IN THE SUPREME COURT OF THE STATE OF NEVADA

TIM WILSON, P.E., Nevada State Engineer, DIVISION OF WATER RESOURCES, DEPARTMENT OF CONSERVATION AND NATURAL RESOURCES,

Appellant,

vs.

PAHRUMP FAIR WATER, LLC., a Nevada limited-liability company; STEVEN PETERSON, an individual; MICHAEL LACH, an individual; PAUL PECK, an individual; BRUCE JABEOUR, an individual; and GERALD SCHULTE, an individual,

Respondents.

Electronically Filed
Feb 19 2019 11:47 a.m.
Elizabeth A. Brown
Clerk of Supreme Court

Case No. 77722

JOINT APPENDIX
Volume IV of XIV, pages 629–957

AARON D. FORD
Attorney General
JAMES N. BOLOTIN
Deputy Attorney General
Nevada Bar No. 13829
Office of the Attorney General
100 North Carson Street
Carson City, Nevada 89701-4717
T: (775) 684-1231
E: jbolotin@ag.nv.gov
Attorney for Appellant

PAUL G. TAGGART, ESQ.
Nevada Bar No. 6136
DAVID H. RIGDON, ESQ.
Nevada Bar No. 13567
TAGGART & TAGGART, LTD.
108 North Minnesota Street
Carson City, Nevada 89703
T: (775) 882-9900
E: paul@legaltnt.com
tim@legaltnt.com
Attorneys for Respondents

Docket 77722 Document 2019-07544

DATE	DOCUMENT DESCRIPTION	VOLUME	PAGE NOS.
10/12/18	Answering Brief filed by State Engineer	XIV	4910–4945
12/10/18	Ex Parte Motion for Order Shortening Time on Motion for Stay of Order Granting Petition for Judicial Review and Reversing State Engineer's Amended Order No. 1293A Pending Appeal	XIV	5474–5476
09/05/18	Letter from Court & Memorandum of Temporary Assignment (Steven Kosach)	XI	3628–3629
12/18/18	Letter from Nye County Clerk to Nevada Supreme Court re: submittal of appeal packet	XIV	5496–5497
09/18/18	Memorandum of Temporary Assignment (Steven Elliott)	XIV	4906
08/22/18	Memorandum of Temporary Assignment (William Maddox)	I	34–35
12/10/18	Motion for Stay of Order Granting Petition for Judicial Review and Reversing State Engineer's Amended Order No. 1293A Pending Appeal on Order Shortening Time	XIV	5461–5473
12/10/18	Notice of Appeal filed by State Engineer	XIV	5442–5460
08/17/18	Notice of Appeal of Nevada State Engineer Amended Order 1293A	I	1–14
01/02/19	Notice of Entry of Order (Denying Motion for Stay)	XIV	5530–5539
12/07/18	Notice of Entry of Order (Granting Petition for Judicial Review)	XIV	5427–5441

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09/11/18	Notice of Transmittal of Record on Appeal	XI	3630–3631
09/11/18	Opening Brief filed by Pahrump Fair Water, LLC, *et al.* ("PFW")	XI	3634–3655
12/18/18	Opposition to Motion for Stay of Order Granting Petition for Judicial Review	XIV	5498–5508
12/27/18	Order Denying Motion for Stay	XIV	5525–5529
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08/31/18	Order Granting Stipulation and Order Regarding Briefing Schedule	XI	3622–3624
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09/11/18	Peremptory Challenge of Judge (Steven Kosach) filed by State Engineer	XI	3632–3633
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11/08/18	PowerPoint Presentation by PFW re: Petition for Judicial Review	XIV	5137–5185
11/08/18	PowerPoint Presentation by State Engineer re: Petition for Judicial Review	XIV	4988–5136
12/27/18	[Proposed] Order Denying Motion for Stay filed by PFW	XIV	5515–5524

DATE	DOCUMENT DESCRIPTION	VOLUME	PAGE NOS.
12/10/18	[Proposed] Order Granting Motion for Stay of Order Granting Petition for Judicial Review and Reversing State Engineer's Amended Order No. 1293A Pending Appeal filed by State Engineer	XIV	5483–5493
11/26/18	[Proposed] Order Granting Petition for Judicial Review filed by PFW	XIV	5402–5416
11/26/18	[Proposed] Order Granting Petition for Judicial Review filed by State Engineer	XIV	5378–5401
12/10/18	[Proposed] Order Shortening Time on Motion for Stay of Order Granting Petition for Judicial Review and Reversing State Engineer's Amended Order No. 1293A Pending Appeal filed by State Engineer	XIV	5477–5482
11/01/18	Reply Brief filed by PFW	XIV	4955–4987
12/20/18	Reply in Support of State Engineer's Motion for Stay of Order Granting Petition for Judicial Review and Reversing State Engineer's Amended Order No. 1293A Pending Appeal	XIV	5509–5514
12/12/18	Request for Submission of Ex Parte Motion for Order Shortening Time	XIV	5494–5495
09/21/18	Request to Set Hearing Date (re: Petition for Judicial Review)	XIV	4907–4909
10/31/18	Stipulation and Order for Extension of Time (re: Reply Brief)	XIV	4948–4954

DATE	DOCUMENT DESCRIPTION	VOLUME	PAGE NOS.
08/30/18	Summary of Record on Appeal and Bates-stamped pages SE ROA 1–3574	I–XI	36–3621
09/11/18	Supplemental Record on Appeal and Bates-stamped pages SROA 1–1245 filed by PFW	XI–XIV	3656–4905
11/08/18	Transcript (re: Oral Arguments on Petition for Judicial Review)	XIV	5186–5377

RESPECTFULLY SUBMITTED this 15th day of February, 2019.

AARON D. FORD
Attorney General

By: /s/ James N. Bolotin
JAMES N. BOLOTIN
Deputy Attorney General
Attorney for Appellant, State Engineer

CERTIFICATE OF SERVICE

I certify that I am an employee of the Office of the Attorney General and that on this 15th day of February, 2019, I served a copy of the foregoing JOINT APPENDIX, by electronic service to:

Paul G. Taggart, Esq.
David H. Rigdon, Esq.
TAGGART & TAGGART, LTD.
108 North Minnesota Street
Carson City, Nevada 89703

/s/ Dorene A. Wright

LYON COUNTY / DAYTON UTILITIES
TOTAL COMBINED DUTY
DAYTON AREA ONLY

BASE RIGHT	CHANGED BY PERMIT	STATUS	RFA,PER, CERT, OR OTHER DATE	ADDITIVE (YES/NO)	DUTY (AFA)	NEW COMBINED DUTY (AFA)	COMMENTS
PTN 44397	71857	PER	7/1/2005	YES	1.25	7108.38	FOR JOHN GAVIN, CONSUMP PTN
PTN 26110	71379	PER	7/19/2005	YES	6.25	7114.63	STANTON PARK, CONSUMP PTN
PTN 26110	71688	PER	7/21/2005	YES	5.375	7120.005	LYON COUNTY, CONSUMP PTN (CP)
PTN 23685	71536	PER	8/1/2005	YES	9.20	7129.205	STANTON PARK, CONSUMP PTN
32921	71856	PER	10/18/2005	YES	5.94	7135.15	LYON COUNTY (WANDLER), CP
PTN 53239	71537	PER	1/16/2005	YES	6.25		STANTON PARK, CONSUMP PTN
PTN 21474	71872	PER	2/20/2005	YES	5.21		TCD 71872 & 71873 NTE 5.47 AFA
PTN 25494	71873	PER	2/20/2005	YES	5.47	7146.87	STANTON PARK, CONSUMP PTN
PTN 25503	72603	PER	9/25/2005	YES	1.25	7148.12	INTNTL CHURCH, CONSUMP PTN
PTN 27817	72914	PER	12/23/2005	YES	12.50	7160.62	STANTON PARK, CONSUMP PTN
PTN 27922	73158	PER	12/23/2005	YES	8.68	7169.30	LYON COUNTY, CONSUMP PTN
62323	73157	PER	12/23/2005	YES	80.00	7249.30	LYON COUNTY
PTN 23685	72932	PER	12/29/2005	YES	88.83	7338.13	LYON COUNTY, CONSUMP PTN
PTN 27922	72931	PER	5/1/2006	YES	0.70	7338.83	LYON COUNTY, CONSUMP PTN
PTN 27922	73183	PER	5/1/2006	YES	7.50	7346.33	STANTON PARK, CONSUMP PTN
PTN 25503	72774	PER	5/1/2006	YES	3.25	7349.58	LYON COUNTY, CONSUMP PTN
PTN 28974	72775	PER	5/1/2006	YES	1.25	7350.83	LYON COUNTY, CONSUMP PTN
PTN 26232	72933	PER	5/1/2006	YES	200.00	7550.83	LYON COUNTY
PTN 53239	73491	PER	5/26/2006	YES	5.63	7556.46	LYON COUNTY, CONSUMP PTN
PTN 26110	73473	PER	5/26/2006	YES	3.17	7559.63	LYON COUNTY, CONSUMP PTN
PTN 61572	73474	PER	5/26/2006	YES	62.50	7622.13	LYON COUNTY, CONSUMP PTN
PTN 26703	73393	PER	5/26/2006	YES	1.18	7623.31	LYON COUNTY, CONSUMP PTN
PTN 23685	73394	PER	5/26/2006	YES	9.38	7632.69	LYON COUNTY, CONSUMP PTN
PTN 29622	72773	PER	5/26/2006	YES	2.41	7635.10	LYON COUNTY, CONSUMP PTN
PTN 32920	73490	PER	5/26/2006	YES	5.00	7640.10	LYON COUNTY, CONSUMP PTN
PTN 71477	71477R01	RLP	7/28/2006	YES	-56.56	7583.54	LYON CO. CREATES 28 DOM. WELL
19961	73992	PER	8/3/2006	YES	5.60	7589.14	BARDIS STK TO MUN (PRE-DESIG.)
PTN 26110	71379	PER	5/31/2007	YES	3.750		LYON CO ADD'NL STIPULT'D DUTY
PTN 26110	71688	PER	7/21/2005	YES	3.225		LYON CO ADD'NL STIPULT'D DUTY
PTN 23685	71536	PER	8/1/2005	YES	5.520		LYON CO ADD'NL STIPULT'D DUTY
PTN 53239	71537	PER	1/16/2005	YES	3.750		LYON CO ADD'NL STIPULT'D DUTY
PTN 21474	71872	PER	2/20/2005	YES	3.130		TCD 71872A & 71873A NTE 8.75 AFA
PTN 25494	71873	PER	2/20/2005	YES	3.280		LYON CO ADD'NL STIPULT'D DUTY
PTN 27817	72914	PER	12/23/2005	YES	7.500		LYON CO ADD'NL STIPULT'D DUTY
PTN 27922	73163	PER	5/1/2006	YES	4.500		LYON CO ADD'NL STIPULT'D DUTY
PTN 26110	73473	PER	5/26/2006	YES	1.898		LYON CO ADD'NL STIPULT'D DUTY
PTN 61572	73474	PER	5/26/2006	YES	37.50		LYON CO ADD'NL STIPULT'D DUTY
PTN 32920	73490	PER	5/26/2006	YES	3.00		LYON CO ADD'NL STIPULT'D DUTY
PTN 53239	73491	PER	5/26/2006	YES	3.37		LYON CO ADD'NL STIPULT'D DUTY
ADDITIONAL DUTY ADDED TO TCD TERM BY STIPULATION					80.423		
NEW AMENDED TOTAL COMBINED DUTY TERM (MAY)						7669.563	**7669.56**
PTN 23685	72932	PER	12/29/2005	YES	53.30		LYON CO ADD'NL STIPULT'D DUTY
PTN 23685	73394	PER	5/26/2006	YES	5.62		LYON CO ADD'NL STIPULT'D DUTY
32921	71856	PER	10/18/2005	YES	3.56		LYON COUNTY ADDITIONAL DUTY
PTN 44397	71857	PER	7/1/2005	YES	0.75		LYON COUNTY ADDITIONAL DUTY
PTN 25503	72603	PER	9/25/2005	YES	0.75		LYON COUNTY ADDITIONAL DUTY
PTN 25503	72774	PER	5/1/2006	YES	1.95		LYON CO ADD'NL STIPULT'D DUTY
PTN 29622	72773	PER	5/26/2006	YES	1.45		LYON CO ADD'NL STIPULT'D DUTY
PTN 28974	72775	PER	5/1/2006	YES	0.75		LYON COUNTY ADDITIONAL DUTY
PTN 27922	73158	PER	12/23/2005	YES	5.20		LYON COUNTY ADDITIONAL DUTY
PTN 27922	72931	PER	5/1/2006	YES	0.42		LYON CO ADD'NL STIPULT'D DUTY
PTN 26703	73393	PER	5/26/2006	YES	0.70		LYON CO ADD'NL STIPULT'D DUTY
ADDITIONAL DUTY ADDED TO TCD TERM BY STIPULATION					74.45		
NEW AMENDED TOTAL COMBINED DUTY TERM (AUGUST)						7744.013	**7744.01**
PTN 23685	74283	RFP	5/9/2006	YES	10.00	7754.01	LY CO CONSUMP PTN only for sub'd 8.0 af
PTN 61572	74284	RFP	5/9/2006	YES	50.00	7804.01	LY CO CONSUMP PTN only for sub'd 40.0 af
PTN 50697	*74285	RFP	5/9/2006	YES	2.34	7806.35	LY CO CONSUMP PTN only for sub'd 1.87 af
PTN 25503	*74286	RFP	5/9/2006	YES	0.24	7806.59	LY CO CONSUMP PTN only for sub'd 0.19 af
PTN 13577	74369	RFP	6/8/2006	NO	68.40		13577 tot sup to 35971 w/l the POU
PTN 35971	74370	RFP	6/8/2006	YES	250.00	8056.59	stripped TCD 74369 & 70 NTE 250.0 (200 sub'd)
PTN 22516	*74427	RFP	6/29/2006	YES	1.68	8058.27	LYON COUNTY CHANGE COM (APPROP.) TO QM
PTN 20928	74434	RFP	6/30/2006	YES	101.00	8159.27	SMITH, D., CONSUMP PTN only for sub'd 80.8
PTN 21475	74562	RFP	7/25/2006	YES	10.00	8169.27	LY CO CONSUMP PTN only for sub'd 8.0 af
PTN 23685	*74569	RFP	7/28/2006	YES	10.00	8179.27	LY CO CONSUMP PTN only for sub'd 8.0 af
PTN 28586	*74570	RFP	7/28/2006	YES	9.98	8189.25	LYON COUNTY BR cerTIFICATED for < consump. use
PTN 61572	74612	RFP	8/9/2006	YES	100.00	8289.25	LY CO CONSUMP PTN only for sub'd 80.0 af
70116	74922	RFP	10/18/2006	YES	2.02	8291.27	LY CO CONSUMP PTN only for sub'd 1.62 af

LYON COUNTY / DAYTON UTILITIES
TOTAL COMBINED DUTY
DAYTON AREA ONLY

BASE RIGHT	CHANGED BY PERMIT	STATUS	RFA,PER, CERT, OR OTHER DATE	ADDITIVE (YES/NO)	DUTY (AFA)	NEW COMBINED DUTY (AFA)	COMMENTS
64782	75101	RFP	11/17/2006	YES	478.96	8770.23	UNSTACKING OF ELDORADO CANYON WATER AND WILL INCREASE THE NON-SUP. GROUND WATER AVAILABLE, THUS INCREASING THE TCD AVAILABLE FOR M & I USE
64783	75102	RFP	11/17/2006	YES			
64784	75103	RFP	11/17/2006	YES			
64785	75104	RFP	11/17/2006	YES			
PTN 23685	75157	RFP	12/4/2006	YES	9.80	8780.03	LY CO CONSUMP PTN only for sub'd 7.84 af
PTN 21475	75159	RFP	12/4/2006	YES	17.24	8797.27	LY CO CONSUMP PTN only for sub'd 13.79 af
73524	75160	RFP	12/4/2006	YES	0.84	8798.11	LYON COUNTY CHANGE COM (APPROP.) TO QM
PTN 61572	75277	RFP	1/23/2007	YES	245.50	9043.61	LY CO CONSUMP PTN only for sub'd 196.4 af
72801	75283	RFP	1/25/2007	YES	2.02	9045.63	LYON COUNTY CHANGE QM (APPROP.) TO QM
27329	75366	RFP	2/20/2007	YES	6.1		LYON CO. CHANGE QM CERTS (TRAILER PARK) ON
27330	75367	RFP	2/20/2007	YES	7.89	9059.62*	2 WELLS TO QM / MUN SYSTEM TCD 13.99 AFA

PROTESTS ON APPLICATIONS 74283 THROUGH 75283 WERE OVERRULED BY STATE ENGINEER' RULING #5823
***WATER UNDER THESE APPLICATIONS CANNOT BE PUMPED UNTIL THE WELL CONSTRUCTION AT THE PROPOSED POINT OF DIVERSION IS APPROVED BY THE STATE ENGINEER PERSUANT TO THE SAME RULING.**

PROTESTS ON APPLICATIONS 75366 AND 76367 WERE OVERRULED BY STATE ENGINEER' RULING #5824

Hydrology of the Valley-Fill and Carbonate-Rock Reservoirs Pahrump Valley Nevada-California

GEOLOGICAL SURVEY WATER-SUPPLY PAPER 1832

Prepared in cooperation with the Nevada Department of Conservation and Natural Resources

JT APP 631
SE ROA 584

Hydrology of the Valley-Fill and Carbonate-Rock Reservoirs Pahrump Valley Nevada-California

By GLENN T. MALMBERG

GEOLOGICAL SURVEY WATER-SUPPLY PAPER 1832

Prepared in cooperation with the Nevada Department of Conservation and Natural Resources

UNITED STATES GOVERNMENT PRINTING OFFICE, WASHINGTON : 1967

JT APP 632
SE ROA 585

UNITED STATES DEPARTMENT OF THE INTERIOR

STEWART L. UDALL, *Secretary*

GEOLOGICAL SURVEY

William T. Pecora, *Director*

Library of Congress catalog-card No. GS 67-173

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Washington, D.C. 20402

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HYDROLOGY OF THE VALLEY-FILL AND CARBONATE-ROCK RESERVOIRS, PAHRUMP VALLEY, NEVADA-CALIFORNIA

By GLENN T. MALMBERG

ABSTRACT

This is the second appraisal of the water supply of Pahrump Valley, made 15 years after the first cooperative study. In the first report the average recharge was estimated to be 23,000 acre-feet per year, only 1,000 acre-feet more than the estimate made in this report. All this recharge was considered to be available for development. Because of the difficulty in salvaging the subsurface outflow from the deep carbonate-rock reservoir, this report concludes that the perennial yield may be only 12,000 acre-feet.

In 1875, Bennetts and Manse Springs reportedly discharged a total of nearly 10,000 acre-feet of water from the valley-fill reservoir. After the construction of several flowing wells in 1910, the spring discharge began to decline. In the mid-1940's many irrigation wells were drilled, and large-capacity pumps were installed. During the 4-year period of this study (1959–62), the net pumping draft averaged about 25,000 acre-feet per year, or about twice the estimated yield. In 1962 Bennetts Spring was dry, and the discharge from Manse Spring was only 1,400 acre-feet.

During the period February 1959–February 1962, pumping caused an estimated storage depletion of 45,000 acre-feet, or 15,000 acre-feet per year. If the overdraft is maintained, depletion of stored water will continue and pumping costs will increase. Water levels in the vicinity of the Pahrump, Manse, and Fowler Ranches declined more than 10 feet in response to the pumping during this period, and they can be expected to continue to decline at the projected rate of more than 3 feet per year.

The chemical quality of the pumped water has been satisfactory for irrigation and domestic use. Recycling of water pumped for irrigation, however, could result in deterioration of the water quality with time.

INTRODUCTION

LOCATION AND EXTENT OF THE AREA

The Pahrump Valley drainage basin discussed in this report includes about 1,050 square miles in Clark and Nye Counties, southern Nevada, and Inyo and San Bernardino Counties, southeastern California (fig. 1). Approximately 200 square miles, or about 20 percent

JT APP 636
SE ROA 589

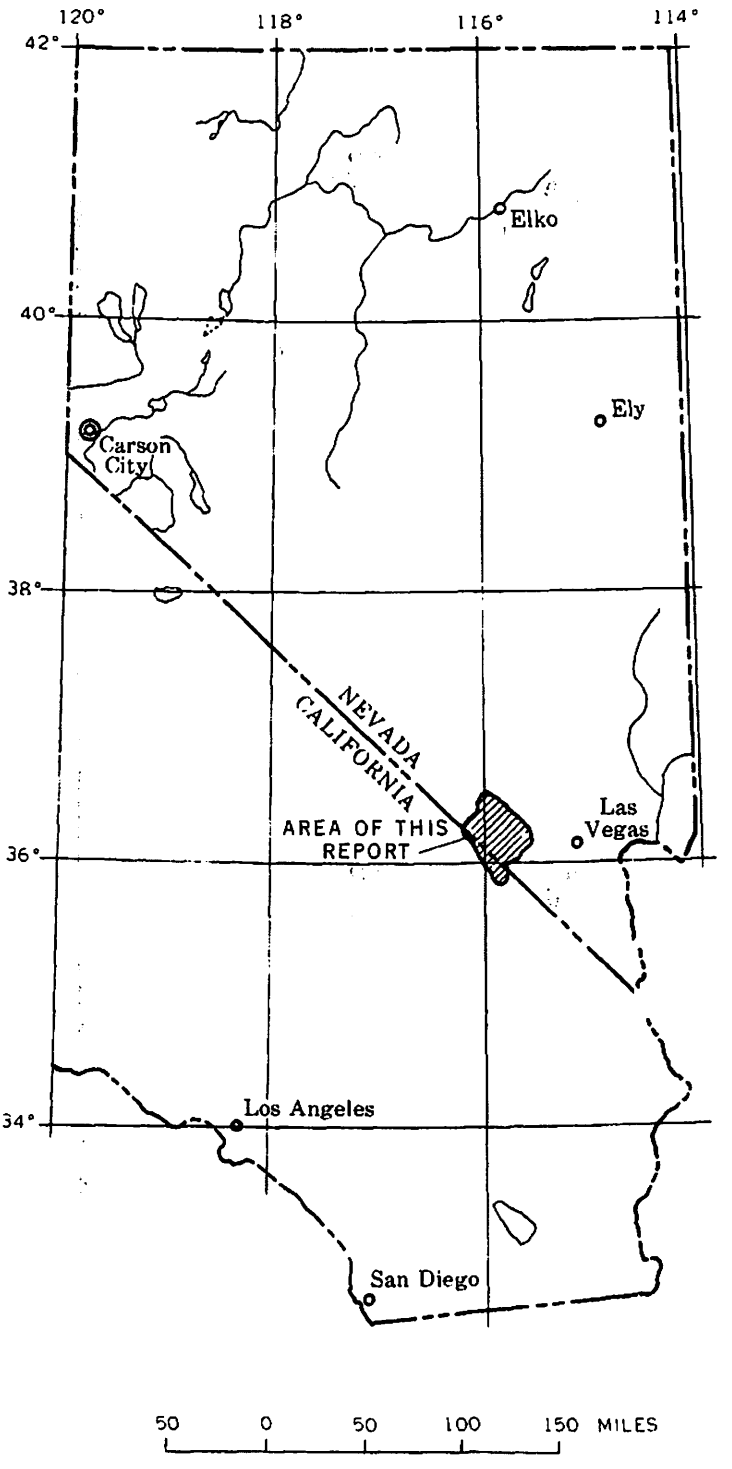

FIGURE 1.—Area in Nevada and southern California described in this report.

of the total drainage area, is in California. Pahrump Valley lies approximately between lats 35°45′ and 36°30′ N. and longs 115°30′ and 116°15′ W. It is east of Death Valley and the southern part of the Amargosa Desert, and west of Las Vegas Valley. The area extends from Johnnie, Nev., southeastward approximately 42 miles to a point about 14 miles south of Hidden Hills Ranch; it is about 30 miles wide and extends from the crest of the Nopah, the Kingston, and the northern part of the Resting Spring Ranges, on the southwest, to the crest of the Spring Mountains, on the northeast.

PURPOSE AND SCOPE OF THE INVESTIGATION

This is the second hydrologic investigation of Pahrump Valley made by the U.S. Geological Survey under a cooperative program with the Nevada Department of Conservation and Natural Resources. Results of the first cooperative investigation are given in a report by Maxey and Jameson (1948), in which the geology and hydrology are briefly described and an estimate of recharge to and discharge from Pahrump Valley are given.

The second investigation was initiated at the request of the Nevada State Engineer and was prompted by inhabitants of the valley who are concerned with the accelerated rate of water-level decline in wells and the decrease in the yields of springs. The probability of overdevelopment of ground water in the valley and the evidence that Pahrump Valley is not a hydraulically closed basin, as it had previously been described, emphasized the need for a reevaluation of the occurrence and availability of the ground-water supply of the valley. This reevaluation is consistent with the objectives of the long-range cooperative program (Shamberger, 1962, p. 14) for the orderly study of the water resources of Nevada; the long-range program provides for additional detailed studies of areas where moderate to substantial development has occurred and where records are available as a result of a long-continuing inventory.

The purpose of the investigation was to (a) describe the ground-water hydrology of the valley, with special emphasis on the occurrence, movement, and chemical character of ground water in the valley-fill reservoir and in the underlying carbonate-rock reservoir; (b) estimate the perennial yield of the basin; and (c) determine the extent of the overdraft. Early in the investigation it was found that subsurface outflow from the valley occurs through the carbonate rocks to adjacent areas. Owing to a lack of data to define the subsurface outflow and points of discharge, only a cursory study was made of this critical factor in the water supply of Pahrump Valley.

The field investigation was made in 1959, and analysis of the resultant data continued through 1962. The field study included a brief study of the geology of the area as related to the occurrence of ground water, an inventory of ground-water pumpage, the collection and analysis of water samples, and a limited number of determinations of the hydraulic characteristics of the saturated part of the valley fill. Thirteen test wells were drilled in December 1959 to augment the data in the undeveloped areas along the southwest margin of the valley and to establish a network of wells so that fluctuations of ground-water levels could be observed. The fieldwork was done by the author, assisted by C. P. Zones and Philip Cohen.

PREVIOUS INVESTIGATIONS

Several reports were published as a result of the previous hydrologic and geologic studies of parts of Pahrump Valley; reports used in the preparation of this report are included in the list of selected references.

One of the first investigations of the water resources of the area was made by Mendenhall (1909), who made a reconnaissance of the water resources of southwestern Nevada and southeastern California. His report describes the wells and springs and gives data on their yields and on the chemical quality of the water. Data on springs and wells in the valley are listed in other publications, but the information commonly is not quantitative.

Waring (1921) studied the water resources of Pahrump Valley somewhat more intensively than did Mendenhall. Waring's report includes data on the quantity and quality of the ground water from springs and wells in Pahrump Valley and discusses the source and occurrence of ground water.

During 1922–36 the University of Nevada Agricultural Experiment Station at Las Vegas, under the direction of George Hardman, studied the occurrence and utilization of ground water in Las Vegas and Pahrump Valleys (Hardman, 1934, 1949). Valuable data on well and spring discharges, water-level measurements, and chemical quality of water were obtained during those studies and are contained in several reports, some of which were published and are listed in "Selected References."

In 1944 a reappraisal of the ground-water resources of Pahrump Valley was made by G. B. Maxey, U.S. Geological Survey, and C. H. Jameson of the Nevada State Engineer's office (Maxey and Jameson, 1948). Results of that investigation were published in Nevada Water Resources Bulletin 5, which contains all data and results of the study of Pahrump Valley up to that time. The report summarizes the early history and development of ground water, describes ground-water

occurrence and quality, and includes estimates of recharge to, and discharge from, the ground-water reservoir. Additional data are contained in two other reports (Robinson and others, 1947; Maxey and Robinson, 1947).

In January and February 1953 several electrical-resistivity depth profiles were made by the U.S. Geological Survey near the springs in Ash Meadows and in the dry lake in Stewart Valley. These profiles were made in an effort to obtain information on the source of water issuing from springs in Ash Meadows. Results of the studies were inconclusive.

WELL-NUMBERING SYSTEM

In this report the numbering of well locations is based on the rectangular system for the division of public lands. The study area encompasses the southeast quadrant of the Mount Diablo base line and meridian, California, and the northeast quadrant of the San Bernardino base line and meridian, California. In this report the numbers assigned to wells in the Nevada part of the area consists of three principal parts: first, a capital S followed by the number of the township south of the Mount Diablo base line; second, a slash followed by a number designating the range east of the Mount Diablo meridian; and third, a hyphen followed by the section number and a series of letters used to designate the well location within the section. The letters a, b, c, and d designate, respectively, the northeast, northwest, southwest, and southeast quadrants. The first letter designates the quarter section; the second letter, the quarter-quarter section; and the third—where it was possible to make a determination—the quarter-quarter-quarter section. Where there is more than one well within a quarter-quarter-quarter section, the wells are consecutively numbered according to the order in which they were recorded. For example, the first well recorded in the NE¼NE¼NE¼ sec. 25, T. 21 S., R. 53 E., is numbered S21/53–25aaa1 (fig. 2), the second well recorded is numbered S21/53–25aaa2, and so forth. Where the 40-acre and 10-acre tracts are unknown, the numbering system is modified to include only the designations for the subdivisions of the sections that are known. All wells in Pahrump Valley west of the boundary between Nevada and California are numbered in this report according to their location in relation to the San Bernardino base line and meridian line by a method similar to that just described. The only modification of the number is that a capital letter N precedes the township number (such as N24/8–26bac), which indicates that the township is north of the San Bernardino base line. It thus enables the reader to distinguish wells in California from those in Nevada.

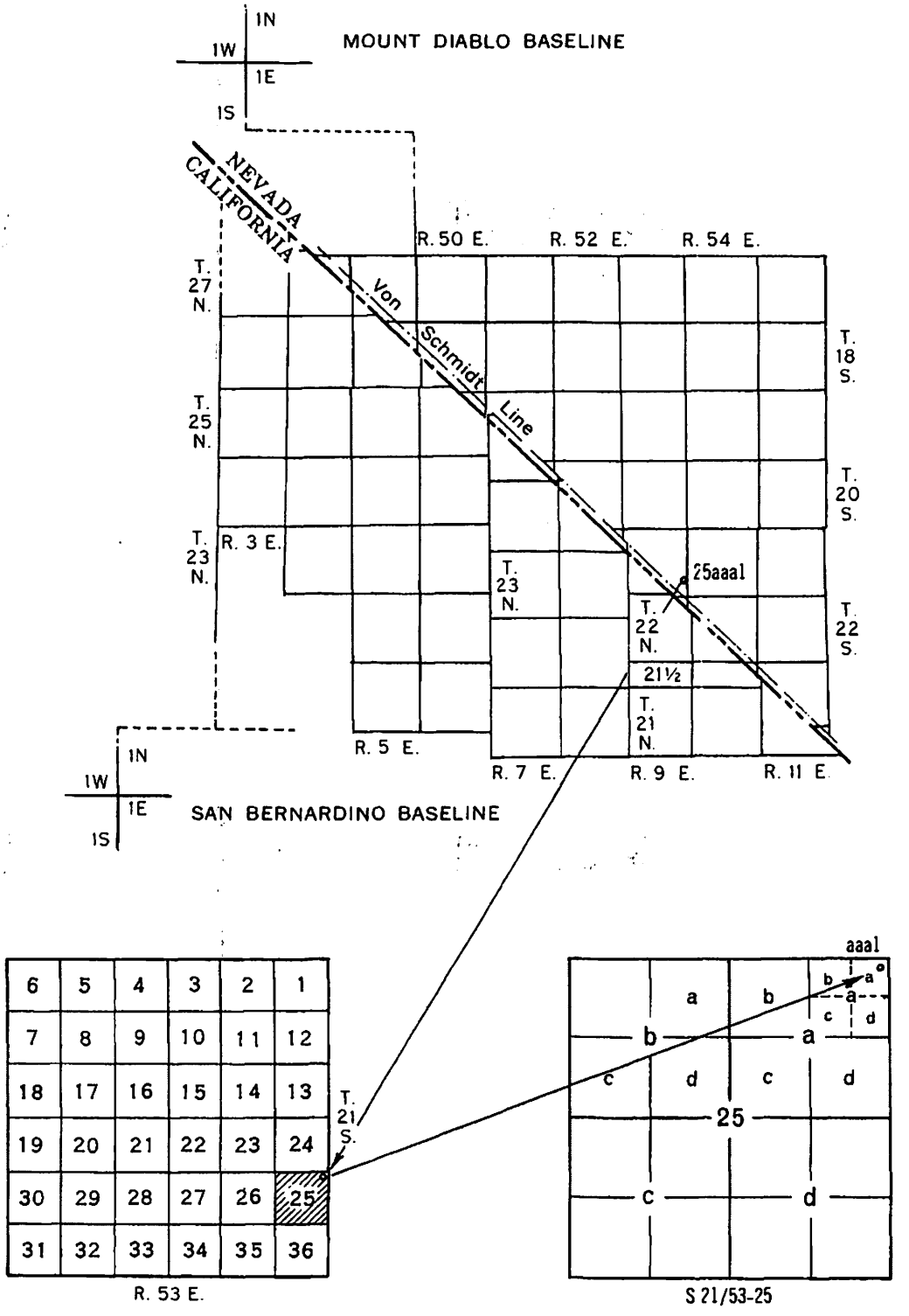

FIGURE 2.—Well-numbering system.

ACKNOWLEDGMENTS

Acknowledgement is made of the cooperation of residents of the valley in supplying data and permitting the use of their wells in the course of this investigation. The author is grateful for the wholehearted assistance received from Federal, State, and local governmental agencies. Most of the drillers' logs and other pertinent data on well construction used in this investigation were furnished by the Nevada State Engineer. Some of the data on chemical analyses of water were furnished by the California Department of Water Resources. Water-level records and estimates of annual pumpage were obtained from the Las Vegas Artesian Well Supervisor.

GEOGRAPHY

TOPOGRAPHY AND DRAINAGE

Pahrump Valley is a structural depression bordered by high mountains. On the northeast the valley is bounded by the Spring Mountains, which have a maximum altitude of approximately 12,000 feet, and on the southwest by the parallel Nopah, Kingston, and Resting Spring Ranges, which have a maximum altitude of 6,000 feet (pl. 1). The crest of a series of unnamed fault-block mountains forms a topographic divide that separates Pahrump Valley on the southwest from the Amargosa Desert. The southeast boundary of the valley is the crest of the unnamed hills that form a topographic divide between Pahrump Valley and Mesquite Valley.

Approximately 5 miles east of the Resting Spring Range, an unnamed bedrock spur about 10 miles long forms a low range of mountains that extend southeastward into Pahrump Valley from the northwest edge of the study area. This bedrock spur becomes progressively lower in altitude toward the southeast, and near the intersection of Nevada Highway 52 and the State border, it plunges beneath the alluvium of the valley floor. The small valley between the bedrock spur and the Resting Spring Range on the southwest is known as Stewart Valley. Stewart Valley is hydraulically continuous with Pahrump Valley to the southeast and is included in the Pahrump Valley drainage basin (pl. 1).

Pahrump Valley is a topographically closed basin from which there is no surface-water flow. Because of the aridity of the region (p. 10), no perennial streams exist in the area, except for short distances below the springs. Even the water from larger springs and from snowmelt in the mountains ordinarily seeps into the gravel of the drainage ways within short distances or is lost by evaporation and transpiration. Storms, though infrequent, cause the other washes to carry surface water for only short periods of time.

Runoff from precipitation within the basin ends in one of two playas, or "dry lakes," that lie at the base of the Resting Spring and Nopah Ranges on the southwest side of the valley. The northwesternmost playa, in Stewart Valley, is the larger of the two, is somewhat irregularly shaped, and has an area of about 6½ square miles. At an altitude of about 2,457 feet, it occupies the lowest part of the study area. The second playa, about 13 miles southeast of Stewart Valley, is about 3½ miles long and 2 miles wide and is about 60 feet higher in altitude than the playa in Stewart Valley. The two playas are separated by a low drainage divide that historically has precluded flow of surface water northwestward to Stewart Valley.

Runoff from most of the Pahrump drainage basin southeast of the Manse Ranch flows into the Pahrump Valley playa, and runoff northwest of the ranch flows to the playa in Stewart Valley. Water ponding in the playas ordinarily evaporates within a few days or weeks.

West of the community of Pahrump the valley floor is broad and flat and appears to have been an ancient playa or lake bottom. The valley floor slopes gently upward to the toe of the Pahrump fan and has an average gradient of about 15 feet per mile. Erosion has dissected it only slightly. Isolated spring mounds and sand dunes occur on this part of the valley floor. Because of the moderately low gradient, the stream channels are poorly integrated and shallow. Consequently, storm runoff reaching this part of the valley generally spreads over a broad area and collects in shallow depressions, from which it is eventually discharged by evaporation and transpiration.

The topography of the valley floor near Hidden Hills Ranch is one of sharp contrasts, characterized in part by badlands. Between the northeast edge of the playa and the Manse Ranch, the valley floor slopes upward about 30 feet per mile. Locally the gradient is much steeper, however, owing to a northwest-trending range of low rounded hills and a series of fault scarps 1½–6 miles northeast of the playa. The hills and the scarps are breached in several places by deep southwest-trending arroyos, the largest of which, about 50 feet deep, are near Hidden Hills Ranch, Stump Spring, and Browns Spring. Locally buttes have formed as the result of erosion.

The southwest side of the Spring Mountains is characterized by large alluvial fans that head high in the canyons leading from Mount Charleston. The most prominent of these alluvial fans have formed at the mouths of Wheeler, Wallace, Carpenter, and Trout Canyons and have coalesced to form two major fans called the Pahrump and Manse fans, which were named for the large ranches established near their toes. The Pahrump and Manse fans extend far into the valley and are among the most notable topographic features of the area. The

slopes of the fans become progressively steeper toward the mountains and range in gradient from about 200 feet per mile near the ranches to about 400 feet per mile near the heads of the fans. Fan-head trenching is especially conspicuous in the Pahrump and Manse fans, where arroyos have been entrenched 100 feet or more into the fan deposits, as shown in figure 3. The large fans have coalesced with smaller fans at the mouths of smaller canyons to form an extensive alluvial apron along the front of the mountain range.

The topography along the southwest side of Pahrump Valley differs markedly from that on the northeast. Southwest of the two playas the alluvial fans rise abruptly to the base of the Nopah and Resting Spring Ranges, the slope being as much as 500–600 feet per mile.

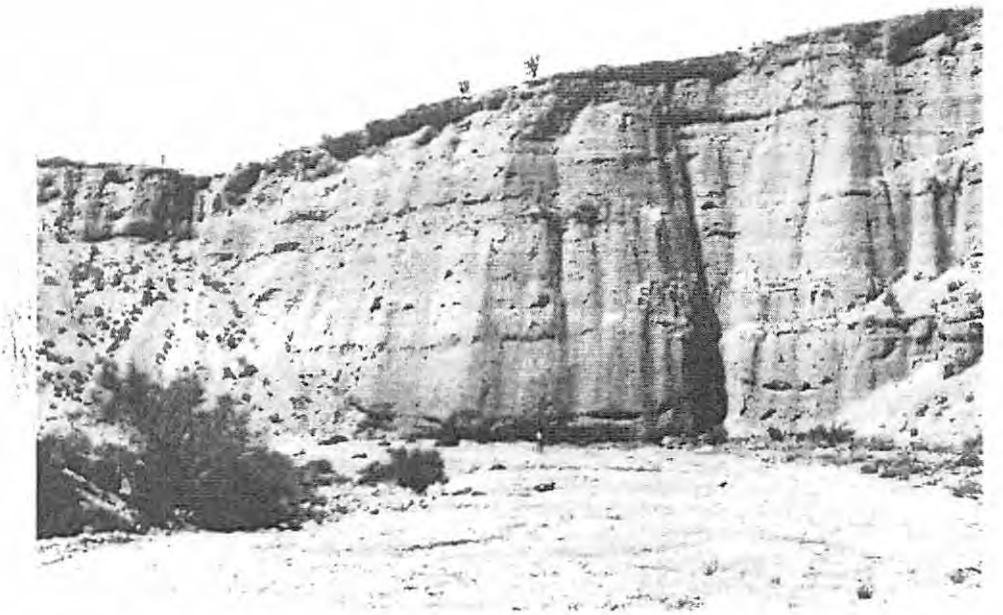

FIGURE 3.—Upper part of the Pahrump fan in Wheeler Wash. The wash has been incised to a depth of more than 100 feet below the surface of the alluvial fan, and the underlying bedrock is exposed.

CULTURE

The small settlement of Pahrump—the only community in the area—is in the north-central part of the valley, at the intersection of Nevada Highways 52 and 16. Pahrump is the local supply center for ranches, and during the summer of 1959 a cotton gin was constructed there to process the cotton grown in the valley. A consolidated public elementary school is available to the school-age residents in the valley.

Pahrump Valley is one of the most productive farming districts in

southern Nevada. Agriculture, the principal occupation in the valley, is dependent wholly on irrigation from ground water. During 1961 approximately 6,500 acres was irrigated. Because the climate is arid and the daytime temperatures are extremely high, only cotton, alfalfa, small grains, and native grasses can generally be grown. Except for a dairy herd and a few range cattle maintained at the Manse Ranch, the raising of livestock has been limited by the sparseness of native vegetation suitable for browsing.

CLIMATE

The climate of southern Nevada ranges from arid to semiarid. Pahrump Valley is arid, characterized by small amounts of precipitation, low humidity, and wide extremes in daily temperatures. Winters are short and mild, and the summers, long and very hot.

The precipitation occurs mainly during the winter, and it generally increases in abundance with altitude. Winter storms are commonly regional in nature, whereas summer storms ordinarily occur as very localized thunderstorms in the mountains. At the lower altitudes evaporation rates are extremely high, probably exceeding 100 inches per year. Strong winds are common throughout the year but are more prevalent in the spring than in the other seasons.

Climatological data have been obtained intermittently at Pahrump Ranch since 1914. Table 1 shows the approximate precipitation for the 14 years during which observations were made and indicates that the annual precipitation for those years ranged from 1.88 to 7.26 inches and averaged about 4 inches.

In 1945 two precipitation storage gages were installed at Roberts Ranch and Bedrock Summit on the west slope of the Spring Mountains. The amount of precipitation recorded at these stations is graphically illustrated in figure 4.

