EMP
					10-14-2003	1330	366.33	2,336.9	S	-	EMP
					11-18-2003	0908	366.39	2,336.8	S	-	EMP
					12-09-2003	1122	366.44	2,336.8	S	-	EMP

Table 5. Periodic water-level data at monitoring sites in Yucca Mountain region, 2003—Continued

Site number (fig. 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-14	361817116244701	Death Valley Jct Well	2,041.8	0.70	01-16-2003	0950	2.48	2,039.3	S	-	EMP
					02-21-2003	1510	2.31	2,039.5	S	-	EMP
					03-07-2003	1532	2.20	2,039.6	S	-	EMP
					04-04-2003	1314	2.54	2,039.3	S	-	EMP
					05-20-2003	1323	2.46	2,039.3	S	-	EMP
					06-12-2003	1616	2.29	2,039.5	S	-	EMP
					07-22-2003	1328	2.49	2,039.3	S	-	EMP
					08-12-2003	1304	2.50	2,039.3	S	-	EMP
					09-15-2003	1651	2.89	2,038.9	S	-	EMP
					10-23-2003	1320	2.61	2,039.2	S	-	EMP
					11-18-2003	1223	3.12	2,038.7	S	-	EMP
					12-09-2003	1341	2.55	2,039.2	S	-	EMP
AM-1	362858116195301	Rogers Spring Well	2,265.9	0.14	01-16-2003	0730	2.82	2,263.1	S	-	EMP
					02-06-2003	1553	2.76	2,263.1	S	-	EMP
					03-06-2003	1522	2.64	2,263.3	S	-	EMP
					04-03-2003	1503	2.74	2,263.2	S	-	EMP
					05-22-2003	0750	2.95	2,263.0	S	-	EMP
					06-13-2003	1113	3.46	2,262.4	S	-	EMP
					07-23-2003	0656	4.16	2,261.7	S	-	EMP
					08-19-2003	0527	4.33	2,261.6	S	-	EMP
					09-29-2003	1101	4.27	2,261.6	S	-	EMP
					10-14-2003	0823	4.04	2,261.9	S	-	EMP
					11-17-2003	1159	3.43	2,262.5	S	-	EMP
					12-05-2003	1038	3.17	2,262.7	S	-	EMP

Table 5. Periodic water-level data at monitoring sites in Yucca Mountain region, 2003—Continued

Site number (fig. 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-2	362755116190401	Five Springs Well	2,367.4	1.17	01-16-2003	1221	0.31	2,367.1	S	F	EMP
					02-06-2003	1518	0.32	2,367.1	S	F	EMP
					03-06-2003	1447	0.31	2,367.1	S	F	EMP
					04-03-2003	1425	0.31	2,367.1	S	F	EMP
					05-22-2003	0854	0.31	2,367.1	S	F	EMP
					06-13-2003	1227	0.31	2,367.1	S	F	EMP
					07-23-2003	0752	0.30	2,367.1	S	F	EMP
					08-19-2003	1658	0.29	2,367.1	S	F	EMP
					09-29-2003	1217	0.30	2,367.1	S	F	EMP
					10-27-2003	1548	0.30	2,367.1	S	F	EMP
					11-17-2003	1304	0.32	2,367.1	S	F	EMP
					12-05-2003	1159	0.32	2,367.1	S	F	EMP
AM-3	362555116205301	Ash Meadows 3	2,157.0	1.29	01-16-2003	0752	21.43	2,135.6	S	-	EMP
					02-06-2003	1412	21.21	2,135.8	S	-	EMP
					03-06-2003	1336	20.84	2,136.2	S	-	EMP
					04-03-2003	1323	20.61	2,136.4	S	-	EMP
					05-22-2003	1129	20.38	2,136.6	S	-	EMP
					06-13-2003	1315	20.49	2,136.5	S	-	EMP
					07-23-2003	1103	21.05	2,136.0	S	-	EMP
					08-19-2003	1541	21.50	2,135.5	S	-	EMP
					09-15-2003	1728	21.85	2,135.2	S	-	EMP
					10-15-2003	0849	21.98	2,135.0	S	-	EMP
					11-17-2003	1423	22.02	2,135.0	S	-	EMP
					12-05-2003	1256	22.02	2,135.0	S	-	EMP

Table 5. Periodic water-level data at monitoring sites in Yucca Mountain region, 2003—Continued

Site number (fig. 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-4	362532116172700	Devils Hole (Altitudes revised from those in previous reports on selected ground-water data for the Yucca Mountain region on the basis of a changed measurement point during May 1992 and surveys accomplished 1992-2002.)	2,360.0	--	08-19-1992	--	2.19	2,357.8	N	-	EMP
					09-15-1992	--	2.06	2,357.9	A	-	NPS
					10-15-1992	--	2.01	2,358.0	A	-	NPS
					11-18-1992	0949	1.95	2,358.0	N	-	EMP
					02-15-1993	--	1.94	2,358.1	A	-	NPS
					02-16-1993	1613	1.86	2,358.1	N	-	EMP
					03-15-1993	--	1.90	2,358.1	A	-	NPS
					04-15-1993	--	1.88	2,358.1	A	-	NPS
					05-15-1993	--	1.87	2,358.1	A	-	NPS
					05-21-1993	--	2.01	2,358.0	N	-	EMP
					06-15-1993	--	1.87	2,358.1	A	-	NPS
					08-15-1993	--	1.89	2,358.1	A	-	NPS
					08-25-1993	0830	1.90	2,358.1	N	-	EMP
					09-15-1993	--	1.95	2,358.0	A	-	NPS
					10-15-1993	--	1.97	2,358.0	A	-	NPS
					11-15-1993	--	2.00	2,358.0	A	-	NPS
					11-17-1993	1148	1.95	2,358.0	N	-	EMP
					12-15-1993	--	2.02	2,358.0	A	-	NPS
					02-15-1994	--	2.01	2,358.0	A	-	NPS
					02-16-1994	1130	1.99	2,358.0	N		EMP
					03-15-1994	--	1.99	2,358.0	A	-	NPS
					04-15-1994	--	1.98	2,358.0	A	-	NPS
					05-15-1994	--	2.01	2,358.0	A	-	NPS
					05-26-1994	1135	2.13	2,357.9	N	-	EMP
					06-15-1994	--	2.02	2,358.0	A	-	NPS

Table 5. Periodic water-level data at monitoring sites in Yucca Mountain region, 2003—Continued