TABLE 1.—*Annual precipitation at Pahrump Ranch*

[NR, no record. From records of the U.S. Weather Bureau]

Year	Inches	Year	Inches
1914	[1] 4.90	1948	NR
1915–19	NR	1949	5.73
1920	7.26	1950	1.88
1921	[2] 5.87	1951–58	NR
1922	5.58	1959	[3] 3.58
1923	[2] 4.49	1960	4.77
1924	2.20	1961	[3] 2.43
1925–44	NR	1962	2.46
1945	4.57		
1946	NR	Average	4.18
1947	2.80		

[1] 3 months of the year estimated from monthly averages.
[2] 1 month of the year estimated from monthly averages.
[3] Values listed as estimates.

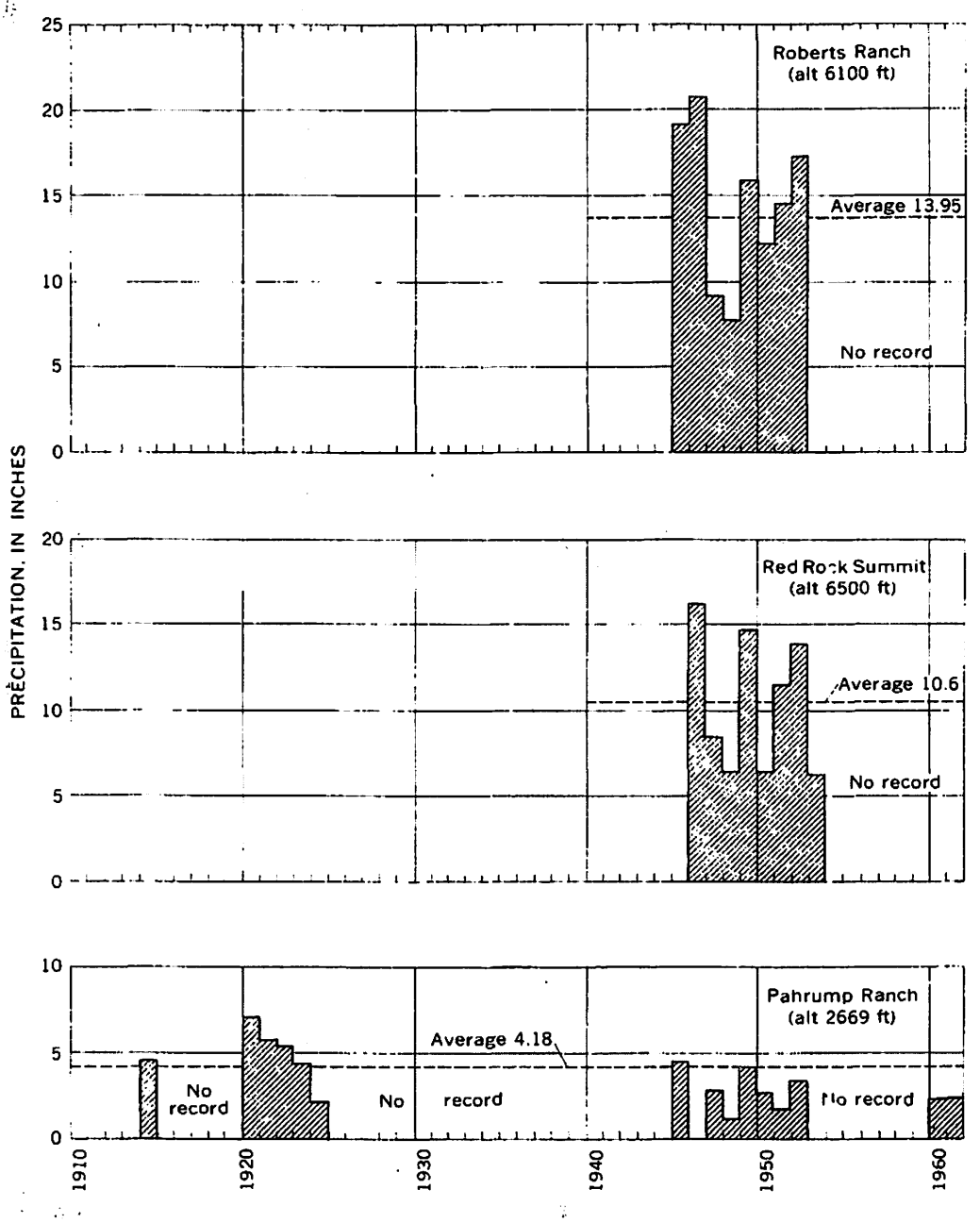

FIGURE 4.—Annual precipitation at three stations in Pahrump Valley.

Records of two snow courses in the Spring Mountains—one in Clark Canyon and the other at Trough Springs—are listed in table 2; the snow-course data indicate a wide annual variation in the amount of water contained in the snow cover.

TABLE 2.—*Snow-course data for two stations in the Spring Mountains, 1945–62*

[NR, no record. Snow and water data given in inches. Record from the Nevada Cooperative Snow Surveys]

Year	Clark Canyon Station (Alt 9,000 ft)						Trough Springs Station (Alt 8,500 ft)					
	February-March			March-April			February-March			March-April		
	Date	Snow	Water	Date	Snow	Water	Date	Snow	Water	Date	Snow	Water
1945	NR	NR	NR	Mar. 28	46.3	14.3	NR	NR	NR	NR	NR	NR
1946	Mar. 2	16.4	4.9	Apr. 1	28.8	8.3	Feb. 27	14.3	4.3	Mar. 29	20.6	6.8
1947	Mar. 6	24.8	7.6	Mar. 27	15.4	5.2	Feb. 28	13.9	4.9	Mar. 26	3.2	1.6
1948	Feb. 26	23.4	7.2	Mar. 29	27.7	8.1	Feb. 25	20.0	6.2	Mar. 30	21.0	7.2
1949	Mar. 4	48.4	13.5	Apr. 1	61.6	18.0	Mar. 4	46.4	11.5	Apr. 3	51.8	14.3
1950	Mar. 1	14.5	4.9	Mar. 30	9.4	3.9	Feb. 27	9.9	3.1	Apr. 2	1.9	0.9
1951	Feb. 27	16.8	2.8	Mar. 29	6.2	1.5	Feb. 28	13.3	2.9	Mar. 30	2.7	0.5
1952	Feb. 24	36.6	11.8	Mar. 25	59.8	18.7	Feb. 25	38.6	13.5	Mar. 31	49.5	17.4
1953	Feb. 26	10.7	3.1	Mar. 29	1.1	0.3	Feb. 28	3.9	1.2	Mar. 28	0	0
1954	Feb. 24	23.3	8.5	Apr. 1	34.5	12.8	Feb. 25	20.1	7.0	Apr. 2	29.2	11.0
1955	Feb. 27	26	7.9	Mar. 30	19	6.2	Mar. 1	23	7.6	Mar. 28	10	3.9
1956	Feb. 25	13	3.8	Mar. 29	2	0.8	Feb. 29	9	2.9	Mar. 30	Trace	Trace
1957	Feb. 28	11	4.6	Mar. 26	8	3.7	Feb. 26	7	2.3	Mar. 28	4	1.2
1958	Feb. 23	24	7.0	Mar. 29	40	11.6	Feb. 23	18	6.6	Mar. 31	29	9.9
1959	Mar. 1	21	5.4	Mar. 29	9	4.7	Feb. 28	16	4.6	Mar. 27	5	2.2
1960	Feb. 26	37	11.1	Mar. 27	22	7.9	Feb. 27	33	10.1	Mar. 26	17	6.0
1961	Feb. 25	10	2.8	Mar. 29	15	3.1	Feb. 25	7	2.0	Mar. 29	7	1.9
1962	Feb. 28	41	12.6	Mar. 29	41	13.7	Feb. 28	34	10.6	Mar. 27	30	10.9
Average			7.0			7.9			5.9			5.6

GEOLOGIC UNITS AND THEIR WATER-BEARING CHARACTER

The geology of many of the mountains bordering Pahrump Valley is described in detail in several published reports, the most pertinent of which are listed in "Selected References." The generalized description of rocks in the mountains, as given in this report, is based mainly on a review of those publications. The geology of the sedimentary deposits of the valley fill was studied and mapped by the author during the course of this investigation.

For purposes of this report the rocks of the area are divided into two very generalized groups. The division is based mainly on the water-bearing character and the relative stratigraphic position of the rocks with respect to the occurrence and movement of ground water: the consolidated rocks that form the mountain ranges and underlie the valley fill, and the unconsolidated and partially consolidated sedimentary deposits of the valley fill. Table 3 shows the principal rock units and their stratigraphic relationships, lithologic character, and water-bearing properties. Plate 1 shows the areal distribution of the lithologic units listed in table 3.

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TABLE 3.—*Geologic units of Pahrump Valley*

System	Series	Lithologic unit	Member	Lithology and occurrence	Water-bearing properties
Quaternary	Pleistocene and Recent	Younger fan deposits	Younger alluvial-fan deposits	Unconsolidated alluvial-fan deposits and mudflow debris, consisting of boulders, gravel, sand, silt, and clay derived from older alluvial fans and local exposures of consolidated rock; occur locally as stringers and lenses of relatively clean sand and gravel that partly mantle the alluvial apron along the mountain fronts. A veneer covers the pediment in the area east of Hidden Hills Ranch. Heterogeneity of the material decreases away from the mountains; material grades laterally into finer grained and better sorted younger alluvium.	Lies mainly above the zone of saturation; however, where it dips beneath the valley floor into the zone of saturation, stringers and lenses of relatively clean well-sorted gravel readily yield water to wells.
			Channel deposits	Unconsolidated fairly well sorted gravel, sand and silt in the principal arroyos draining the major watershed areas. Particle size decreases and sorting and rounding generally increase away from mountain fronts.	Highly permeable material occurring mainly above the zone of saturation in the recharge area. Outcrops provide ready access for ground-water recharge from snow melt and storm runoff. Where buried within the alluvial fans, deposits transmit water from areas of recharge to the valley fill. Deposits yield large quantities of water when tapped by wells in the zone of saturation.
		Younger surficial deposits	Younger alluvium	Unconsolidated moderately well sorted sand, silt, and clay and minor amounts of gravel derived mostly from medial and older lacustrine deposits and from alluvial fans. Extensively exposed on the valley floor.	Moderate to low permeability generally limits productivity of wells to small yields.
			Playa deposits	Unconsolidated clay, silt, and fine sand. The surface of the playa in Stewart Valley is loosely compacted and flocculated clay, whereas the surface of the playa in the west-central part of the valley is hard and compact.	Where saturated, the permeability of these deposits is very low; consequently, they will not readily yield water to wells. The chemical quality of the ground water beneath the playa in Stewart Valley is generally unfit for most uses.

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TABLE 3.—*Geologic units of Pahrump Valley*—Continued

System	Series	Lithologic unit	Member	Lithology and occurrence	Water-bearing properties
Quaternary—Con.	Pleistocene and Recent—Con.	Younger surficial deposits—Con.	Dune sand	Unconsolidated sand, silt, and clay derived mainly from younger alluvium and older and medial lacustrine deposits. Dunes are commonly stabilized by vegetation.	Lies above the zone of saturation. Downward percolation and subsequent ground-water recharge from precipitation are limited because of the low permeability of the material.
			Sinter	Calcareous siliceous spring mounds derived form the conspicuous mounds along the fault in the central part of the valley.	Limited areal extent and low degree of permeability render the deposit unimportant as an aquifer.
Tertiary and Quaternary	Pliocene and early Pleistocene	Medial fanglomerate		Unconsolidated to cemented alluvial fan deposits and mudflow debris composed of boulders, sand, silt, and clay; contains stringers and lenses of relatively clean well sorted sand and gravel. Crops out adjacent to consolidated rock along the Spring Mountains and dips toward the center of the valley beneath the younger alluvial-fan deposits.	The generally poor sorting and partial cementation limit the water bearing zones to buried gravel trains in the higher areas of the alluvial fans. Zones are also limited to lenses of fairly well-sorted and rounded sand and gravel in the lower areas of the fans. Where the deposits lie in the zone of saturation, highly permeable lenses of gravel and sand readily yield water to wells and are the most productive aquifers in the valley.
		Medial lacustrine deposits		Calcareous clay and silt. Occur as shore-line deposits along the base of the Pahrump and Manse fans.	Unconsolidated to partly consolidated clay and silt and minor amounts of sand that occur mainly above the zone of saturation.
		Older lacustrine deposits		Predominantly clay and silt; minor amounts of fine sand and mudflow debris; a few beds of caliche; faulted and gently warped. Principal exposures occur on the upthrown fault block along the longitudinal axis of the valley.	Mostly unconsolidated to indurated fine-grained material that has low permeability. Where saturated, thin beds of fine-grained sand may yield moderate amounts of water to wells.
		Older fanglomerate		Poorly consolidated to unconsolidated alluvial-fan and mudflow debris consisting of poorly-sorted boulders, gravel, sand, silt, and clay. The debris, derived mainly from Kingston Mountain, is of igneous, metamorphic and sedimentary origin. Outcrops are present only in the southern half of the valley. The unit is faulted and highly dissected.	Lies largely above the zone of saturation and is not known to be penetrated by wells. Heterogeneity of the material suggests that its permeability is low.

TABLE 3.—*Geologic units of Pahrump Valley*—Continued

System	Series	Lithologic unit	Member	Lithology and occurrence	Water-bearing properties
Tertiary	Miocene or Pliocene	Tuff		White and light-yellow to light-green beds of thinly laminated tuff; extensively faulted and folded. Exposed at the base of the upthrown fault block along the Nevada-California border.	Consolidated and partly to highly indurated; has very low permeability. Where saturated, it would yield virtually no water to wells.
Precambrian to Tertiary(?)		Sedimentary, metamorphic, and igneous rocks		Basement complex; forms the confines of the alluvial basin; composed of: Precambrian gneiss, granite, and sedimentary rock; Paleozoic limestone, dolomite, and quartzite; Mesozoic clastic and granitic rocks; and Tertiary tuff, some volcanic flows, and fresh-water limestone.	Highly indurated rock having limited primary porosity. The intensive faulting and crushing and subsequent solution of the carbonate rocks have resulted in the formation of local and regional zones of high permeability. Inferences drawn from the existing data suggest that highly fractured and altered carbonate rocks transmit approximately half of the estimated average annual recharge to adjacent areas. Rocks not tapped by wells.

CONSOLIDATED ROCKS

GENERAL FEATURES

The consolidated rocks that crop out in Pahrump Valley are several thousand feet thick and are made up predominantly of dense highly indurated crystalline, metamorphic, and sedimentary rocks. The sedimentary rocks include a thick sequence of beds composed mainly of calcareous and clastic material; they are widespread throughout eastern and southern Nevada and adjacent areas of Utah and California. In this region the consolidated rocks have been intensely folded, faulted, and deeply dissected by erosion. Consequently, they form a rugged surface of high relief. Sedimentary rocks of Paleozoic age and, to a lesser extent, sedimentary and igneous rocks of Mesozoic and Tertiary age occur beneath the intermontane basins and form most of the mountain ranges that border the basins. Beneath the floor of most of the alluvium-filled valleys the consolidated rocks occur at depths of as much as several thousand feet.

The lithologic units forming the consolidated-rock group differ widely in lithology. In the study area they consist principally of limestone, dolomite, sandstone, shale, and quartzite and lesser amounts of intrusive igneous rocks, tuff, breccia, and volcanic flows. In aggregate, the units range in thickness from about 13,000 feet (Hewett, 1931,

p. 9), in the southern part of the Spring Mountains, to about 33,000 feet (Nolan, 1929, p. 465), at the north end of the range.

The Spring Mountains, south of Charleston Peak, are composed of about 8,500 feet of dominantly fossiliferous limestone and dolomite of Paleozoic age (Hewett, 1931, p. 9, 10) overlain by approximately 4,500 feet of largely sandstone, shale, and conglomerate of Mesozoic age. North of Charleston Peak the Paleozoic section thickens, and near Mount Sterling the exposed rocks consist of about 12,000 feet of quartzite and shale of Cambrian age (Nolan, 1929, p. 461–465) overlain by about 21,000 feet of dominantly carbonate rocks of marine origin.

In the Kingston Range, bordering Pahrump Valley on the southwest, about 5,400 feet of metamorphic and sedimentary rocks of Precambrian age is exposed. The Precambrian rocks are overlain by about 2,000 feet of carbonate rocks of Paleozoic age which have been intruded by monzonite porphyry and related intrusive rocks of Late Cretaceous to late Tertiary age. The carbonate rocks, in turn, are overlain by an unmeasured thickness of unconsolidated deposits consisting of sand, gravel, bentonite, and ash of Cenozoic age (Hewett, 1948, p. 196–200). In the Nopah and Resting Spring Ranges, about 7,000 feet of Precambrian metamorphic, igneous, and sedimentary rocks is overlain by about 22,900 feet of Paleozoic rocks (Hazzard, 1937, p. 289). The base of the Paleozoic section is composed of about 14,800 feet of dominantly clastic rock of Cambrian age. Most of the overlying strata in the Paleozoic section are carbonate rocks. Lava flows of probable Tertiary age lie unconformably on rocks of Paleozoic age in the Resting Spring Range but are absent from the Nopah Range. Isolated exposures of highly indurated fresh-water limestone, tuff, and flows of Tertiary(?) age on the north and northeast flanks of the Kingston Range are included with the basement complex on plate 1.

In the Spring Mountains, normal faults having relative displacements of several thousand feet and a series of north-trending thrust faults have caused intense local fracturing of the rocks and the superposition of rocks of older geologic age on younger ones. The regional structural deformation that created the mountains also formed the large structural depression in the consolidated rocks that underlie Pahrump Valley. More than a thousand feet of erosional debris from the adjacent highland areas has accumulated in this depression and now covers most of the underlying bedrock. Consequently, the geologic and topographic features that resulted from the structural activity are buried and are not known. Because of the structural origin of the basin, however, the relief on the buried bedrock surface probably varies markedly within short distances.

WATER-BEARING CHARACTER

The consolidated rocks differ widely in hydraulic properties; most are dense and well indurated and possess little primary permeability. Some of the rocks, however, are capable of absorbing, storing, and transmitting water owing to intensive fracturing and chemical weathering. The crystalline and clastic units contain some water in fractures and joints, although the fractures are generally tight and, therefore, do not readily transmit water.

The carbonate-rock units, on the other hand, principally those of Paleozoic age, contain fractures and solution channels and are locally moderately to highly permeable. They constitute a major reservoir system that underlies most of southern Nevada, and ground water is thereby transmitted beneath topographic divides from one valley to another. In this report the complex carbonate rocks, as related to the hydrology of the valley, are referred to simply as the carbonate-rock reservoir. This reservoir was not recognized in the study made 20 years ago by Maxey and Jameson (1948, p. 116), who stated that the consolidated rocks were impermeable.

Test drilling at several locations at the Nevada Test Site, about 25 miles north of Pahrump Valley, has shown that locally the carbonate-rock aquifer is capable of transmitting large quantities of ground water. Coefficients of transmissibility, computed from pumping-test data for wells tapping this aquifer, range from 400 to 900,000 gpd per ft (gallons per day per foot) (Winograd, 1963, p. 29). The coefficient of transmissibility is defined as the rate of flow of water, at the prevailing water temperature, in gallons per day, through a 1-foot-wide vertical strip of the aquifer that extends the full saturated height of the aquifer, under a hydraulic gradient of 100 percent (Theis 1935). The test drilling also showed that the Precambrian crystalline and sedimentary rocks and Paleozoic clastic formations have low permeability. These rocks contain little water and generally function as barriers that impede ground-water movement.

Hundreds of feet of core from numerous widely spaced wells at the Nevada Test Site indicate that the permeability of the carbonate-rock aquifer at depth is probably due principally to fractures rather than to solution channels. The presence of numerous caves and large springs in carbonate rocks that crop out throughout the southern and eastern parts of the State, and the occurrence of open fractures in the carbonate rocks at depths of several thousand feet suggest, however, that solution by percolating ground water is also a significant factor in the transmission of ground water. Devils Hole, near Ash Meadows, is an example of a solution opening in Paleozoic carbonate rocks.

VALLEY FILL

Thick semiconsolidated to unconsolidated continental deposits of fluvial and lacustrine origin have accumulated in Pahrump Valley and form the principal ground-water reservoir. The continental deposits are of Tertiary and Quaternary age and are composed mainly of detrital material; they underlie an area of about 650 square miles in the central part of the valley. Thickness of the valley fill is unknown; although several wells have been drilled to depths of about 1,000 feet, none have penetrated bedrock.

The valley fill consists principally of alluvial material derived from older consolidated rocks in the surrounding mountains and is interbedded with some tuff and chemical precipitates. The oldest recognized sedimentary deposits of the valley fill are composed of an unknown thickness of partially consolidated and highly indurated tuff of Tertiary age. Overlying the tuff is a succession of unconsolidated material consisting of alluvial-fan and lacustrine deposits ranging in age from late(?) Tertiary to Quaternary. Six major units are recognized in this succession of deposits; they are: Older fanglomerate, older lacustrine deposits, medial lacustrine deposits, medial fanglomerate, younger surficial deposits, and younger fan deposits.

The older deposits have been uplifted by faulting and gentle folding and subsequently have been exposed by erosion. Northeast of the fault that approximately parallels the California-Nevada border (pl. 1), erosion of the upthrown fault block has exposed approximately 1,000 feet of the upper part of the valley fill.

The valley-fill deposits are grouped into two very generalized types. On the basis of their lithologic and and hydrologic character as determined from exposures and lithologic logs, the types are (1) the coarse-grained alluvial-fan deposits of low to high permeability along the margin of the valley, and (2) the uniformly fine-grained lacustrine and playa deposits of low permeability in the central part of the valley.

COARSE-GRAINED DEPOSITS

The coarse-grained deposits of the valley fill crop out in an area of about 300 square miles along the perimeter of the valley and in isolated exposures on the crests of a range of low hills along the Nevada-California border. The coarse-grained deposits, composed principally of sand, gravel, and boulders, were derived from adjacent mountains. The material was deposited mainly in alluvial fans and aprons that form thick wedges of gravel along the edge of the valley. These deposits are the older and the medial fanglomerate of Pliocene and early Pleistocene age and the younger fan deposits of Pleistocene and

Recent age. Those alluvial-fan deposits that had been raised above the adjacent alluvial surfaces by faulting or upwarping and then dissected by erosion were mapped as older and medial fanglomerate. Alluvial-fan deposits that are unaltered by deformation and erosion and are sites of active deposition were mapped as younger fan deposits. Coarse-grained channel deposits in the major arroyos were also included in the younger fan deposits.

The most extensive outcrop area of coarse-grained deposits is in the alluvial apron along the east side of Pahrump Valley, adjacent to the Spring Mountains. Exposures are widest at the reentrant valleys that drain onto the Pahrump and Manse fans. The outcrop is approximately 12 miles wide on the Pahrump fan, but elsewhere along the northeast side of the valley it averages about 7 miles wide. Less extensive areas of alluvial-fan deposits are exposed along the southwest side of Pahrump Valley, where the average width of the outcrop is less than 3 miles.

Most material in the alluvial fans and aprons is poorly bedded, and locally it is moderately to highly indurated by calcareous cement. The beds dip away from the mountain fronts toward the central part of the valley.

The coarsest, most angular, and least sorted material occurs near the heads of the alluvial slopes at the mountain front. Farther away from the mountains the dip of the beds decreases, and the material becomes smaller, slightly more rounded, and better sorted. Along the lower margins of the fans, these deposits interfinger with and grade laterally into contemporaneous lacustrine or playa deposits. Well logs of some of the deeper wells drilled near the toes of the fans along the northeast side of the valley show that beds of sand, gravel, and boulders interfinger with playa or lacustrine strata. Although marked differences in lithology between typical fan deposits and typical lacustrine or playa deposits are common, the lateral change in lithology is generally gradational through a zone of several miles.

Faulting, upwarping, and subsequent erosion of the alluvial-fan deposits have resulted in the formation of drainage channels, or arroyos, that have been deeply entrenched in the heads of the alluvial fans. Characteristically, the bed material in these channels is coarsest near the mouths of the canyons and becomes progressively finer grained downslope. In the larger stream channels, stringers of relatively clean gravel and sand have been transported to points many miles from the mountains.

WATER-BEARING CHARACTER

The coarse-grained valley-fill deposits form the most productive water-bearing material in the area. For purposes of this report, the older and the medial fanglomerates and the younger fan deposits

along the mountain fronts, as shown on plate 1, are regarded as a single hydrogeologic unit. The high degree of cementation of the alluvial deposits in the walls of the arroyos near the heads of the alluvial fans indicates that the bulk of the coarse-grained material in the upper part of the alluvial apron has low permeability and porosity. Stringers of relatively clean uncemented gravel in the existing channels and in those buried within the alluvial-fan deposits, however, are highly permeable and readily transmit water. Most runoff from the watershed that reaches the alluvial fans percolates into the gravel deposits. Following cloudbursts, only rarely does runoff from the mountains reach the valley floor.

Because of the wide variation in lithology of the alluvial-fan deposits, the hydraulic characteristics vary greatly within short distances; and predictions of the water-bearing properties in undeveloped areas are, therefore, somewhat speculative. Wells drilled along the toes of the fans, however, usually penetrate highly permeable lenses or stringers of sand and gravel that are capable of yielding large quantities of water. The specific capacities of 20 wells drilled along the toes of Pahrump and Manse fans range from about 5 to 185 gpm (gallons per minute) per foot of drawdown. The specific capacity of a well is defined as the rate of yield per unit of drawdown and is generally expressed as gallons per minute per foot of drawdown (Wenzel, 1942, p. 151).

Water-bearing lenses of sand and gravel in the alluvial-fan deposits are generally irregular in thickness and in areal extent and commonly cannot be traced as individual beds from well to well. These alluvial-fan deposits are overlain locally by layers of caliche or other comparatively impermeable material, or they interfinger with lacustrine or playa deposits; therefore they may contain ground water under confined or artesian pressure. In early stages of agricultural development of the valley, many high-capacity flowing wells were developed in these deposits.

Southwest of the alluvial apron the thickness and the number of highly permeable layers of sand and gravel decrease, and the amount of silt and clay increases. Consequently, the yields of wells commonly decrease farther away from the fans.

No attempt has been made to develop wells in the coarse-grained deposits along the base of the Nopah and Resting Spring Ranges on the southwest side of Pahrump Valley. The water-bearing character of the deposits in this area, therefore, generally is not known. Because the alluvial fans are small and the transport distance of the alluvial-fan material is short, however, the materials probably are more angular, less well sorted, and less permeable than correlative material on the northeast side of the valley.

FINE-GRAINED DEPOSITS

The deposits that crop out in an area of about 350 square miles in the central part of Pahrump Valley are composed principally of silt, clay, and fine-grained sand and some tuff and precipitates. These fine-grained deposits include four principal lithologic units (table 3; pl. 1): (1) tuff of Miocene or Pliocene age, (2) older and (3) medial lacustrine deposits of Pliocene and early Pleistocene age, and (4) younger surficial deposits of Pleistocene and Recent age, which include younger alluvium, playa deposits, dune sand, and sinter.

The beds of tuff and overlying older lacustrine deposits are exposed in the central part of the valley, where they have been uplifted and faulted and subsequently exposed by erosion. The fault is approximately parallel to the boundary between Nevada and California and extends from the south edge of the study area about 23 miles along the trough of the valley. The deposits northeast of the fault are now stratigraphically higher than those on the southwest side, and the beds adjacent to the fault on the northeast are tilted at angles of as much as 15°. Along the east margin of the fine-grained deposits, the medial and older lacustrine deposits are slightly tilted and bowed upward. Erosion has planed off the surface of the upthrown fault block, exposing approximately 1,000 feet of the uppermost beds of the fine-grained deposits.

Exposed in the banks of arroyos near Hidden Hills Ranch (pl. 1) is about 200 feet of thin-bedded to massive tuff that is overlain by about 800 feet of thin to massive beds predominantly of silt and clay. The silt and clay are interbedded locally with layers of caliche, laminations of fine-grained sand, and thin beds of fanglomerate. Most of the material is erosional debris transported from the alluvial fans and weathered material eroded from older Tertiary deposits. Some of the strata containing mud cracks, ripple marks, and crossbedding are interbedded with uniform layers of clay and silt, which suggests that they probably were deposited in a basin that was occupied alternately by playas and by lakes. The thickness of the lacustrine deposits generally is unknown and may vary considerably from one area to another, owing to the irregularity of the surfaces of the tuff and bedrock on which the deposits lie unconformably.

Logs of wells drilled in the fine-grained deposits in the northern part of the valley west of Pahrump (pl. 1) indicate a gross overall lithology similar to that exposed near Hidden Hills Ranch. Data are insufficient at this time, however, to indicate whether individual beds extend as continuous stratigraphic units beneath the entire valley floor.

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WATER-BEARING CHARACTER

The predominance of clay throughout the fine-grained deposits generally causes them to be poor aquifers. In the upper 800 feet of the exposed material in the walls of the dry wash passing through Hidden Hills Ranch, the only beds that would be capable of transmitting small amounts of ground water are thin beds of fine sand. The tuff in the lower 200 feet of exposed material has low porosity and low permeability and generally tends to retard the movement of ground water.

Several attempts have been made to develop ground water from the fine-grained deposits near Hidden Hills Ranch, in the adjacent area to the southwest, and in the area west of Pahrump. Several wells have been drilled in these areas to depths of 800 feet or more, and well N22/10–26 (not shown on pl. 1), 2½ miles southwest of Stump Spring, was reportedly drilled to a depth of 1,351 feet. This well, though never completed, is the deepest known in the valley, and the driller reported that it was dry. The driller's log shows that, except for minor amounts of sand, silt, and cemented gravel, the entire drilled thickness was clay.

Of the wells in the vicinity of Hidden Hills Ranch for which pumping data are available, none have a specific capacity greater than 1 gpm per foot of drawdown. In the area between the toes of the Manse and Pahrump fans and the California-Nevada boundary, approximately 50 wells of various depths have been developed in fine-grained deposits. The highest specific capacity in any of the 10 wells tested in this group was only about 5 gpm per foot of drawdown.

GROUND-WATER HYDROLOGY

RESERVOIR SYSTEMS

Ground water in Pahrump Valley occurs in two principal reservoirs: the valley fill and the carbonate rocks. The valley-fill reservoir is coextensive with the area shown as fine-grained and coarse-grained deposits on plate 1. The carbonate-rock reservoir underlies the valley fill and extends laterally into the adjacent hills and mountains. Because no wells penetrate both systems, the hydraulic continuity and magnitude of interflow between them these systems is poorly understood.

Figure 5 is a diagrammatic cross section of Pahrump Valley showing, the probable general relation between the valley-fill and carbonate-rock reservoirs. If the tuff in the lower part of the valley fill is widespread, as is suggested by the diagrammatic section, the hydraulic continuity between the two systems beneath the valley floor

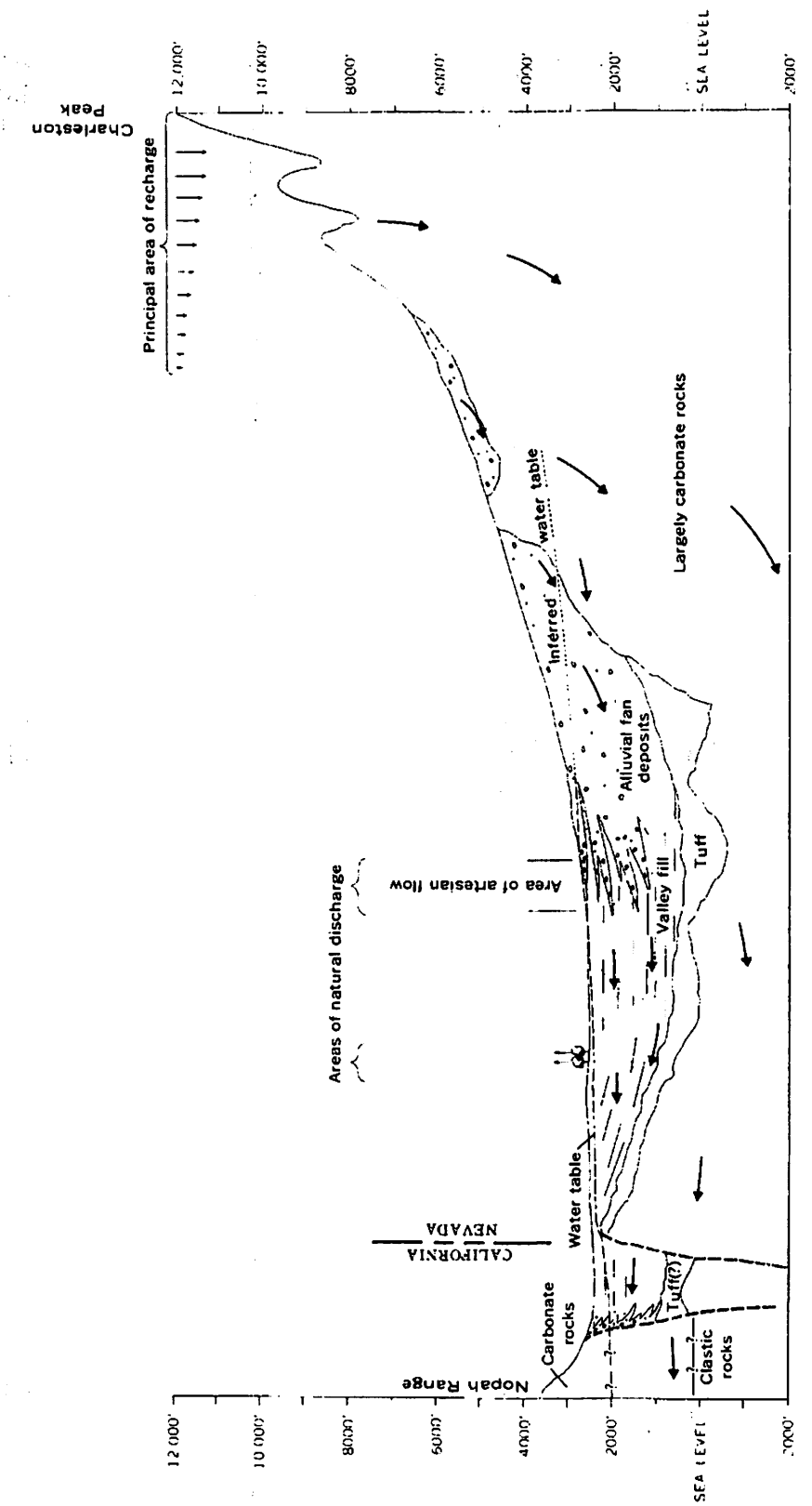

FIGURE 5.—Principal topographic, geologic, and hydrologic features of Pahrump Valley, as shown in section from Charleston Peak to the Nopah Range.

would be poor; nonetheless, the lateral continuity may be reasonably good. Thus, beneath the valley floor the two ground-water reservoirs are considered to function mainly as independent flow systems, although interflow almost certainly occurs laterally along the contact between them.

CARBONATE-ROCK RESERVOIR

The carbonate-rock reservoir crops out in the Spring Mountains, underlies the valley fill of Pahrump Valley, and extends southwestward through the Nopah and Resting Spring Ranges into California and Chicago Valleys (pl. 1; fig. 5). Except for a small wedge of carbonate rocks north of Stewart Valley, the reservoir is terminated by structural deformation along the northwest side of Pahrump Valley, where quartzite and other poorly permeable rocks crop out. The reservoir probably extends southeastward to Mesquite Valley.

The carbonate-rock reservoir, which may have a maximum thickness of at least 20,000 feet locally, is inferred by the author to be hydraulically continuous beneath the area just described. Continuity in the carbonate-rocks reservoir probably is achieved principally through extensive fractures and to a small degree by localized solution channels. Ground water in the reservoir is mainly unconfined in the mountainous areas where the carbonate rocks crop out and receive recharge; at depth it is confined beneath the tuff in Pahrump Valley. No wells tap the carbonate-rock reservoir; hence, the head distribution is not known.

VALLEY-FILL RESERVOIR

On the northeast, northwest, and southwest, the valley-fill reservoir is terminated by consolidated rocks, but on the southeast it is generally continuous with the valley-fill reservoir in Mesquite Valley (pls. 1, 2). The southeast edge of the reservoir is arbitrarily regarded to be at the surface divide between Pahrump and Mesquite Valleys. The total area in Pahrump Valley is about 650 square miles. The bottom of the reservoir is the contact between the older lacustrine deposits and the older fanglomerate and the underlying tuff. In most places the saturated thickness of the reservoir probably exceeds 1,000 feet.

The principal aquifers in the valley-fill reservoir are the coarse-grained deposits which underlie Pahrump and Manse fans and which southwestward interfinger with the fine-grained deposits (pl. 1). Similarly, aquifers probably occur along the southwest side of the valley, where only a few wells have been drilled.

Confined ground water occurs along the toes of Pahrump and Manse fans in a narrow band about 2 miles wide and 13 miles long. Prior to extensive ground-water development, two large springs—Bennetts (Pahrump) and Manse Springs—discharged nearly 10,000 acre-feet

per year of water in this area. By 1962 Bennetts Spring was dry and Manse Spring discharged only a third of its original flow (table 6). The area of artesian flow had decreased to only several square miles (pl. 2).

SOURCE AND MOVEMENT OF GROUND WATER

Plate 2 shows that in 1962 the movement of ground water in the valley-fill reservoir was southwestward across the valley; this indicates that the principal recharge area is in the Spring Mountains. Similarly, the direction of flow in the carbonate-rock reservoir is presumed to be southwestward (fig. 5). Although the configuration of the water-level contours in the valley fill has been substantially modified by pumping along the toes of Pahrump and Manse fans, the overall slope of the flow net in the rest of the valley has not been greatly altered by pumping.

The contours also show that near the southwest side of the valley the ground water moves into the Nopah and Resting Spring Ranges, thus demonstrating a hydraulic continuity between the valley-fill and carbonate-rock reservoirs in this part of the valley. In 1962 the depth to water in wells along the southwest side of the valley ranged from 21 feet, in Stewart Valley, to more than 200 feet, at the base of the Kingston Range. Except in Stewart Valley, there was little possibility of water being lost through evapotranspiration. Most ground water reaching this part of the valley is transmitted from Pahrump Valley southwestward through the mountains to California and Chicago Valleys.

Along the southeast side of the valley, ground-water flow is generally parallel to the arbitrary boundary between Pahrump and Mesquite Valleys (pls. 1, 2). Any extensive ground-water development near the boundary would change the flow net and, hence, necessitate a corresponding change in position of the present arbitrary boundary between the two valleys.

At the northwest edge of the valley-fill reservior, the water-level contours are generally normal to the consolidated rocks and, therefore, do not indicate any water movement into them. The small wedge of carbonate rocks north of Stewart Valley provides a potential avenue of flow northwestward to the springs in Ash Meadows—Last Chance, Bole, Big, and Jack Rabbit Springs, which issue at depth from carbonate rocks. Although the head differential is favorable for the potential northwestward flow of ground water in the carbonate-rock reservoir, the water-level contours in the valley fill do not indicate this possibility, nor does the quality of water in the two areas support this thesis. Nevertheless, until the head distribution in the carbonate rocks in Pahrump and Stewart Valleys and in the intervening area to the

northwest is known, the possibility of northwestward flow to the springs must remain unresolved.

RECHARGE

Maxey and Jameson (1948, p. 117) estimated that the long-term average recharge to Pahrump Valley is about 23,000 acre-feet per year. This estimate was based on the assumption that 25 percent of the precipitation at altitudes above 8,500 feet, 20 percent of the precipitation at altitudes between 6,500 and 8,500 feet, and little precipitation below the 6,500-foot level reach the ground-water reservoirs; virtually all recharge occurs in the Spring Mountains. Maxey and Jameson's estimate of recharge is in close accord with that described next, which was determined by use of a similar technique.

A method described by Eakin and others (1951, p. 26, 27) is used to reappraise the estimated recharge to Pahrump Valley. This method is also based on the assumption that a fixed percentage of a given average annual rate of precipitation ultimately recharges the ground-water reservoirs. More altitude zones are used, however, to correspond more closely to the amounts of precipitation, which ranges from about 4 inches on the valley floor (alt, about 2,600 ft), to about 28 inches in the higher parts of the Spring Mountains (alt, 11,000 ft).

The altitude zones and the estimated average annual precipitation and recharge in these zones are given in table 4, which shows that ordinarily no recharge occurs in the zones where precipitation is less than 8 inches per year. The estimated average annual precipitation in the entire area is about 420,000 acre-feet, and the estimated average annual recharge from this precipitation is 22,000 acre-feet, or only about 5 percent of the total precipitation. This estimate of recharge is 1,000 acre-feet less than that made by Maxey and Jameson (1948).

TABLE 4.—*Estimated average annual precipitation and ground-water recharge in Pahrump Valley*

Precipitation zone (ft)	Area (acres)	Estimated annual precipitation			Estimated recharge	
		Range (in.)	Average (ft)	Average (acre-ft)	Assumed percentage of precipitation	Acre-feet per year
Above 8,000	29,500	>20	1.75	51,600	20	10,300
7,000–8,000	30,200	15–20	1.46	44,100	15	6,600
6,000–7,000	48,600	12–15	1.12	54,400	7	3,800
5,000–6,000	51,100	8–12	.83	42,400	3	1,300
Below 5,000	454,000	<8	.50	227,000	0	-------
Total (rounded)	613,000	-------	-------	420,000	-------	[1] 22,100

[1] Except for several hundred acre-feet of recharge in the Nopah and Resting Spring Ranges, virtually all the estimated recharge occurs in the Spring Mountains.

The recharge, as estimated by this method, may occur in three ways: by direct infiltration of rainfall in areas that are generally higher than 5,000 feet, by seepage loss from streams in the mountains and in the valley, and by lateral movement from the carbonate-rock reservoir, as well as from fractures in the other consolidated rocks to the valley-fill reservoir. Because there are many unknown factors in the spatial distribution both of recharge to and of interflow between ground-water reservoirs, no direct estimates of recharge to each of the two reservoirs could be made. In the section "Discharge," however, the probable division of the total average annual recharge is computed indirectly to be about 12,000 acre-feet to the valley-fill reservoir and about 10,000 acre-feet to the carbonate-rock reservoir.

DISCHARGE

Ground-water discharge from Pahrump Valley occurs by pumping from wells, by evapotranspiration, through springs, and by subsurface outflow principally to areas southwest of the valley. Prior to the construction and use of large-capacity wells in about 1912, virtually all the discharge was by natural processes. By 1962, pumpage constituted about 60 percent of the total discharge from the valley.

In this section of the report, estimates of discharge are made for natural conditions and for the 4-year period 1959–62; some discharge records that date back discontinuously to 1875 are also presented (table 6). For the valley-fill reservoir, direct estimates are made for the several elements of discharge; but for the carbonate-rock reservoir, only an indirect estimate of discharge by subsurface outflow can be made from the present data.

VALLEY-FILL RESERVOIR

SPRINGS

Before large-scale withdrawals from wells began, ground water under artesian pressure issued from two large springs in the valley fill near the toes of Pahrump and Manse fans. Bennetts Spring (Pahrump Spring), originally the larger of the two, is approximately a quarter of a mile south of the community of Pahrump (pl. 1). Manse Spring is about 6 miles southeast, near the headquarters of the Manse Ranch.

During the initial phases of ground-water development in the valley, diversions from the large springs provided virtually all water for irrigation. Subsequently, ground-water development from wells tapping the valley-fill reservoir has caused a reduction of artesian pressure and a continual decline of the spring discharge. The artesian head in the vicinity of the two large springs was sufficiently lowered

by 1959 to cause Bennetts Spring to become dry and the flow from the Manse Spring to decrease to about a third of the original flow. The total discharge from these two springs has dwindled from nearly 10,000 acre-feet per year under natural conditions to about 1,400 acre-feet per year in 1962 (table 6).

Several small springs issue from the scarps that transect the valley fill in the southern part of Pahrump Valley. These include Stump Spring, southeast of Hidden Hills Ranch, Brown's Spring, and several other unnamed springs and seeps northwest of the ranch headquarters (pl. 1). The combined discharge of these small springs probably does not exceed 50 acre-feet per year (table 6, col. 4). Their flow in 1962 had not been affected by ground-water development.

The term "net spring discharge" is used to describe that part of the total spring discharge that is permanently removed from the valley-fill reservoir by evapotranspiration downstream from the spring orifices. The total spring discharge less the net spring discharge is the amount that returns to ground water in the valley-fill reservoir. As described in the following section of this report, under natural conditions approximately 7,000 acre-feet of the total spring discharge of nearly 10,000 acre-feet per year (table 6) was consumed by evapotranspiration. Thus, in approximate terms, the net spring discharge prior to pumping averaged about 7,000 acre-feet per year, and the amount that returned to ground water averaged about 3,000 acre-feet per year.

During the period 1959-62, the total spring discharge averaged only about 1,600 acre-feet per year and was almost wholly from Manse Spring. Approximately one-third of the anual flow of Manse Spring occurred in the nongrowing season—from about November 10 to March 15. During this 4-month period, most spring discharge percolated into the ground and returned to the ground-water reservoir. Accordingly, the net spring discharge in the period 1959-62 probably averaged about 1,000 acre-feet per year.

EVAPOTRANSPIRATION

Evaporation from bare soil and transpiration by phreatophytes occur along stream channels downstream from the springs, along drainage ditches that convey tail-waste from irrigated areas, around the playa in Stewart Valley, and locally in the lowlands west of the community of Pahrump. The areal extent of phreatophytes in 1961 is shown on plate 3. Areal photographs made in 1952 show that the distribution of phreatophytes was about the same in 1952 as in 1961. Phreatophyte areas formerly supported by spring flow under natural conditions were receiving irrigation tail waste in 1961 from irrigated

areas through the same channels that originally carried the spring flow. Consequently the phreatophyte areas and the amount of water probably used by them have not been appreciably altered from the natural state.

The principal phreatophytes include mesquite, saltgrass, saltbrush, saltcedar, and cottonwood. The areas, estimated rates of use, and estimated evapotranspiration from areas of phreatophytes are shown in table 5. The estimated use also includes the evaporation from bare soil in and near the areas of phreatophytes. Table 5 shows that the estimated annual evapotranspiration from spring discharge and irrigation tail-waste was about 7,000 acre-feet and that from areas of shallow ground water, about 3,300 acre-feet.

TABLE 5.—*Estimated annual evapotranspiration in Pahrump Valley*

Phreatophytes	Phreatophyte area (acres)	Rate of use [1] (ft)	Evapotranspiration [2] (acre-ft)
From spring discharge and irrigation tail-waste:			
Mesquite	1,600	3.3	5,300
Saltgrass and saltbrush	450	3.0	1,400
Saltcedar	35	6.0	200
Cottonwood	10	5.5	50
Subtotal (rounded)	2,100	-------	7,000
From ground water in the valley-fill reservoir:			
Mesquite	1,000	3.3	3,300
Total (rounded)	3,100	-------	10,000

[1] Modified to reflect climatic and hydrologic conditions in Pahrump Valley: mesquite (Robinson, 1958, p. 38), saltgrass (Young and Blaney, 1942, p. 129), saltcedar (Gatewood and others, 1950, p. 150–152), and cottonwood (Blaney and Harris, 1952).
[2] Includes evaporation from bare soil in and near phreatophyte areas.

SUBSURFACE OUTFLOW

The water-level contours (pl. 2) show that ground water in the valley-fill reservoir moves southwestward into the carbonate-rock reservoir in the Nopah and Resting Spring Ranges. The outflow from the valley-fill reservoir can be estimated by use of a form of Darcy's law:

$$Q = 0.00112\ TIL,$$

in which Q is the discharge, in acre-feet per year; T is the coefficient of transmissibility, in gallons per day per foot; I is the hydraulic gradient, in feet per mile; and L is the width, in miles, of the cross section through which outflow occurs (Ferris and others, 1962, p. 73). The factor 0.00112 is used to convert gallons per day to acre-feet per year.

The logs of wells in the southwestern part of the valley show that the valley fill is dominantly clay and silt; hence, the coefficient of transmissibility probably is low and may be only about 1,000–5,000 gallons per day per foot. The hydraulic gradient averages about 20 feet per mile along the 35-mile length of the valley trough. Thus, by substituting these values in the above equation, this preliminary estimate of outflow is computed to be about 2,000 acre-feet per year. Because little historic change in hydraulic gradient has occurred in this part of the valley, the subsurface outflow remained nearly constant through 1962. The pumping in an area 5–10 miles northeast of the valley trough and in the southern part of the valley may eventually reduce the hydraulic gradient and thereby proportionately reduce the outflow.

PUMPAGE

Practically all discharge of ground water by pumping and by flow from artesian wells occurs along the toes of Manse and Pahrump fans on the northeast side of the valley floor. After the first successful flowing artesian wells were drilled in 1910, the number of new wells drilled and the annual discharge increased slowly until the mid-1940's. At that time many wells were drilled and large-capacity pumps were installed. From the mid-1940's through 1962 the annual discharge from wells increased from an estimated 10,000 acre-feet to about 28,000 acre-feet. During the period 1959–62 the discharge averaged about 26,000 acre-feet per year. Discharge from wells in 1962 was about three times that from springs in 1875.

Table 6 lists the discharge from wells and springs for all years for which records or estimates are available. Figure 6 shows the areal distribution and approximate magnitude of well and spring discharge in 1961. Figure 6 shows that the largest areas of well and spring discharge are centered around the Fowler and Manse Ranches, where the discharge was about 5,700 and 6,200 acre-feet, respectively.

As described in "Storage capacity" of this report, approximately 1,000 acre-feet of irrigation water infiltrated the valley-fill reservoir each year during the period 1959–62. The net pumping draft, or the amount of ground water permanently removed from the reservoir by pumping, therefore, was about 25,000 acre-feet per year for that period. Moreover, an estimated 7,000 acre-feet per year of the pumped water ran off as tail-waste and, as previously mentioned, was consumed by evapotranspiration. These estimates suggest that approximately 18,000 acre-feet, or 70 percent, of the annual pumpage during this period was consumptively used for the irrigation of about 6,500 acres of crops—that is, about 2.8 acre-feet per irrigated acre.

TABLE 6.—*Approximate discharge, in acre-feet, from springs and wells in Pahrump Valley, 1875–1962*

[Discharge measurements from records of the Nevada State Engineer, except as indicated]

Year	Springs [1]			Wells	Total	Remarks
	Manse	Bennetts	Other			
1875	[2] 4,300	[2] 5,400		0	[2] 9,700	
1877	[3] 4,300			0		
1910				0		First well drilled in Pahrump Valley.
1913				[4] 500		Combined flow from 3 wells.
1916	[5] 2,300	[5] 3,400		[5] 4,300	[5] 10,000	28 wells in valley; 15 flowing.
1927	[6] 1,900	[6] 1,600		[6] 4,600	[6] 9,000	
1937	2,200	4,100		3,300	9,600	
1939	2,200	3,200		3,500	8,900	
1940	2,200	2,600		2,200	7,000	
1943		4,100				Bennetts Spring cleaned and deepened.
1946	2,200			16,300	18,500	Flow from Bennetts Spring included in estimate of well discharge.
1947	1,500			15,500	17,000	Do.
1948	2,000			16,000	18,000	Do.
1949	1,900			19,100	21,000	Do.
1950	1,900			13,100	15,000	Do.
1951	1,900			16,100	18,000	39 wells in use.
1952						No inventory made.
1953	1,800			26,200	28,000	39 wells in use.
1954	1,900			25,100	27,000	Do.
1955	1,800			27,200	29,000	Do.
1956	1,700	2,000		23,300	27,000	
1957	1,800	2,000		21,300	25,000	
1958	1,700	1,400		22,900	26,000	
1959	1,800	0	[7] 50	24,200	26,000	
1960	1,700	0		25,300	27,000	
1961	1,500	0		28,500	30,000	
1962	1,400	0		27,600	29,000	

[1] Flow from springs estimated on the basis of one or more measurements a year.
[2] Maxey and Jameson (1948, p. 10).
[3] Maxey and Jameson (1948, p. 78).
[4] Clark County Review, Feb. 22, 1913.
[5] Waring, G. A. (1921, p. 61–66).
[6] George Hardman (written commun., 1935).
[7] Estimated by author. The discharge has probably remained constant during historic period.

Pumpage for domestic and other uses probably was only a few hundred acre-feet per year for the period 1959–62. This amount of pumpage is so small that it is within the limits of error of the estimated pumpage for irrigation. Therefore, the discharge from wells (table 6) is considered to be the total pumpage in Pahrump Valley.

CARBONATE-ROCK RESERVOIR

Virtually all discharge of ground water from the carbonate-rock reservoir in Pahrump Valley is by subsurface outflow beneath topographic divides to Chicago and California Valleys and possibly to Ash Meadows (pl. 2). A minor amount of discharge may occur in the vicinity of Sixmile Spring, where several seeps are present adjacent to carbonate-rock outcrops (pl. 1). Sixmile Spring apparently has never flowed; Waring (1921) described it as water standing about 6 feet below the surface in a low sandy mound. In 1962 the water was at about the same level, and standing about 10 feet above the regional water level in the valley fill; the higher head may be due to the flow system in the carbonate-rock reservoir.

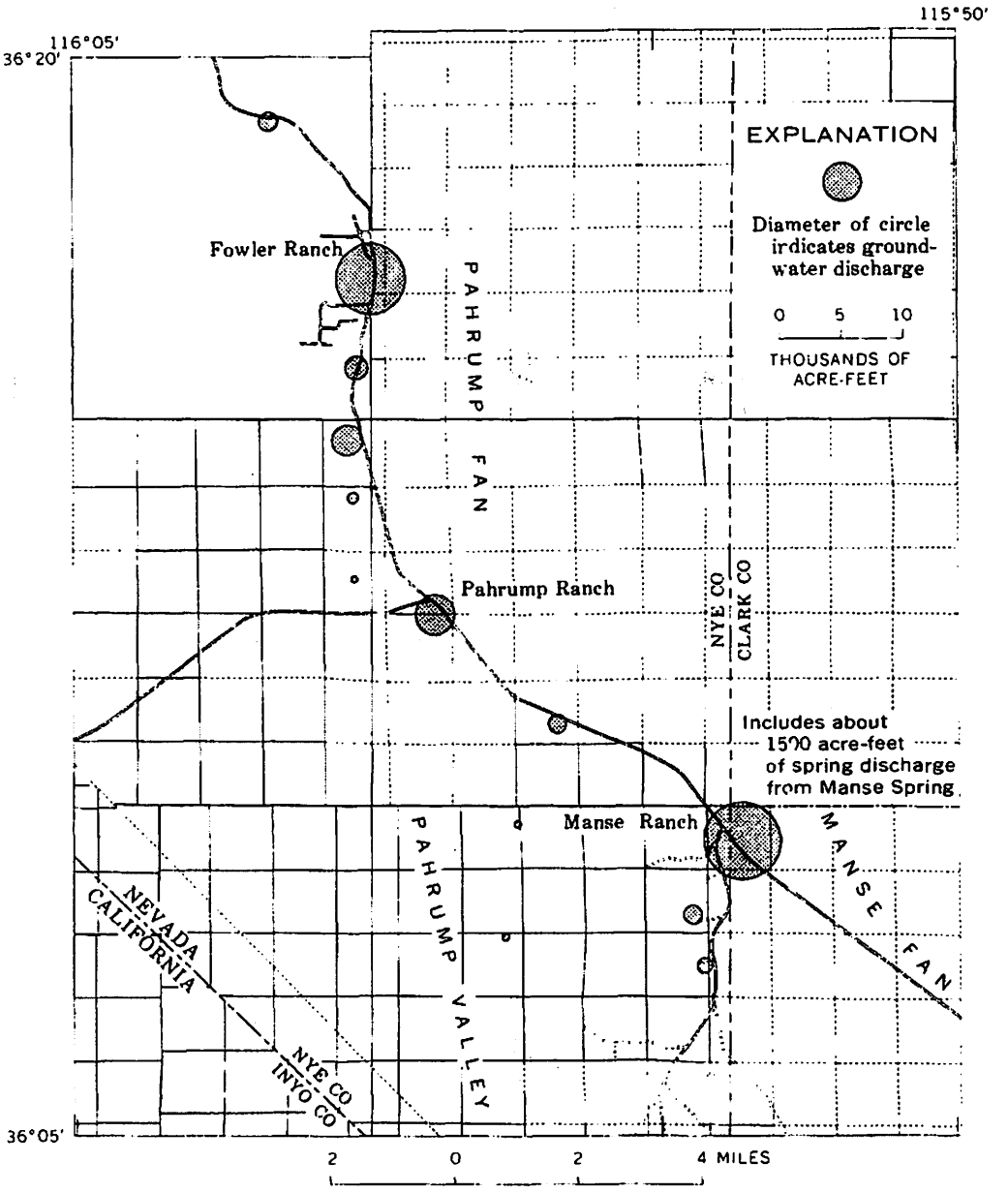

FIGURE 6.—Approximate area and magnitude of ground-water discharge from springs and wells in Pahrump Valley in 1961.

A crude estimate of the average annual subsurface outflow is indirectly computed as the difference between the total recharge (22,000 acre-ft, table 4) and the natural discharge from the valley-fill reservoir by evapotranspiration (about 10,000 acre-ft, table 5), or about 12,000 acre-feet. Of this annual outflow from the carbonate-rock reservoir, approximately 2,000 acre-feet is supplied from the valley-fill reservoir along the southwest side of the valley (p. 30); the rest, 10,000 acre-feet, is supplied by flow at depth from the recharge

area in the Spring Mountains (fig. 5). These crude estimates suggest in turn that the division of total recharge between the two reservoirs is 12,000 acre-feet to the valley-fill reservoir and 10,000 acre-feet to the carbonate-rock reservoir.

The ultimate disposition of all the estimated 12,000 acre-feet of subsurface outflow to adjacent valleys was not resolved during this study. The geologic controls suggest that most of the outflow moves southwestward through a thick section of carbonate rocks beneath the Nopah and Resting Spring Ranges; part may move northwestward through a thin section of carbonate rocks or along major fault zones to the springs at Ash Meadows. Most springflow at Ash Meadows, however, probably is derived from sources to the north (I. J. Winograd, U.S. Geol. Survey, oral commun., 1965).

In Chicago Valley, the phreatophytes (pl. 3), covering an area of about 600 acres, probably discharge about 2,000 acre-feet per year—far more than the local recharge. Tecopah Springs, at the southwest end of California Valley (pl. 3), and other springs may have a combined total discharge of 1,000–2,000 acre-feet per year. But even if all this discharge of 3,000–4,000 acre-feet per year were supplied from Pahrump Valley and none were supplied from local sources—which is not true—it would account for only about a fourth of the estimated subsurface outflow from Pahrump Valley.

GROUND WATER IN STORAGE

STORAGE CAPACITY

The valley-fill reservoir in Pahrump Valley contains a large amount of ground water that is moving slowly from areas of recharge to points of discharge. The amount stored, or in transient storage, in the reservoir is many times the average annual recharge and represents water accumulated during several hundred years. The amount of water contained in a selected volume of the valley-fill reservoir is computed by multiplying the volume of saturated material by the specific yield of the material. As defined by Meinzer (1923, p. 28), specific yield is the ratio of (1) the volume of water which the material, after being saturated, will yield by gravity to (2) the volume of the material. This ratio is stated as a percentage.

An estimated specific yield of 15 percent is assigned for determinations in this report because no tests were made to ascertain the specific yield of the valley-fill deposits in Pahrump Valley. Studies made in other areas show that the specific yield of valley fill commonly ranges from 7 to 20 percent. (For example, see Davis and others, 1959, p. 206–211, 242–253; and Thomasson and others, 1960, p. 283–286, 292.)

To show that a large amount of ground water probably is stored

in the valley-fill reservoir in Pahrump Valley, an estimate is made for the upper 100 feet of saturated material. The reservoir area is about 650 square miles, or about 400,000 acres; the selected saturated zone is 100 feet thick; and the assigned specific yield is 15 percent. The estimated ground water in storage is the product of these three values, or about 6 million acre-feet—that is, the water in storage in each foot of saturated material is about 60,000 acre-feet, which is equivalent to about 5 years of recharge to the valley-fill reservoir.

DEPLETION OF GROUND WATER IN STORAGE

Changes in the amount of ground water in storage are indicated by water-level fluctuations and occur chiefly in response to changes in the rates of recharge and discharge. Pumping from wells commonly places a large stress on a ground-water system and, if prolonged or intense, generally results in a marked decline in water levels and a corresponding decrease in stored water.

Development of ground water in the valley-fill reservoir was started in the vicinity of Manse and Bennetts Springs. Since about 1948 the water level in well S21/54–10aac, near Manse Spring, and in well S20/53–24caa, near Bennetts Springs, has been declining because of pumping (fig. 7). In these two areas, pumping had caused water levels to lower more than 25 feet by 1962. Hydrographs of wells N24/8–26bac and S19/53–32aaa, which are farther from heavy-pumping areas, show only minor changes in water level during the period of ground-water development (fig. 7).

Plate 4 shows the net change in water levels for the 3-year period February 1959–February 1962. Areas in which water levels have declined 5 feet or more are around major centers of pumping and total about 13,000 acres; areas having less than 5 feet of water-level decline are ill-defined but probably total at least four times as much acreage. The total volume of deposits dewatered during the 3-year period was about 300,000 acre-feet. Determined with the assigned specific yield of 15 percent, this total volume indicates a probable storage depletion of roughly 45,000 acre-feet, or about 15,000 acre-feet per year.

INCREASE OF GROUND WATER IN STORAGE

Infiltration of irrigation water along diversion ditches and in irrigated areas during the period 1959–62 caused water levels to rise 1–2 feet each year in three areas southwest of the principal irrigated areas (pl. 4). The estimated total return flow in these areas, as represented by the net increase in storage, is the product of (1) the area of about 7,000 acres, (2) the average water-level rise of about 0.8 foot, and (3) the assigned specific yield of 15 percent, or a net increase of approximately 1,000 acre-feet. Areas of water-level rise generally dissipate

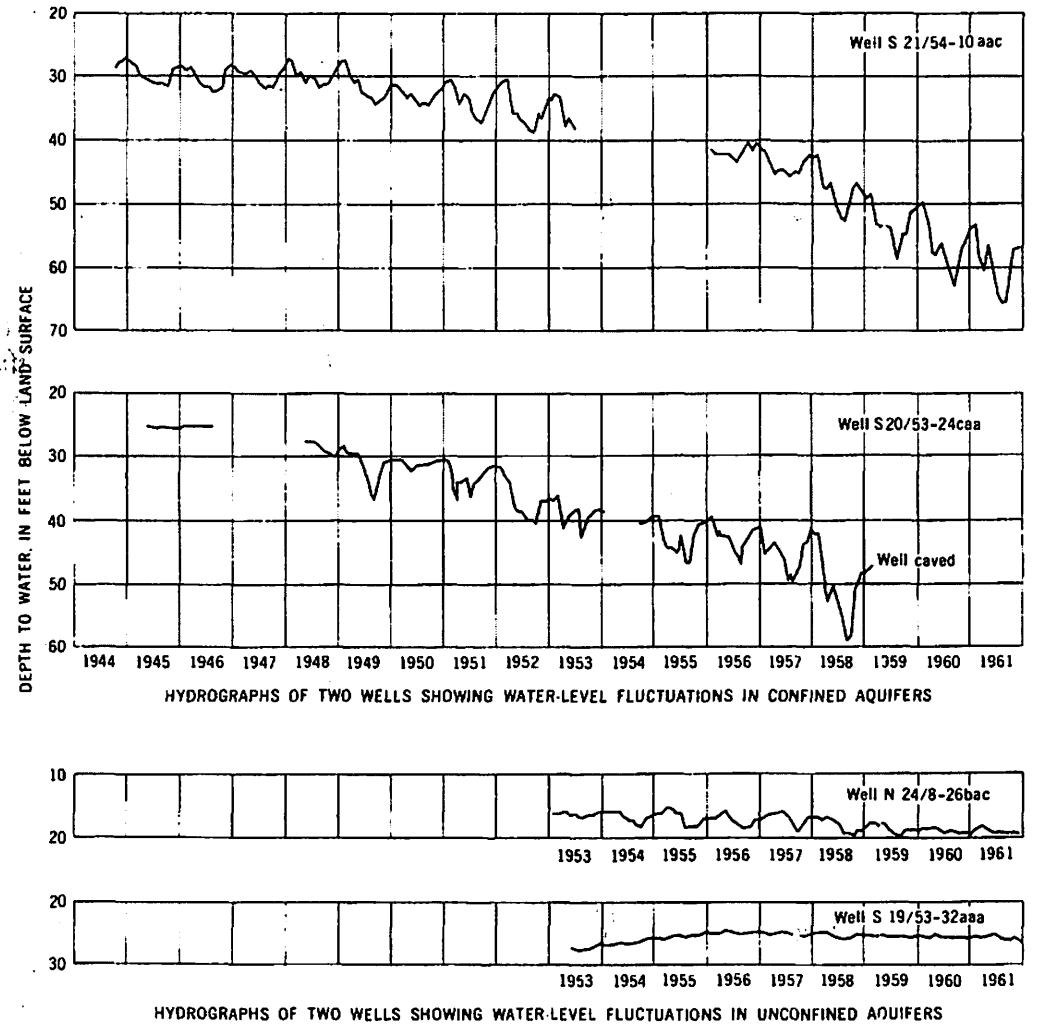

FIGURE 7.—Water-level fluctuations in selected wells tapping the valley-fill reservoir in Pahrump Valley.

after each successive year's irrigation season; hence, the computed return-flow value of about 1,000 acre-feet mainly indicates the annual increment of return flow, or recycled water.

WATER BUDGET

The water budget for Pahrump Valley brings together and compares the estimated elements of recharge and discharge and the changes in amount of ground water in storage for natural conditions and for the 4-year period 1959–62. This analysis includes the carbonate-rock and valley-fill reservoirs and shows the magnitude of the errors involved in the estimates made in the preceding sections of this report. These estimates are summarized in table 7 and show the marked change that has occurred in the ground-water regimen of the valley-fill reservoir from conditions prior to ground-water development to conditions of moderately large withdrawals in the period 1959–62.

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TABLE 7.—*Water-budget analysis, in acre-feet per year, for Pahrump Valley*

[Boldface numbers indicate steps in analysis]

Budget item	Natural conditions			Conditions in 1959–62		
	Carbonate-rock reservoir	Valley-fill reservoir	Total	Carbonate-rock reservoir	Valley-fill reservoir	Total
Recharge (1)						
Precipitation (table 4)	[1] 10,000	[2] 12,000	22,000	[1] 10,000	[2] 12,000	22,000
Discharge:						
Springs:						
Total (p. 28, 31)	Minor	(10,000)		Minor	(1,600)	
Return to storage (p. 28)		(−3,000)			(−600)	
Net discharge (p. 28)	Minor	[3] 7,000	7,000	Minor	[4] 1,000	[4] 1,000
Evapotranspiration:						
Shallow ground water (table 5)	Minor	3,300	3,300	Minor	3,300	3,300
Subsurface outflow (p. 30, 32)	10,000	2,000	12,000	10,000	2,000	12,000
Pumpage:						
Total (table 5)	0	0	0	0	(26,000)	
Return to storage (p. 34)					(−1,000)	
Net pumping draft (p. 30)					[4] 25,000	[4] 25,000
Total (2)	10,000	12,000	22,000	10,000	31,000	41,000
Difference (3)=(1−2)	0	0	0	0	−19,000	−19,000
Storage depletion (4)	0	0	0	0	−15,000	−15,000
Difference between methods (3−4)	0	0	0	0	[5] 4,000	[5] 4,000

[1] Computed by difference: total recharge less recharge to valley-fill reservoir.
[2] Assumed equal to total discharge under natural conditions from the valley-fill reservoir.
[3] Total amount was consumed by evapotranspiration (p. 29).
[4] Of the 26,000 acre-feet of net spring discharge and net pumping draft, about 7,000 acre-feet was consumed by evapotranspiration of irrigation tail waste.
[5] Average for 3-year period February 1959–February 1962.

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SE ROA 624

Pumping from the valley-fill reservoir probably has not yet intercepted any of the subsurface outflow from the valley. Table 7 shows that the annual outflow of 10,000 acre-feet from the carbonate-rock reservoir and the outflow of 2,000 acre-feet from the valley-fill reservoirs to the carbonate-rock reservoir have therefore remained constant. For two reasons, moreover, the water budget for the carbonate-rock reservoir balances: (1) it is assumed that no change in storage has occurred; and (2) the estimates of recharge and discharge, which were determined by difference, were assumed to be equal. Similarly, the water budget for natural conditions in the valley-fill reservoir balances.

During the period 1959–62 the estimated total annual discharge from the valley-fill reservoir increased from about 12,000 acre-feet under natural conditions to approximately 31,000 acre-feet—nearly a threefold increase (table 7). As a result the estimated annual natural discharge has been reduced from 12,000 acre-feet to 6,000 acre-feet, and the ground water in storage has been depleted at an estimated average rate of 15,000 acre-feet per year.

The water-budget analysis for the period 1959–62 also shows a discrepancy of 4,000 acre-feet per year in the difference between the estimated recharge and discharge and the estimated storage depletion. This imbalance shows a magnitude of error of about 25 percent in the several estimates of recharge, discharge, and storage change. Except for the estimates of pumpage and storage depletion, the estimates of other budget items are too small to affect the imbalance. One probable source of error is the estimated return to storage of irrigation water, which seems low—only 4 percent of the pumpage. In other areas the return commonly ranges from 25 to 40 percent of the total pumpage (Thomasson and others, 1960). The estimated storage depletion of 15,000 acre-feet per year may also be considerably in error, owing principally to the poor control of area and thickness in determining the volume of deposits dewatered in the areas of pumping.

PERENNIAL YIELD

The perennial yield of a ground-water reservoir may be defined as the maximum amount of water of usable chemical quality that can be withdrawn and consumed economically each year for an indefinite period of time. If the perennial yield is continually exceeded, water levels will decline until the ground-water reservoir is depleted of water of usable quality or until the pumping lifts become uneconomical to maintain. Perennial yield cannot exceed the natural recharge to an area indefinitely; it is ultimately limited to the maximum amount of natural discharge that can be salvaged for beneficial use.

Before pumping began, the natural discharge from Pahrump Valley comprised about 10,000 acre-feet per year from the carbonate-rock reservoir and about 12,000 acre-feet per year from the valley-fill reservoir (table 7). During the period 1959–62, when pumpage averaged about 26,000 acre-feet per year, natural discharge from the valley-fill reservoir was about 6,000 acre-feet per year less than before pumping began, but probably little or no decrease had occurred in the discharge from the carbonate-rock reservoir. To estimate the maximum amount of natural discharge that can be salvaged, the future cause-and-effect relation between pumping and natural discharge must be evaluated. The following estimates and assumptions are made to ascertain this relation:

1. The 1962 areal pattern of pumping on the Nevada side of Pahrump Valley will probably not change appreciably in the near future, but pumpage may increase. As a result, Manse Spring probably will stop flowing, and evapotranspiration from areas of shallow ground water west of Pahrump will markedly decrease (pl. 3). The total additional salvage of natural discharge may ultimately be as much as 4,000 acre-feet per year.
2. Pumping on the California side and near the south end of Pahrump Valley may markedly increase. From February 1959 to February 1962 (pl. 3), pumping lowered water levels in this area about 4 feet. Large withdrawals will reduce the ground-water outflow from the valley-fill reservoir to the carbonate-rock reservoir possibly as much as 50 percent, or about 1,000 acre-feet per year. No other development on the California side seems feasible or imminent as of 1962.
3. At the 1962 rate or at a higher rate, prolonged pumping from the valley-fill reservoir will probably somewhat reduce subsurface outflow from the carbonate-rock reservoir to adjacent valleys. Until both the cause-and-effect relation of the future pumping regimen and the subsurface outflow from the carbonate-rock reservoir can be more thoroughly evaluated, the salvable outflow from the carbonate-rock reservoir is assumed to be only 1,000 acre-feet per year.
4. The carbonate-rock reservoir probably occurs at a depth of more than a thousand feet beneath most of Pahrump Valley. Future drilling of deep wells in an attempt to tap water in fracture zones in the carbonate rocks seems only a remote possibility. Accordingly, the possibility of salvaging outflow from this reservoir by pumping also seems remote at this time.

Based on these estimates and assumptions, the maximum amount of natural discharge that can be salvaged probably is not more than 12,000

acre-feet per year, which is 6,000 acre-feet per year more than the yearly amount salvaged during the period 1959–62.

In summary, the maximum salvable discharge comprises the following (annual estimates):

1. All net spring discharge, which was originally 7,000 acre-feet;
2. Possibly as much as 3,000 acre-feet of evapotranspiration in areas of shallow ground water;
3. About 1,000 acre-feet of subsurface outflow from the valley-fill reservoir;
4. Possibly 1,000 acre-feet of outflow from the carbonate-rock reservoir to adjacent valleys (table 7).

Thus, the estimated perennial yield of Pahrump Valley also probably does not exceed 12,000 acre-feet. This means that about 10,000 acre-feet per year of subsurface outflow probably is not salvable and that, ultimately, any net pumping draft in excess of 12,000 acre-feet per year will be supplied from ground water in storage.

OVERDRAFT

Overdraft may be defined as the amount by which the net pumping draft exceeds the perennial yield. During the period 1959–62 the estimated net pumping draft averaged 25,000 acre-feet per year (table 7), or approximately twice the estimated perennial yield of 12,000 acre-feet. Annual overdraft in Pahrump Valley during this period thus averaged about 13,000 acre-feet. Even if the net pumping draft was somewhat smaller than that estimated (p. 37), it still would have exceeded the estimated yield.

Table 6 shows that pumpage increased during the last several years of record. As long as annual pumpage continues to increase, overdraft also will continue to increase. Over the long term this deficiency will be supplied almost wholly from ground water in storage in the valley-fill reservoir. This depletion in turn will be manifested, principally in the areas of large withdrawals, by the continued downward trend of water levels, as shown in figure 7, and by increased pumping lifts.

Continued overdraft and the accompanying increase in pumping lifts will clearly result in an increase in pumping costs. The electrical energy required to lift water from a well to the point of discharge commonly is 2 kilowatt-hours per acre-foot per foot of lift. For example, using this energy factor, 200 kilowatt-hours would be required to lift 1 acre-foot of water from a pumping level 100 feet below the discharge point. If the pumping lift should double in the future, the kilowatt-hours per acre-foot would also double, provided that the well and pumping plant efficiencies were to remain nearly the same.

CHEMICAL QUALITY OF WATER

Chemical analyses made by several agencies are available for water from 43 wells and 5 springs in Pahrump Valley and vicinity. Of these analyses, 18 are "complete" analyses and 30 are "partial" analyses (specific conductance, chloride, hardness, and pH). Water-temperature data are also available for most of the sampling points. Representative chemical analyses are shown in table 8, and the range in chemical quality of all "complete" analyses is shown in table 9. Plate 5 shows the chemical quality of water and its variation from one part of the valley to another.

The scope of this section is limited to brief presentations of the variations in water quality and of the suitability of the water for irrigation use. A brief analysis is made of the geothermal gradient in the valley-fill reservoir.

VARIATIONS IN QUALITY

Along the northeast side of Pahrump Valley most ground water in the valley-fill reservoir is of calcium-magnesium bicarbonate type (pl. 5), indicating the abundance of carbonate rocks in the Spring Mountains, where most recharge occurs. The dissolved-solids content of the ground water increases as the water moves southwestward across the valley. Most of the water analyzed, however, was from shallow wells, and its quality may not be indicative of the quality of water in the deeper aquifers. Most analyses of water sampled in the vicinity of the Nevada-California boundary showed an increase in magnesium concentration in relation to calcium; consequently, magnesium is the predominant cation in solution. Northeast of the boundary the total dissolved-solids content is generally less than 300 ppm (parts per million).

Analyses of ground water sampled along the southwest side of the valley showed a wide variation in quality. In Stewart Valley the water generally has a high sodium content, and locally high contents of magnesium, sulfate, and chloride. The total dissolved-solids content ranges from about 520 ppm (well N24/8–6dcd) to about 40,000 ppm (well N25/7–25ccc, not shown on pl. 5). At the north edge of the playa in Pahrump Valley, the water (well N22/9–5abc) is high in magnesium, sodium, sulfate, and total dissolved-solids content. Elsewhere on the California side of Pahrump Valley, the water is generally of magnesium bicarbonate type, having a total dissolved-solids content of less than 500 ppm.

TABLE 8.—*Chemical analyses of typical irrigation water in Pahrump Valley*

[Constituents in parts per million, except as indicated. CO_3 not present. Analyses by U.S. Geol. Survey, except as indicated]

Selected wells	Depth of well (ft)	Date of collection	Temperature (°F)	Silica (SiO_2)	Calcium (Ca)	Magnesium (Mg)	Sodium (Na)	Potassium (K)	Bicarbonate (HCO_3)	Sulfate (SO_4)	Chloride (Cl)	Fluoride (F)	Nitrate (NO_3)	Boron (B)	Dissolved solids (calculated)	Hardness as $CaCO_3$	pH	Specific conductance (micromhos at 25°C)
S19/52-36bdd	389	4-29-59	69.5	26	30	22	13	2.2	199	22	5.0	0.2	1.5	0.06	220	165	7.8	360
S19/53-9bbc	746	4-24-59	73	21	46	26	28	4.0	280	36	12	.3	2.4	.14	314	222	7.8	524
S19/53-21aan	595	4-29-59	72.5	20	47	28	7.5	1.6	269	20	6.0	.1	2.0	.04	264	232	7.9	447
S20/53-3cda	662	4-29-59	70.5	17	50	22	6.9	2.2	242	26	3.8	.2	1.7	.5	249	215	8.1	431
S20/53-20bba	902	5-22-59	.....	23	62	60	11	2.7	257	176	17	.3	2.4	.06	431	400	7.4	719
S21/54-16ada	795	2-10-55	74	16	53	22	7.1	.8	224	47	3.0	.5	.6	.....	260	223	7.8	428
S21/54-21bca	1,050	5-28-53	.....	20	36	24	9.2	1.5	186	48	2.8	.2	.9	.02	234	188	7.7	403
S22/54-24dcc[1]	690	5-10-57	.....	20	69	26	6.9	.4	281	55	6.0	.4	.5	0	324	.....	8.0	518

[1] Analysis by California Department of Water Resources.

TABLE 9.—*Summary of chemical quality of ground water in Pahrump Valley*

[Constituents in parts per million except as indicated]

	Maximum	Minimum	Median	Number of determinations
Silica (SiO^2)	90	3.6	20	26
Iron (Fe):				
Total	3.0	.00	0.10	17
Dissolved	1.4	.00	.01	6
Calcium (Ca)	264	5.6	43	40
Magnesium (Mg)	594	8.3	29	40
Sodium (Na)	13,000	5.8	23	40
Potassium (K)	1,980	.3	3.1	40
Bicarbonate (HCO_3)	1,450	125	238	40
Carbonate (CO_4)	57	0	0	40
Sulfate (SO_4)	8,830	14	55	40
Chloride (Cl)	15,700	2.0	16	40
Fluoride (F)	1.4	.1	.3	28
Nitrate (NO_3)	42	0	1.5	27
Boron (B)	54	.00	.07	37
Dissolved solids (calculated)	40,600	220	301	30
Hardness as $CaCO_3$:				
Total	3,100	54	223	38
Noncarbonate	2,780	0	17	29
Specific conductance (micromhos at 25°C)	50,300	348	515	30
pH	9.3	7.4	7.9	36
Percent sodium	83	5	18	31

Water in Sixmile Spring is of calcium bicarbonate type and is, therefore, different from the types of water in nearby wells which tap the valley-fill reservoir (pl. 5). The spring-water type suggests that it is derived from the carbonate-rock reservoir.

SUITABILITY OF THE WATER FOR IRRIGATION

Most water users in Pahrump Valley are interested in the suitability of the water for irrigation, because the economy of the valley is dependent almost wholly on irrigation agriculture. Table 9 briefly summarizes the range of principal chemical constituents in the ground water, listing the maximum, minimum, and the median values for each constituent and the number of samples on which these values are based. Several characteristic properties of the water are also listed; these include dissolved solids, hardness, specific conductance, pH, and percent sodium (the ratio of sodium ions to the total number of cations in solution). Table 8 shows the chemical character of the ground water in eight selected wells in and adjacent to the principal areas of pumpage. Of the factors shown in this table, the most critical with respect to the suitability of water for irrigation are the dissolved-solids content and the concentration of toxic elements, such as boron. Other factors, such as soil type and composition, climate, and methods of water application also affect the suitability of water for irrigation.

Extensive irrigation in the poorly drained central part of Pahrump Valley may cause an eventual rise in the water table that will result in water logging and drainage problems. To maintain irrigation on a permanent basis in these areas, construction of drainage ditches may be required to control the depth of the water table and to prevent an excessive increase in dissolved-mineral constituents in the soil and in the underlying ground water.

Recirculation, or reuse, of water also tends to increase the dissolved-solids content. As water levels along the base of the Manse and Pahrump fans continue to decline, recirculation of irrigation water probably will increase because of the accompanying decrease in ground-water movement away from the pumped area. The recirculation of water through several cycles of irrigation in the same area will tend to increase the concentration of dissolved solids.

The ground water in most of Pahrump Valley is of moderate salinity and is low in sodium content. Water that is low in sodium content can be used successfully for irrigation of nearly all soils. After a small amount of leaching, the soil in the principal irrigated areas and at the south end of the valley is satisfactory for irrigation.

TEMPERATURE

The temperature of ground water is closely related to the temperature of the aquifer in which the water occurs. Therefore, insofar as the temperature of the water is in equilibrium with that of the aquifer, an increase in water temperature with depth probably is indicative of the geothermal gradient in the area. Residual heat from metamorphism, from crushing and shearing during faulting, or from underlying bodies of hot igneous rock may cause local anomalous temperatures both areally and at depth. Difference in thermal conductivity of different rock types may also result in different geothermal gradients in the same area.

The regional geothermal gradient is controlled by the transfer of heat from great depths within the earth toward the land surface. Hence, if the regional geothermal gradient is not altered by localized thermal activity, the temperature of the ground and of the water it contains will increase with depth. If the rate of temperature change with depth is known, the temperature of water being discharged from a well or spring may indicate the depth from which the water is coming. Although variations in the heat-flow pattern within the zone of saturation may result from many causes, the heat from the interior of the earth probably is fairly constant throughout the study area.

Near-surface temperatures approximate the mean annual air temperature, but they may vary slightly in response to exposure or to environmental changes caused by the activity of man.

The mean annual air temperature in Pahrump Valley is approximately 65°F, and the temperature of ground water from wells and springs in the valley area should equal or exceed that amount. In figure 8, 65 measurements of ground-water temperature are plotted against the depth of the well from which the water was discharged. Temperatures were measured at the point of discharge and possibly are somewhat lower than the water temperature in the principal aquifer supplying water to the well. The average temperature gradient for the area, as shown by the approximate curve of best fit in figure 8, is about 1°F for each 85 feet in depth.

Figure 8 is useful in estimating the approximate depth of the source of water. For example, the water temperature of Bennetts and Manse Springs averages about 75° and 76°F, respectively. This temperature is about 10°–11° warmer than the temperature of the shallowest water in the zone of saturation, which is at mean annual air temperature. This suggests that if the water from Bennetts Spring originated from a single water-bearing zone, the depth of the zone would be about 850 feet. Also, water discharged at the Manse Spring probably would originate from a depth of about 900 feet. If the spring discharge is a mixture of water derived from different depths, however, its temperature would be a composite of the temperatures of all the contributing aquifers, and the computed depths of 850–900 feet, therefore, would represent average depths.

SUMMARY AND CONCLUSIONS

This second appraisal of the ground-water resources of Pahrump Valley has revealed the existence of two reservoir systems—one in the valley fill, which has been extensively developed for irrigation, and the other in the underlying carbonate rocks, which is undeveloped. Of the estimated total average annual recharge of 22,000 acre-feet, approximately 12,000 acre-feet is believed to leave the valley by subsurface outflow through the carbonate rocks to adjacent areas. Pumping from the valley-fill reservoir in the future may salvage only 2,000 acre-feet per year of this outflow. This possibility suggests in turn that the salvable discharge may be only 12,000 acre-feet per year, or that the perennial yield of the valley may be limited to this amount of water over a long period of time.