Site number (fig. 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-4	362532116172700	Devils Hole	2,360.0	--	07-15-1994	--	2.03	2,358.0	A	-	NPS
					08-15-1994	--	2.05	2,358.0	A	-	NPS
					08-24-1994	1300	2.09	2,357.9	N	-	EMP
					10-15-1994	--	2.08	2,357.9	A	-	NPS
					11-09-1994	1000	1.98	2,358.0	N	-	EMP
					11-15-1994	--	2.10	2,357.9	A	-	NPS
					12-15-1994	--	2.06	2,357.9	A	-	NPS
					01-15-1995	--	2.06	2,357.9	A	-	NPS
					02-15-1995	--	2.02	2,358.0	A	-	NPS
					03-15-1995	--	2.02	2,358.0	A	-	NPS
					03-27-1995	1405	1.94	2,358.1	N	-	EMP
					04-15-1995	--	2.00	2,358.0	A	-	NPS
					05-15-1995	--	2.00	2,358.0	A	-	NPS
					05-31-1995	1045	2.10	2,357.9	N	-	EMP
					06-15-1995	--	2.01	2,358.0	A	-	NPS
					07-15-1995	--	2.03	2,358.0	A	-	NPS
					08-15-1995	--	2.03	2,358.0	A	-	NPS
					08-30-1995	1350	2.06	2,357.9	N	-	EMP
					10-15-1995	--	2.06	2,357.9	A	-	NPS
					11-08-1995	1200	2.09	2,357.9	N	-	EMP
					11-15-1995	--	2.09	2,357.9	A	-	NPS
					12-15-1995	--	2.09	2,357.9	A	-	NPS
					01-15-1996	--	2.08	2,357.9	A	-	NPS
					02-07-1996	--	2.09	2,357.9	N	-	EMP
					02-13-1996	--	2.08	2,357.9	N	-	EMP

Table 5. Periodic water-level data at monitoring sites in Yucca Mountain region, 2003—Continued

Site number (fig. 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-4	362532116172700	Devils Hole	2,360.0	--	02-15-1996	--	2.07	2,357.9	A	-	NPS
					03-15-1996	--	2.05	2,358.0	A	-	NPS
					04-15-1996	--	2.06	2,357.9	A	-	NPS
					05-07-1996	1726	2.06	2,357.9	N	-	EMP
					05-15-1996	--	2.03	2,358.0	A	-	NPS
					06-15-1996	--	2.06	2,357.9	A	-	NPS
					07-15-1996	--	2.06	2,357.9	A	-	NPS
					08-15-1996	--	2.08	2,357.9	A	-	NPS
					08-29-1996	1604	2.06	2,357.9	N	-	EMP
					09-15-1996	--	2.08	2,357.9	A	-	NPS
					10-15-1996	--	2.09	2,357.9	A	-	NPS
					11-15-1996	--	2.12	2,357.9	A	-	NPS
					11-21-1996	0926	2.10	2,357.9	N	-	EMP
					12-15-1996	--	2.11	2,357.9	A	-	NPS
					01-15-1997	--	2.11	2,357.9	A	-	NPS
					02-15-1997	--	2.09	2,357.9	A	-	NPS
					02-26-1997	0811	2.01	2,358.0	N	-	EMP
					03-15-1997	--	2.09	2,357.9	A	-	NPS
					04-15-1997	--	2.05	2,358.0	A	-	NPS
					05-15-1997	1130	2.06	2,357.9	N	-	EMP
					05-15-1997	--	2.05	2,358.0	A	-	NPS
					06-15-1997	--	2.04	2,358.0	A	-	NPS
					07-15-1997	--	2.07	2,357.9	A	-	NPS
					08-15-1997	--	2.08	2,357.9	A	-	NPS
					08-19-1997	1105	2.16	2,357.8	N	-	EMP

Table 5. Periodic water-level data at monitoring sites in Yucca Mountain region, 2003—Continued

Site number (fig. 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-4	362532116172700	Devils Hole	2,360.0	--	09-15-1997	--	2.07	2,357.9	A	-	NPS
					10-15-1997	--	2.09	2,357.9	A	-	NPS
					11-15-1997	--	2.08	2,357.9	A	-	NPS
					11-18-1997	1240	2.07	2,357.9	N	-	EMP
					12-15-1997	--	2.10	2,357.9	A	-	NPS
					01-15-1998	--	2.07	2,357.9	A	-	NPS
					02-15-1998	--	2.03	2,358.0	A	-	NPS
					02-27-1998	0857	2.08	2,357.9	N	-	EMP
					03-15-1998	--	2.01	2,358.0	A	-	NPS
					04-15-1998	--	2.04	2,358.0	A	-	NPS
					05-15-1998	--	2.01	2,358.0	A	-	NPS
					05-27-1998	1131	2.16	2,357.8	N	-	EMP
					06-15-1998	--	2.01	2,358.0	A	-	NPS
					08-05-1998	0915	2.16	2,357.8	N	-	EMP
					08-15-1998	--	2.03	2,358.0	A	-	NPS
					09-15-1998	--	2.01	2,358.0	A	-	NPS
					10-15-1998	--	2.05	2,358.0	A	-	NPS
					11-15-1998	--	2.07	2,357.9	A	-	NPS
					12-15-1998	--	2.08	2,357.9	A	-	NPS
					01-05-1999	0713	2.01	2,358.0	R	-	NPS
					02-04-1999	0733	1.87	2,358.1	R	-	NPS
					03-02-1999	0742	1.95	2,358.0	R	-	NPS
					04-06-1999	0553	1.93	2,358.1	R	-	NPS
					04-11-1999	0915	1.98	2,358.0	R	-	NPS
					05-04-1999	0548	1.93	2,358.1	R	-	NPS

Table 5. Periodic water-level data at monitoring sites in Yucca Mountain region, 2003—Continued

Site number (fig. 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-4	362532116172700	Devils Hole	2,360.0	--	05-19-1999	0538	1.88	2,358.1	R	-	NPS
					06-01-1999	0535	1.89	2,358.1	R	-	NPS
					06-16-1999	0543	1.88	2,358.1	R	-	NPS
					07-06-1999	0730	2.02	2,358.0	R	-	NPS
					08-03-1999	0618	2.01	2,358.0	R	-	NPS
					08-18-1999	1112	1.89	2,358.1	S	-	EMP
					09-01-1999	0559	1.90	2,358.1	R	-	NPS
					10-01-1999	0732	1.89	2,358.1	R	-	NPS
					10-19-1999	0631	2.22	2,357.8	R	-	NPS
					11-02-1999	0723	2.22	2,357.8	R	-	NPS
					12-01-1999	0714	2.11	2,357.9	R	-	NPS
					01-04-2000	0732	2.11	2,357.9	R	-	NPS
					02-01-2000	0719	2.14	2,357.9	R	-	NPS
					03-01-2000	0823	2.06	2,357.9	R	-	NPS
					04-04-2000	0636	2.12	2,357.9	R	-	NPS
					04-19-2000	0920	2.19	2,357.8	R	-	NPS
					05-02-2000	0537	1.96	2,358.0	R	-	NPS
					05-16-2000	0516	2.02	2,358.0	R	-	NPS
					05-31-2000	0519	2.02	2,358.0	R	-	NPS
					07-05-2000	0622	2.01	2,358.0	R	-	NPS
					07-18-2000	0712	2.10	2,357.9	R	-	NPS
					08-01-2000	0616	2.01	2,358.0	R	-	NPS
					08-09-2000	0809	2.17	2,357.8	R	-	NPS
					08-15-2000	0604	2.05	2,358.0	R	-	NPS
					09-05-2000	0708	2.14	2,357.9	R	-	NPS

Table 5. Periodic water-level data at monitoring sites in Yucca Mountain region, 2003—Continued

Site number (fig. 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-4	362532116172700	Devils Hole	2,360.0	--	09-12-2000	0657	2.12	2,357.9	R	-	NPS
					09-18-2000	0729	2.06	2,357.9	R	-	NPS
					10-02-2000	0759	2.03	2,358.0	R	-	NPS
					10-04-2000	0716	2.08	2,357.9	R	-	NPS
					10-16-2000	0754	2.06	2,357.9	R	-	NPS
					11-01-2000	0804	2.13	2,357.9	R	-	NPS
					11-20-2000	0803	2.23	2,357.8	R	-	NPS
					12-04-2000	0801	2.18	2,357.8	R	-	NPS
					12-18-2000	0934	2.24	2,357.8	R	-	NPS
					01-02-2001	0946	2.17	2,357.8	R	-	NPS
					01-17-2001	1200	2.13	2,357.9	R	-	NPS
					02-01-2001	0845	2.14	2,357.9	R	-	NPS
					02-16-2001	1002	2.14	2,357.9	R	-	NPS
					03-03-2001	0923	2.05	2,358.0	R	-	NPS
					03-12-2001	1030	2.18	2,357.8	R	-	NPS
					04-02-2001	0720	1.97	2,358.0	R	-	NPS
					04-17-2001	1102	2.09	2,357.9	R	-	NPS
					04-20-2001	1235	2.06	2,357.9	R	-	NPS
					05-01-2001	1008	2.01	2,358.0	R	-	NPS
					05-15-2001	1146	2.05	2,358.0	R	-	NPS
					06-02-2001	0903	2.13	2,357.9	R	-	NPS
					07-02-2001	0806	2.20	2,357.8	R	-	NPS
					07-16-2001	0720	2.20	2,357.8	R	-	NPS
					08-01-2001	0707	2.27	2,357.7	R	-	NPS
					08-02-2001	0708	2.20	2,357.8	R	-	NPS

Table 5. Periodic water-level data at monitoring sites in Yucca Mountain region, 2003—Continued

Site number (fig. 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-4	362532116172700	Devils Hole	2,360.0	--	08-20-2001	0832	2.11	2,357.9	R	-	NPS
					09-05-2001	0955	2.11	2,357.9	R	-	NPS
					09-17-2001	0805	2.13	2,357.9	R	-	NPS
					10-01-2001	0900	2.23	2,357.8	R	-	NPS
					10-16-2001	0844	2.20	2,357.8	R	-	NPS
					11-01-2001	1401	2.12	2,357.9	R	-	NPS
					11-15-2001	1404	2.09	2,357.9	R	-	NPS
					12-03-2001	1152	2.08	2,357.9	R	-	NPS
					12-13-2001	1440	2.11	2,357.9	R	-	NPS
					01-02-2002	0821	2.07	2,357.9	R	-	NPS
					01-16-2002	0845	2.12	2,357.9	R	-	NPS
					02-01-2002	0913	2.14	2,357.9	R	-	NPS
					02-15-2002	0939	2.17	2,357.8	R	-	NPS
					03-04-2002	0939	2.16	2,357.8	R	-	NPS
					03-15-2002	0900	2.16	2,357.8	R	-	NPS
					04-01-2002	0925	2.09	2,357.9	R	-	NPS
					04-20-2002	0704	2.14	2,357.9	R	-	NPS
					05-01-2002	0729	2.10	2,357.9	R	-	NPS
					05-14-2002	1041	2.18	2,357.8	R	-	NPS
					06-01-2002	0854	2.05	2,358.0	R	-	NPS
					06-17-2002	0748	2.15	2,357.8	R	-	NPS
					07-01-2002	0746	2.13	2,357.9	R	-	NPS
					07-19-2002	0718	2.22	2,357.8	R	-	NPS
					08-02-2002	0809	2.15	2,357.8	R	-	NPS
					08-16-2002	0732	2.21	2,357.8	R	-	NPS

Table 5. Periodic water-level data at monitoring sites in Yucca Mountain region, 2003—Continued