The net pumping draft in the 4-year period 1959–62 averaged about 25,000 acre-feet per year, which is about twice the estimated perennial yield, or an overdraft of about 13,000 acre-feet per year. Over the long term the overdraft will be supplied from ground water stored in the valley-fill reservoir. This will result in declining water levels, increased pumping lifts, and, hence, increased pumping costs.

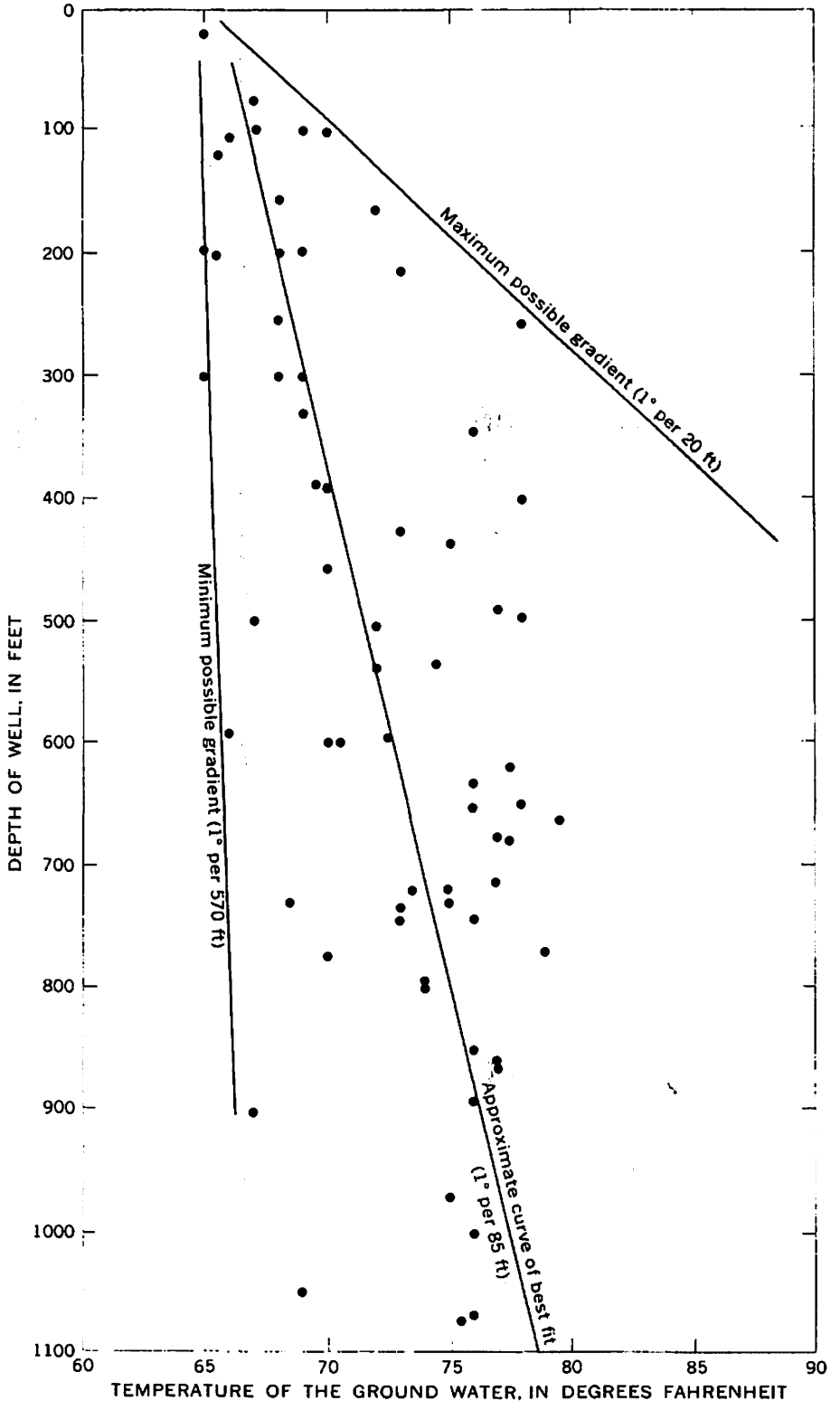


FIGURE 8.—Approximate geothermal gradient in Pahrump Valley.

Still unresolved is the ultimate disposition of the subsurface outflow from Pahrump Valley. This second investigation suggests that most of the outflow is southwestward through the Nopah and Resting Springs Ranges to discharge points in California, and that part may move northwestward to discharge at the springs in Ash Meadows. A direct determination of the magnitude and direction of the outflow, however, would require costly exploratory drilling. Even if the magnitude of the outflow could be determined, the amount that could be salvaged by pumping in Pahrump Valley probably would be small.

SELECTED REFERENCES

Blaney, H. F., and Harris, Karl, 1952, Report on water supply of the lower Colorado River Basin (provisional): U.S. Bur. Reclamation Proj. Plan. Rept., 24 p.

Bowyer, Ben, Pampeyan, E. H., and Longwell, C. R., 1958, Geologic map of Clark County, Nevada: U.S. Geol. Survey Mineral Inv. Field Studies Map MF–138.

Davis, G. H., Green, J. H., Olmsted, F. H., and Brown, D. W., 1959, Groundwater conditions and storage capacity in the San Joaquin Valley, California: U.S. Geol. Survey Water-Supply Paper 1469, 287 p.

Eakin, T. E., and others, 1951, Estimated annual increment to ground water, *in* Contributions to the hydrology of eastern Nevada: Nevada State Engineer, Water Resources Bull. 12, p. 26–27.

Ferris, J. G., Knowles, D. B., Brown, R. H., and Stallman, R. W., 1962, Theory of aquifer tests: U.S. Geol. Survey Water-Supply Paper 1536–E, 174 p.

Gatewood, J. S., Robinson, T. W., Colby, B. R., Hem, J. D., and Halpenny, L. C., 1950, Use of water by bottom-land vegetation in lower Safford Valley, Arizona: U.S. Geol. Survey Water-Supply Paper 1103, 210 p.

Hardman, George, and Mason, H. S., 1949, Irrigated lands of Nevada: Nevada Univ. Agr. Expt. Sta. Bull. 183, 57 p.

Hardman, George, and Miller, Meredith, 1934, The quality of the waters of southeastern Nevada, drainage basins and water resources: Nevada Univ. Agr. Expt. Sta. Bull. 136, p. 22–28.

Hazzard, J. C., 1937, Paleozoic section in the Nopah and Resting Springs Mountains, Inyo County, California: California Jour. Mines and Geology, v. 33, no. 4, p. 289–339.

Hewett, D. F., 1931, Geology and ore deposits of the Goodsprings quadrangle, Nevada: U.S. Geol. Survey Prof. Paper 162, 172 p.

——— 1948, Iron deposits of the Kingston Range, San Bernardino County, California: California Div. Mines Bull. 129, p. 195–206.

——— 1956, Geology and mineral resources of Ivanpah quadrangle, California and Nevada: U.S. Geol. Survey Prof. Paper 275, 172 p.

Jennings, C. W., 1958, Geologic map of California, Death Valley sheet: California Dept. Nat. Resources, O. P. Jenkins, ed.

——— 1961, Geologic map of California, Kingman sheet: California Dept. Nat. Resources, O. P. Jenkins, ed.

Jennings, C. W., Burnett, J. L., and Troxel, B. W., 1962, Geologic map of California, Trona sheet: California Dept. Nat. Resources, O. P. Jenkins, ed.

Loeltz, O. J., 1960, Source of water issuing from springs in Ash Meadow Valley, Nye County, Nevada (abs.): Geol. Soc. America Bull., v. 71, no. 12, p. 2.

Maxey, G. B., and Jameson, C. H., 1948, Geology and water resources of Las Vegas, Pahrump, and Indian Spring Valleys, Clark and Nye Counties, Nevada: Nevada Water Resources Bull. 5, 121 p.; app. 1, 128 p.; app. 2, 43 p.

Maxey, G. B., and Robinson, T. W., 1947, Ground water in Las Vegas, Pahrump, and Indian Spring Valleys, Nevada: Nevada Water Resources Bull. 6, 23 p.

Meinzer, O. E., 1923, Outline of ground-water hydrology, with definitions: U.S. Geol. Survey Water-Supply Paper 494, 71 p.

Mendenhall, W. C., 1909, Some desert watering places in southeastern California and southwestern Nevada: U.S. Geol. Survey Water-Supply Paper 224, 98 p.

Miller, M. R., Hardman, George, and Mason, H. G., 1953, Irrigation waters of Nevada: Nevada Univ. Agr. Expt. Sta. Bull. 187, 63 p.

Nolan, T. B., 1929, Notes on the stratigraphy and structure of the northwest portion of Spring Mountain, Nevada: Am. Jour. Sci., 5th ser., v. 17, p. 461–472.

Robinson, T. W., 1958, Phreatophytes: U.S. Geol. Survey Water-Supply Paper 1423, 84 p.

Robinson, T. W., and others, 1947, Water levels and artesian pressure in wells in Las Vegas Valley and in other valleys in Nevada, 1913–45: Nevada Water Resources Bull. 3, 77 p.

Scofield, C. S., 1936, The salinity of irrigation waters: Smithsonian Inst. Ann. Rept. 1935, p. 275–287.

Shamberger, Hugh A., 1962, A proposed ten-year cooperative water resources program between the State of Nevada and the U.S. Geological Survey: Nevada Dept. Conserv. Nat. Resources, Water Resources Inf. Ser. Rept. 4, 18 p.

Theis, C. V., 1935, Relation between the lowering of the piezometric surface and the rate and duration of discharge of a well using ground-water storage: Am. Geophys. Union Trans., pt. 2, p. 519–524.

Thomasson, H. G., Jr., Olmsted, F. H., and LeRoux, E. F., 1960, Geology, water resources, and usable ground-water storage capacity of part of Solano County, California: U.S. Geol. Survey, Water-Supply Paper 1464, 693 p.

U.S. Salinity Laboratory Staff, 1954, Diagnosis and improvement of saline and alkali soils: U.S. Dept. Agriculture, Agriculture Handb. 60.

Walker, G. E., and Eakin, T. E., 1963, Geology and ground water of Amargosa Desert, Nevada-California: Nevada Dept. Conserv. Nat. Resources, Ground-Water Resources Reconn. Ser. Rept. 14, 45 p.

Waring, G. A., 1921, Ground water in Pahrump, Mesquite, and Ivanpah Valleys, Nevada and California: U.S. Geol. Survey Water-Supply Paper 450–C, p. C51–C86.

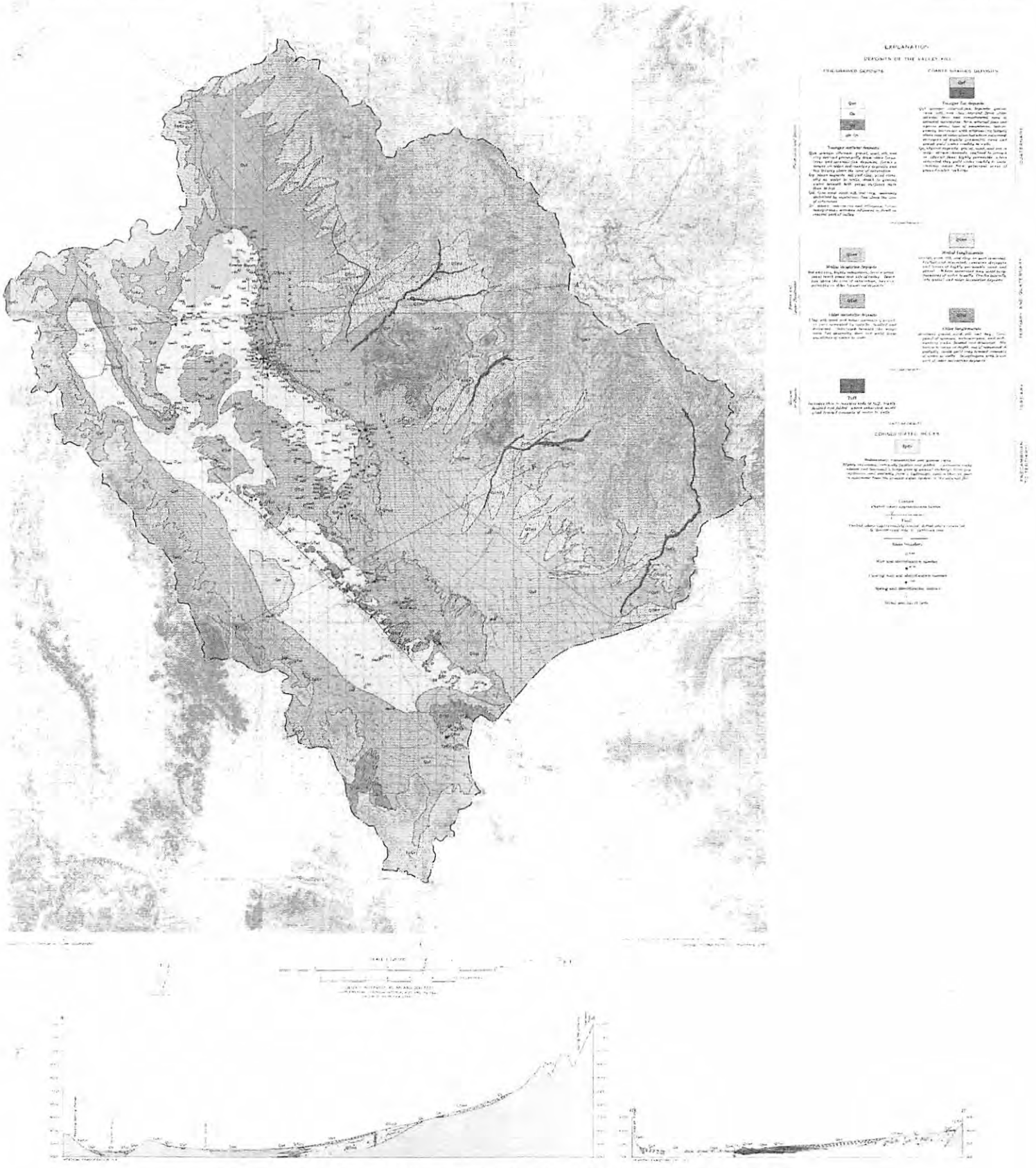
Wenzel, L. K., 1942, Methods for determining permeability of water-bearing materials, with special reference to discharging-well methods: U.S. Geol. Survey Water-Supply Paper 887, 192 p.

Winograd, I. J., 1962, Interbasin movement of ground water at the Nevada Test Site, Nevada: U.S. Geol. Survey Prof. Paper 450–C, p. C108–C111.

——— 1963, A summary of the ground-water hydrology of the areas between the Las Vegas Valley and the Amargosa Desert with special reference to the effects of possible new withdrawals of ground water: U.S. Geol. Survey TEI–840, 79 p.

Young, A. A., and Blaney, H. F., 1942, Use of water by native vegetation: California Dept. Public Works, Div. Water Resources Bull. 50, 160 p.

U.S. GOVERNMENT PRINTING OFFICE: 1967 O—240-366



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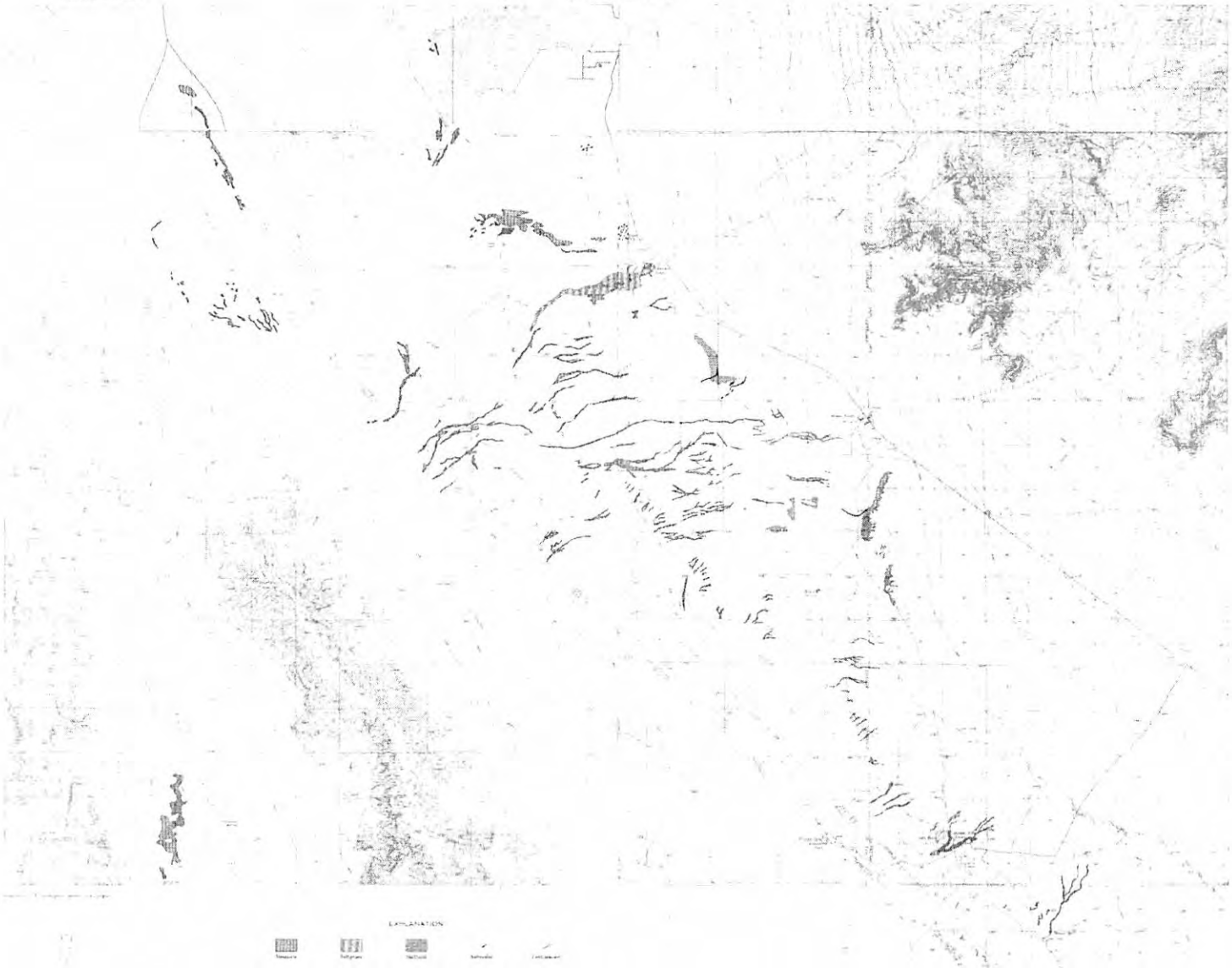
MAP OF PAHRUMP VALLEY, NEVADA-CALIFORNIA, SHOWING WATER-LEVEL CONTOURS IN THE VALLEY-FILL RESERVOIR IN FEBRUARY 1962



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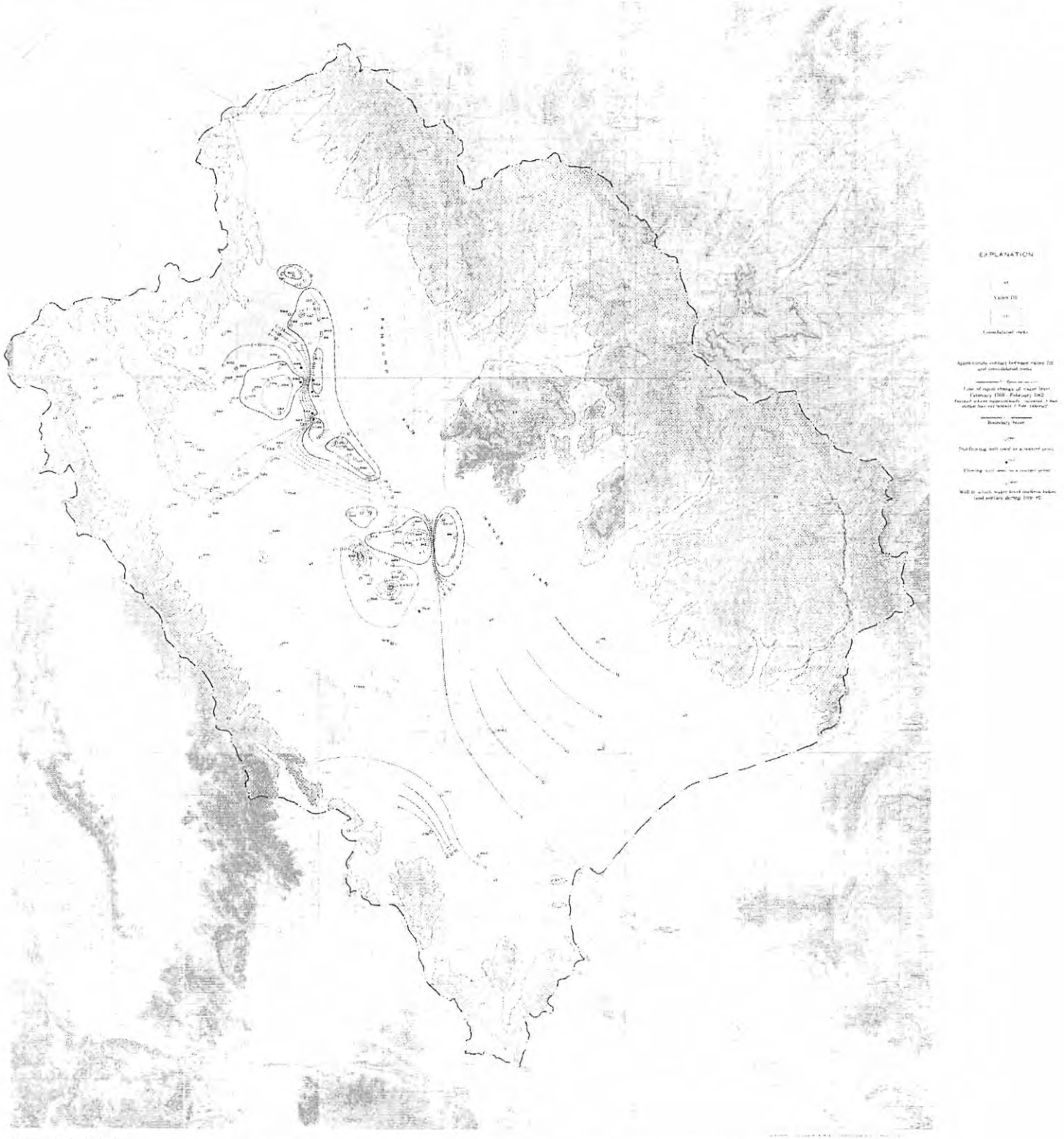

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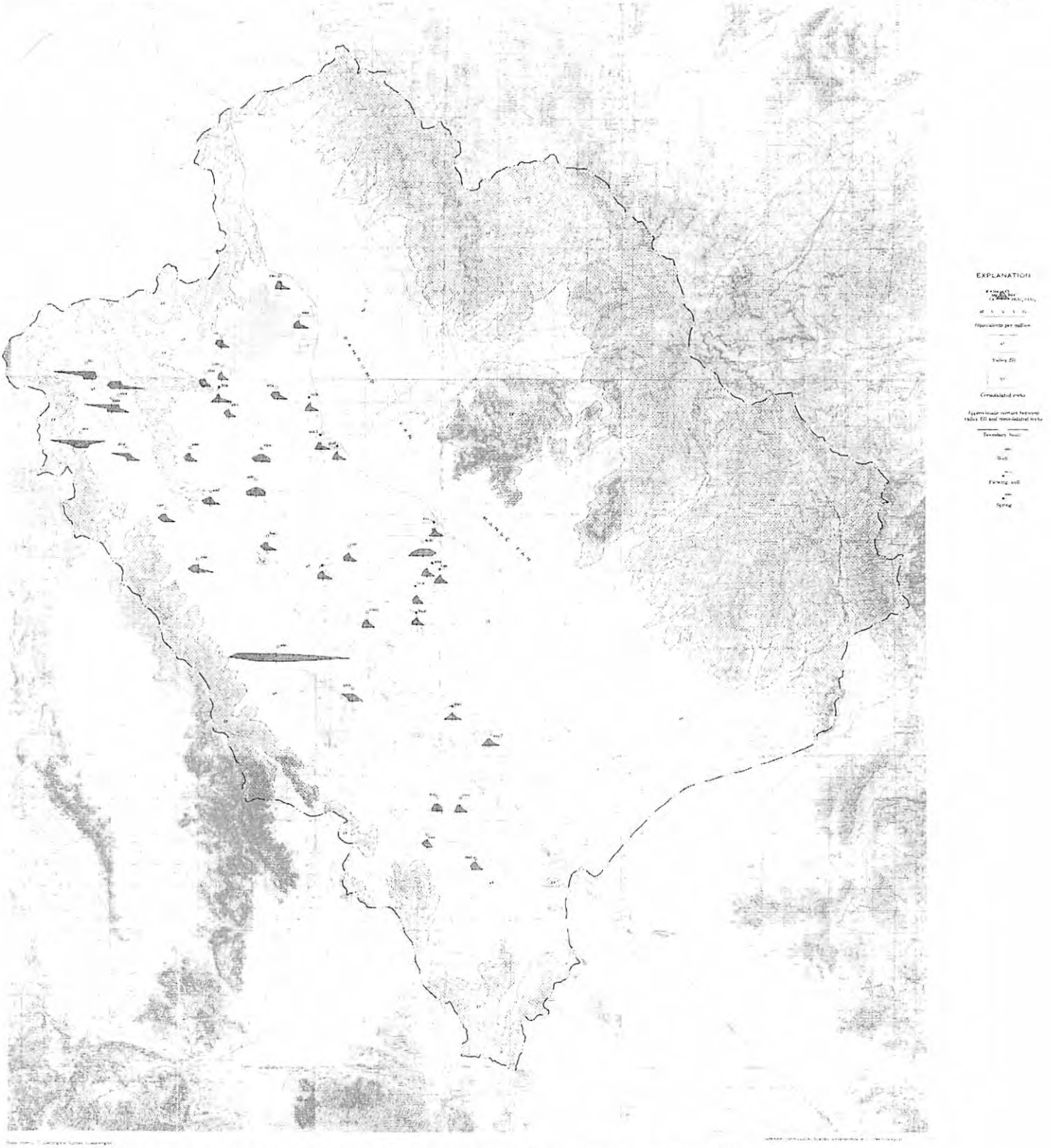

MAP SHOWING VARIATIONS IN PRINCIPAL CHEMICAL CONSTITUENTS OF GROUND WATER
IN PAHRUMP VALLEY, NEVADA-CALIFORNIA

Ground-Water Storage Depletion In Pahrump Valley, Nevada-California, 1962-75

By JAMES R. HARRILL

Prepared in cooperation with the Nevada Department of Conservation and Natural Resources, Division of Water Resources

U.S. GEOLOGICAL SURVEY WATER-SUPPLY PAPER 2279

JT APP 688
SE ROA 641

DEPARTMENT OF THE INTERIOR
DONALD PAUL HODEL, Secretary

U.S. GEOLOGICAL SURVEY
Dallas L. Peck, Director

UNITED STATES GOVERNMENT PRINTING OFFICE: 1986

For sale by the Books and Open-File Reports Section, U.S. Geological Survey,
Federal Center, Box 25425, Denver, CO 80225

Library of Congress Cataloging-in-Publication Data

Harrill, James R.
Ground-water storage depletion in Pahrump Valley,
Nevada-California, 1962-75.

(U.S. Geological Survey water-supply paper; 2279)
Bibliography: p. 51
Supt. of Docs. no.: I 19.13:2279
1. Water, Underground—Pahrump Valley (Nev. and Calif.)
I. Nevada. Division of Water Resources. II. Title. III.
Title: Ground-water storage depletion in Pahrump
Valley, Nevada-California, 1962-75. IV. Series.
TD225.P24H37 1985 553.7'9'0979334 84-600395

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Ground-Water Storage Depletion in Pahrump Valley, Nevada-California, 1962-75

By James R. Harrill

Abstract

During the 13-year period February 1962 to February 1975, about 540,000 acre-feet of ground water was pumped from Pahrump Valley. This resulted in significant water-level declines along the base of the Pahrump and Manse fans where pumping was concentrated. Maximum observed net decline was slightly more than 60 feet. Much smaller declines occurred in the central valley; and, locally, water levels in some shallow wells rose owing to recharge derived from the deep percolation of irrigation water. The pumping resulted in about 219,000 acre-feet of storage depletion. Of this, 155,000 acre-feet was from the draining of unconsolidated material, 46,000 acre-feet was from the compaction of fine-grained sediments, and 18,000 acre-feet was from the elastic response of the aquifer and water. The total storage depletion was equal to about 40 percent of the total pumpage. The remaining pumped water was derived from the capture of natural ground-water discharge and reuse of pumped water that had recirculated back to ground water.

Natural recharge to and discharge from the ground-water system is estimated to be 37,000 acre-feet per year. Of this, 18,000 acre-feet per year leaves the area as subsurface outflow through carbonate-rock aquifers which form a multivalley flow system. The extent of this system was not precisely determined by this study. The most probable discharge area for this outflow is along the flood plain of the Amargosa River between the towns of Shoshone and Tecopa. This outflow probably cannot be economically captured by pumping from Pahrump Valley. Consequently, the maximum amount of natural discharge available for capture is 19,000 acre-feet per year. This is larger than the 12,000 acre-feet per year estimated in a previous study; the difference is due to different techniques used in the analysis.

As of 1975, pumping was causing an overdraft of 11,000 acre-feet per year on the ground-water system. No new equilibrium is probable in the foreseeable future. Water levels will probably continue to decline slowly until pumping is reduced. The moderate rates of decline and the very large amounts of ground water stored in the valley-fill reservoir suggest that it will be a long time before the valleywide depletion of ground-water storage becomes critical. Problems involving water quality, land subsidence, and well interference will probably occur first.

INTRODUCTION

This study, made in cooperation with the Nevada Division of Water Resources, Department of Conservation and Natural Resources, evaluates the effects of ground-water withdrawals during the period February 1962 through February 1975 on depletion of storage in Pahrump Valley. The study updates an earlier report by Malmberg (1967) which indicated an overdraft on the ground-water system of about 13,000 acre-ft/yr during the 4-year period 1959–62. Since that time, pumping has increased substantially and large tracts of former agricultural land are being subdivided for residential development. Concern about the effects of sustained overdraft on a valley that contains permanent residential development is the basic reason for this study.

Purpose and Approach

The objectives of this study are to (1) determine or estimate, for the period 1962 through 1975, the areal extent and amount of water-level decline, the magnitude of ground-water storage depletion, and the annual pumpage, (2) evaluate any additional impacts of development, to date, on the hydrologic system, and (3) to the extent possible, demonstrate some general long-term effects likely to occur if pumping is maintained at the 1975 rate.

In scope, the study included the Pahrump Valley and part of the mountainous area on three sides. Considered were water levels, pumpage, well records, and aquifer hydraulics. A digital ground-water flow model provided insight into long-term pumping effects.

Work began early in 1975. Principal work included (1) reviewing published information, (2) compiling available well-construction, water-level, and pumpage information, (3) canvassing selected wells, (4) collecting a fairly comprehensive set of water-level measurements in February 1976, (5) drilling 11 small-diameter water-level observation wells, (6) conducting short-term pumping

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tests on 5 wells, (7) evaluating and analyzing the information obtained, and (8) using a digital ground-water flow model to test and refine the analysis of the ground-water system to gain insight into possible long-term effects if pumping is continued at the 1975 rate. Most of the fieldwork was done between early 1975 and June 1976.

The net effect of seasonal pumping during the 14 irrigation seasons starting in 1962 and continuing through 1975 was evaluated by water-level measurements made between February 1962 and February 1976. Evaluation of net changes in ground-water levels was based on measurements made when conditions are least affected by pumping, usually in late winter of each year. For example, the change in water level from February 1975 to February 1976 largely reflected the residual effects of pumping during the previous spring, summer, and fall 1975.

Location and General Features

Pahrump Valley encompasses about 1,050 mi² in Nye and Clark Counties, Nev., and Inyo and San Bernardino Counties, Calif. The area discussed in this report conforms with boundaries of the Pahrump Valley hydro-

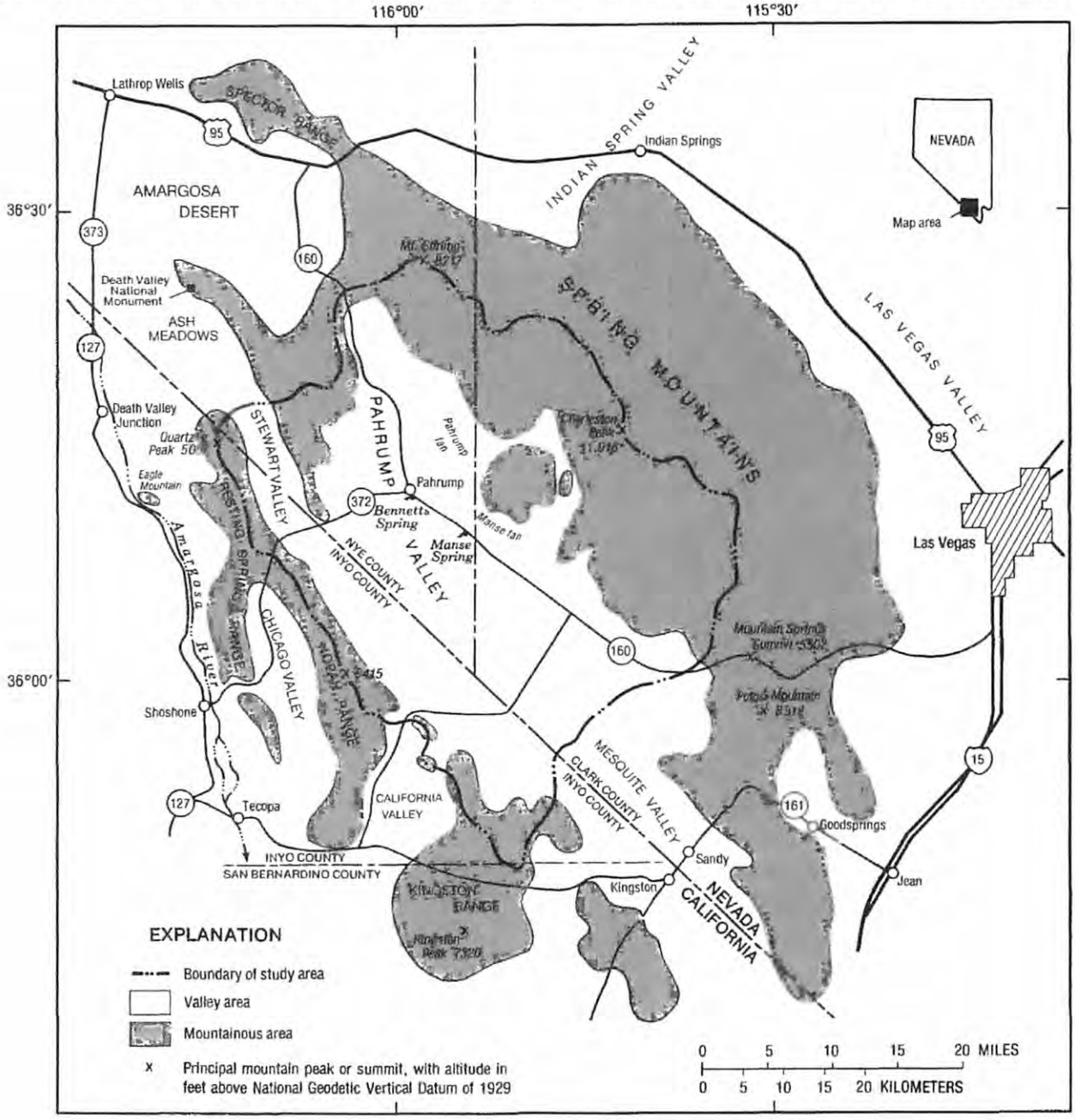

Figure 1. Location and general features of the study area.

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graphic area designated by Rush (1968) and also with the area used by Malmberg (1967) in his earlier study. Boundaries and general features of the study area are shown in figure 1.

The Spring Mountains form the northeast border of the area and are the dominant topographic feature. They are the source area for virtually all the area's water supply.

Charleston Peak (altitude 11,918 ft) is the highest point in the area. Altitude of much of the valley floor is between 2,500 and 2,800 ft, so the maximum topographic relief is more than 9,000 ft. For most of the area, however, topographic relief between the valley floor and adjacent mountains is between 2,000 and 6,000 ft.

The southwest side of the Spring Mountains is characterized by large alluvial fans that head high in the canyons leading from Mount Charleston. The most prominent of these fans have coalesced to form the major fans called the Pahrump and Manse fans (Malmberg, 1967, p. 8).

Pahrump Valley is part of an intervalley ground-water flow system that contributes ground water to low areas adjacent to Death Valley. The closest major areas of ground-water discharge downgradient from Pahrump Valley are between the towns of Tecopa and Shoshone, Calif., 10 to 15 mi southwest of the topographic boundary of Pahrump Valley (fig. 1).

Previous Work

About 20 previous studies deal with various aspects of the hydrology and geology of Pahrump Valley. Most of these studies are evaluations of larger areas and either include only descriptive information about Pahrump Valley or include quantitative information about only parts of the area. Only two studies contain detailed information that deals specifically with the hydrology of Pahrump Valley (Maxey and Jameson, 1948; Malmberg, 1967). The following paragraphs outline the general scope of the principal existing studies.

Mendenhall (1909) made a reconnaissance of the water resources of southwestern Nevada and southeastern California which included information on some springs in Pahrump Valley. This constituted one of the first investigations of the valley's water resources.

Waring (1921) studied the water resources of Pahrump, Mesquite, and Ivanpah Valleys in more detail. This report included data on wells and springs in Pahrump Valley and discussed the source and occurrence of ground water.

During the period 1922-36, the University of Nevada Agricultural Experiment Station at Las Vegas studied the occurrence and use of ground water in Las Vegas and Pahrump Valleys (Hardman and Miller, 1934; Hardman and Mason, 1949) and collected data on well and spring discharges, water levels, and chemical quality.

In 1944, a reappraisal of the ground-water resources of Pahrump Valley (Maxey and Jameson, 1948) was made which summarized all available information at that time. This study also included the first quantitative estimates of recharge to and discharge from the ground-water reservoir. Two other reports (Maxey and Robinson, 1947; Robinson and others, 1947) contain additional data compiled during this evaluation.

Data on wells in the California part of the valley are summarized in an office report by the California Division of Water Resources (1956).

A comprehensive evaluation of the hydrology of the study area was made by Malmberg (1967). This study included a reappraisal of the hydrology of the valley, documentation of the extent of development as of 1962, and a first evaluation of cause-effect relationships associated with pumping ground water. Three major contributions of this study were (1) detailed mapping of the surficial geology of the valley fill, including mapping of faults that affect ground-water flow; (2) demonstration that appreciable subsurface outflow occurs through consolidated rocks beneath the Nopah Range; and (3) formulation of a reasonably balanced ground-water budget that allows better estimates of the long-term yield of the basin. Geology of the valley has been mapped at 1:250,000 scale (Jennings, 1958, 1961; Jennings and others, 1962; Longwell and others, 1965; Cornwall, 1972; Wright and others, 1981). Gravity studies by Healey and Miller (1965), Kane and Carlson (1964), Chapman, Healey, and Troxel (1971), Healey (1973), and Nilsen and Chapman (1971) provided additional information about the structural basin. A regional study by Winograd and Thordarson (1975) that evaluated the hydrologic and hydrochemical framework of the south-central Great Basin provided information about flow characteristics of consolidated rock units and the regional structural framework.

The U.S. Bureau of Reclamation has included Pahrump Valley in one of the areas encompassed by the Inland Basins Project (U.S. Bureau of Reclamation, 1969, 1972). These reports contain summaries of hydrologic and other information about the valleys and evaluate the feasibility of large-scale pumping projects in selected areas.

Hydrologic studies of adjacent areas (Malmberg and Eakin, 1962; Malmberg, 1965; Hughes, 1966; Glancy, 1968; Dudley and Larson, 1976; Harrill, 1976) provided supplemental information that has transfer value for some areas and conditions in Pahrump Valley.

Numbering System for Wells and Springs

Pahrump Valley straddles the Nevada-California State line. A different well-numbering system is used in each State; both systems are used in this report to permit

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each well to be numbered compatibly for the State in which it is located.

Nevada System

The numbering system used for Nevada is based on an index of hydrographic areas (Rush, 1968) and the rectangular subdivision of the public lands referenced to the Mount Diablo base line and meridian or, in one small area, the San Bernardino base line and meridian. Each number consists of four units separated by spaces. The first unit is the hydrographic area number. The second unit is the township, preceded by an N or S to indicate location north or south of the base line. The third unit is the range, preceded by an E to indicate location east of the meridian. The fourth unit is the section number, followed by letters and a number that indicate location and sequence within the section. The letters "A" through "D" indicate quarter sections, counterclockwise beginning with "A" for the northeast quarter section. Where field maps are sufficiently accurate, additional letters "A" through "D" are also assigned in counterclockwise sequence to further subdivide the quarter sections into 40- or 10-acre tracts. The letters are followed by a number indicating the order in which the well was recorded in that particular tract. For example (see fig. 2), well 162 S19 E53 01ADA1 is in Pahrump Valley (hydrographic area 162), and it is the first well recorded in the NE¼SE¼NE¼, sec. 1, T. 19 S., R. 53 E., Mount Diablo base line and meridian, in Nevada. Wells located in Nevada between the Von Schmidt line and the State line, and west of R. 53 E., are referenced to the San Bernardino base line and meridian. This is indicated by an S in front of the township designation. For example, well 162 SN24 E08 26BAB1 is in the NW¼NE¼NW¼, sec. 26, T. 24 N., R. 8 E., referenced to the San Bernadino base line and meridian.

California System

Wells in the California part of Pahrump Valley are numbered according to their location in the rectangular system for subdivision of public land, referenced to the San Bernardino base line and meridian. For example, in the well number 22N/10E-1H1, the number and letter preceding the slash indicate the township (T. 22 N.), the number and letter following the slash indicate the range (R. 10 E.), the number following the hyphen indicates the section (sec. 1), and the letter following the section number indicates the 40-acre subdivision of the section, according to the lettered diagram in figure 2. The final digit is a serial number for wells in each 40-acre subdivision.

Basic Data

The basic data on water wells and ground-water levels collected during this study are stored in the ground-water site inventory files of the U.S. Geological Survey WATSTORE data base. This information may be retrieved through the U.S. Geological Survey District Office in Carson City, Nev., or through any designated NAWDEX assistance center.

Acknowledgments

Acknowledgment is made of the cooperation of residents of the valley in supplying data and permitting the use of their wells in the course of this investigation. Considerable information on historical water-level measurements, pumpage, and other well data was provided by Francis Thorne and Keith Cutler of the Nevada Division of Water Resources office in Las Vegas. Most of the drillers' logs and detailed data on well construction used in this investigation were furnished by the Nevada Division of Water Resources in Carson City, Nev. The Valley Electric Association furnished information on power consumption for irrigation and public-supply pumpage.

GEOLOGIC FRAMEWORK

The geologic framework determines many characteristics of a ground-water flow system. The processes of structural deformation and erosion determine the location, orientation, and altitude of mountain masses and also the extent and depth of structural basins. The rock type or lithology strongly affects water-bearing properties of consolidated rocks and valley-fill deposits. These factors can be related to the hydrology as follows:

1. The altitude and area of the mountains determine, to a large extent, the amount of precipitation that will be available to recharge the ground-water reservoir. The precipitation that falls on the mountains, primarily from winter storms, generally exceeds 15 in/yr in the higher mountain areas. This water provides virtually all natural recharge to the ground-water reservoir.
2. The amount of ground water that is stored in saturated materials is largely a function of the extent, thickness, and lithology of unconsolidated deposits that occupy the structural depression that typically underlies a valley in the Great Basin region.
3. Lithology may strongly affect the hydrologic regimen of a valley, particularly if a certain lithology predominates. For example, thick sequences of permeable carbonate rocks may transmit water well enough to cause a topographically closed basin to be either drained or recharged by subsurface flow, depending on the direction of hydraulic gradients between adjacent areas.

In this study, the geologic framework is evaluated in terms of the lithology of the consolidated rocks and unconsolidated deposits and the character of the structural basin that underlies the valley.

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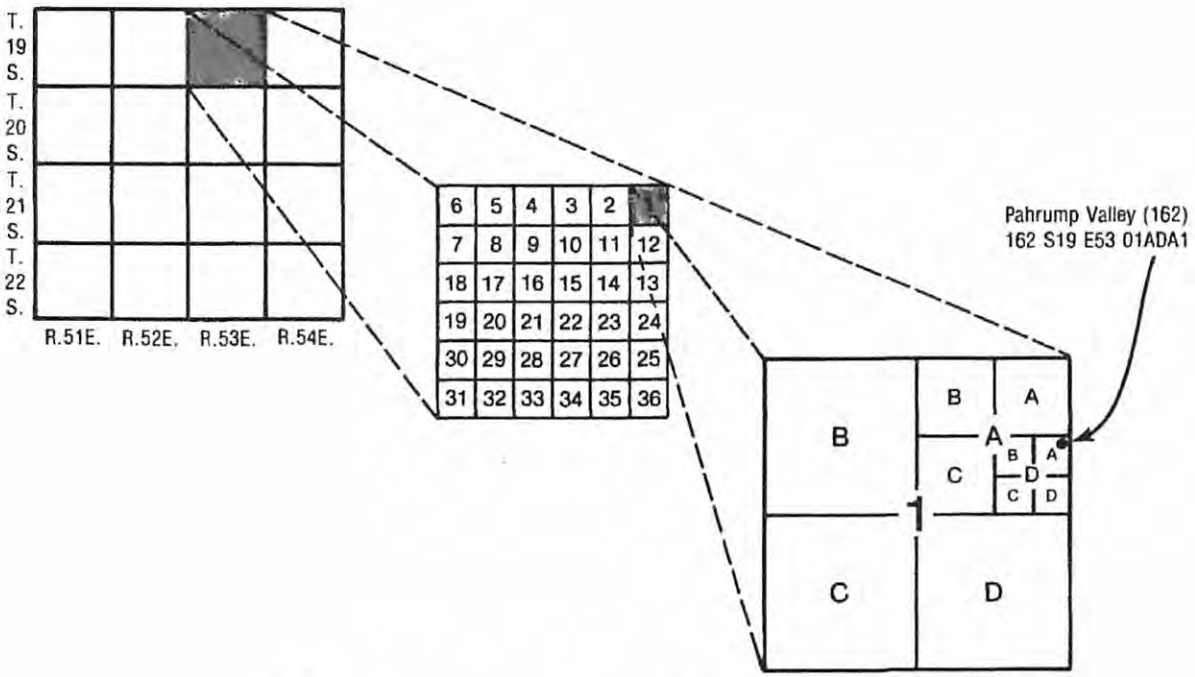
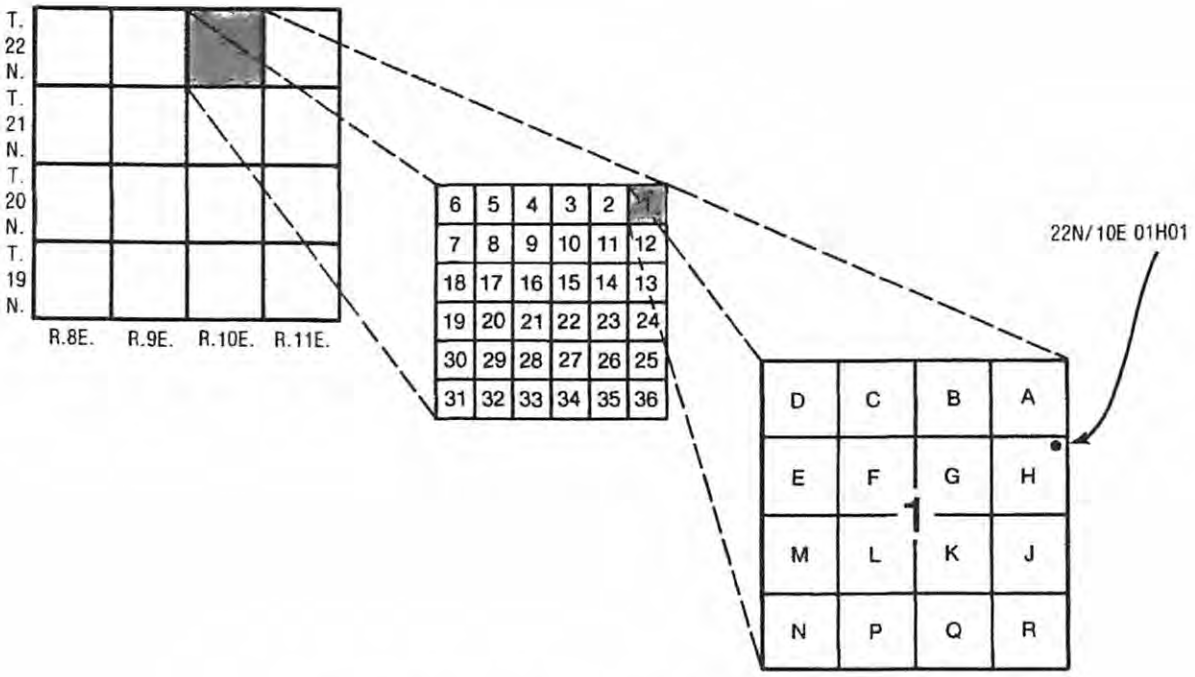


A. Numbering system used by Nevada



B. Numbering system used by California

Figure 2. Numbering systems for wells and springs, Nevada and California.

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Lithologic Units

For purposes of this report, the principal lithologic units in Pahrump Valley are grouped into two general categories: (1) unconsolidated and partly consolidated deposits, which form the valley fill and are generally highly porous (coarser grained deposits of this group generally transmit water readily), and (2) consolidated rocks, which compose the mountains and underlie the valley fill (commonly they have low porosity and permeability and do not readily transmit water except where highly fractured or where fractures in carbonate rocks have been enlarged by solution).

Each major group has been subdivided into several subcategories on the basis of lithologic and water-bearing properties. Nine lithologic units are described in table 1; descriptions are adapted from Longwell and others (1965), Cornwall (1972), Malmberg (1967), Winograd and Thordarson (1975), and Jennings (1958 and 1961). Distribution of these units is shown on plate 1.

The valley-fill deposits and the consolidated-rock aquifers form the two principal ground-water reservoirs in the area. They will be discussed in greater detail in a later section of this report.

Structural Features

Longwell and others (1965, p. 60) state that major orogenic, or mountain-building, activity in southern Nevada began in the late Mesozoic Era and continued into the Cenozoic Era. They list a number of events that relate to southern Nevada in general; however, two appear to have had the most direct effects on the ground-water regimen in Pahrump Valley. These are large-scale thrust faulting with associated folding in the late Mesozoic Era and normal faulting in the Tertiary Period of the Cenozoic Era.

Several large thrust faults are exposed in the Spring Mountains and at the north end of the Nopah Range (pl. 1). In some places, low-permeability clastic sedimentary rocks have been thrust above or adjacent to water-bearing carbonate rocks and restrict ground-water movement. Also, under some conditions, brecciated zones along fault planes may be conduits for ground water. Folding, which also occurred at this same general time, promotes development of sets of joints, and this process can result in significant secondary permeability under the right conditions.

Normal faulting in Cenozoic time, associated with the development of the Basin and Range province, formed the structural depression underlying Pahrump Valley and the adjacent mountain masses. Normal faults of large displacement are inferred to be present along the margins of Spring Mountains and Nopah Range. Stewart Valley (fig. 1) occupies a narrow structural trough; Malmberg (1967, pl. 1) mapped a fault in the valley fill that extends southeast from Stewart Valley parallel to the State line for about 15 miles. Wright and others (1981) mapped several faults with right-lateral components of movement in this area and referred to it as the Pahrump fault zone. These are the faults shown on plate 1. Springs and stands of mesquite along the northeast side of this feature suggest that it forms a partial barrier to ground-water flow.

GROUND-WATER RESERVOIRS

There are two distinct ground-water reservoirs in the study area: (1) the consolidated rocks that form the mountains surrounding Pahrump Valley and underlie the valley at depth, and (2) the unconsolidated deposits that have accumulated in the structural depression underlying Pahrump Valley.

Certain types of consolidated rocks transmit water well enough to carry significant underflow from Pahrump Valley. However, there has been virtually no development of this reservoir, and significant future development is improbable. Consequently, the consolidated-rock reservoir will be evaluated primarily in terms of its effect on the flow regimen of the valley-fill reservoir.

The valley-fill reservoir contains the most productive known aquifers in the area and supports virtually all existing development. It is the most feasible source for future development. Consequently, the analysis presented in this report will be made largely in terms of the hydrology of the valley-fill reservoir

Consolidated-Rock Reservoirs

Carbonate-Rock Aquifers

The carbonate-rock aquifers are composed primarily of carbonate sedimentary rocks from Cambrian to Permian age that crop out in the Spring Mountains, underlie the valley fill of Pahrump Valley, and extend westward through the Nopah and Resting Springs Ranges into California and Chicago Valleys (table 1, fig. 1, pl. 1). These aquifers are roughly equivalent to the lower and upper carbonate aquifers defined by Winograd and Thordarson (1975, p. C14-C31) in their evaluation of regional flow systems in the south-central Great Basin.

No wells in the study area penetrate the carbonate aquifers, so their properties must be inferred from information about other areas. The aggregate stratigraphic thickness of this sequence of rocks may be as much as 18,000 ft; however, these rocks have been complexly faulted and folded, and the aggregate vertical thickness at

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any one place may be substantially more or less than this stratigraphic thickness.

Hydraulic continuity is probably achieved through extensive fractures and, to a small degree, by localized solution channels. The effective fracture porosity of the lower carbonate aquifer was estimated by Winograd and Thordarson to average probably less than 1 percent, although locally it may be much higher. If these rocks were to be dewatered by pumping or other means, the average specific yield would be low, probably on the order of 0.5 percent.

Transmissivity is highly variable. Winograd and Thordarson (1975, p. C22) computed or estimated transmissivities from the results of pumping tests of 10 wells that penetrated one or more formations in the lower carbonate aquifer. Values ranged from about 130 to 120,000 ft^2/d (feet squared per day). They suggested that the wide range in transmissivity may not be randomly distributed but may be structurally controlled. They concluded that in the vicinity of the test site, extensive zones of above-average fracture transmissivity over long distances are improbable.

They also estimated the gross fracture transmissivity of the lower carbonate aquifer at several places, using potentiometric contour maps and known or estimated amounts of flow. In areas of high fracture permeability, such as the Spector Range, transmissivity was estimated to be in the hundreds of thousands to millions of feet squared per day. In contrast, beneath Yucca Flat (about 50 mi north of Pahrump Valley) transmissivity of the lower carbonate aquifer was estimated to average less than 1,300 ft^2/d. For purposes of this study, average transmissivity of the carbonate-rock aquifers around and beneath Pahrump Valley is estimated to be between 1,500 and 2,500 ft^2/d.

Clastic Aquitards

The term "clastic aquitard" was used by Winograd and Thordarson (1975) to categorize certain assemblages of low-permeability rocks in parts of the south-central Great Basin. The same concept is used in this report. The principal clastic aquitards in the vicinity of Pahrump Valley are a sequence of clastic sedimentary rocks of Cambrian and Precambrian age and a younger sequence of continental deposits of Cretaceous to Triassic age (table 1). In addition, there is a sequence of interbedded limestone and fine-grained clastic sedimentary rocks of Permian age which are probably more permeable than the first two units mentioned but still transmit water slowly enough to be relative barriers to ground-water flow.

The surficial distribution of these rocks is shown on plate 1. There is virtually no information about the distribution of these rocks beneath areas of valley fill. It was assumed that the rocks exposed in the mountains were general indicators of the rock type probably present beneath adjacent areas of valley fill. Thus, the northwest and southeast ends of the valley are presumed to be underlain by rocks of comparatively low permeability.

No wells in the area tap the clastic aquitards, so their hydraulic properties had to be inferred from information from nearby areas. Winograd and Thordarson (1975, p. C42–C43) evaluated the water-bearing characteristics of two units they termed the "upper" and "lower" clastic aquitards. They stated that although, where locally fractured, transmissivity may be as high as 1,300 ft^2/d for the lower aquitard, transmissivity for the bulk of the aquitard probably does not exceed 130 ft^2/d. They estimated that transmissivity was probably less than 70 ft^2/d for the upper clastic aquitard. Conditions are presumed to be similar in Pahrump Valley, and the average transmissivity of the clastic aquitards is estimated to be between 30 and 60 ft^2/d.

Valley-Fill Reservoir

The valley-fill reservoir is composed of unconsolidated alluvial, colluvial, and lacustrine deposits that partly fill the structural depression underlying Pahrump Valley. Some volcanic tuff is interbedded with the fill deposits.

Areal Extent

The approximate areal extent of the valley-fill reservoir is shown on plate 1. Total surface area is about 650 mi^2, or about two-thirds of the total area of Pahrump Valley. The reservoir is bounded on the northeast, northwest, and southwest by consolidated rocks of the Spring Mountains, Resting Springs Range, Nopah Range, and Kingston Range (fig. 1). The southeast end of the valley is generally continuous with the valley-fill reservoir in Mesquite Valley. For the purposes of this study, the southeast boundary of the reservoir is regarded to be coincident with the topographic divide between Pahrump and Mesquite Valleys. The topographic divide approximates a flow line along the predevelopment potentiometric surface, so there was no significant flow across this boundary under natural conditions.

Thickness

Wells drilled in the valley-fill reservoir range from several tens to more than a thousand feet deep. With the exception of one or two wells on the margins of the reservoir, they do not fully penetrate the valley fill and encounter bedrock. Consequently, it was necessary to use gravity data to obtain generalized information about the

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Table 1. Principal lithologic units and their hydrologic properties

Age	Unit	Thickness (feet)	Lithology	Occurrence	General hydrologic properties
Holocene and Pleistocene	Playa deposits	0-50	Unconsolidated; clay, silt, and fine sand.	Playas in Stewart Valley and southwestern Pahrump Valley.	High porosity and very low permeability. Deposits function as confining beds and do not readily yield water to wells.
Holocene and Pleistocene at and near surface to Pliocene or Miocene at depth	Lacustrine and associated fine-grained deposits	0-5,000	Predominantly clay, silt, and some fine sand. Some mudflow debris and beds of caliche. Youngest deposits typically calcareous.	Occupies valley floor at surface and at depth. Includes medial lacustrine deposits and older lacustrine deposits as mapped by Malmberg (1967).	Fine-grained materials generally have high porosity and low permeability. Beds of fine sand may yield moderate amounts of water to wells. Deposits at depth presumably more compacted, with lower porosity and permeability.
	Fanglomerate and associated course-grained deposits		Unconsolidated to cemented alluvial-fan deposits and mudflow debris composed of boulders, sand, silt, and clay. Contains lenses of relatively clean, well-sorted sand and gravel.	Occurs over margins of valley. Occupies areas on intermediate slope between comparatively flat valley floor and mountains. Deposits at depth occupy same general position, and interfinger with lacustrine and associated fine-grained deposits toward center of valley. Includes some surficial deposits, younger fan deposits, medial fanglomerate, and older fanglomerate as mapped by Malmberg (1967).	Highly permeable lenses of gravel and sand readily yield water to wells, and are the most productive aquifers in the valley.
Pliocene or Miocene	Tuff		White and light-yellow to light-green beds of thinly laminated tuff; extensively faulted or folded.	Exposed at base of the upthrown fault block along the Nevada California border; may be interbedded with other valley-fill deposits at depth.	Consolidated and partly to highly indurated; has very low permeability. Would yield virtually no water to wells.
Tertiary or Cretaceous	Megabreccia		Landslide blocks of monolithologic dolomite breccia from Bonanza King Formation.	Occurs along south end of ridge between Pahrump Valley and Stewart Valley. Uncomformably overlies Stirling Quartzite in this area.	May transmit significant amounts of water along fractures and breccia openings enlarged by solution.

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Cretaceous to Triassic	Continental deposits	1,500±	Sandstone, shale, and conglomerate. Some interbedded limestone and gypsum.	Exposed in Spring Mountains in southeastern part of study area. Includes Chinle and Moenkopi Formations.	Generally low permeability; may transmit small to moderate amounts of water along fractures. Gypsum may increase sulfate content of ground water.
Permian	Limestone and fine-grained clastic rocks	800±	Limestone, dolomite, shale, conglomerate, and sandstone. Sequence contains significant gypsum.	Exposed in Spring Mountains in southeastern part of study area. Includes Kaibab Limestone, Toroweap Formation, and red beds.	Generally impermeable; may transmit moderate amounts of water where fractured or where fractures have been enlarged by solution. Gypsum may increase sulfate content of ground water.
Permian to Cambrian	Carbonate sedimentary rocks	18,000±	Limestone, dolomite with medial shale, sandstone, and quartzite.	Exposed in Spring Mountains; in Nopa and Resting Spring Range, along southwest side of area; and in mountains at northwest end of Pahrump Valley. Also underlies valley-fill deposits in parts of area. Includes Bird Spring Formation, Monte Cristo Limestone, Devils Gate Limestone, Nevada Formation, Sultan Limestone, Lone Mountain Dolomite, Ely Springs Dolomite, Eureka Quartzite, Pogonip Group, Nopah Formation, Bonanza King Formation, and upper part of Carrara Formation.	Generally impermeable except where fractured. Where solution has caused secondary enlargement of joints and fractures, rocks may be highly permeable. Unit acts as an aquifer and transmits significant subsurface outflow from Pahrump Valley.
Cambrian and Precambrian	Clastic sedimentary rocks	10,000±	Sandstone, shale, siltstone, quartzite, minor limestone, and dolomite.	Exposed in Spring Mountains at north end of valley; in Resting Springs Range at west end of area; and probably at north end of Kingston Range at south end of valley. Includes lower part of Carrara Formation, Zabriskie Quartzite, Weed Canyon Formation, Stirling Formation, and Johnnie Formation.	Generally impermeable; may transmit moderate amounts of water where fractured. Unit acts as an aquitard.

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subsurface configuration of the reservoir. When the force of gravity is measured at a given point, the reading is affected in part by the density of underlying materials. Unconsolidated valley-fill deposits typically have substantially lower densities than adjacent and underlying consolidated rocks. This results in gravity anomalies, in valley areas, that are roughly proportional to the thickness of valley-fill deposits.

Several investigators, Healey and Miller (1965), Kane and Carlson (1964), Chapman and others (1971), and Healey (1973), have constructed Bouguer gravity anomaly maps that include parts of Pahrump Valley. A composite map of the complete Bouguer gravity anomalies for Pahrump was constructed from their work (pl. 2).

Anomalies shown on plate 2*A* are affected by both regional trends and local conditions. The regional trends were eliminated from the data by drawing 20 sections and subtracting a regional gradient from the observed anomalies along each section. The residual anomalies were then plotted on a map and contoured. The resulting map is shown on plate 2*B*. These anomalies give a very rough approximation of the subsurface configuration of the valley-fill reservoir.

Rough quantitative estimates of the thickness of the valley-fill deposits were developed by making a two-dimensional analysis of the anomalies along four cross sections (*A*–*A'*, *B*–*B'*, *C*–*C'*, and *D*–*D'* on pl. 2*A*). The analysis was performed by using the Talwani method (Talwani and others, 1959) and a computer program developed by the Geological Survey. Density of the valley fill was assumed to average about 2.2 g/cm^3 (grams per cubic centimeter) and density of consolidated rocks was assumed to average about 2.7 g/cm^3, resulting in a density contrast of 0.5 g/cm^3. These values are the same as those used by Healey and Miller (1965, p. 7) in their gravity survey of the adjacent Amargosa Desert area. Profiles computed from this analysis are shown on plate 2*D*. The relation between residual anomalies and computed depth along the four sections was applied to the anomalies on plate 2*B* to estimate approximate thicknesses of fill throughout the valley. The estimated thicknesses are shown on plate 2*C*. Maximum computed thickness of about 4,800 ft occurred along section *D*–*D'* in the central part of the valley.

In general, the thickest accumulations of valley fill are along the axis of the valley south of State route 372. The area of maximum thickness is offset slightly toward the south end of the valley, which suggests some structural relief in that area. Also, the shape of the structural depression changes from a broad shallow trough north of State route 372 (section *A*–*A'*) to a composite depression south of route 372 (sections *C*–*C'* and *D*–*D'*). In this area the basin consists of (1) a broad upper trough that spans the entire width of the valley and has a maximum depth of 2,000 to 2,500 ft, and (2) a second trough 1,000 to 2,000 ft deeper that occupies the central part of the first depression. This suggests that the basin probably contains significant internal structures and that the history of deformation may be complex. However, since only reconnaissance-level data were available for analysis, additional fieldwork with a higher density of gravity stations is needed before anything but generalized approximations can be made regarding subsurface structure.

An example of the inadequacy of the present information to handle details concerns the fault, mapped on plate 1, which parallels the State line in townships 21, 22, and 23 south. This feature has been mapped as a normal fault upthrown on the northeast side (Malmberg, 1967, pl. 1) and as a fault with a right-lateral component of movement (Wright and others, 1981). An eroded fault-line scarp with a maximum relief of about 80 ft and tilted bedding on the upthrown side support some vertical movement; however, sections *C*–*C'* and *D*–*D'* show no offset on the bedrock. There are a number of possible explanations for this apparent discrepancy. One of the simplest is that the structural relief was too small to register in the analysis of the available data. This emphasizes the need for additional subsurface information.

Hydraulic Properties of the Valley Fill

Hydraulic Conductivity

Hydraulic conductivity is a measure of how easily a material will transmit water. Hydraulic conductivity is customarily expressed in terms of unit values for the area of aquifer through which a fluid moves under unit gradient per unit of time. Many natural materials transmit water in the horizontal direction much more readily than in the vertical direction. Approximate values of the horizontal conductivity of deposits typical of those in the valley-fill reservoir are listed below (values modified from Chow, 1964, fig. 13–8).

Lithologic unit (table 1)	Typical materials	Probable range of hydraulic conductivity (ft/d)
Playa deposits	Clay and silt	0.001 - 0.3
	Very fine sand	0.1 1.6
Lacustrine and associated fine-grained deposits.	Silt and clay	0.1 - 0.5
	Fine sand	1 4
Fanglomerate and associated coarse gravel.	Mostly silt, sand, and gravel	0.1 4
	Sand	4 30+
	Gravel	20 - 150+

These values illustrate that well-sorted gravel and sand are by far the most prolific water-yielding materials in the valley fill. Consequently, most of the water produced by wells that penetrate a variety of materials may be derived from only a few beds of coarse sand and gravel.

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The average vertical hydraulic conductivity of a sequence of deposits typically is much less than the average horizontal hydraulic conductivity. The ratio between the two generally varies according to the type of material. Sequences of well-sorted sand and gravel commonly have higher vertical hydraulic conductivities than do sequences that contain significant amounts of clay, silt, or cemented materials. For the latter materials, average vertical hydraulic conductivity values can be as small as a hundredth to a thousandth of the horizontal hydraulic conductivity. Figure 3 shows the estimated distribution of vertical hydraulic conductivity in the upper 500 ft of valley-fill deposits. The distribution shown was first estimated using available geologic and hydrologic information and was then refined during calibration of the aquifer model described in a later section of this report.

Transmissivity

Transmissivity is a measure of the ability of an aquifer to transmit water. Transmissivity is dependent on the hydraulic conductivity and thickness of the water-bearing material. Transmissivity may be calculated from the results of aquifer tests, estimated as the product of hydraulic conductivity and thickness of the aquifer, or estimated from specific capacities of wells, provided the wells are highly efficient. Specific capacities are expressed as well yield, in gallons per minute per foot of drawdown. Properly designed wells in deposits with high transmissivity have higher specific capacities than wells tapping deposits with low transmissivity.

Figure 4 shows the approximate distribution of transmissivity of the upper 1,000 ft of saturated valley fill. This thickness was chosen because it roughly approximates the interval most affected by pumping.

Indices of Ground-Water Storage

When the hydraulic head in an aquifer changes there is a resulting change in the amount of ground water in storage. Water can come from the draining of deposits, elastic changes in the aquifer or water, or inelastic changes in the aquifer. Water produced by these processes is described in terms of the specific yield of an unconfined aquifer, the storage coefficient of an aquifer, and the specific storage of a porous medium.

Specific yield of a deposit is the ratio of (1) the volume of water which, after being saturated, the deposit will yield by gravity, to (2) its own volume, usually expressed as a percentage (Lohman and others, 1972, p. 12). Specific yield of alluvial deposits ranges from about 30 percent in well-sorted sand or gravel to less than 5 percent in compacted clay or deposits with extensive caliche development. The fanglomerate and associated coarse-grained deposits shown on plate 1 typically have specific yields of between about 13 and 25 percent. The higher end of the range is associated with well-sorted sands and gravels, and the lower end with poorly sorted mudflow deposits and areas with significant caliche development. The lacustrine and associated fine-grained deposits shown on plate 1 typically have specific yields of between about 5 and 15 percent depending on the degree of compaction of clay and the amount of fine sand present. The distribution of specific yield used in this study is shown in figure 5.

Storage coefficient of an aquifer is the volume of water released from or taken into storage per unit of surface area per unit change in head. Water comes from expansion of the water and compression of the aquifer. Compression of the aquifer may be elastic or inelastic. Coarse-grained deposits such as sand and gravel are characterized by a relatively rigid framework that is supported by grain-to-grain contact; aquifer compression in these deposits is typically elastic. Fine-grained deposits, such as clay or silt, generally do not possess a rigid framework, and typically both elastic and inelastic compression occur. For conditions that exist in Pahrump Valley, the quantity of water involved in inelastic compression of the aquifer is much greater than that involved in elastic compression. Consequently, for purposes of evaluating the current response to pumping in Pahrump Valley, it is satisfactory to assume that virtually all water yielded from storage by fine-grained materials is produced by inelastic compaction. Fine-grained materials form only a part of the total valley fill, and their aggregate thickness varies from place to place. Consequently, it is necessary to consider water released from or taken into storage per unit volume of a porous medium.

Specific storage is the volume of water released from or taken into storage per unit volume of the porous medium per unit change in head. There are no field data to describe specific storage of fine-grained deposits in Pahrump Valley; however, in adjacent Las Vegas Valley, areas underlain by fine-grained deposits generally required 20 to 80 ft of head decline to produce 1 ft of land subsidence. Comparison of these known magnitudes of land subsidence with measured head declines and the approximate thickness of the confining layer suggests that in Las Vegas Valley specific storage of the confining beds is on the order of 0.001 to 0.0001 per foot (Harrill, 1976, p. 19). Lofgren (1977, p. 30) states that compressible deposits may have an inelastic (largely nonrecoverable) virgin specific storage of about 0.0001 per foot. Compressible fine-grained deposits in Pahrump Valley probably have specific storage values of about the same magnitude.

In Pahrump Valley, the thickness of the saturated valley fill ranges from about 200 to 4,000 ft. If no appreciable fine-grained deposits were present, the storage coefficient for these thicknesses would be 0.0002 to 0.003. The percentage of fine-grained materials present ranges from

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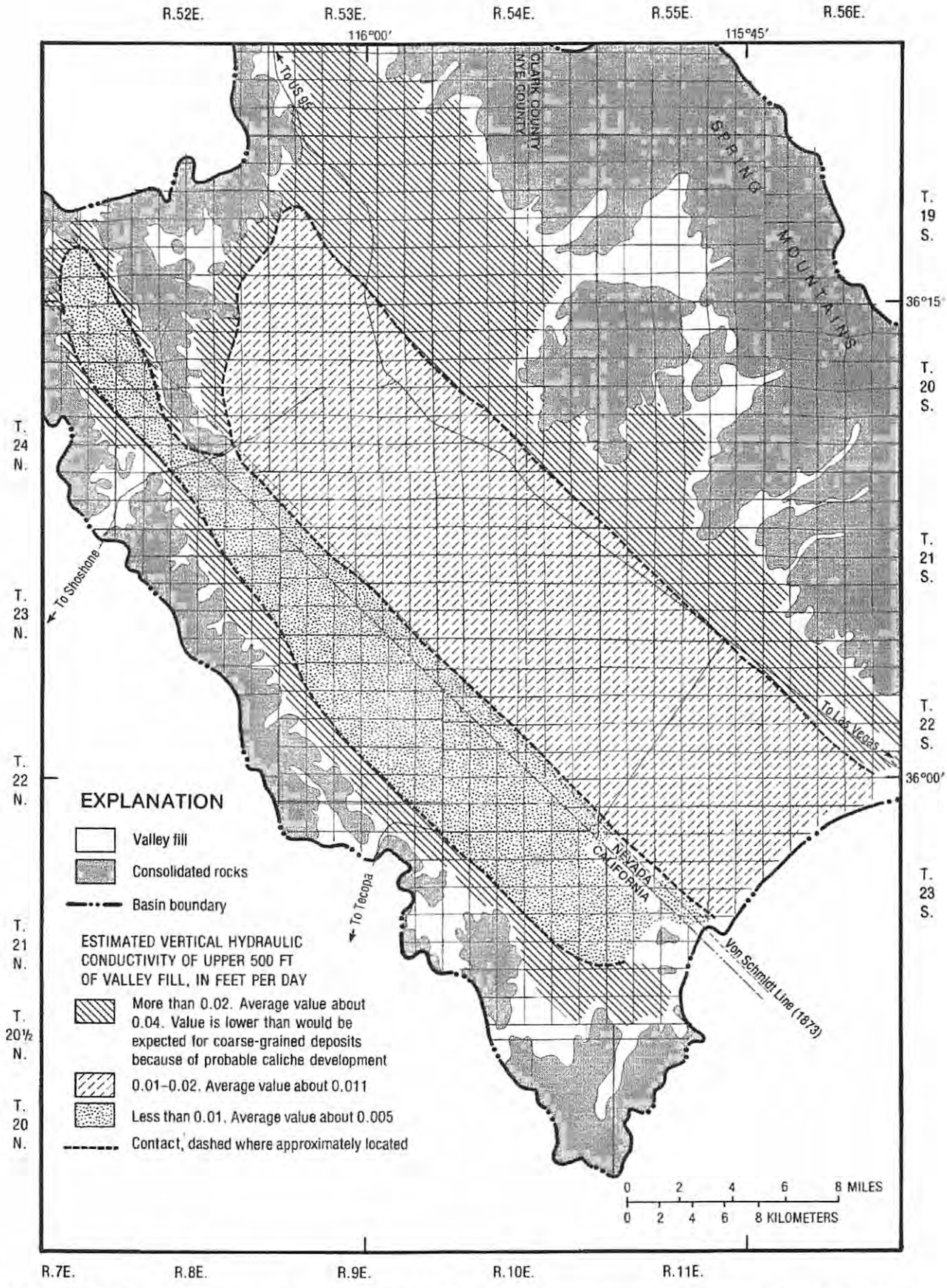

Figure 3. Estimated distribution of average vertical hydraulic conductivity in upper 500 ft of saturated valley fill.

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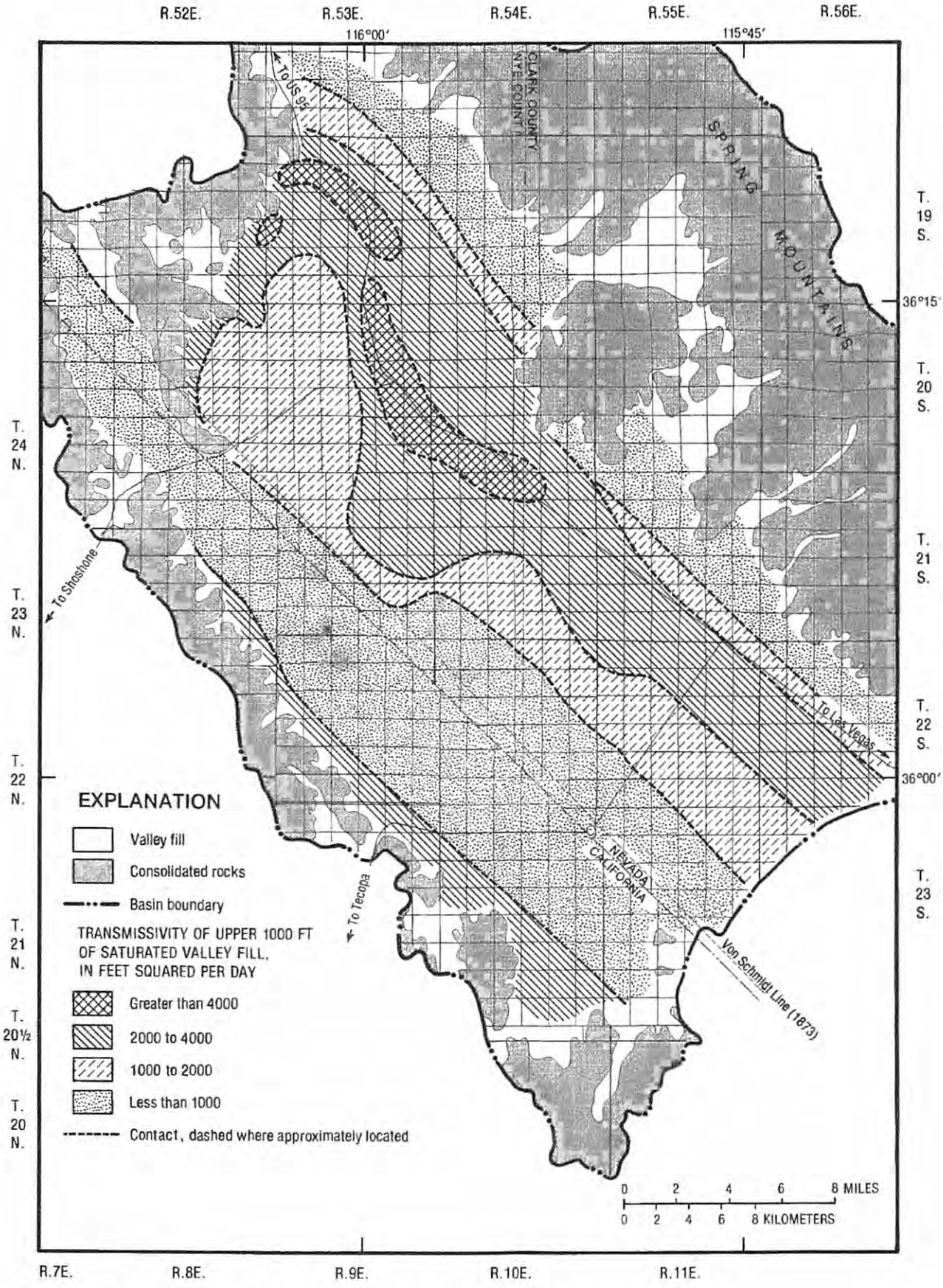

Figure 4. Estimated transmissivity of upper 1,000 ft of saturated valley fill.

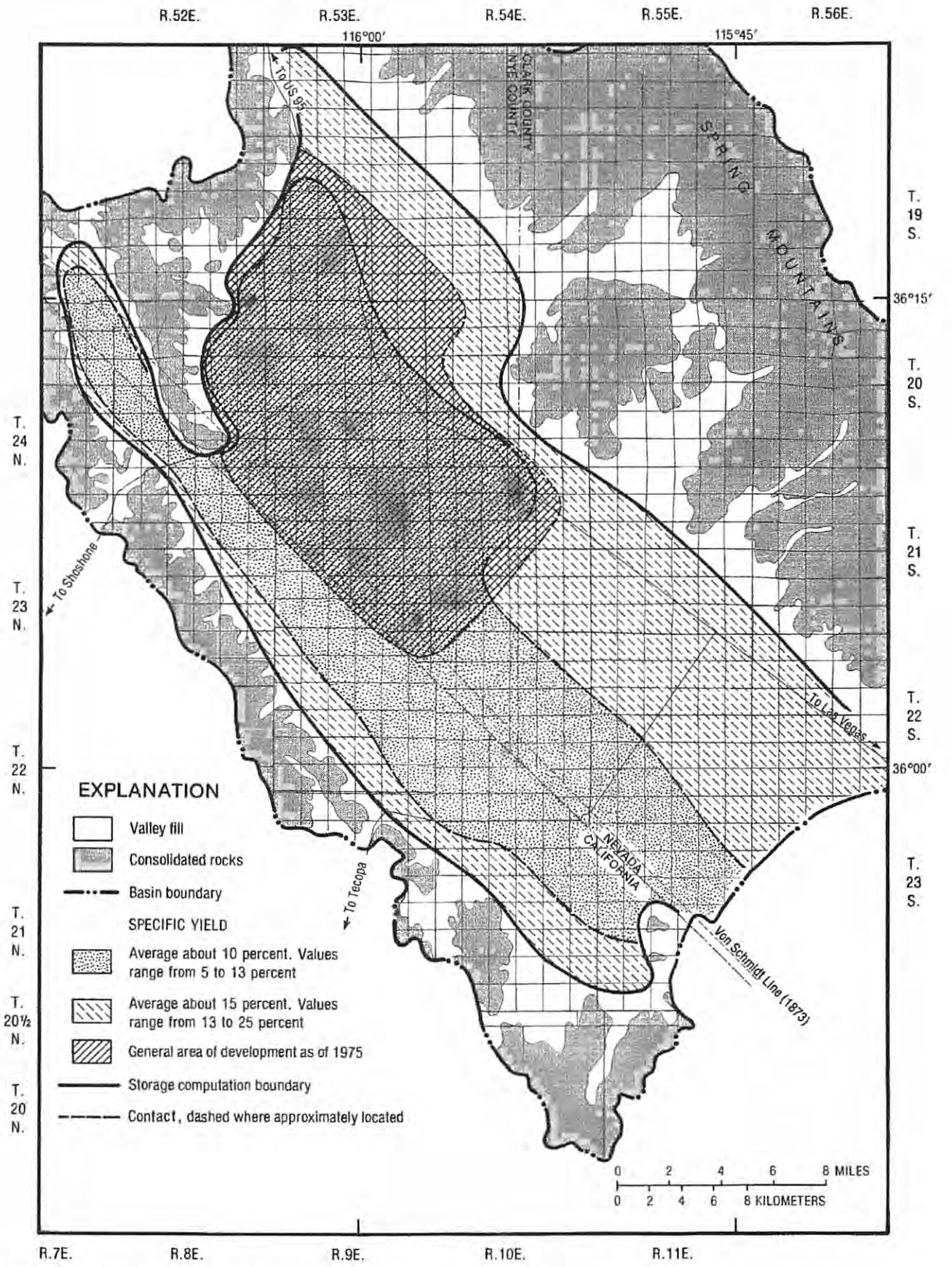

Figure 5. Estmated specific yield.

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a very small amount around the margins of the valley to possibly as much as 80 in the central valley. If a change in head were uniformly distributed throughout the full thickness of the reservoir, the storage coefficient would be nearly 0.25. However, it is more probable that significant head changes would occur primarily in the most heavily pumped zones of the reservoir, for example, a 500-foot-thick interval in the upper part of the reservoir. In this case, the storage coefficient would be estimated to be about 0.04. In the quantitative parts of this study, values within the range 0.0002 to 0.003 were used for coarse-grained deposits around the margins of the valley and values within the range 0.001 and 0.04 were used for fine-grained deposits in the central part of the valley.

OUTLINE OF GROUND-WATER HYDROLOGY

Source, Occurrence, and Movement of Ground Water

Virtually all the ground water in Pahrump Valley is derived from precipitation that falls within the basin. Deep infiltration (recharge) occurs in the mountains, where percolating water moves through bedrock fractures to the zone of saturation, and on the upper slopes of the alluvial apron, where streamflow percolates through unsaturated valley fill to the zone of saturation.

Recoverable ground water is primarily in the saturated parts of the valley and in fill under both water-table and confined conditions. Confined conditions exist where saturated permeable deposits are overlain by less permeable strata and where the water at the top of the aquifer is under greater than atmospheric pressure. Water-table conditions exist where the water at the top of the zone of saturation, the water table, is at atmospheric pressure. Figure 6 shows the generalized depth to ground water as of March 1976.

Ground water moves along the path of lowest resistance from areas of high hydraulic head to areas of lower hydraulic head. The rate of movement depends on the hydraulic gradient and on the permeability and porosity of the material through which the water is moving. Typical rates in this area range from several feet per year to several hundred feet per year.