Site number (fig. 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-4	362532116172700	Devils Hole	2,360.0	--	09-01-2002	0809	2.25	2,357.8	R	-	NPS
					09-16-2002	0754	2.19	2,357.8	R	-	NPS
					10-04-2002	0855	2.30	2,357.7	R	-	NPS
					10-18-2002	0731	2.19	2,357.8	R	-	NPS
					11-01-2002	1228	2.16	2,357.8	R	-	NPS
					11-15-2002	0746	2.30	2,357.7	R	-	NPS
					12-01-2002	0957	2.19	2,357.8	R	-	NPS
					12-17-2002	0957	2.04	2,358.0	R	-	NPS
					01-04-2003	1136	2.10	2,357.9	R	-	NPS
					01-14-2003	0908	2.11	2,357.9	R	-	NPS
					01-22-2003	1408	2.15	2,357.8	R	-	NPS
					02-03-2003	0949	2.12	2,357.9	R	-	NPS
					02-18-2003	1011	2.11	2,357.9	R	-	NPS
					02-28-2003	0839	2.07	2,357.9	R	-	NPS
					03-15-2003	0853	2.00	2,358.0	R	-	NPS
					04-01-2003	1335	1.98	2,358.0	R	-	NPS
					04-15-2003	1105	2.24	2,357.8	R	-	NPS
					05-02-2003	0811	2.07	2,357.9	R	-	NPS
					05-16-2003	0701	2.08	2,357.9	R	-	NPS
					05-29-2003	1225	2.10	2,357.9	R	-	NPS
					06-16-2003	0649	2.03	2,358.0	R	-	NPS
					07-01-2003	0549	2.03	2,358.0	R	-	NPS
					07-16-2003	0649	2.04	2,358.0	R	-	NPS
					07-31-2003	0542	2.07	2,357.9	R	-	NPS
					08-14-2003	0620	2.05	2,358.0	R	-	NPS
					09-02-2003	0605	2.20	2,357.8	R	-	NPS
					10-01-2003	0715	2.16	2,357.8	R	-	NPS
					10-15-2003	1140	2.10	2,357.9	R	-	NPS
					10-30-2003	0703	1.99	2,358.0	R	-	NPS
					11-17-2003	0826	2.20	2,357.8	R	-	NPS
					12-03-2003	1534	2.07	2,357.9	R	-	NPS

Table 5. Periodic water-level data at monitoring sites in Yucca Mountain region, 2003—Continued

Site number (fig. 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-5	362529116171100	Devils Hole Well	2,404.1	0.9	01-16-2003	0810	48.16	2,355.9	S	-	EMP
					01-23-2003	0930	48.13	2,356.0	T	-	USFWS
					02-24-2003	1332	47.99	2,356.1	S	-	EMP
					03-06-2003	1312	48.12	2,356.0	S	-	EMP
					04-03-2003	1301	48.16	2,355.9	S	-	EMP
					05-15-2003	1100	48.21	2,355.9	T	-	USFWS
					05-22-2003	1108	48.10	2,356.0	S	-	EMP
					06-16-2003	0759	48.10	2,356.0	S	-	EMP
					07-21-2003	1230	48.15	2,356.0	T	-	USFWS
					07-23-2003	1029	48.19	2,355.9	S	-	EMP
					08-20-2003	1050	48.20	2,355.9	S	-	EMP
					09-15-2003	0918	48.19	2,355.9	T	-	USFWS
					09-15-2003	1830	48.11	2,356.0	S	-	EMP
					10-15-2003	0908	48.17	2,355.9	S	-	EMP
					11-17-2003	1443	48.17	2,355.9	S	-	EMP
					12-05-2003	1425	48.15	2,356.0	S	-	EMP
					12-16-2003	1320	48.30	2,355.8	T	-	USFWS

Table 5. Periodic water-level data at monitoring sites in Yucca Mountain region, 2003—Continued

Site number (fig. 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	01-16-2003	1326	21.43	2,297.4	S	-	EMP
					02-06-2003	1308	21.44	2,297.4	S	-	EMP
					03-06-2003	1209	21.54	2,297.3	S	-	EMP
					04-03-2003	1201	21.46	2,297.3	S	-	EMP
					05-15-2003	1200	21.40	2,297.4	T	-	USFWS
					05-22-2003	1007	21.43	2,297.4	S	-	EMP
					06-12-2003	1815	21.58	2,297.2	S	-	EMP
					07-23-2003	--	21.66	2,297.1	T	-	USFWS
					07-23-2003	0919	21.70	2,297.1	S	-	EMP
					08-20-2003	1135	21.71	2,297.1	S	-	EMP
					09-15-2003	1821	21.63	2,297.2	S	-	EMP
					09-18-2003	1400	21.58	2,297.2	T	-	USFWS
					10-15-2003	0956	21.63	2,297.2	S	-	EMP
					11-17-2003	1518	21.52	2,297.3	S	-	EMP
					12-05-2003	1334	21.50	2,297.3	S	-	EMP
					12-16-2003	1442	21.46	2,297.3	T	-	USFWS

Table 5. Periodic water-level data at monitoring sites in Yucca Mountain region, 2003—Continued

Site number (fig. 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-7	362417116163600	Point of Rocks South Well	2,333.5	0.8	01-16-2003	1407	7.39	2,326.1	S	-	EMP
					01-23-2003	1030	7.41	2,326.1	T	-	USFWS
					02-06-2003	1334	7.35	2,326.2	S	-	EMP
					03-06-2003	1244	8.25	2,325.2	S	-	EMP
					04-03-2003	1229	7.29	2,326.2	S	-	EMP
					05-15-2003	1340	7.33	2,326.2	T	-	USFWS
					05-22-2003	1038	7.33	2,326.2	S	-	EMP
					06-12-2003	1750	7.37	2,326.1	S	-	EMP
					07-23-2003	--	7.60	2,325.9	T	-	USFWS
					07-23-2003	0958	7.60	2,325.9	S	-	EMP
					08-20-2003	1209	7.63	2,325.9	S	-	EMP
					09-15-2003	1756	7.54	2,326.0	S	-	EMP
					09-18-2003	1448	7.60	2,325.9	T	-	USFWS
					10-15-2003	1041	7.52	2,326.0	S	-	EMP
					11-17-2003	1550	7.44	2,326.1	S	-	EMP
					12-05-2003	1400	7.38	2,326.1	S	-	EMP
					12-16-2003	1506	7.45	2,326.0	T	-	USFWS
DV-3	362230116392901	Travertine Point 1 Well	2,728.4	2.0	01-28-2003	1443	602.21	2,126.2	V	-	EMP
					02-26-2003	1130	602.14	2,126.3	V	-	EMP
					03-12-2003	1219	602.19	2,126.2	V	-	EMP
					04-23-2003	1319	602.23	2,126.2	V	-	EMP
					05-21-2003	0946	602.24	2,126.2	V	-	EMP
					06-12-2003	1348	602.20	2,126.2	V	-	EMP
					07-24-2003	0742	602.26	2,126.1	V	-	EMP
					08-19-2003	1417	602.26	2,126.1	V	-	EMP
					09-16-2003	1551	602.25	2,126.2	V	-	EMP
					10-15-2003	1307	602.29	2,126.1	V	-	EMP
					11-18-2003	1108	602.46	2,125.9	V	-	EMP
					12-09-2003	1143	602.45	2,126.0	V	-	EMP

Table 6. Daily average water levels in well JF-3 for calendar year 2003

[---, data not available]