The general slope of the ground-water surface in Pahrump Valley under predevelopment conditions (prior to 1913) is shown in figure 7. This figure shows the approximate configuration of the potentiometric surface in that part of the valley-fill reservoir penetrated by most of the high-yield wells (generally the upper 200 to 1,000 ft of saturation). It was constructed with the earliest measurements available. Ground-water flow was generally from the principal recharge areas adjacent to the Spring Mountains southwestward across the valley toward the Nopah Range. Water left the valley by evapotranspiration in areas of shallow ground water and by subsurface outflow beneath the Nopah Range. As drawn, the contours in figure 7 suggest that as water flowed across the northwest border of Pahrump Valley it moved into and through projections of consolidated rocks. The final disposition of this water is not known with certainty. Hydraulic gradients exist toward both the Ash Meadows discharge area (in the Amargosa Desert north and west of Pahrump Valley) and a discharge area along the Amargosa River between the towns of Shoshone and Tecopa (southwest of Pahrump Valley). Winograd and Thordarson (1975, p. C90-C92) evaluated the relation of the Ash Meadows ground-water basin to the Pahrump Valley ground-water basin and concluded that because a significant assemblage of rocks assigned to the clastic aquitards was exposed between Pahrump Valley and the Ash Meadows ground-water discharge area, at most only a small percentage of the Ash Meadows discharge can be derived from either Stewart Valley or western and northwestern Pahrump Valley.

Ground-Water Storage

The potentially recoverable water stored in the valley-fill reservoir can be estimated as the product of an area, a thickness, and a specific yield. The following procedures were used to compile estimates for Pahrump Valley:

1. The area underlain by valley fill was divided into a number of rectangular nodes identical to those used in the ground-water model that will be described in a later section of this report (see fig. 15).
2. For each node the thickness of saturated valley fill was determined, using total thickness of fill shown on plate 2*C* and depths to water shown in figure 6; the specific yield was determined from figure 5.
3. Recoverable storage for each node was calculated as the product of the area of the node, an interval of saturated valley fill, and a specific yield. Two intervals were used, the upper 200 ft of saturation and the remainder of the saturated valley fill. The yield of the interval below 200 ft was reduced by 5 to 15 percent (depending on the thickness of fill at each node) to account for lower yields in the older, more deeply buried deposits.
4. Values for nodes were summed to give the results listed in table 2. Computations were made for two general areas, the developed area as of 1975 (shown in fig. 5) and the remaining area of valley fill.

The estimated total amount of recoverable water stored in the valley-fill reservoir, 57 million acre-ft, illustrates the vast amounts of water stored in large

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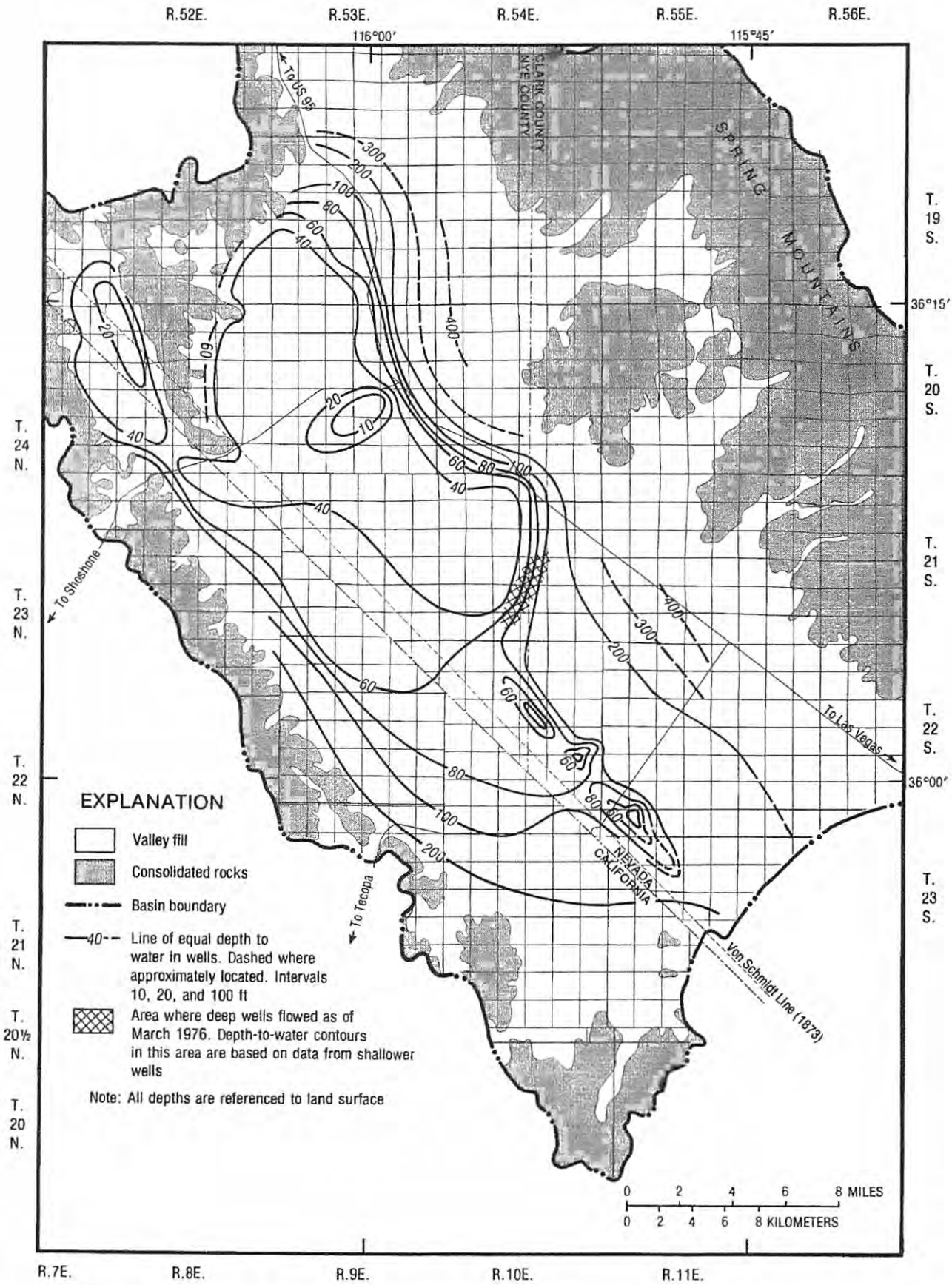

Figure 6. Depth to water, March 1976.

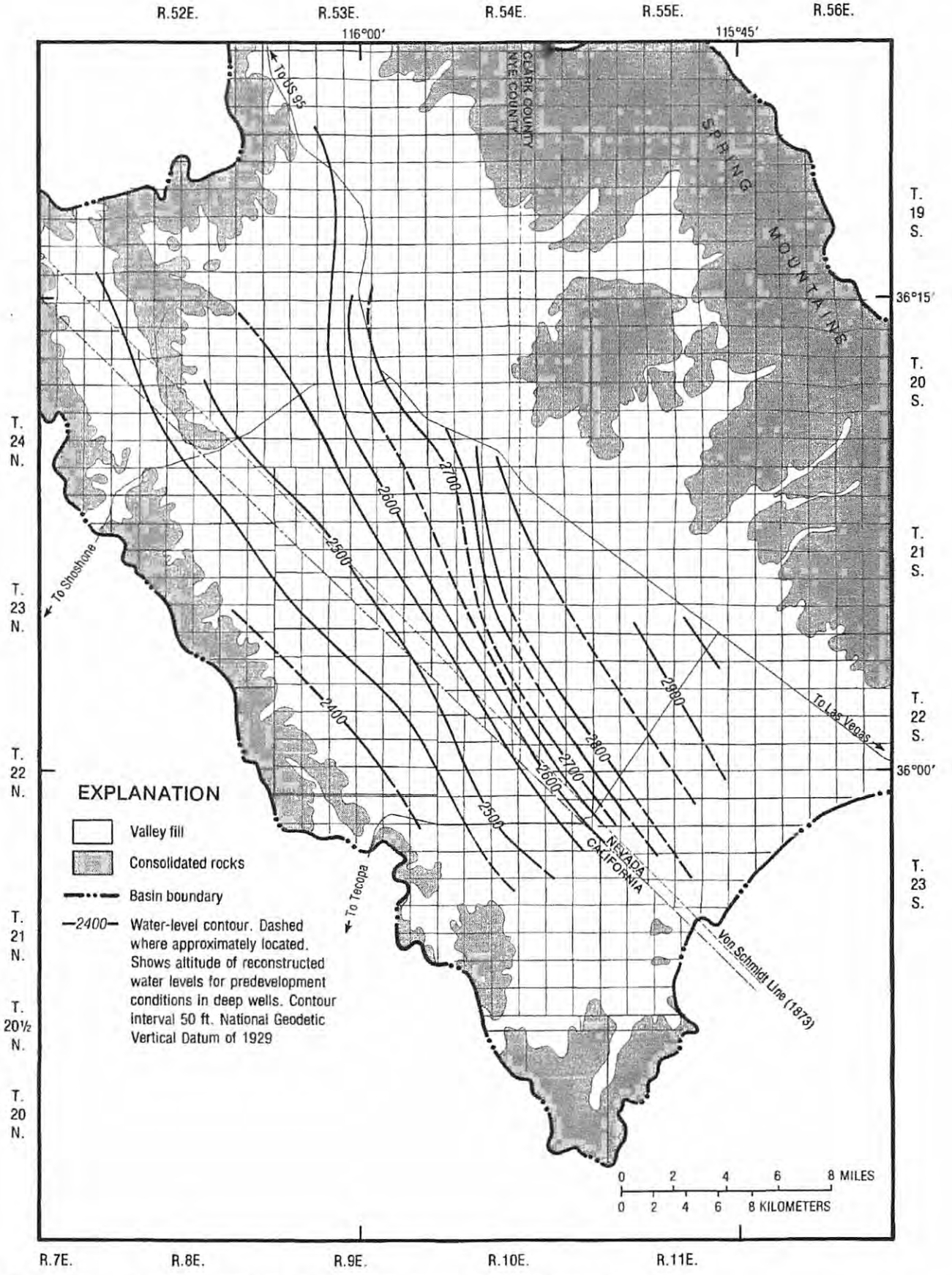

Figure 7. Water-level contours for deep wells under predevelopment conditions.

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Table 2. Estimated recoverable ground-water storage

Location[1]	Recoverable ground-water storage (acre-feet, rounded)		
	Upper 200 feet of saturation	Saturated valley fill below 200 feet	Total valley fill
Developed area as of 1975	2,300,000	17,000,000	19,000,000
Area remote from 1975 development	5,500,000	32,000,000	38,000,000
Totals	7,800,000	49,000,000	57,000,000

[1] See figure 5 for location of areas.

valley-fill ground-water reservoirs in the Great Basin. However, much of this water cannot be practically recovered with our existing technology owing to economic factors, such as high pumping lifts, and environmental factors, such as land subsidence. Also, the quality of the deeper water is not known. The estimated 2.3 million acre-ft stored in the upper 200 ft of saturated valley fill in the 1975 area of development is probably within economic pumping lifts using the 1975 distribution of pumpage. Even so, depletion of this amount of storage would probably cause land subsidence in the central part of the valley.

Ground-Water Development

Development Prior to 1962

Pahrump Valley has supported agricultural development for many years. Two large springs (Bennetts Spring and Manse Spring, fig. 1) provided water to early travelers and were soon developed for irrigation. Mendenhall (1909, p. 91) described the level of development in Pahrump Valley shortly after the turn of the century as follows:

> Pahrump, one of the oldest settlements in the southern part of Nevada, is about 7 miles northwest of Manse, on the road to Fairbanks Ranch. It is a large ranch in whose cultivation a number of Indians are employed. Here orchards, vineyards, and extensive fields of alfalfa flourish, and the water used in irrigation is supplied by a number of large, deep-seated warm springs similar to those at Manse. Travelers can obtain hay and grain here.
>
> The springs at Manse have been known for years to travelers going northward from points in southern Nevada, and the place has long been the principal stopping point along this route. By the use of the water which the springs yield, this portion of the desert has been converted into a veritable oasis, and the 500 or 600 acres of alfalfa, orchards, and vineyards show the capabilities of the desert soil when water can be applied to it in sufficient quantity.

The springs described on the Pahrump Ranch were named Bennetts Spring and are reported to have flowed at about 7.5 ft^3/s in the late 1800's. Manse Spring is reported to have flowed at about 6 ft^3/s at that time (Maxey and Jameson, 1948, p. 10). The total average annual flow was about 9,800 acre-ft.

In 1910, the first well was drilled in Pahrump Valley in an attempt to obtain artesian water from wells. That attempt was unsuccessful; however, in 1913, three flowing artesian wells were successfully completed, and development of the area's ground-water resources had begun. In 1916, Waring (1921, p. 76–79) reported 28 wells in Pahrump Valley, 15 of which were flowing.

The number of new wells drilled and the annual pumpage increased slowly until the mid-1940's. At that time many wells were drilled and large-capacity pumps installed. From the mid-1940's through 1962, the annual discharge from wells increased from an estimated 10,000 acre-ft/yr to about 28,000 acre-ft/yr (Malmberg, 1967, p. 30-31). Thus, pumpage from the ground-water reservoir in 1962 was about three times greater than the reported natural flow from springs in the late 1800's.

Development 1962–75

The period 1962–75 was one of population growth and significant change in land use for Pahrump Valley. Population increased from about 250 in 1962 to nearly 1,500 in 1975. This increase in population was accompanied by conversion of land from agricultural use to real-estate development.

In the early 1960's Pahrump Valley was one of the most productive farm districts in southern Nevada. Cotton and alfalfa were the principal crops. The area remained primarily on an agriculture-based economy during most of the 1960's. In 1963, electrical power was introduced to the valley, followed by telephone service in 1965. In the late 1960's several large tracts of farmland were subdivided for real-estate development. Land sales soon became a major factor in the economy of the valley. The largest development in the valley, Calvada, is reported to have sold about 10,400 lots during the period 1970–74 and was selling an average of 300 lots per month in 1974 (Nevada West and Pahrump Valley Times, August 1974, p. 11).

Ground water provides the water supply for virtually all development in Pahrump Valley. Pumpage increased rapidly between 1962 and 1968. Pumpage decreased after 1968 when some land was taken out of agricultural production and subdivided for real-estate development. If this land is fully developed, pumpage will probably return to about the same level as in 1968.

Development during the period 1962–75 is summarized in table 3, which lists estimates of population, irrigated acreage, and ground-water withdrawal. In

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Table 3. Summary of population, irrigated-land area, and ground-water withdrawals, 1962–75

[Populations and acreages rounded to nearest 10, withdrawals to nearest 100]

Year	Population[2]	Irrigated land (acres)[1]			Ground-water withdrawals[1] (acre-feet)		
		Cotton	Other[3]	Total	Manse Spring	Pumpage	Total
1962	250	3,320	3,170	6,490	1,400	27,600	29,000
1963	280	3,360	4,480	7,840	1,300	31,200	32,500
1964	320	3,160	4,510	7,670	1,300	36,200	37,500
1965	430	2,950	5,300	8,250	800	35,700	36,500
1966	490	2,240	5,320	7,560	1,100	37,000	38,100
1967	510	2,230	6,000	8,230	1,100	40,400	41,500
1968	570	2,310	6,070	8,380	900	47,100	48,000
1969	750	2,220	6,180	8,400	700	40,200	40,900
1970	960	1,210	3,640	4,850	400	42,200	42,600
1971	1,050	1,370	3,180	4,550	800	37,200	38,000
1972	1,230	1,200	3,120	4,320	700	35,900	36,600
1973	1,390	2,070	5,100	7,170	600	38,800	39,400
1974	1,470	1,610	5,320	6,930	400	41,000	41,400
1975	1,480	1,530	5,010	6,540	200	40,600	40,800
Total for period (rounded)					12,000	530,000	540,000

[1]From records of the Nevada State Engineer.

[2]Populations for 1975 and 1970 reported in Nevada West and Pahrump Valley Times, May 1975, p. 4. Populations for other years estimated by the author from data on home power and telephone hookups.

[3]Primarily alfalfa.

1975, irrigation remained the principal use of water, accounting for about 38,000 of the 40,800 acre-ft withdrawn for use. Of the remaining 2,800 acre-ft, about 800 acre-ft was used for self-supplied domestic purposes and about 2,000 acre-ft was used for public supply and commercial purposes. Part of the pumped water is recycled back to ground water. The percentage varies both with type of use and with individual systems. An average of about 25 percent of the agricultural pumpage, 70 percent of the self-supplied domestic pumpage, and 50 percent of the public supply and commercial pumpage was estimated to be recirculated back to ground water. The relative amount of water used for domestic, public-supply, and commercial purposes will probably increase substantially in the near future, and the amount of water recirculated will be affected accordingly. Also, agricultural water requirements could be affected by future changes in cropping patterns. For example, population increases in both Pahrump and Las Vegas Valleys could provide a significant market for certain vegetables and other diversified crops that require much less water per acre than alfalfa. A discussion of the effects of various cropping patterns on the area's water requirements and economy is beyond the scope of this study. However, this is an alternative that should be considered when evaluating means of dealing with the overdraft on the area's ground-water resources. Figures 8 and 9 show the areal distribution of ground-water withdrawals in 1962 and 1975.

Effects of Development

As of 1975, a total of nearly 700,000 acre-ft of pumpage and about 550,000 acre-ft of spring flow had been discharged from the valley-fill reservoir in Pahrump Valley since pumping began in 1913. Of this, 530,000 acre-ft of pumpage and 12,000 acre-ft of spring flow occurred during the period 1962-75.

Response of the ground-water system to withdrawals was complex. The two most apparent effects were large water-level declines and cessation of most spring discharge. These will be discussed in the following paragraphs. Some of the more subtle responses, such as variations in ground-water evapotranspiration, probable land subsidence, and probable diminished subsurface outflow, will be discussed in later parts of this report.

Water-Level Changes

Water levels in wells generally have been declining since the first wells were constructed in 1913. The annual rate of decline and the net change between predevelopment and 1975 water levels vary at different locations,

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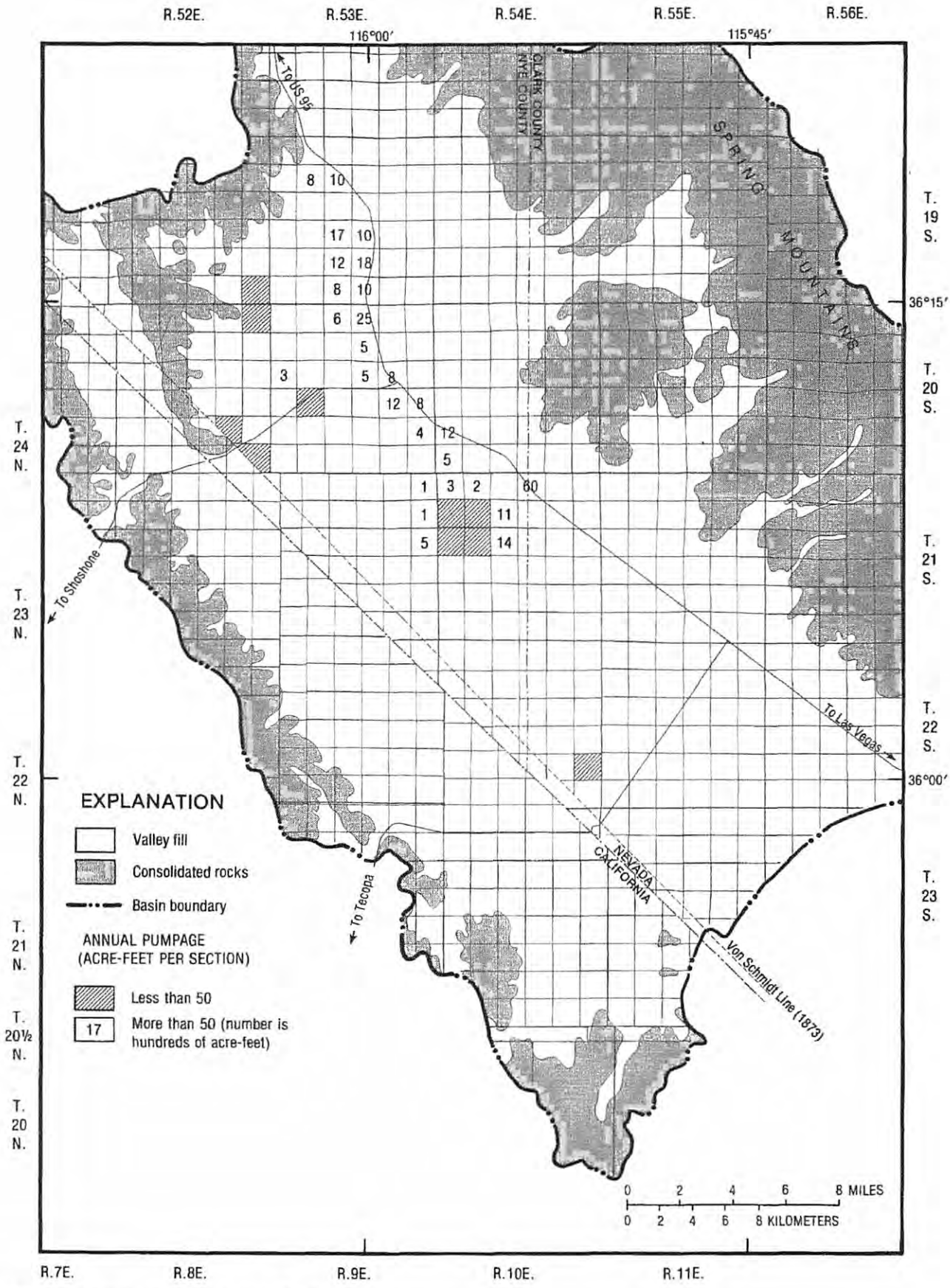

Figure 8. Distribution of pumpage in 1962.

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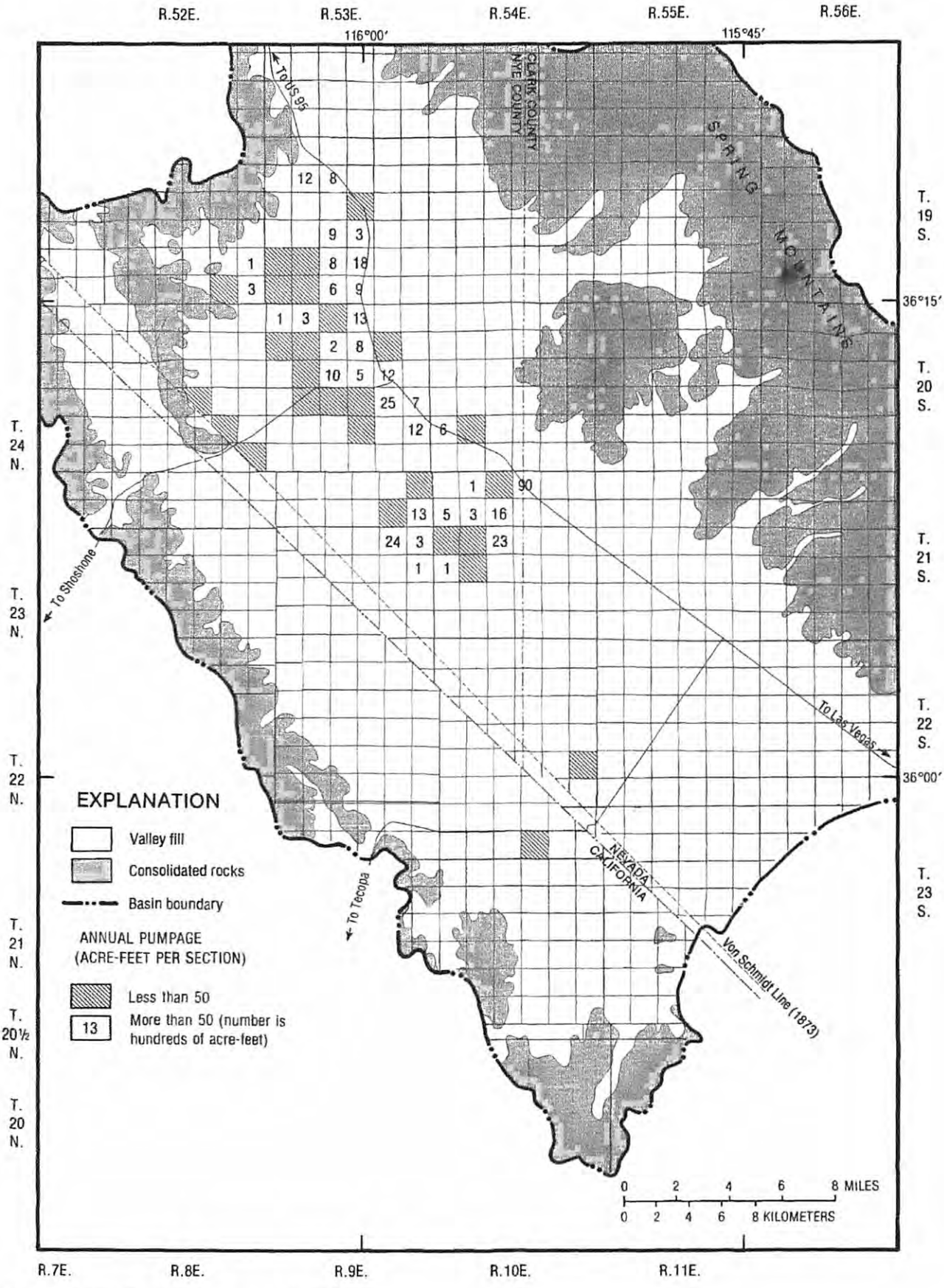

Figure 9. Distribution of pumpage in 1975.

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depending on the distribution of pumping (figs. 8, 9), hydraulic properties of the valley fill (figs. 3-5), and the depth of the well being measured. Hydrographs of water-level changes in six wells were prepared to illustrate typical rates and magnitudes of change in various parts of the valley. Figure 10 shows locations of the six observation wells, and figure 11 shows the hydrographs. Generally, the greatest declines occurred along the base of the Pahrump and Manse fans, where maximum declines of about 100 ft were observed between predevelopment and February 1976 levels. The two wells located away from the fan in the central valley (162 S20 E53 06CDA1 and 162 S22 E53 01AAA1) exhibit substantially lesser rates of water-level decline. An exception to the generally declining trend occurs in some shallow wells located near irrigated areas. Some irrigation water recharges the shallow part of the valley-fill reservoir; consequently, water levels in some shallow wells on or near irrigated land may be higher than under predevelopment conditions. Additional information about the areal distribution of water-level changes is presented on net-change maps, located in a later section that deals with simulation of the response to pumping.

Declines in Spring Discharge

Pumping in Pahrump Valley is well situated to capture the discharge of Bennetts and Manse Springs. Consequently, spring flow began to decrease shortly after pumping began and continued to decrease until 1975, when it ceased during the pumping season. In 1959, Bennetts Spring ceased to flow. As of 1975, Manse Spring was dry during the summer irrigation season but discharged about 200 acre-ft during the winter months. Figure 12 is a graph illustrating changes in spring discharge through 1975. The amount by which spring discharge has decreased is also the amount of water captured by pumping. Thus, as of 1975, about 10,000 acre-ft per year of spring discharge had been captured by pumping.

GROUND-WATER RECHARGE AND DISCHARGE

Estimates of ground-water recharge and discharge for predevelopment conditions have been developed by Malmberg (1967, p. 36). In this study it was not necessary to develop completely new estimates but only to evaluate the existing ones to see if any revisions are warranted in light of other information and experience gained since the mid-1960's. In the Pahrump Valley area, virtually all inflow consists of recharge from precipitation that falls within the basin. Natural discharge consists of evapotranspiration and subsurface outflow. Spring discharge is either consumed by evapotranspiration or returns to ground water to be discharged as subsurface outflow.

Malmberg (1967, p. 26) used a method described by Eakin and others (1951, p. 26, 27) to estimate recharge in Pahrump Valley to be about 22,000 acre-ft/yr. This method is based on the assumption that a fixed percentage of a given average annual rate of precipitation ultimately recharges the groundwater reservoir. However, during the 1960's and early 1970's this technique was applied to some other areas in Nevada where investigators used higher precipitation rates on the sides of mountains facing the prevailing storm tracks and also used higher percentages of recharge where there are significant areas of higher altitude. These variations could be roughly applied to Malmberg's estimates (1967, table 4) by changing average precipitation and assumed percentage of precipitation in the zone above 8,000 ft from 1.75 ft and 20 percent to 2.0 ft and 25 percent, respectively. The resulting revised estimate of recharge is about 26,000 acre-ft/yr.

There are insufficient data to determine which set of assigned values is best, so this technique will be considered to produce results ranging from 22,000 to 26,000 acre-ft/yr, depending on the set of assumptions and assigned values used.

Malmberg (1967, p. 29) estimated annual evapotranspiration by mapping areas and densities of phreatophytes present in 1961 and multiplying the areas by assigned use rates. Areas associated with spring discharge and irrigation tail water were separated from other areas of evapotranspiration. The total evapotranspiration estimated in this way was 10,000 acre-ft/yr (Malmberg, 1967, table 5). Estimates based on the 1961 distribution of phreatophytes include the assumption that there had been no significant change in areas or rates of evapotranspiration from the natural conditions. But, if pumping or clearing land for irrigated crops has reduced phreatophyte areas or discharge, then the estimate of discharge under natural conditions is too low. An alternate approach would be to assume that virtually all natural spring discharge was ultimately consumed by evapotranspiration. Total evapotranspiration could be estimated as the sum of estimated predevelopment spring discharge (10,000 acre-ft/yr) and natural evapotranspiration outside of areas where evapotranspiration is supported by spring discharge. The resulting total of 13,000 acre-ft/yr is larger than the original estimated 10,000 acre-ft/yr but is still of the same order of magnitude. Both approaches depend on assumptions that cannot be verified by existing data. The earliest estimates of discharge from Bennetts and Manse Springs were reported by the owners (Maxey and Jameson, 1948, p. 10). The earliest measurements were made in 1916 and were about 40 percent lower than the initial values reported by Maxey and Jameson. It could not be determined with

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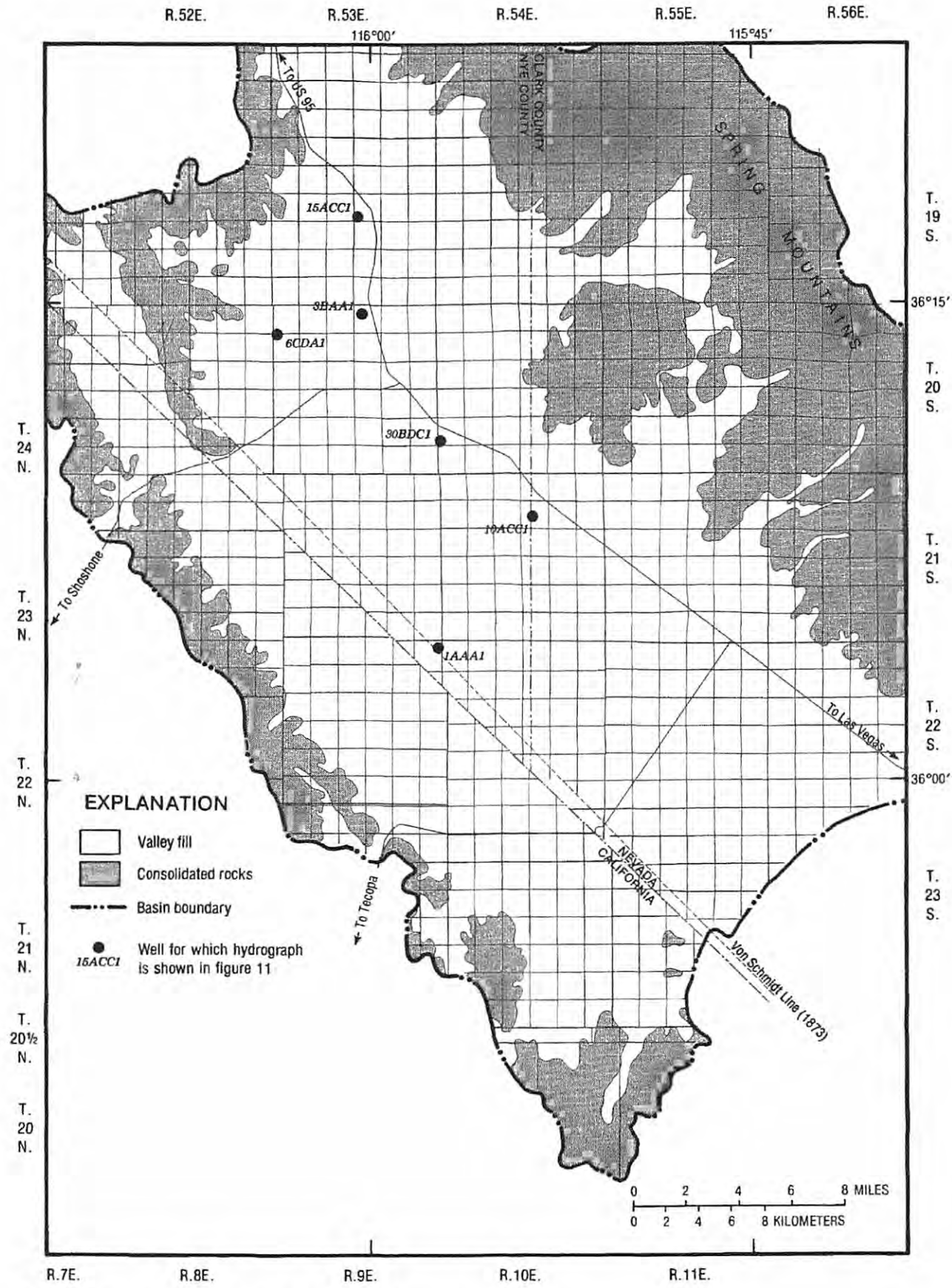

Figure 10. Location of selected observation wells.

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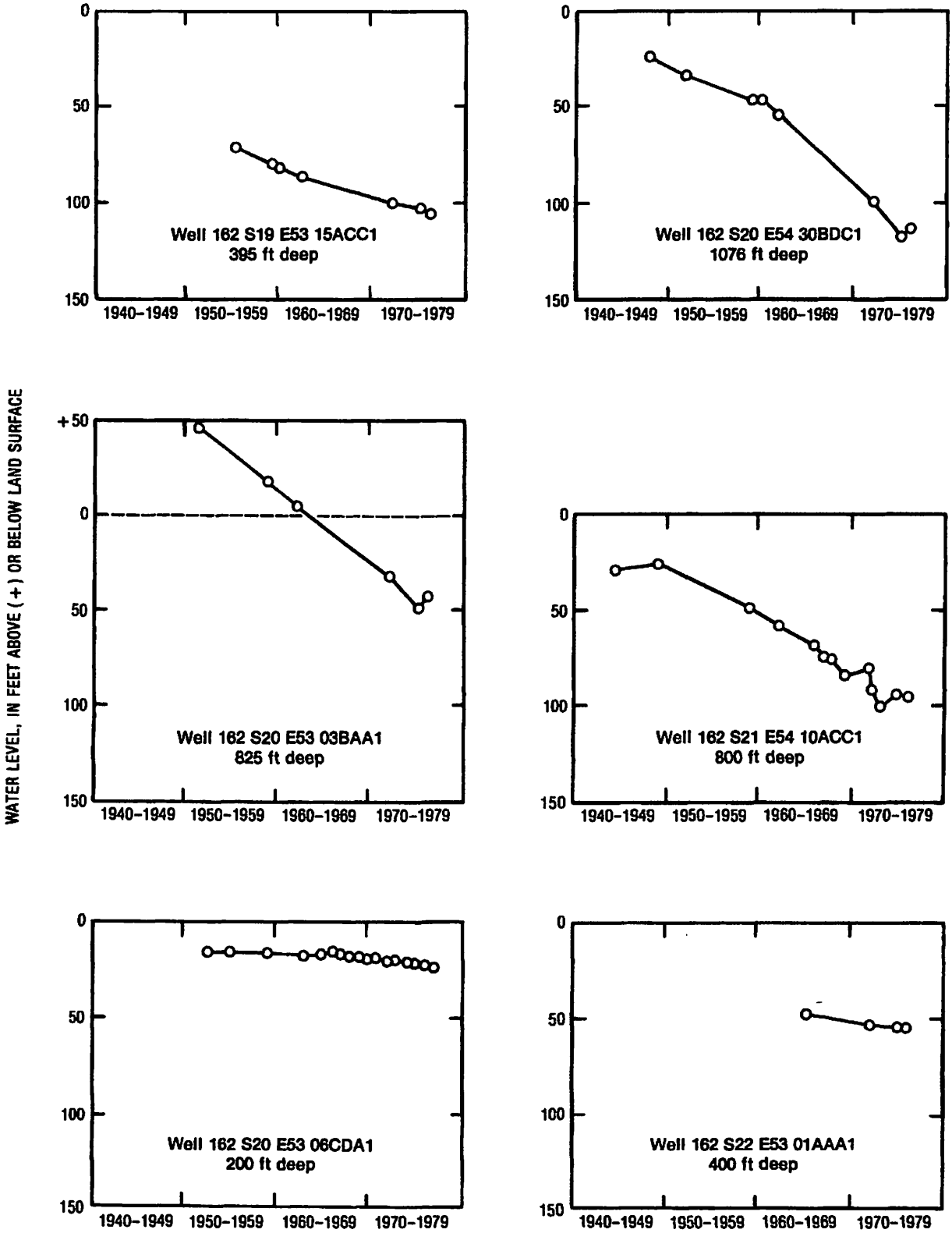

Figure 11. Water-level changes in six observation wells.

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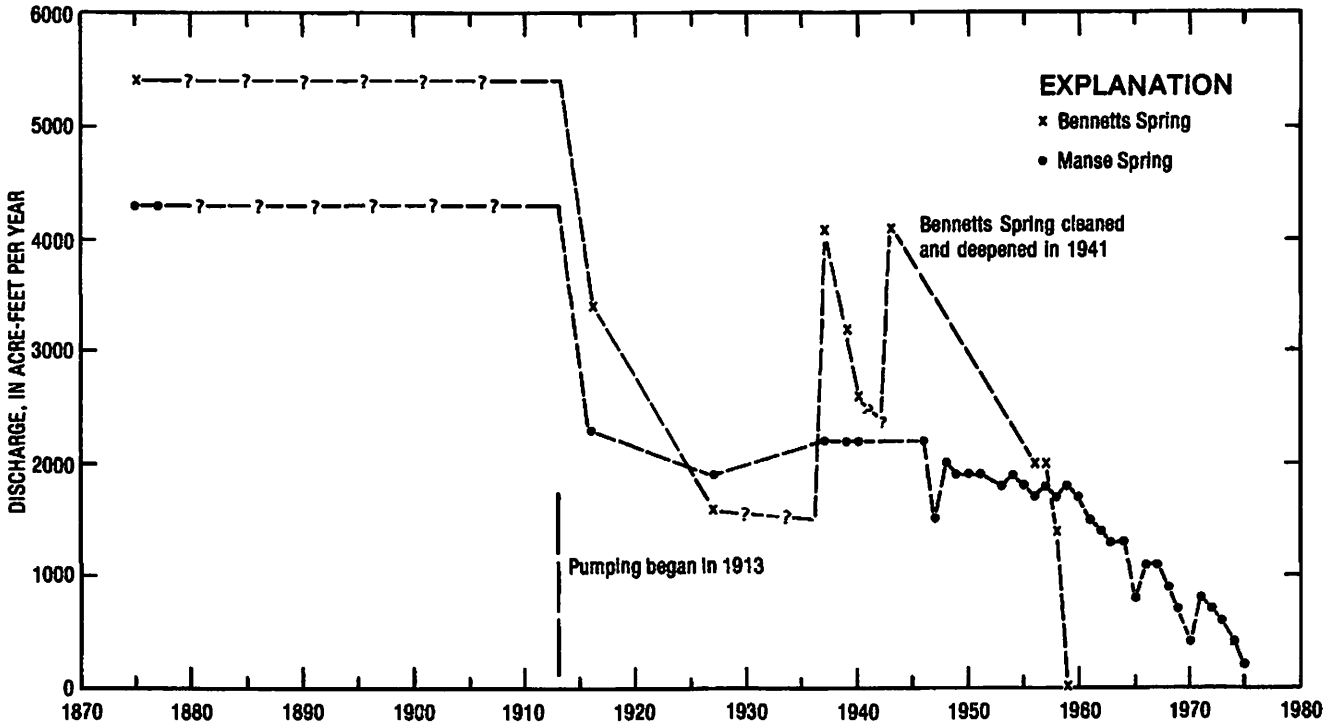

Figure 12. Annual discharge of Bennetts and Manse Springs, 1875–1975.

certainty if the earliest measurements represented reduced spring discharge caused by nearby flowing wells or if the earliest reported estimates were in error. Consequently, in this study, natural evapotranspiration is estimated to be between 10,000 and 13,000 acre-ft/yr.

During fieldwork conducted in 1975 and 1976, shad scale (atriplex) was observed growing in comparatively shallow ground-water areas near irrigated land in the north-central part of the valley. Some species of shad scale are phreatophytes and consume ground water. It was not determined if there were substantial stands of shad scale in the valley prior to development or if the shad scale seen today has developed as a result of the availability of irrigation tail water. If a significant amount of shad scale was present prior to development, then natural ground-water evapotranspiration probably is greater than the range indicated above.

Malmberg (1967, p. 30) estimated subsurface outflow from the southwest edge of the valley-fill reservoir on the basis of computations using transmissivity, ground-water gradients, and width of flow section. The range of transmissivity that he used (134 to 668 ft/d) gives a range of outflow estimates of 1,000 to 4,000 acre-ft/yr. Within this range, Malmberg chose 2,000 acre-ft/yr as his best estimate of the outflow. Because of the uncertainties involved in estimating transmissivity, the range of 1,000 to 4,000 acre-ft/yr will be used for this estimate of outflow.

It was not possible to make a credible direct estimate of subsurface outflow through the carbonate-rock reservoir. Malmberg (1967, p. 32) estimated this quantity as the difference between the other items of recharge and discharge. The same approach was used in this study and a range of 5,000 to 15,000 acre-ft/yr was obtained. Thus, total subsurface outflow through both valley fill and consolidated rocks is estimated to range from 6,000 to 19,000 acre-ft/yr.

Table 4 summarizes the various estimates of recharge and discharge. Ranges of estimates are given because of the uncertainties involved in assumptions for a given technique or because of varying results obtained when slightly different techniques were used to estimate the same parameter. Values estimated by Malmberg (1967, p. 36) are within the general range of estimates and generally fall in the lower part of the range. These estimates will be further evaluated in a later section of this report by using a computerized mathematical model of the flow system. The values listed in table 4 (which were based on field and empirical techniques) were used as input values for the initial computer runs, and where the model results differ they provide a basis for comparison.

Conceptualization of the Ground-Water System

The ground-water system, as described in the preceding sections of this report, is a thick reservoir of

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unconsolidated deposits bounded on its sides and bottom by consolidated rocks, some of which are permeable enough to transmit significant regional ground-water flow. Water-bearing properties of the valley fill vary from place to place. Generally, the most productive deposits are along the lower parts of alluvial fans on the northeast side of the valley. Deposits in the central part of the valley are predominantly finer grained materials and are much less productive. Ground water in the valley-fill reservoir is both confined and unconfined. Water is unconfined at and near the upper surface of saturation (the water table). Interbedded silt and clay in the central valley and caliche horizons and cemented zones around the margins of the valley inhibit vertical movement, and ground water in most of the deeper valley-fill deposits is under leaky confining conditions. Water levels in the deeper wells generally are assumed to represent composite heads typical of conditions in the upper 1,000 ft of saturation. Heads in deeper parts of the valley-fill reservoir and underlying consolidated rocks are not known.

The ground-water reservoir underlying Pahrump Valley functions as a three-dimensional system. Generally, water flows from recharge areas in and near the Spring Mountains southwestward toward the Nopah Range, where it leaves the area as subsurface outflow. There is a downward vertical component of movement in the recharge areas and an upward vertical component of movement in the discharge areas. Consequently, head varies both areally and with depth, and a multiple-layer concept is required to give a reasonable representation of the system.

The ground-water system in Pahrump Valley is evaluated as a three-layer system. The top layer approximates the water table and the underlying adjacent material in which water is unconfined. It is assumed to be about 50 ft thick. The middle layer represents the part of the valley-fill reservoir most affected by pumping. This is assumed to be generally the zone from 50 to 1,000 ft below the water table. The bottom layer consists of the valley fill not included in the overlying layer and the consolidated rocks that underlie the valley-fill reservoir and transmit significant subsurface flow.

Figure 13 is a conceptualization of the ground-water system in Pahrump Valley. The southwest edge of the system has been extended approximately 15 mi southwest of Pahrump Valley to include probable discharge areas of the subsurface outflow from the valley.

Table 4. Summary of estimates of recharge and discharge for natural conditions

[Acre-feet per year]

Recharge	22,000–26,000
Discharge:	
Evapotranspiration	10,000–13,000
Subsurface outflow from valley fill	1,000– 4,000
Difference (recharge minus discharge)	[1]5,000–15,000

[1]Difference is assumed to be outflow through carbonate-rock reservoir. Calculated as maximum recharge minus minimum discharge for high end of range and minimum recharge minus maximum discharge for low end.

Development of the Mathematical Model

The preceding sections have developed qualitative and quantitative information that describes the ground-water system and its current state of development. A mathematical model is used in the following sections to simulate natural conditions and the response to development of the ground-water system. If a reasonable match between observed and simulated conditions can be obtained, the model can provide useful information about the available ground-water supply and probable responses to development.

Mathematical models are tools that increase an investigator's capability to formulate and test hypotheses about a ground-water system and to predict generalized responses to a given scheme of development.

Any attempt to simulate a ground-water flow system is subject to limitations inherent in the technique used. The model itself is essentially a set of equations that describe an idealized system having properties similar to a real ground-water system. If the model adequately describes a real ground-water system, then the response of the model to imposed stresses, such as ground-water pumpage, will be very close to the response of the real system if it were to undergo the same stress. The degree of exactness with which a model can describe a natural system is limited by characteristics of both the model used and the system being described. Examples of three types of limitations in most models are as follows:

1. The inability of a model to handle all the complexities of a natural system. The simplifying assumptions and generalizations that are incorporated into a model affect the output. If a model is designed to perform a specific task, the simplifying assumptions can be made so that the effects on a particular type of prediction are minimal. If the model is used to make predictions other than those for which it was designed, the generalizations and assumptions used could significantly affect the results.
2. The inadequacy of existing data to describe the system. In most valleys, development is localized in a comparatively small area. Reasonably good data on water levels and aquifer properties in the vicinity of the development may be available; however, away

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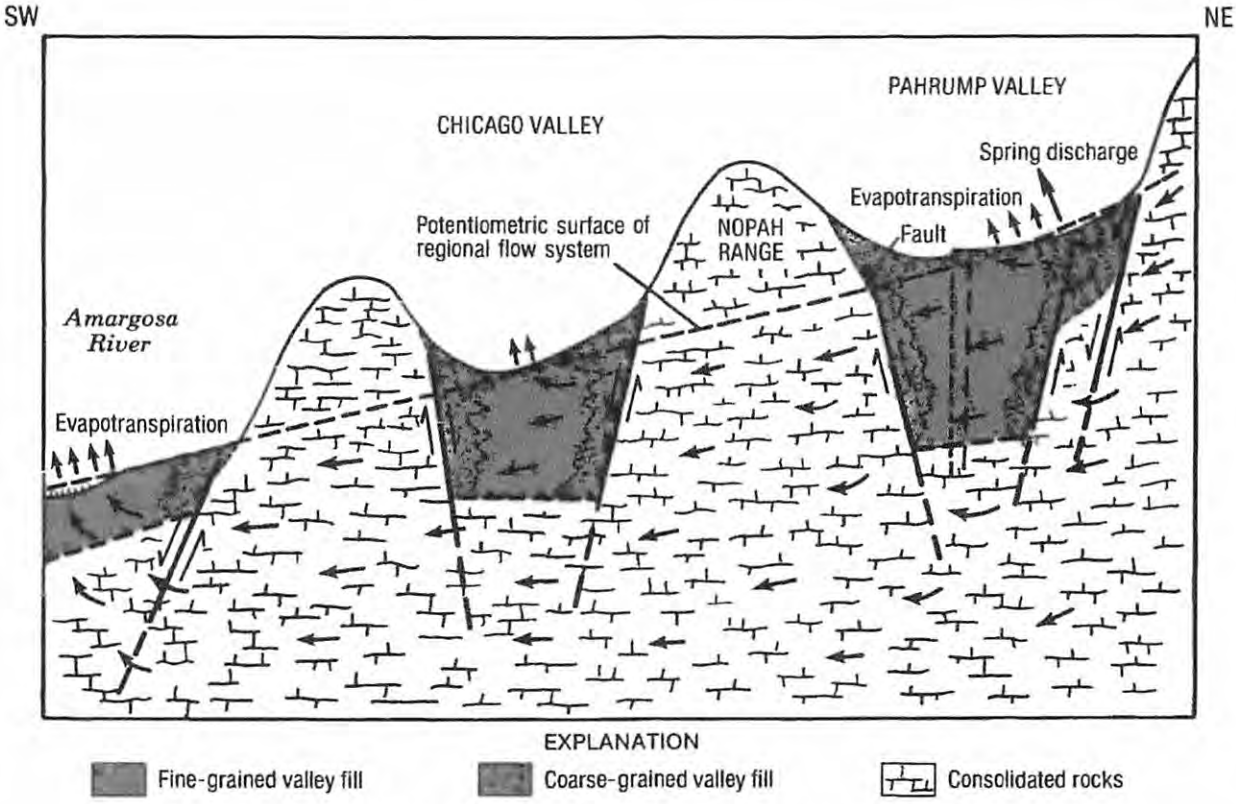
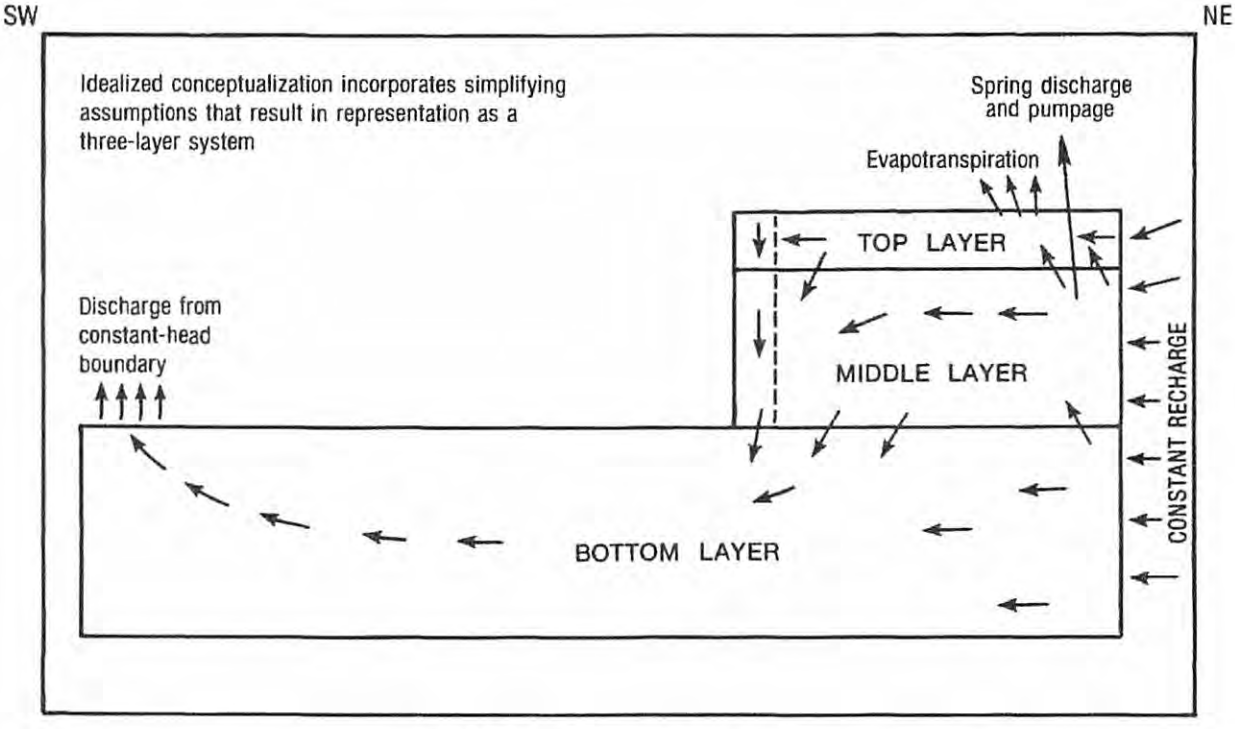


A. Generalized section across Pahrump Valley and basins to the southeast



B. Idealized ground-water flow

Figure 13. Conceptualization of the ground-water flow system in and downgradient from Pahrump Valley. Arrows show direction of ground-water movement.

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from developed areas, information is generally sparse and aquifer properties and hydraulic heads must be estimated on the basis of what little information is available. Errors in these estimates may significantly affect the results. The severity of these adverse effects varies with the intended uses of the model. For some purposes, the probable errors associated with data deficiencies in areas remote from existing development may have little effect on the results. For other purposes, it may be necessary to collect additional data before an adequate model can be constructed.

3. The problem of nonunique solutions. Most ground-water models are calibrated by comparing model output with observed changes such as hydraulic heads or water-level changes and then adjusting model parameters, within limits, until a reasonable agreement between observed and computed values is obtained. However, in some cases it is possible to obtain identical water-level configurations with numerous different combinations of parameters. Consequently, computed solutions are not unique and a match between observed and modeled conditions does not guarantee that the model parameters and the parameters of the real system are identical. It guarantees only that the combination of parameters used will reproduce the observed conditions. If the parameters used are generally compatible with known information, the model will constitute a best fit of the data and errors caused by nonuniqueness are minimal.

These examples illustrate several factors that can limit the accuracy of model results. Generally, if the intended uses of a model are carefully considered prior to its formulation, it can be constructed so that the adverse effects of these and other factors will be minimal. It was not possible to determine the absolute accuracy of results obtained from the model used in this study. Few data were available to describe the materials underlying the valley fill, and, if the estimates used for these materials are reasonably accurate, the model results are considered by the author to be accurate to within about 30 percent of the real values.

Governing Equations of Ground-Water Flow

The flow of ground water in a porous medium in three dimensions (Jacob, 1950; Cooper, 1966) may be expressed as follows:

$$\frac{\partial^2 h}{\partial x^2} + \frac{\partial^2 h}{\partial y^2} + \frac{\partial^2 h}{\partial z^2} = \frac{S_S}{K}\frac{\partial h}{\partial t}, \qquad (1)$$

in which

h is hydraulic head, in feet;
S_S is specific storage, per foot;
K is hydraulic conductivity, in feet per unit time; and
t is time.

Permitting hydraulic conductivity to be heterogeneous and anisotropic and adding a source term, equation 1 becomes

$$\left[\frac{\partial}{\partial x}\left(K_{xx}\frac{\partial h}{\partial x} + K_{xy}\frac{\partial h}{\partial y} + K_{xz}\frac{\partial h}{\partial z}\right) + \frac{\partial}{\partial y}\left(K_{yx}\frac{\partial h}{\partial x} + K_{yy}\frac{\partial h}{\partial y} + K_{yz}\frac{\partial h}{\partial z}\right) + \frac{\partial}{\partial z}\left(K_{zx}\frac{\partial h}{\partial x} + K_{zy}\frac{\partial h}{\partial y} + K_{zz}\frac{\partial h}{\partial z}\right)\right] = S_S\frac{\partial h}{\partial t} + W(x,y,z,t), \qquad (2)$$

in which $W(x,y,z,t)$ is a volumetric flux per unit time, K_{ij} is the hydraulic conductivity that produces flux along axis i caused by the component of hydraulic gradient on axis j, and i and j are x, y, or z. Assuming that the coordinate axes x, y, and z are aligned with the principal directions of the hydraulic conductivity tensor, the cross-product terms drop out of equation 2 and it becomes, in expanded form,

$$\frac{\partial}{\partial x}\left(K_{xx}\frac{\partial h}{\partial x}\right) + \frac{\partial}{\partial y}\left(K_{yy}\frac{\partial h}{\partial y}\right) + \frac{\partial}{\partial z}\left(K_{zz}\frac{\partial h}{\partial z}\right) = S_S\frac{\partial h}{\partial t} + W(x,y,z,t), \qquad (3)$$

in which K_{xx}, K_{yy}, and K_{zz} are the principal components of the hydraulic conductivity tensor, in feet per unit time.

In the finite-difference simulator, it is often convenient to represent a hydraulic unit by one layer of nodes. For this approach, equation 3 is multiplied by b, the thickness of the hydraulic unit, giving

$$\frac{\partial}{\partial x}\left(T_{xx}\frac{\partial h}{\partial x}\right) + \frac{\partial}{\partial y}\left(T_{yy}\frac{\partial h}{\partial y}\right) + \frac{\partial}{\partial z}b\left(K_{zz}\frac{\partial h}{\partial z}\right) = S\frac{\partial h}{\partial t} + bW(x,y,z,t), \qquad (4)$$

in which T_{xx} and T_{yy} are the principal components of the transmissivity tensor, in feet squared per unit time, and S is the dimensionless storage coefficient.

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Application of Flow Equations to a Finite-Difference Model

A computer algorithm for the model was developed by P.C. Trescott (1975) of the U.S. Geological Survey. The program is written to solve finite-difference approximations of the differential equations of ground-water flow (as expressed in eq. 4). The version used in this study allows for a multilayer heterogeneous aquifer with irregular boundaries, numerous wells, and evapotranspiration from the upper layer in areas of shallow ground water. Flow between layers is treated as vertical flow through confining layers using the quasi-three-dimensional option of the program where no horizontal flow or storage of water is allowed in the confining beds. Program output was modified to enable evaluation of the areal distribution of evapotranspiration. In this study, the ground-water system is represented by three layers of the variable-space finite-difference network shown in figure 14. A finite-difference representation for the ground-water-flow equation is written for each node in the network. This results in a series of simultaneous equations which are solved by the strongly implicit procedure. The reader is referred to Trescott (1975) and Trescott and Larson (1976) for detailed information about the model.

Parameter Values Used and Assumptions Made

Assumptions made and parameters used in this model are briefly outlined in the following paragraphs.

Boundary Conditions

The boundary condition of a model must be specified before satisfactory solution of the finite-difference flow equation can be obtained. When an area of interest is near model boundaries, the solution obtained is generally quite sensitive to the boundary conditions specified. Consequently, adequate evaluation and proper specification of appropriate boundary conditions is an important step in adjusting a mathematical model to be representative of a given area.

The northeast boundary of the model is recharged by inflow from the Spring Mountains and is treated as a constant-recharge boundary. The recharge is simulated by wells situated along the northeast margin of the model that inject water at a constant rate.

The northwest and southeast boundaries of the model are close to the ground-water flow lines under predevelopment conditions. Moreover, low-permeability bedrock belonging to the clastic aquitards is present just beyond the northwest edge of the model, and the southeast edge is remote from any heavy pumping. Consequently, these boundaries were specified as no-flow boundaries in the model.

The southwest boundary is assumed to be the discharge area of a multivalley flow system. Heads along this boundary are the lowest in the system. Discharge along this border is represented by flow into a series of constant-head nodes. Heads at these nodes have been set at altitudes comparable with the potentiometric surface in the vicinity of the Amargosa River. It was assumed, for the time periods and rates of pumping used in this simulation, that pumping in Pahrump Valley would have no significant effect on the water levels along the flood plain of the Amargosa River, some 25 mi away. The effects, if any, would most probably be small reductions in discharge. These changes would be roughly approximated by variations in flow to the constant-head nodes.

The lower part of the multivalley flow system also receives some inflow from the Amargosa Desert in the vicinity of the Amargosa River. Walker and Eakin (1963, p. 23) estimated that in the vicinity of Eagle Mountain there was subsurface flow of about 500 acre-ft/yr from the Amargosa Desert toward Shoshone. It is beyond the scope of this study to attempt to simulate the multivalley flow system; however, one constant-head node was placed along the northwest boundary of the model (fig. 14) where most of the inflow from the Amargosa Desert was assumed to occur. The head was varied until the amount of water added to the system from the node was about equal to the amount estimated by Walker and Eakin (1963). This same water was discharged from constant-head nodes near Shoshone, so there was little net effect on conditions in Pahrump Valley.

The bottom surface of the model was specified as a no-flow boundary. The upper surface was specified as a variable-flow boundary where discharge (if any) depends on the depth that the head in the upper layer is below land surface. This condition will be more fully described in the section on evapotranspiration.

Initial Conditions

For each simulation the model must have the head at each node set to an initial value. For transient-state simulations these values should represent a set of equilibrium conditions for the entire model; otherwise, simulated head changes may represent response to the initial conditions rather than to any imposed stress such as pumping.

The predevelopment water levels were assumed to represent equilibrium conditions. Figure 7 shows the predevelopment water levels representative of conditions in the middle layer of the model. Similar maps were prepared for the top and bottom layers. These values were used as the initial condition for the steady-state calibration of the model. The results of the steady-state calibration of the model produced a set of head values,

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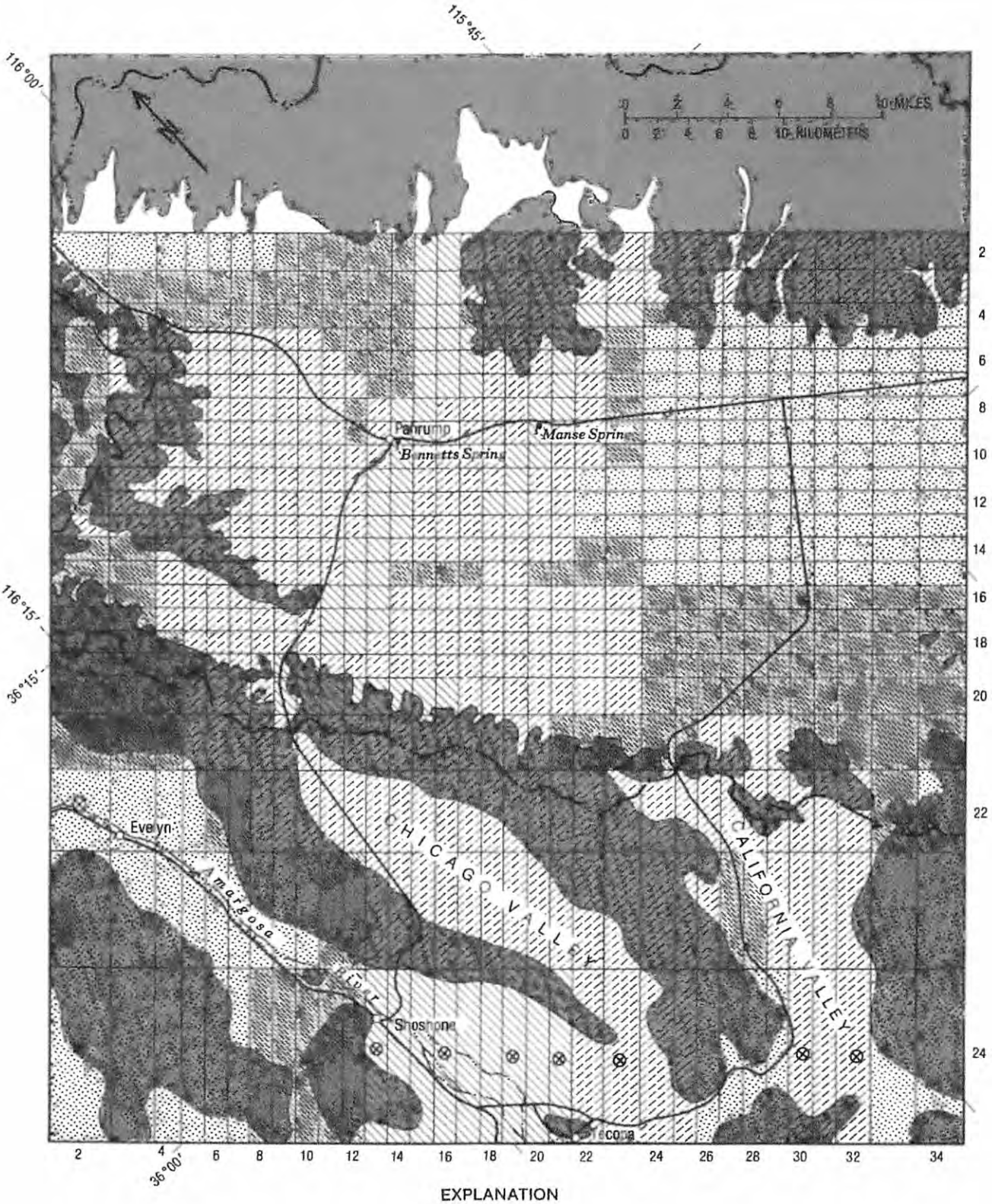

EXPLANATION

- Valley fill
- Consolidated rocks
- Boundary of Pahrump Valley
- Finite-difference grid used to model ground-water flow system. (Only bottom layer of model extends beyond Pahrump Valley)
- ⊗ Constant-head node used to simulate discharge from lower end of system
- ⊠ Constant-head node used to simulate inflow from Amargosa Desert

TRANSMISSIVITY USED IN BOTTOM LAYER OF MODEL, IN FEET SQUARED PER DAY

- 0 to 500
- 500 to 1500
- 1500 to 2500
- More than 2500

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recharge rates, and discharge rates that were at equilibrium. These values were used as the initial condition for the transient-state simulation runs which began with the year 1913.

Transmissivity

The distribution of transmissivity used for the top and middle layers of the model is similar to that in figure 4. It is apportioned between the two units on the basis of their relative thickness (5 to 10 percent to the top layer and 90 to 95 percent to the middle layer). Both the top and middle layers do not extend beyond Pahrump Valley. Consequently, vertical hydraulic conductivities along the downgradient margins of each layer were adjusted to ensure adequate continuity with the more extensive bottom layer.

There is no direct field information on which to base the exact distribution of transmissivity in the bottom layer of the model. It was assumed that rock types in an area overlain by valley fill would be generally the same as those exposed in adjacent mountains. Using this assumption and the transmissivity values listed in the section "Consolidated-Rock Reservoirs," a preliminary distribution of transmissivity was prepared. Adjustments were made to also allow for accumulations of saturated valley fill greater than 1,000 ft in parts of Pahrump Valley. This initial distribution was subsequently refined during calibration of the model. The final distribution used is shown in figure 14. One of the adjustments made during calibration was to assume two southwest-northeast-trending linear zones of higher permeability in the vicinity of Bennetts and Manse Springs (fig. 14). Orientation of the thrust faults shown on plate 1 and the steep gravity gradients shown on plate 2 provide some indirect support for this assumption. However, the principal reason these zones were added is that their presence was necessary to obtain an adequate model calibration. Additional information is needed to confirm or deny their existence.

Evapotranspiration of Ground Water

Evapotranspiration of shallow ground water is approximated as a linear relationship between a maximum, when depth to water in the top layer is at land surface, and zero, when the water table reaches the depth at which significant evapotranspiration ceases. The value used for maximum evapotranspiration, 6.3 ft/yr, is slightly higher than the probable average annual lake evaporation in the area (Meyers, 1962, pl. 3) but less than the probable maximum of about 8 ft/yr that might occur if shallow ponds of water were maintained on a year-round basis. In actuality, the relationship between rate of annual ground-water evapotranspiration and depth to water table is probably not linear. The relation selected is considered to give a better approximation of the actual relationship at the depths to water table most commonly encountered in areas of evapotranspiration (generally between 10 and 20 ft). Under natural conditions, phreatophytes were not commonly found where depth to water table exceeded 20 ft. Consequently, that depth was selected as the maximum effective depth at which significant ground-water evapotranspiration occurred.

Vertical Hydraulic Conductivities

Vertical hydraulic conductivites used to represent confining beds between layers are those in figure 3. The model allows only vertical flow and no storage of water in the confining layers. Before being placed into the model, values were adjusted for thickness to represent more accurately the resistance to flow between midpoints of the various layers.

Storage Coefficient

The storage coefficients used for the upper layer approach the specific yield values shown in figure 5. They are generally 1 or 2 percent lower to allow for slow drainage and local retention of some water above impermeable clay beds and caliche layers. Storage coefficients used in the middle layer ranged between 0.0008 and 0.002 for coarse-grained valley-fill deposits around the margins of the valley. A higher storage coefficient was used for finer grained deposits in the central valley to account for water released by compaction associated with head declines. In reality, water yielded by compaction varies with time and is produced only during periods when water levels decline below the level that previously produced permanent deformation in the system. It is almost entirely a one-way process, and when water levels rise, the amount of water returned to the aquifer per unit of water level rise is much less than was originally released as a result of compaction. These refinements are beyond the scope of this study. The approximation made by increasing the coefficient of storage between 0.01 and 0.04 is satisfactory for the purposes of this study; however, the model cannot be used to accurately simulate the response to sustained cutbacks in pumping or other conditions that would result in rising water levels. The storage coefficient used for the bottom layer was 0.002.

Figure 14. Finite-difference grid and transmissivity used in bottom layer of the model (materials underlying upper 1,000 ft of saturated deposits).

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Method of Analysis

The system and its response to development were simulated in three phases: (1) the natural condition prior to 1913, (2) the response through 1975, and (3) the probable future response assuming that pumpage remains the same as in 1975. Analysis of the first two phases provided insight about the nature of the system and was a means of evaluating parameters used in the model. The model was calibrated so that computed heads, water-level changes, and distribution of evapotranspiration agreed reasonably well with observed and estimated values. Transmissivity, vertical hydraulic conductivity, recharge, and subsurface outflow were adjusted mostly during the first phase of calibration, and distribution of storage coefficient and recirculation of pumpage was adjusted mostly during the second phase. Once a reasonable fit between observed and computed value was obtained, model output for the period 1962–75 was used to supplement the other analyses done during this study. Finally, a run was made for the period 1975–2040 to roughly determine the magnitudes of future change if the amount and distribution of pumping stays the same as in 1975.

Simulated Natural Conditions

Figure 7 shows the approximate predevelopment potentiometric surface in the part of the valley fill tapped by deep wells, and figure 15 shows the steady-state potentiometric surface generated for the middle layer of the model. These results were obtained using parameters already described and an average annual recharge of about 37,000 acre-ft/yr. The distribution of recharge and computed subsurface outflow (18,000 acre-ft/yr) is shown in figure 15. The area of most concentrated ground-water recharge (22,600 acre-ft/yr) is located upgradient from Bennetts and Manse Springs. Plate 1 shows this area to be underlain by carbonate sedimentary rocks that have been deformed by several thrust faults. The transmissivity of these rocks may have been substantially increased by this structural deformation. This, coupled with this area's location on the side of the Spring Mountains most exposed to major storms that move in from the southwest, may account in part for the exceptionally high recharge indicated.

Values of recharge and discharge developed by the model are higher than those estimated by using empirical techniques. However, they provide a reasonable fit with known information, and if assumptions about the deeper parts of the valley-fill reservoir and the underlying bedrock are adequate, the model should provide reasonably accurate quantitative results. Figure 16 illustrates the agreement obtained between "observed" and simulated head for all nodes in the model where there was adequate information to make a reasonably accurate estimate of the head.

The quantity and distribution of evapotranspiration were one of the parameters evaluated by the model. Comparison of the modeled distribution of evapotranspiration and the mapped distribution of phreatophytes provides an additional check on the ability of the model to simulate the ground-water system. The mapped distribution of phreatophytes is shown on plate 3*A*, and the modeled distribution of evapotranspiration is shown on plate 3*B*.

Response Through 1975

Changes in the hydrologic system that occurred as a result of development prior to 1962 are not directly within the scope of this study; however, simulation of the entire period after 1912 provides additional information about the degree to which the model can reproduce changes in the natural system. The interval 1913 through 1975 was divided into 10 pumping periods. This was considered the minimum number of steps needed to approximate variations in pumpage that occurred during the 63-year period. Figures 8 and 9 show distribution of pumping in 1962 and 1975. A similar distribution of pumping was prepared for each period. All pumpage was assumed to be from the middle layer of the model. A percentage of the pumpage was assumed to be recirculated back to the water table (top layer of the model) by deep percolation of irrigation water. A value of between 20 and 30 percent was selected initially and then adjusted during calibration of the model. A comparatively high percentage of recirculation was used for the first pumping period for areas of pasture subirrigated by recirculated spring discharge. The lower percentage for periods 2, 3, and 4 allow for some recirculated water on newly irrigated land to become stored as soil moisture. Results from individual pumping periods were grouped for the longer periods, 1913–61 and 1962–75. Table 5 summarizes pumpage data used in each period of the simulation.

The model contains sufficient computational power to allow the response to development to be evaluated in terms of water-level changes, variations in natural discharge, and ground-water storage depletions. These items will be discussed in moderate detail in the following sections. One important item that was beyond the scope of this study, but should be considered, is possible changes in the chemical quality of ground water as a result of development activities.

Water-Level Changes

Figure 17 shows simulated net changes in the water table during the period 1913–76. There are not adequate data from shallow wells for a detailed comparison of

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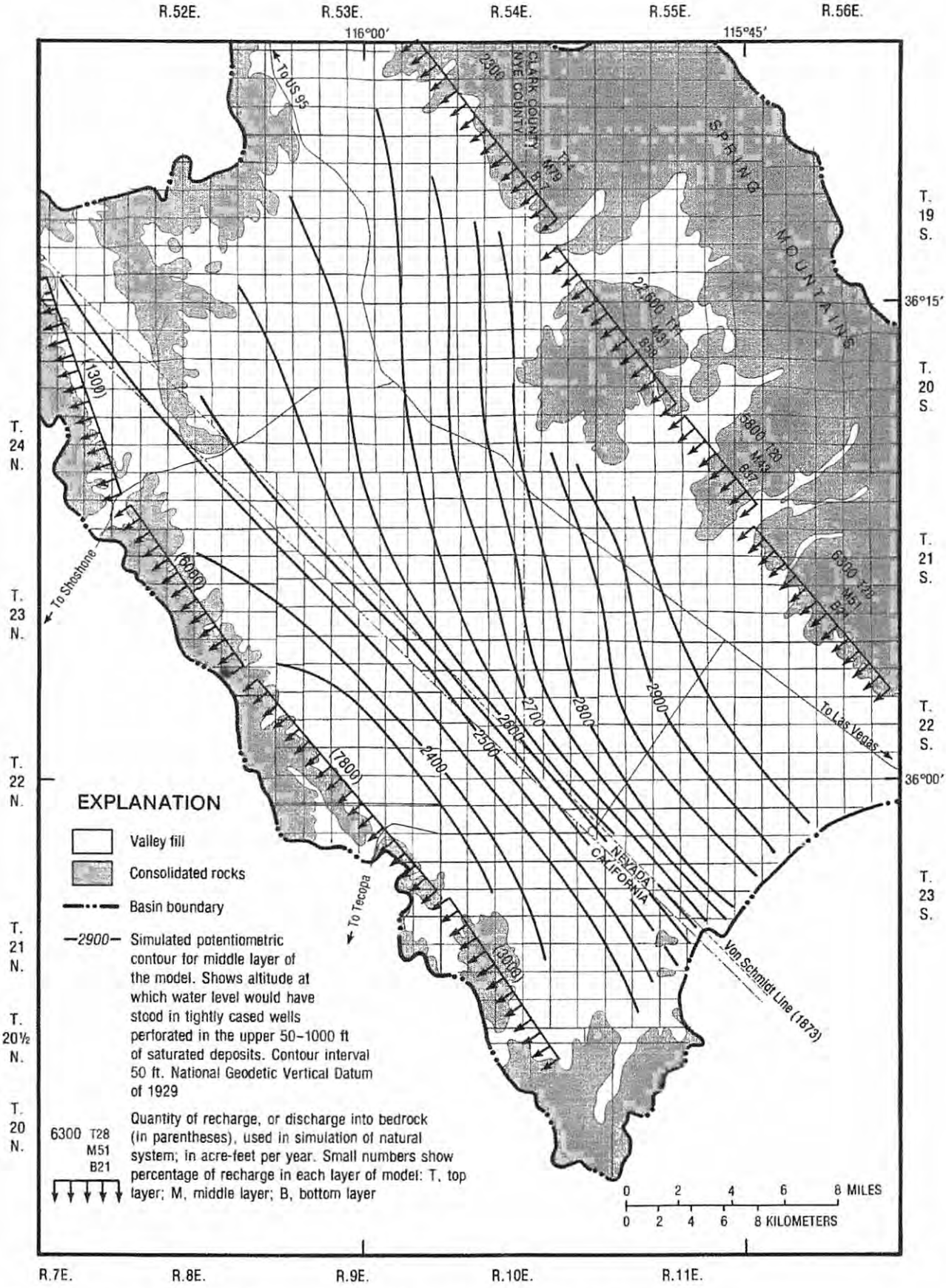

Figure 15. Contours of a simulated potentiometric surface for natural conditions.

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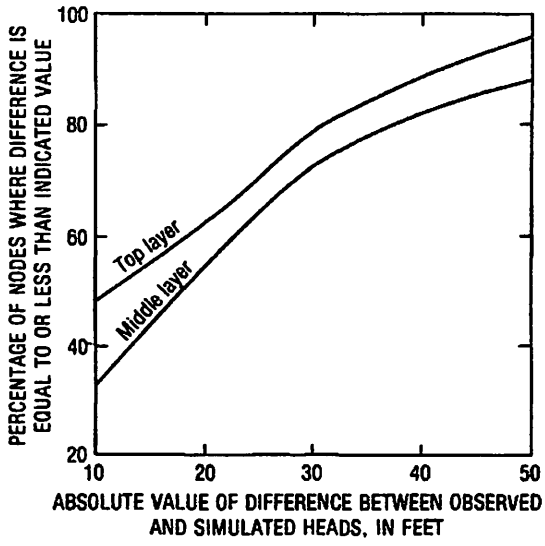

Figure 16. Relation between observed and simulated heads for natural conditions. Number of nodes used for calibration: top layer, 299; middle layer, 242; bottom layer, 0. Nodes used in calibration were those for which data were adequate to evaluate predevelopment heads.

observed and simulated water-table fluctuations. However, information available indicates changes of the same general magnitude as shown in figure 17. Also, water levels in some shallow wells near irrigated areas were reported to have risen slightly. The model produces similar results.

Water levels in deeper wells declined significantly more than those in shallow wells. Figure 18*A* shows the observed distribution of water-level declines in deeper wells and figure 18*B* shows the simulated head declines in the middle layer of the model during the period 1913–76. There is reasonable agreement between the observed and simulated distribution of water-level declines; however, there are two significant differences.

The first difference is that simulated declines along the base of the Pahrump fan were less than the observed values. The exact reason for this is not known; the three most probable causes are discussed here. (1) The amount of recharge assigned to nodes upgradient from this area may be more than that which occurs in the natural system. The resulting capture of discharge by pumping would cause water-level declines to be less than the observed values. (2) The assumption that the distribution

Table 5. Pumpage data used in simulation

Pumping period	Period	Number of nodes used as pumping centers	Average annual spring discharge and pumpage		Spring discharge and pumpage recycled back to ground-water system (acre-ft/yr)
			Spring discharge (acre-ft/yr)	Pumpage (acre-ft/yr)	
1	1913-44	2	6,000	4,000	4,300
2	1945-51	10	5,200	13,000	3,500
3	1952 58	26	4,000	23,000	5,000
4	1959-61	29	1,600	25,400	5,000
5	1962-63	35	1,200	29,000	7,600
6	1964-67	39	1,200	37,400	9,700
7	1968-68	39	900	47,900	12,600
8	1969 70	42	700	41,900	11,300
9	1971 72	41	600	37,600	9,900
10	1973 75	54	400	41,200	11,200
			Total acre-feet (rounded)		
Period 1913 61			260,000	460,000	210,000
Period 1962 75			12,000	[1]540,000	140,000
Entire period 1913 75			270,000	1,000,000	350,000

[1]Pumpage higher than 530,000 acre-feet shown in table 3 because of (1) minor increases made during model calibration and (2) rounding of values selected to represent average rates for each pumping period.

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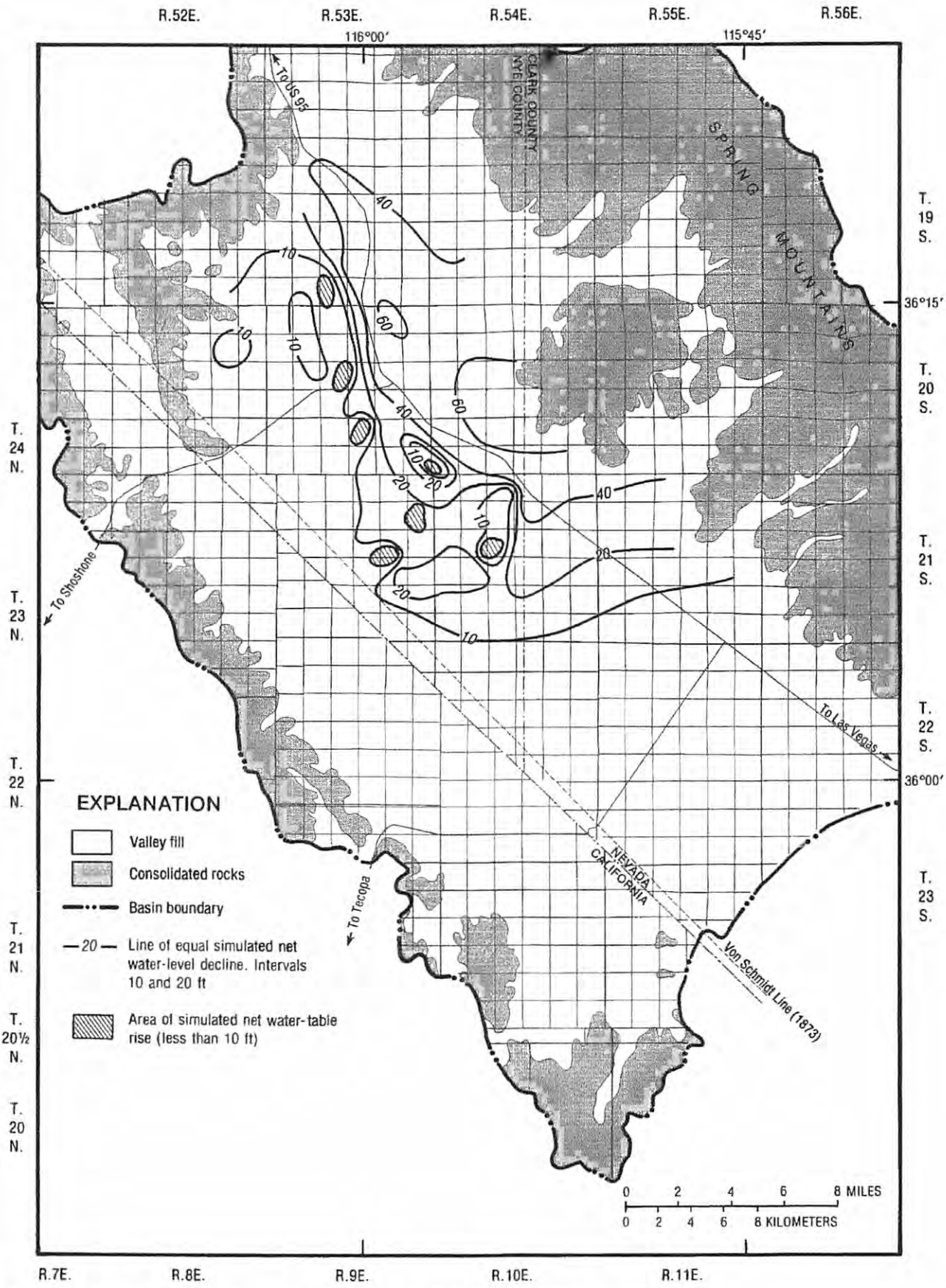

Figure 17. Simulated net changes in the water table, February 1913–February 1976.