Day	Water level, in feet below land surface											
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
1	709.86	709.27	709.70	709.11	709.66	709.54	709.55	709.60	709.50	709.55	709.59	709.47
2	709.85	709.48	709.84	709.20	709.52	709.47	709.54	709.52	709.58	709.36	709.51	709.61
3	709.76	709.73	709.53	709.55	709.48	709.46	709.54	709.49	709.58	709.37	709.51	709.47
4	709.71	709.55	709.42	709.46	709.59	709.45	709.52	709.48	709.59	709.52	709.64	709.47
5	709.65	709.59	709.66	709.55	709.58	709.54	709.47	709.47	709.56	709.55	709.63	709.43
6	709.74	709.66	709.71	709.67	709.45	709.54	709.41	709.49	709.49	709.51	709.65	709.28
7	709.71	709.66	709.64	709.83	709.45	709.50	709.47	709.52	709.41	709.44	709.60	709.20
8	709.54	709.56	709.77	709.80	709.45	709.46	709.60	709.53	709.33	709.50	709.58	709.51
9	709.51	709.69	709.79	709.55	709.62	709.47	709.64	709.56	709.34	709.40	709.50	709.63
10	709.56	709.68	709.65	709.44	709.76	709.54	709.61	709.58	709.59	709.42	709.54	709.38
11	709.69	709.61	709.51	709.47	709.70	709.55	709.59	709.50	709.74	709.67	709.63	709.33
12	709.81	709.51	709.57	709.43	709.62	709.52	709.56	709.44	709.53	709.66	709.47	709.60
13	709.80	709.39	709.58	709.49	709.59	709.60	709.53	709.54	709.53	709.70	709.55	709.64
14	709.63	709.50	709.47	709.45	709.46	709.65	709.50	709.60	709.59	709.56	709.55	709.39
15	709.75	709.66	709.33	709.60	709.52	709.59	709.49	709.61	709.46	709.50	709.43	709.75
16	709.78	709.63	709.34	709.64	709.58	709.56	709.55	709.61	709.34	709.67	709.40	709.87
17	709.65	709.67	709.46	709.44	709.50	709.53	709.60	709.48	709.43	709.69	709.53	709.67
18	709.60	709.67	709.74	709.52	709.57	709.43	709.57	709.44	709.64	709.60	709.77	709.56
19	709.60	709.52	709.79	709.72	709.74	709.35	709.63	709.51	709.54	709.57	709.60	709.44
20	709.55	709.56	709.72	709.60	709.67	709.41	709.57	709.62	709.50	709.61	709.33	709.27
21	709.58	709.70	709.82	709.31	709.59	709.49	709.50	709.57	709.52	709.59	709.13	709.39
22	709.73	709.51	709.75	709.36	709.53	709.48	709.47	709.47	709.52	709.50	709.55	709.62
23	709.65	709.40	709.53	709.57	709.48	709.39	709.53	709.50	709.49	709.43	709.79	709.41
24	709.59	709.35	709.55	709.54	709.38	709.67	709.47	709.59	709.53	709.53	709.46	709.29
25	709.69	709.41	709.81	709.49	709.41	709.88	709.52	709.55	709.58	709.71	709.25	709.07
26	709.75	709.51	709.58	709.54	709.61	709.81	709.64	709.53	709.53	709.74	709.48	709.40
27	709.51	709.55	709.60	709.50	709.70	709.61	709.58	709.52	709.50	709.53	709.94	709.82
28	709.53	709.67	709.87	709.50	709.61	709.50	709.50	709.50	709.50	709.26	709.77	709.80
29	709.69	---	709.98	709.56	709.50	709.51	709.52	709.49	709.48	708.97	709.48	709.39
30	709.71	---	709.80	709.63	709.45	709.56	709.58	709.54	709.58	709.01	709.43	709.36
31	709.64	---	709.43	---	709.51	---	709.64	709.47	---	709.36	---	709.38
MEAN	709.67	709.56	709.64	709.52	709.56	709.54	709.54	709.53	709.52	709.50	709.54	709.48
MAX	709.86	709.73	709.98	709.83	709.76	709.88	709.64	709.62	709.74	709.74	709.94	709.87
MIN	709.51	709.27	709.33	709.11	709.38	709.35	709.41	709.44	709.33	708.97	709.13	709.07

(2003 annual summary Mean 709.55 Maximum 709.98 Minimum 708.97)

Table 7. Daily average water levels in well AD-6 for calendar year 2003

[---, data not available]

Day	Water level, in feet below land surface											
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
1	41.90	41.64	---	41.60	41.78	41.74	41.75	41.81	41.78	41.79	41.88	41.86
2	41.89	41.77	---	41.68	41.72	41.70	41.75	41.78	41.81	41.72	41.83	41.91
3	41.84	41.86	---	41.80	41.73	41.70	41.75	41.77	41.80	41.74	41.83	41.84
4	41.83	41.77	---	41.74	41.77	41.69	41.74	41.76	41.81	41.80	41.89	41.85
5	41.81	41.79	---	41.78	41.76	41.72	41.72	41.76	41.80	41.81	41.88	41.83
6	41.86	---	---	41.82	41.70	41.73	41.69	41.77	41.77	41.78	41.88	41.77
7	41.82	---	41.77	41.87	41.72	41.70	41.73	41.77	41.75	41.76	41.86	41.74
8	41.77	---	41.83	41.84	41.71	41.69	41.77	41.78	41.72	41.78	41.86	41.88
9	41.77	---	41.83	41.74	41.79	41.70	41.78	41.79	41.73	41.74	41.82	41.91
10	41.79	---	41.77	41.71	41.83	41.73	41.76	41.79	41.83	41.75	41.85	41.80
11	41.84	---	41.72	41.73	41.79	41.73	41.76	41.76	41.87	41.86	41.88	41.79
12	41.89	---	41.75	41.72	41.75	41.73	41.75	41.74	41.78	41.84	41.81	41.92
13	41.88	---	41.75	41.75	41.74	41.76	41.74	41.78	41.78	41.86	41.87	41.92
14	41.81	---	41.70	41.72	41.69	41.77	41.74	---	41.81	41.81	41.86	41.81
15	41.87	---	41.65	41.79	41.74	41.75	41.73	41.80	41.76	41.79	41.81	41.98
16	41.88	---	41.67	41.79	41.75	41.74	41.75	41.81	41.71	41.87	41.81	42.00
17	41.82	---	41.72	41.70	41.71	41.72	41.77	41.75	41.76	41.88	41.87	41.92
18	41.80	---	41.82	41.75	41.75	41.68	41.76	41.74	41.84	41.84	41.95	41.88
19	41.81	---	41.82	41.84	41.81	41.66	41.80	41.77	41.79	41.83	41.87	41.84
20	41.79	---	41.79	41.76	41.78	41.70	41.77	41.82	41.78	41.86	41.77	41.77
21	41.80	---	41.84	41.66	41.75	41.72	41.74	41.80	41.79	41.84	41.69	41.83
22	41.87	---	41.81	41.70	41.72	41.71	41.73	41.76	41.78	41.81	41.90	41.91
23	41.82	---	41.72	41.78	41.71	41.67	41.76	41.78	41.77	41.79	41.98	41.82
24	41.80	---	41.75	41.74	41.67	41.80	41.73	41.81	41.79	41.83	41.83	41.78
25	41.84	---	41.86	41.72	41.69	41.86	41.76	41.79	41.81	41.91	41.76	41.69
26	41.86	---	41.74	41.74	41.77	41.81	41.81	41.79	41.78	41.91	41.87	41.86
27	41.75	---	41.77	41.72	41.79	41.74	---	41.79	41.77	41.82	42.03	42.02
28	41.77	---	41.90	41.73	41.74	41.71	41.75	41.78	41.78	41.72	41.95	41.98
29	41.84	---	41.93	41.75	41.70	41.73	41.76	41.77	41.77	41.62	41.84	41.80
30	41.83	---	41.85	41.78	41.69	41.76	41.78	41.79	41.80	41.66	41.84	41.81
31	41.79	---	41.70	---	41.73	---	41.82	41.76	---	41.81	---	41.83
MEAN	41.83	41.77	41.78	41.75	41.74	41.73	41.76	41.78	41.78	41.80	41.86	41.86
MAX	41.90	41.86	41.93	41.87	41.83	41.86	41.82	41.82	41.87	41.91	42.03	42.02
MIN	41.75	41.64	41.65	41.60	41.67	41.66	41.69	41.74	41.71	41.62	41.69	41.69

(2003 annual summary Mean 41.79 Maximum 42.03 Minimum 41.60)

Table 8. Ground-water-discharge data at monitoring sites in Yucca Mountain region, 2003

Site number: Alphanumeric identifier used to identify sites on maps and tables. First part represents hydrographic area in which site is located. Hydrographic areas: AD or AM, Amargosa Desert; DV, Death Valley. Second part is sequential numbering representing relative location of site within hydrographic area or Ash Meadows spring-discharge area; numbering order generally is north to south, then west to east.

U.S. Geological Survey site identification: Unique identification number for site as stored in files and data bases of U.S. Geological Survey (USGS).

Discharge: Reported to two significant figures. Discharge measured at site AM-2 represents a combination of flow directly through slotted casing at land surface and leakage from the casing's annular space.

Method: Method used to measure discharge. C, current meter; V, volumetric; Z, discharge represents monthly mean discharge on basis of continually recorded stage.

Data source: EMP, Environmental-Monitoring Program (USGS); NPS, National Park Service; USFWS, U.S. Fish and Wildlife Service.

[--, measurement time not available or not applicable]

Site number (fig.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	03-27-2003	1157	1,600	C	EMP
			06-24-2003	0738	1,600	C	EMP
			09-05-2003	1331	1,600	C	EMP
			12-18-2003	1039	1,600	C	EMP
AM-2	362755116190401	Five Springs Well	01-16-2003	1201	38	V	EMP
			02-06-2003	1501	37	V	EMP
			03-06-2003	1424	38	V	EMP
			04-03-2003	1411	37	V	EMP
			05-22-2003	0836	35	V	EMP
			06-13-2003	1206	33	V	EMP
			07-23-2003	0733	35	V	EMP
			08-19-2003	1644	35	V	EMP
			09-29-2003	1158	35	V	EMP
			10-27-2003	1536	38	V	EMP
			11-17-2003	1249	38	V	EMP
			12-05-2003	1132	36	V	EMP
AM-5a	362502116192301	Crystal Pool	01-22-2003	1315	2,900	C	USFWS
			03-14-2003	1414	2,600	C	EMP
			05-15-2003	0930	2,700	C	USFWS
			06-26-2003	1448	2,800	C	EMP
			07-23-2003	0700	2,600	C	USFWS
			08-29-2003	1124	2,600	C	EMP
			09-24-2003	1028	2,800	C	USFWS
			10-22-2003	1340	2,700	C	USFWS
			12-12-2003	1511	3,000	C	EMP
AM-8	362230116162001	Big Spring	01-23-2003	1500	990	C	USFWS
			03-14-2003	1656	1,000	C	EMP
			05-20-2003	1000	1,100	C	USFWS
			06-24-2003	1007	990	C	EMP
			07-23-2003	1347	980	C	USFWS
			08-29-2003	1024	1,100	C	EMP
			09-25-2003	0830	1,000	C	USFWS
			12-12-2003	1225	1,100	C	EMP
			12-18-2003	0916	1,000	C	USFWS

Table 8. Ground-water-discharge data at monitoring sites in Yucca Mountain region, 2003—Continued

Site number (fig.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	01-15-2003	--	200	Z	NPS
			02-15-2003	--	200	Z	NPS
			03-15-2003	--	200	Z	NPS
			03-19-2003	1342	190	C	EMP
			04-15-2003	--	200	Z	NPS
			05-15-2003	--	200	Z	NPS
			06-15-2003	--	190	Z	NPS
			06-17-2003	1036	180	C	EMP
			07-15-2003	--	200	Z	NPS
			08-15-2003	--	190	Z	NPS
			09-04-2003	1416	200	C	EMP
			09-15-2003	--	200	Z	NPS
			10-15-2003	--	200	Z	NPS
			11-15-2003	--	200	Z	NPS
			12-15-2003	--	200	Z	NPS
			12-18-2003	1322	190	C	EMP
DV-2	362252116425301	Navel Spring	03-19-2003	1518	0.87	V	EMP
			06-17-2003	1204	0.82	V	EMP
			09-04-2003	1549	0.84	V	EMP
			12-11-2003	1423	0.83	V	EMP

Table 9. Estimated annual ground-water withdrawals from wells in Yucca Mountain region, 1959–2003

Year	Alkali Flat-Furnace Creek Ranch ground-water subbasin (fig. 1) (millions of gallons)			Ash Meadows ground-water subbasin (fig. 1) (millions of gallons)		
	Amargosa Desert[1]	Crater Flat[2]	Jackass Flats[2]	Amargosa Desert (excluding Ash Meadows area)[1]	Amargosa Desert (Ash Meadows area)[1]	Mercury Valley[2]
1959	--	--	[3]10.3	--	--	--
1960	--	--	[3]14.8	--	--	--
1961	--	--	30.0	--	--	--
1962	--	--	[3]60.6	--	--	4.2
1963	--	--	[3]182.5	--	--	2.7
1964	--	--	[3]182.5	--	--	[3]32.4
1965	--	--	[3]182.5	--	--	25.4
1966	1,370	--	[3]182.5	--	--	47.3
1967	3,025	--	[3]182.5	--	--	56.1
1968	2,947	--	--	--	--	52.7
1969	--	--	--	--	650	78.1
1970	--	--	--	--	2,200	69.4
1971	--	--	--	--	2,200	96.1
1972	--	--	--	--	2,000	[3]85.4
1973	2,321	--	--	--	1,400	[3]70.1
1974	--	--	--	--	1,300	[3]77.9
1975	--	--	--	--	1,200	[3]76.6
1976	--	--	--	--	1,200	[3]64.9
1977	--	--	--	--	620	[3]57.7
1978	--	--	[3]5.9	--	10	[3]60.0
1979	--	--	[3]12.4	--	85	[3]51.5
1980	--	--	[3]24.4	--	10	[3]59.3
1981	--	--	[3]48.6	--	30	[3]65.5

Table 9. Estimated annual ground-water withdrawals from wells in Yucca Mountain region, 1959–2003—Continued

Year	Alkali Flat-Furnace Creek Ranch ground-water subbasin (fig. 1) (millions of gallons)			Ash Meadows ground-water subbasin (fig. 1) (millions of gallons)		
	Amargosa Desert[1]	Crater Flat[2]	Jackass Flats[2]	Amargosa Desert (excluding Ash Meadows area)[1]	Amargosa Desert (Ash Meadows area)[1]	Mercury Valley[2]
1982	--	--	[3]41.8	--	<1	[3]73.0
1983	--	--	70.6	--	--	56.8
1984	--	--	65.9	--	--	82.1
1985	3,155	--	53.6	--	--	41.6
1986	2,362	--	46.0	--	--	34.9
1987	1,877	--	52.9	--	--	34.7
1988	1,339	--	46.0	--	--	53.1
1989	1,278	12.8	50.6	--	--	114.4
1990	2,544	43.4	51.7	--	--	126.0
1991	1,995	13.9	51.2	--	--	109.9
1992	2,644	9.5	38.9	16	--	139.4
1993	3,666	4.9	66.8	16	--	110.2
1994	4,104	14.8	90.2	--	--	76.9
1995	4,899	10.0	90.6	--	--	24.1
1996	4,422	[3]32.8	127.4	4	10	17.7
1997	4,509	[3]108.0	112.2	19	2	11.4
1998	4,989	[3]54.3	48.8	19	3	1.0
1999	4,598	[3]99.1	33.3	20	3	[3]1.5
2000	4,054	[3]41.1	29.2	21	6	0.6
2001	3,907	[3]15.4	36.2	19	6	37.6
2002	4,025	[3]16.2	17.7	19	3	53.0
2003	4,405	14.4	13.5	19	3	50.9

[1] Data recompiled from ground-water pumpage inventory for entire Amargosa Desert. Conversion from acre-feet to millions of gallons (325.851 gallons per acre-foot) is rounded to nearest 1 million gallons.
[2] Data reported, estimated, or recompiled from flowmeter readings and listed to nearest 0.1 million gallons. See text section "Ground-Water Withdrawals" for discussion of data sources.
[3] Estimated ground-water withdrawal revised from that in previous reports on selected ground-water data for the Yucca Mountain region. Revisions are on the basis of more-recent information or further reviews by data sources.

Table 10. Minimum, maximum, and median water-level altitudes, and average deviation of measurements, at selected wells in Jackass Flats for the baseline period 1992–93 and for calendar years 1994 through 2003

Calendar years: Years for which measurements were used to calculate summary statistics. Italics indicate 1992–93 baseline period.

Number: Number of water-level measurements for year(s) specified. For JF-2 (1992-93), JF-2a (1992-97), and JF-3, value represents number of daily average water levels.

Water level: Based on periodic water-level measurements for JF-1, JF-2 (after 1993), JF-2a (after 1997), J-13, J-11, and J-12. Based on daily average water levels for JF-2 (1992-93), JF-2a (1992-97), and JF-3.

Minimum: Minimum water-level altitude or minimum daily average water-level altitude for year(s) specified.

Maximum: Maximum water-level altitude or maximum daily average water-level altitude for year(s) specified.

Median: Statistically representative water-level altitude calculated from periodic measurements or daily average water levels for year(s) specified.

Average deviation: Calculated dispersion of measurements about median water-level altitude. Average deviation is equal to sum of absolute differences between measured water levels and median, divided by number of measurements.

Change in median: Differences between median water level for calendar years 1994 through 2003 compared with the 1992–93 baseline period. Minus sign indicates that median water-level altitude was lower for the specified year than for the baseline period.

[Excludes water-level altitudes that may reflect short-term conditions at a site. Abbreviation and symbol: N/A, not applicable (data field is not related to referenced data set); --, transducer installed in site JF-2 prevented periodic measurement for most of 2002]

Site number (fig. 1)	Calendar year(s)	Number	Water level (feet above sea level)			Average deviation (feet)	Change in median (feet)
			Minimum	Maximum	Median		
JF-1	[a] *1992-93*	[a] 20	[a] 2,391.9	[a] 2,392.7	2,392.5	[a] 0.1	N/A
	2003	16	2,393.0	2,393.6	2,393.3	0.1	0.8
	2002	16	2,393.0	2,393.4	2,393.2	0.1	0.7
	2001	18	2,392.8	2,393.3	2,393.0	0.1	0.5
	2000	14	2,392.8	2,393.4	2,392.8	0.1	0.3
	1999	12	2,392.3	2,393.0	2,392.7	0.1	0.2
	1998	22	2,392.3	2,392.8	2,392.5	0.1	0.0
	1997	10	2,392.1	2,392.6	2,392.4	0.1	-0.1
	1996	8	2,392.0	2,392.6	2,392.3	0.2	-0.2
	1995	7	2,392.3	2,392.8	2,392.5	0.2	0.0
	1994	12	2,392.1	2,392.6	2,392.3	0.1	-0.2
JF-2	[a] *1992-93*	[a] 718	[a] 2,391.7	[a] 2,392.8	2,392.1	[a] 0.1	N/A
	2003	10	2,392.6	2,392.9	2,392.6	0.1	0.5
	2002	1	--	--	--	--	--
	2001	18	2,392.4	2,393.2	2,392.8	0.2	0.7
	2000	14	2,392.3	2,393.2	2,392.7	0.2	0.6
	1999	13	2,392.0	2,392.7	2,392.5	0.1	0.4
	1998	21	2,391.8	2,392.6	2,392.1	0.1	0.0
	1997	11	2,391.8	2,392.4	2,392.0	0.1	-0.1
	1996	7	2,391.6	2,392.3	2,392.1	0.2	0.0
	1995	9	2,392.2	2,392.5	2,392.4	0.1	0.3
	1994	9	2,392.0	2,392.6	2,392.2	0.1	0.1
JF-2a	[a] *1992-93*	[a] 707	[a] 2,466.9	[a] 2,469.2	[a] 2,468.7	[a] 0.3	N/A
	2003	14	2,471.0	2,473.2	2,471.5	0.7	2.8
	2002	16	2,470.5	2,471.3	2,471.0	0.2	[a] 2.3
	2001	18	2,470.8	2,471.2	2,471.0	0.1	[a] 2.3
	2000	14	2,470.1	2,471.1	2,470.8	0.3	[a] 2.1
	1999	13	2,469.8	2,470.4	2,470.2	0.1	[a] 1.5
	1998	20	2,469.8	2,470.4	2,470.0	0.1	[a] 1.3
	1997	267	2,468.8	2,470.0	2,469.5	0.1	[a] 0.8
	1996	214	2,468.6	2,469.6	2,469.3	0.1	[a] 0.6
	1995	357	2,468.7	2,469.3	2,469.1	0.1	[a] 0.4
	1994	356	2,468.4	2,469.4	2,469.0	0.1	[a] 0.3

Table 10. Minimum, maximum, and median water-level altitudes, and average deviation of measurements, at selected wells in Jackass Flats for the baseline period 1992-93 and for calendar years 1994 through 2003—Continued

Site number (fig. 1)	Calendar year(s)	Number	Water level (feet above sea level)			Average deviation (feet)	Change in median (feet)
			Minimum	Maximum	Median		
J-13	[a]*1992-93*	[a]37	[a]2,389.6	2,390.7	[a]2,389.9	0.1	N/A
	2003	19	2,390.2	2,390.9	2,390.6	0.2	0.7
	2002	15	2,390.0	2,390.8	2,390.4	0.1	[a]0.5
	2001	17	2,390.1	2,390.9	2,390.4	0.2	[a]0.5
	2000	13	2,390.0	2,391.0	2,390.2	0.2	[a]0.3
	1999	13	2,389.6	2,390.2	2,390.0	0.1	[a]0.1
	1998	20	2,389.4	2,390.2	2,389.8	0.1	[a]-0.1
	1997	11	2,389.5	2,389.9	2,389.6	0.1	[a]-0.3
	1996	8	2,389.2	2,389.9	2,389.6	0.1	[a]-0.3
	1995	11	2,389.6	2,390.4	2,389.8	0.1	[a]-0.1
	1994	23	2,389.4	2,390.0	2,389.7	0.1	[a]-0.2
J-11	[a]*1992-93*	[a]20	2,401.9	[a]2,402.7	2,402.2	0.1	N/A
	2003	17	2,402.2	2,402.8	2,402.6	0.1	0.4
	2002	16	2,402.1	2,402.7	2,402.5	0.1	0.3
	2001	18	2,402.3	2,403.0	2,402.6	0.2	0.4
	2000	14	2,402.3	2,403.2	[a]2,402.4	0.1	[a]0.2
	1999	14	2,402.2	2,402.8	2,402.4	0.1	0.2
	1998	20	2,402.2	2,402.9	2,402.6	0.2	0.4
	1997	10	2,402.2	2,402.8	2,402.6	0.2	0.4
	1996	8	2,402.2	2,402.6	2,402.4	0.1	0.2
	1995	11	2,402.2	2,402.5	2,402.4	0.1	0.2
	1994	12	2,402.0	2,402.5	2,402.3	0.1	0.1
J-12	[a]*1992-93*	[a]36	[a]2,387.9	[a]2,389.0	2,388.3	0.1	N/A
	2003	18	2,388.4	2,389.0	2,388.8	0.1	0.5
	2002	16	2,388.4	2,388.8	2,388.6	0.1	0.3
	2001	18	2,388.3	2,388.6	2,388.5	0.1	0.2
	2000	14	2,387.9	2,388.6	2,388.4	0.1	0.1
	1999	12	2,388.1	2,388.5	2,388.3	0.1	0.0
	1998	17	2,387.9	2,388.3	2,388.0	0.1	-0.3
	1997	16	2,387.7	2,388.4	2,388.0	0.1	-0.3
	1996	18	2,387.5	2,388.5	2,388.0	0.1	-0.3
	1995	16	2,388.0	2,388.3	2,388.2	0.1	-0.1
	1994	24	2,387.8	2,389.1	2,388.2	0.2	-0.1
JF-3	*1992-93*	582	2,387.7	2,388.8	2,388.3	0.1	N/A
	2003	365	2,388.3	2,389.3	2,388.8	0.1	0.5
	2002	314	2,388.1	2,389.0	2,388.6	0.1	0.3
	2001	331	2,388.1	2,389.0	2,388.5	0.1	0.2
	2000	366	2,387.9	2,388.8	2,388.4	0.1	0.1
	1999	365	2,387.6	2,388.6	2,388.2	0.1	-0.1
	1998	316	2,387.6	2,388.6	2,388.0	0.1	-0.3
	1997	345	2,387.4	2,388.8	2,388.0	0.1	-0.3
	1996	359	2,387.5	2,388.5	2,388.0	0.1	-0.3
	1995	347	2,387.7	2,388.4	2,388.1	0.1	-0.2
	1994	284	2,387.6	2,388.6	2,388.1	0.1	-0.2

[a] Information revised from that in previous reports on selected ground-water data for the Yucca Mountain region. Revisions are due to changed baseline periods or further review of data.

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