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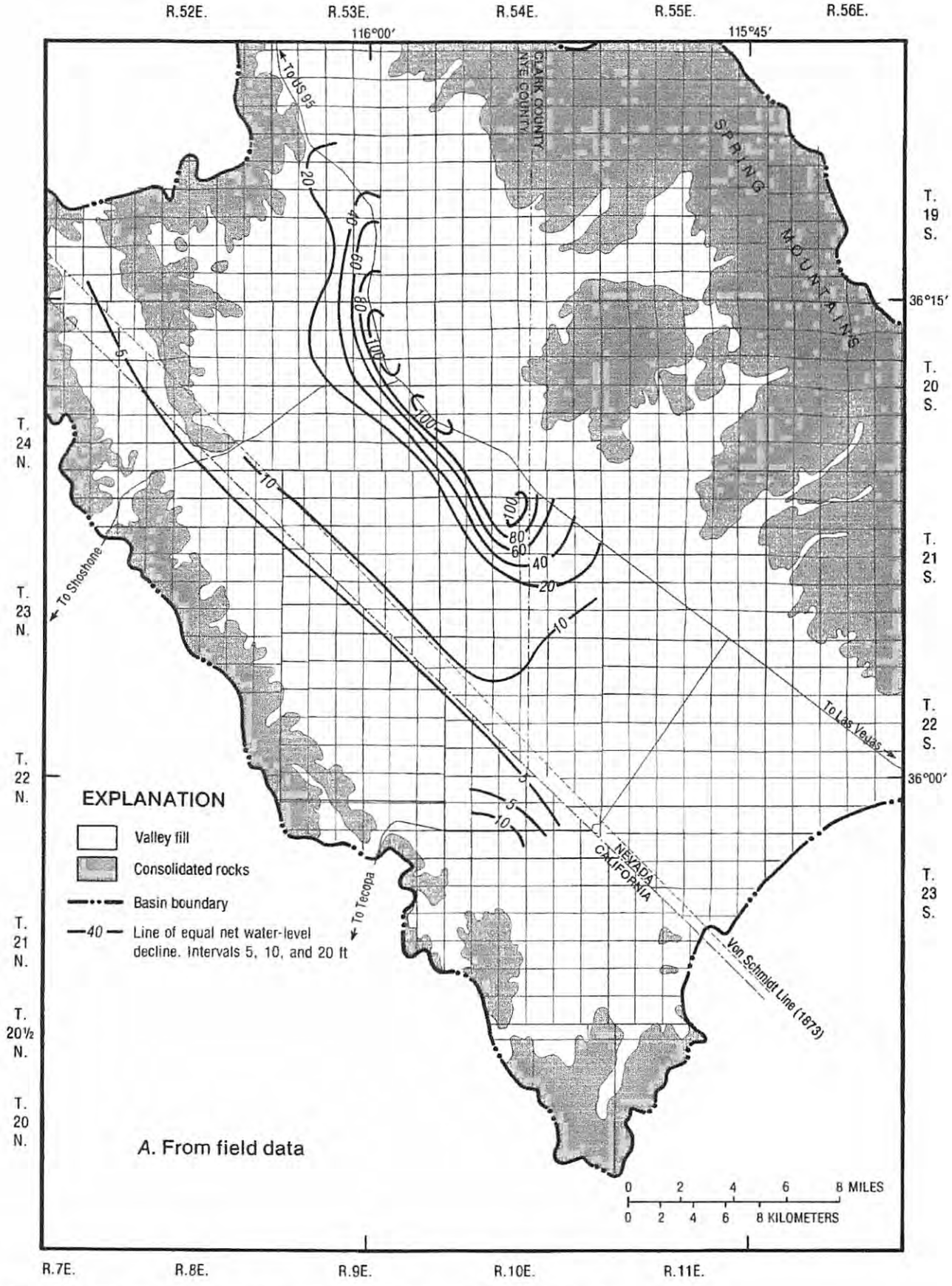

Figure 18*A*. Net water-level declines in deep wells, 1913–76, from field data.

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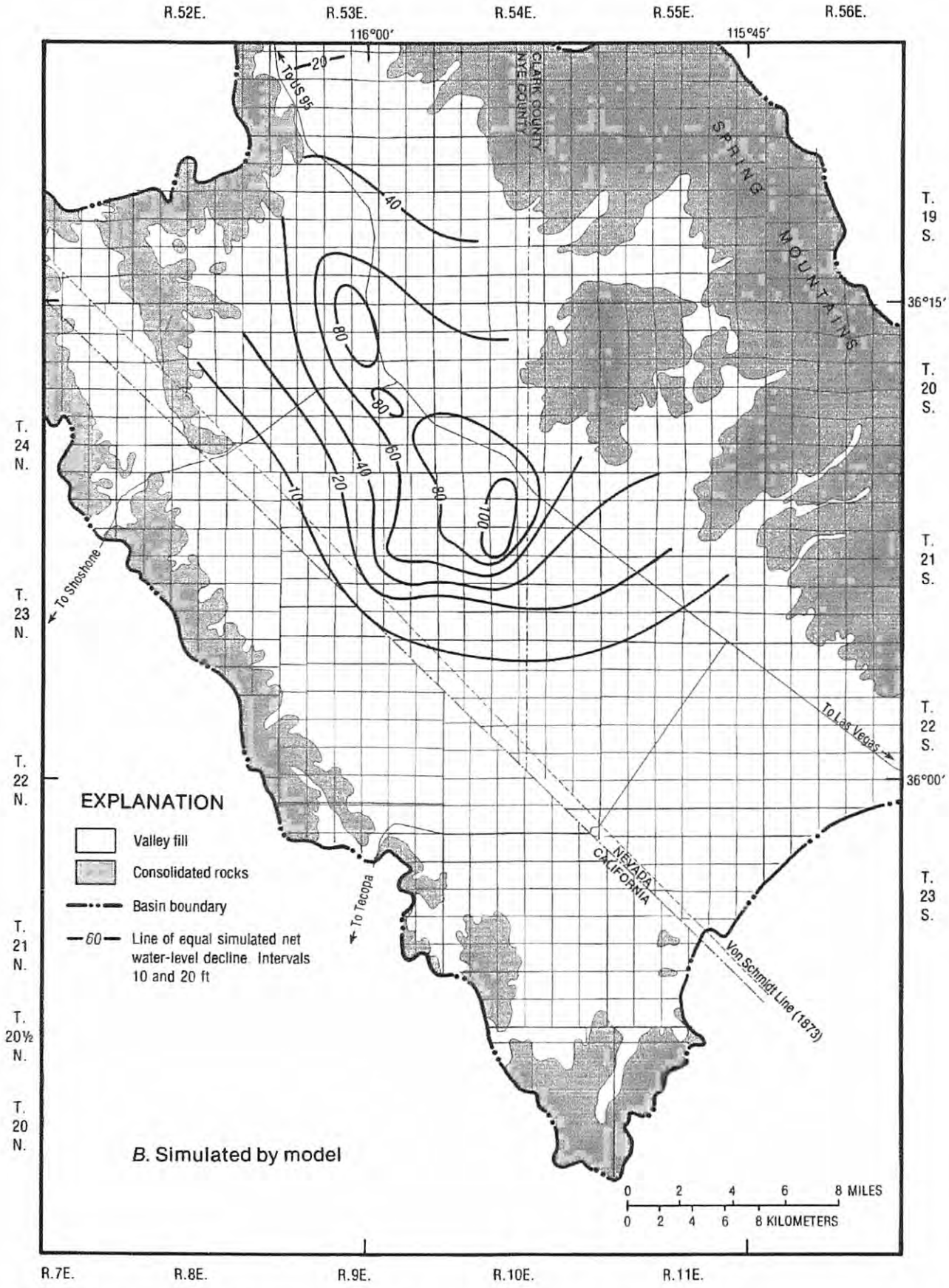

Figure 18*B*. Net water-level declines in deep wells, 1913–76, simulated by the model.

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of recharge does not change may not be valid. Heavy pumping in the vicinity of Manse Spring may have altered heads in nearby carbonate rocks sufficiently to induce water that formerly flowed toward Bennetts Spring to move toward Manse Spring instead. During the last calibration run of the model a total of about 0.8 ft^3/s (580 acre-ft/yr) of recharge was gradually shifted from a recharging node upgradient from Bennetts Spring to a recharging node upgradient from Manse Spring. The response was somewhat better agreement between the observed and simulated heads. (3) Modeled pumpage estimates may be smaller than the true values. Many pumpage estimates for individual wells were compiled by using an average discharge rate and an estimated or reported duration of pumping. More widespread use of meters and timing devices or site-specific determination of electrical consumption and wire-to-water pump efficiencies may be required before the absolute accuracy of existing pumping records can be determined.

The second significant difference between the observed and simulated distribution of water-level declines is that small areas with rapidly changing rates of decline tend to be smoothed out over a slightly larger area in the model. This is largely a result of the grid size selected for the model. A smaller grid size would produce more detailed results, but the larger number of nodes required would make the simulation more expensive. Results obtained with the existing grid are adequate for the purpose of this study; however, if there is a need to simulate detailed changes over localized areas of the valley, a much smaller grid size will be required.

Figure 19 shows the observed water-level declines in deeper wells and the simulated head declines in the middle layer of the model for the period 1962–76. There is general overall agreement, but the differences noted for the longer period are present in this shorter period also.

Variations in Natural Discharge

Changes in natural ground-water discharge include decreases in spring discharge, evapotranspiration of ground water by phreatophytes, and possible changes in subsurface outflow.

Spring discharge was located near areas where heavy pumping centers developed. Consequently, this type of natural discharge was most readily captured by pumping. Spring discharge decreased from nearly 10,000 acre-ft/yr under natural conditions to about 1,400 acre-ft/yr in 1962 (Malmberg, 1967, p. 31) and to about 200 acre-ft/yr in 1975.

Changes in ground-water evapotranspiration were evaluated by the model. Simulated ground-water evapotranspiration (not including direct evapotranspiration of about 5,000 acre-ft/yr of spring discharge from the soil or open-water surfaces) declined from about 14,000 acre-ft/yr under natural conditions to about 4,500 acre-ft/yr in 1962 and to about 2,600 acre-feet in 1975. The capture of this amount of natural discharge has been a significant factor in limiting water-level declines to the values shown in figures 17, 18, and 19.

Plate 3 shows the simulated distribution of evapotranspiration of ground water by phreatophytes under natural conditions and in 1962 and 1975. Areas and rates of evapotranspiration near centers of heavy pumping (figs. 8, 9) have experienced the greatest changes, while there have been only minor changes in areas remote from pumping. Plate 3*D* indicates large areas where simulated evapotranspiration was eliminated when the water table declined to more than 20 ft below the land surface. In actuality, changes are not so clearly defined. Phreatophytes attempt to adjust to declining water levels by growing deeper tap roots, by developing a shallow root system to better use soil moisture, and by becoming established where they can use irrigation tail water. Consequently, residual stands of phreatophytes may survive for a number of years after declining water tables have virtually eliminated ground water as a source of supply.

Changes in subsurface outflow were evaluated by using the model. The amount of subsurface outflow captured by pumping was considered equal to the net decrease in flow to constant-head nodes along the southwest boundary of the model (fig. 14). As of 1976, only about 200 acre-ft/yr of the total outflow of 18,000 acre-ft/yr had been captured.

Ground-Water Storage Depletion

Ground-water storage depletion is primarily the result of drainage of unconsolidated porous materials as the water table is lowered. However, consolidation of fine-grained deposits and the elastic response of water and the aquifer also account for small but significant quantities of water. These processes are discussed in more detail in the following paragraphs.

Water derived from the drainage of unconsolidated materials is evaluated in the model as the product of a storage coefficient, a change in head, and an area. The storage coefficients used for the top layer of the model were generally 1 to 3 percent less than the specific yield values shown in figure 5, to allow for delayed drainage and impermeable lenticular deposits and caliche layers. The head changes used are those shown in figure 17, and the areas are the area of each node (fig. 14). The maximum water-table declines shown in figure 17 occurred along the lower parts of the Pahrump and Manse fans. This area also coincides with the area of highest specific yield shown in figure 5. Consequently, most of the ground-water storage depletion was derived from the

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dewatering of deposits along the lower parts of the Pahrump and Manse alluvial fans.

The release of water from storage in confining beds causes consolidation of these deposits and commonly results in subsidence of the land surface. There are no data on reported leveling of benchmarks in critical areas of the valley to establish the magnitude and rate of land subsidence, if any, in the area. During the spring of 1972, a small ground fissure and some casing protrusion was observed in a localized part of NE¼ sec. 15, T. 20 S., R. 53 E. This suggests that land subsidence is active in at least parts of the area. Additional indirect arguments for the presence of active land subsidence were developed during calibration of the model.

During calibration, the storage coefficient of the middle layer was initially assigned values on the order of 0.001 or 0.002. These values are representative of the confined aquifer where water is derived mainly from the elastic response of water and the aquifer. Reasonable agreement between observed and computed values was obtained around the margins of the valley; however, where heavy pumping coincided with areas where significant fine-grained material was present in the valley fill, computed changes were much greater than observed changes. Attempts were made to improve agreement by increasing the vertical leakage, but this resulted in large head declines in the top layer that did not agree with available field data. The best agreement was obtained when the storage coefficient of the middle layer was increased to 0.02 or 0.03 in areas containing a significant amount of fine-grained material (see pl. 1). Theoretically, storage changes in a confined aquifer much in excess of the initial values used would have to be derived from the consolidation of fine-grained materials. Crude estimates of probable land subsidence were made by assuming that the amount by which the storage coefficient of the middle layer of the model exceeded 0.002 would represent water being derived from the consolidation of fine-grained materials. The volume of subsidence can be estimated as the residual of the storage coefficient times the drawdown times an area. The amount of land subsidence can be estimated as the product of the residual of the storage coefficient times the decline in a given area. Figure 20 shows areas of possible land subsidence estimated in this way. The total volume of subsidence was inferred to be about 68,000 acre-ft. This inference is based on adjustments made during calibration of the model and consequently is only an indicator of the possible extent and magnitude of land subsidence. However, it points out the need for additional field information.

Under confined conditions both the water and aquifer undergo small elastic changes in volume in response to changes in artesian head. Although the amount of change is small when evaluated on a unit basis, the total changes in confined systems cover large areas and involve significant amounts of water. Both the middle and bottom layers of the model were considered to be under confined conditions. Storage depletions due to elastic response were evaluated as the product of change, area, and 0.002.

Table 6 summarizes estimates of storage depletion by all processes for the periods 1913-61 and 1962-75. The total storage depletion of about 375,000 acre-ft at the end of 1975 was equal to 38 percent of the total pumpage of about 1,000,000 acre-ft since 1913 (table 5).

Table 6. Summary of estimates of storage depletion
[Acre-feet]

Period	Type of depletion			Total depletion
	Drainage of unconsolidated deposits	Consolidation of fine-grained deposits	Elastic response of aquifer and water	
1913-61	120,000	22,000	14,000	156,000
1962-75	155,000	46,000	18,000	219,000
1913-75	275,000	68,000	32,000	375,000

Future Response

It is difficult to predict future responses to pumping because magnitude, distribution, and use of the pumped water changes with time. However, generalized information about how the ground-water system is likely to respond in the future can be obtained by assuming that future pumping will remain at about the 1975 level. This assumption was incorporated in the model, and probable system response to the year 2040 was simulated. This long period was selected only to allow a crude quantitative evaluation of likely trends. Precise prediction is beyond the scope of this study, and this limitation should be kept in mind while evaluating the results presented in the following paragraphs.

Simulated future response is summarized in terms of two types of parameters. The first type comprises rates of flow that represent the total pumpage, spring discharge, ground-water evapotranspiration, and storage depletion at a given time. These factors provide insight as to the state of the system. The second type of parameter comprises water-level changes in different parts of the valley. Flow quantities listed as the first type of parameter tend to react with each other and the system in a complex manner. However, the net result is integrated into a simple change in water levels which provides an indication of the net response of the system. Three areas were selected, and computed water-level changes at nodes within each area were averaged to provide generalized indications of water-level trends. The areas are (1) a

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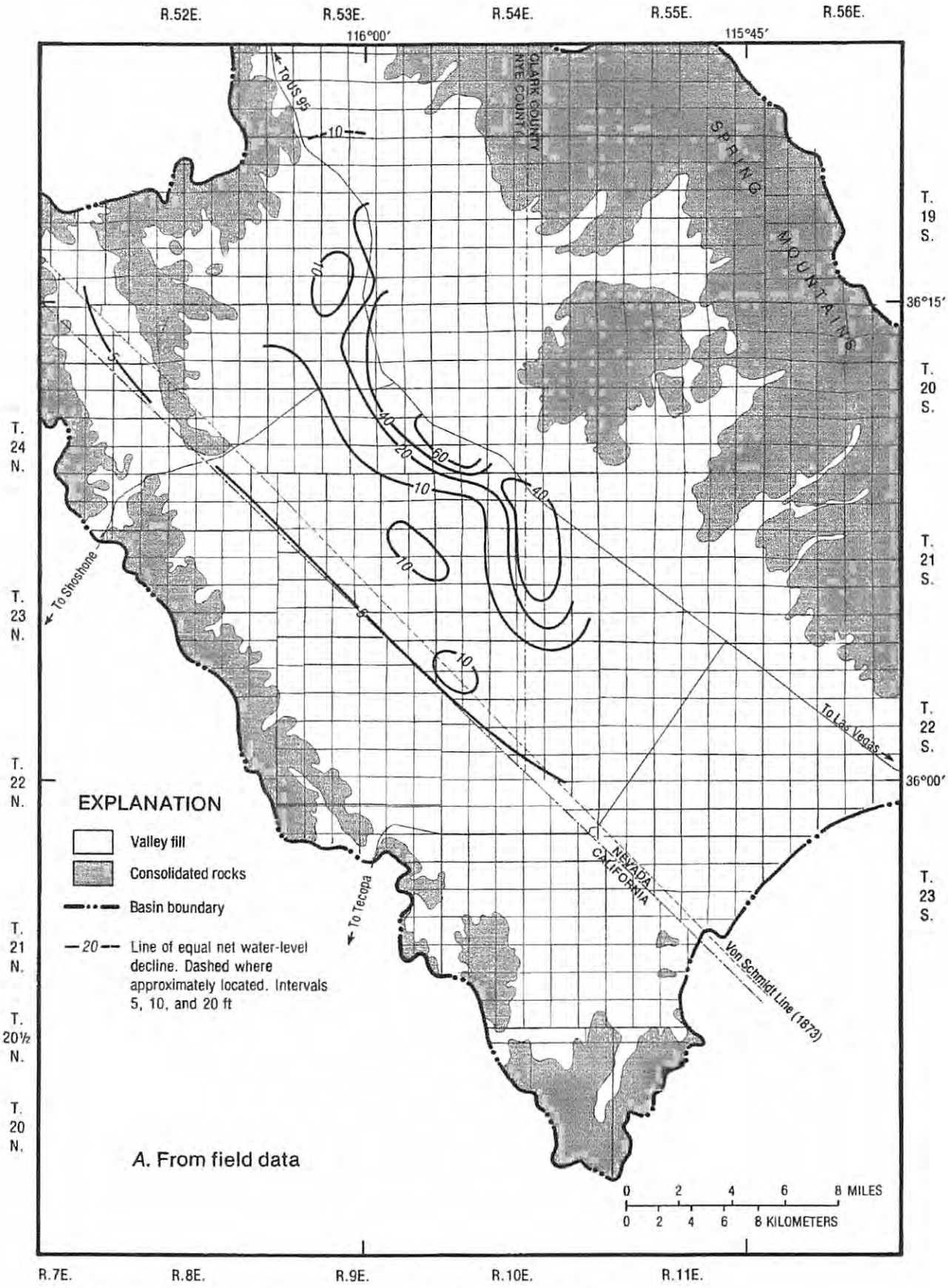

Figure 19*A*. Net water-level declines in deep wells, 1962–76, from field data.

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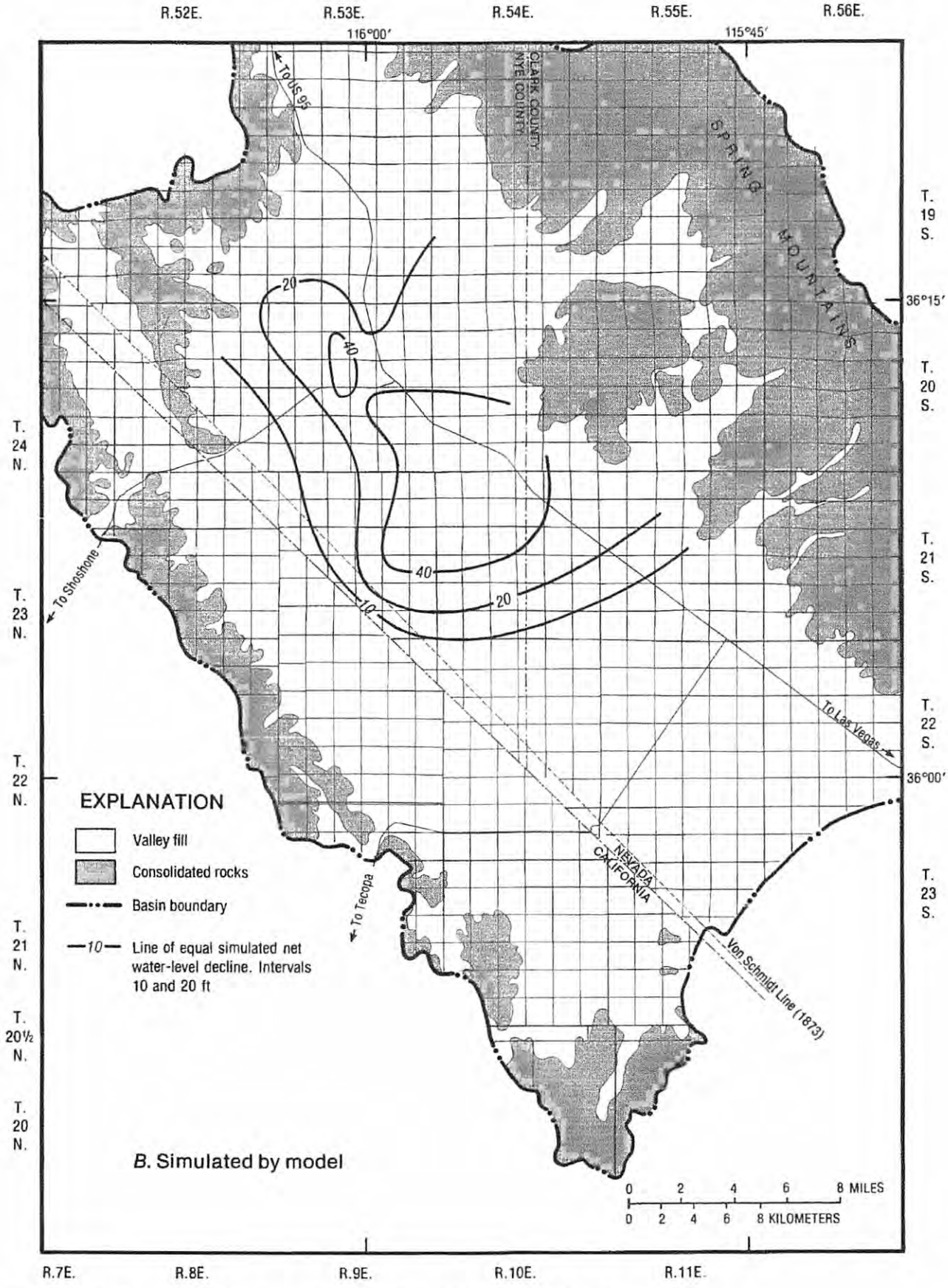

Figure 19*B*. Net water-level declines in deep wells, 1962–76, simulated by the model.

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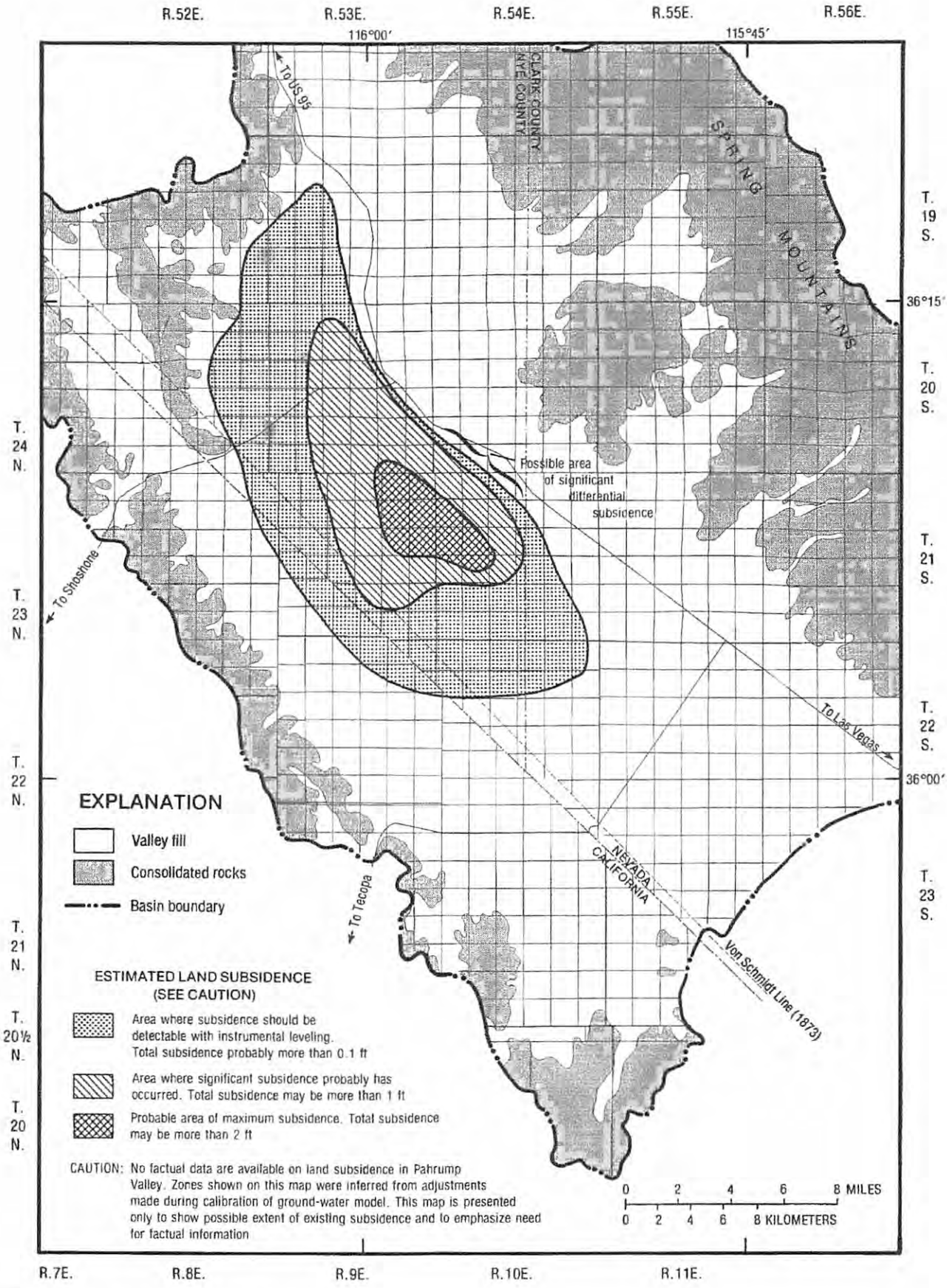

Figure 20. Estimated land-surface subsidence.

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zone, C, along the base of the Pahrump and Manse fans where pumping historically has been concentrated, (2) a zone, B, along the axis of the Nevada part of the valley that contains some development, and (3) a zone, A, along the Nevada side of the State line that is southeast of any significant development. Location of these areas is shown in figure 21.

Figure 22 shows plots of the various parameters against time. The illustration shows results for the entire period of simulation (1913–2040). This was done because future trends tend to have more significance when viewed in terms of the perspective provided by historical information.

The following statements are based on information shown in figure 22:

1. Virtually all spring discharge was captured by pumping prior to 1976. Consequently, future water-level declines will not be moderated by additional capture of spring discharge.
2. Ground-water evapotranspiration was captured more slowly by pumping than was spring discharge. As of 1976, about 2,600 acre-ft/yr of ground-water evapotranspiration remained. Capture of all ground-water evapotranspiration by pumping probably will not occur in the foreseeable future because some remaining areas of active evapotranspiration are too remote from pumping.
3. It is very difficult to capture appreciable amounts of subsurface outflow from Pahrump Valley. As of 1976, only about 200 acre-ft/yr of the total of 18,000 acre-ft/yr had been captured. By the year 2040, a total of only 600 to 700 acre-ft/yr may be captured.
4. Ground-water storage depletion and water-level declines will continue at fairly constant rates until 2040, and the system will remain in nonequilibrium as long as pumping is maintained at the 1975 rate.

Accuracy of Model Results

Calculations performed by the model produce precise results. However, accuracy of the computer output depends on the validity of simplifying assumptions used in model formulation and the accuracy of the concept of the hydrologic system.

In Pahrump Valley, hydrologic conditions in the deeper valley fill and underlying bedrock must be inferred. Consequently, the assumptions made about these areas introduce a comparatively large degree of uncertainty into the model results. Moreover, because the boundary conditions and transmissivity of the lower layer are not precisely defined, the problem of nonunique solutions, which has already been mentioned in the section "Development of the Mathematical Model," also introduces uncertainty in results that give a reasonable match to observed conditions. More specifically, the fact that a reasonably good fit between observed and simulated heads for natural conditions was obtained by using 37,000 acre-ft/yr of recharge and the distribution of transmissivity and vertical hydraulic conductivity shown in figures 3, 4, and 14 does not preclude that matches equally as good could be obtained by using other values of recharge and transmissivity. In theory, identical head distributions could be obtained by multiplying all the variables by a constant factor.

In this study the range of uncertainty of the final steady-state solution was evaluated by keeping the evapotranspiration function constant and multiplying other model parameters by a constant. When model parameters were increased by 30 percent (multiplied by 1.3), the agreement between observed and simulated heads was not as good as that shown in figure 16 (the difference was probably due to the increase in heads needed to cause additional evapotranspiration). However, when model parameters were decreased by 30 percent (multiplied by 0.7), the agreement between observed and simulated heads was almost as good as that shown in figure 17. The area of evapotranspiration was about the same as that shown on plate 3*B* but the rates were substantially less. The exact areas and rates of evapotranspiration that existed under natural conditions are not known, but further decreases probably would not produce representative results. Thus, analysis of the steady-state model results indicates a possible range in recharge of 37,000 to 26,000 acre-ft/yr.

It was necessary to evaluate the transient-state simulations where pumping was introduced into the model in order to determine a rate of recharge and the associated parameters that would give the best overall fit. Model parameters compatible with 37,000 acre-ft/yr of recharge produced the best fit between observed and simulated drawdowns. Consequently, 37,000 acre-feet is used as the best estimate of recharge generated by the model. When evaluating the accuracy of recharge estimates generated by the model, the possible range of 37,000 to 26,000 acre-ft/yr should be kept in mind.

THE AVAILABLE WATER SUPPLY

Ground-Water Budget

Under natural conditions, the ground-water flow system was in a state of dynamic equilibrium in which, over the long term, average annual recharge was equal to the discharge and there was no net change in ground-water storage. Pumping ground water has created an imbalance: the total discharge (natural discharge plus pumpage) exceeds the total recharge (natural recharge plus recirculated pumpage).

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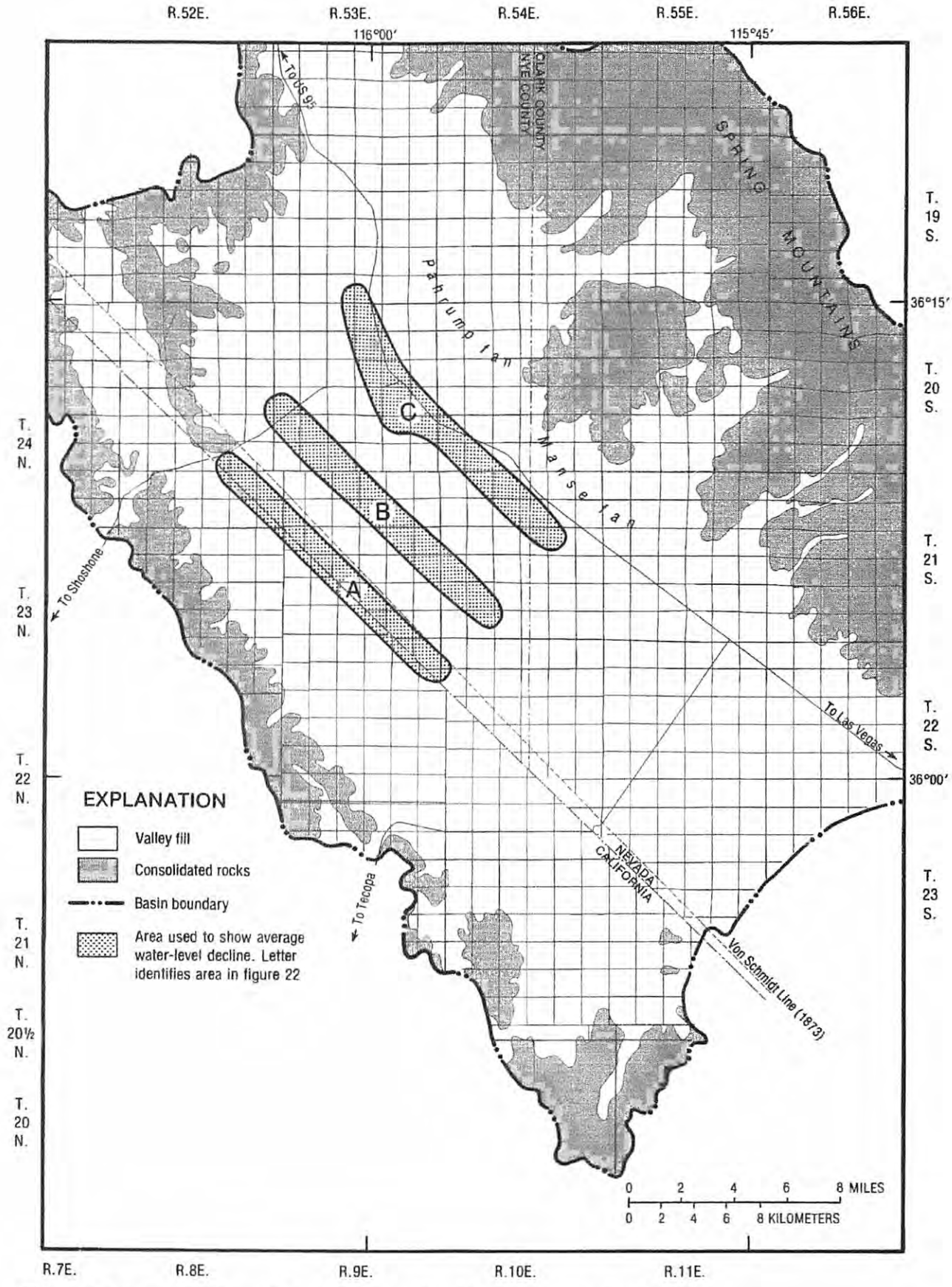

Figure 21. Areas used in figure 22 to indicate simulated long-term water-level declines.

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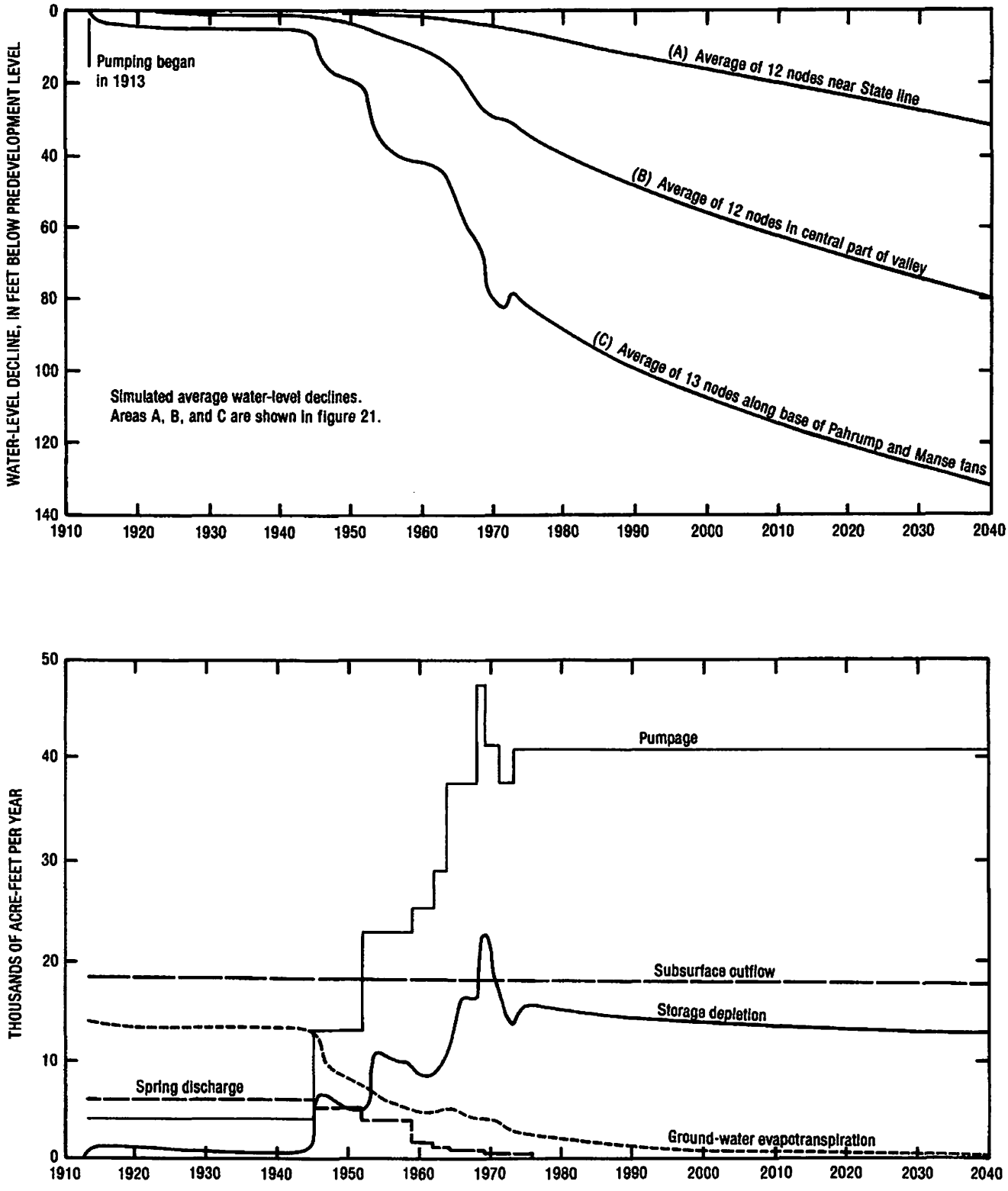

Figure 22. Simulated long-term trends in selected hydrologic parameters, 1910–2040.

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The system responds to pumping by removing ground water from storage and subsequently capturing natural discharge in an attempt to establish a new equilibrium in which recharge (natural recharge plus recycled pumpage) again equals discharge (pumpage plus the reduced natural discharge). If pumpage exceeds the recharge to the system, a new equilibrium is not possible. Water will continually be withdrawn from storage, and ground-water levels will decline.

Table 7 lists a ground-water budget that summarizes the various items of inflow to and outflow from the ground-water system (1) under predevelopment natural conditions, (2) as of spring 1962, and (3) as of spring 1976. The varying quantities can be compared with the graphical information shown in figure 23 to get a feel for the state of the system at times other than the three times selected for a budget analysis. The simulated areal distribution of evapotranspiration for the three times for which budgets were formulated is shown on plate 3. Two budgets for natural conditions are shown in table 7. One is based on estimates derived by using field and empirical techniques and the other summarizes the items of inflow and outflow used in the calibrated steady-state version of the model. The estimates generated by field and empirical techniques are less than those generated using the model. Determination of which of the two techniques provides the most accurate information is difficult. Credibility of the lower set of values is limited because of (1) the empirical nature of the techniques used, (2) the assumption that the distribution of evapotranspiration in 1962 was very close to that under natural conditions (see pl. 3), and (3) the need to estimate subsurface outflow by difference. On the other hand, credibility of the precise computations performed by the model is limited by the accuracy of the information entered in the model (see previous discussion on accuracy of model results). Budget values generated by the model are considered slightly better because they represent a set of data in which individual elements are internally compatible and because the assumptions used represent the best approximations that could be made at this time. However, the relatively wide range of results obtained by using both techniques, when the range of natural recharge is 37,000–26,000 acre-ft/yr, is an indication of the uncertainties in the estimates.

Under natural conditions the general level of net inflow to and outflow from the ground-water system is estimated by the model to be about 37,000 acre-ft/yr. In 1962 and 1976, when the system was not in equilibrium,

Table 7. Ground-water budgets

[Acre-feet per year, rounded to two significant figures]

	Natural conditions		Spring 1962	Spring 1976
	Based on field and empirical techniques	Based on steady-state simulation		
Inflow:				
Natural recharge	22,000–26,000	37,000	37,000	37,000
Recirculated pumpage and spring discharge	([1])	[2]4,600	5,900	11,000
Total inflow	22,000–26,000	[3]42,000	43,000	48,000
Outflow:				
Evapotranspiration	10,000–13,000	[4]14,000	4,900	2,600
Pumpage	0	0	27,000	42,000
Spring discharge	([1])	9,800	1,400	200
Subsurface outflow	6,000–19,000	18,000	18,000	18,000
Total outflow	16,000–32,000	[3]42,000	51,000	63,000
Difference	6,000–10,000	0	8,000	15,000
Storage depletion	0	0	[5]8,600	[5]16,000

[1]Spring discharge under natural conditions was about 9,800 acre-ft/yr. All of this quantity is included in the estimate of evapotranspiration and is not repeated in order to avoid double counting.

[2]Amount of spring discharge recirculated back to top layer of model to produce distribution of evapotranspiration shown on plate 3*B*.

[3]Includes 4,600 acre-feet of internal recirculation. Net inflow and outflow 37,000 acre-ft/yr.

[4]Does not include direct evapotranspiration of 5,200 acre-ft/yr of spring discharge not recirculated back to ground water.

[5]Average rates for periods 1959-61 and 1973-75, respectively.

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the difference between inflow and outflow agrees closely with the calculated rates of storage depletion.

Table 8 presents a cumulative mass balance which summarizes cumulative values of the budget items listed in table 7 for the periods 1913–61, 1962–75, and 1913–75. As in table 7, the differences between cumulative values of recharge and discharge are about the same as the estimates of cumulative storage depletion. In theory, they should be in exact agreement. The observed differences are due to accumulating small consistent errors and to independent rounding of large numbers. During the period 1913–61, about 34 percent of the water pumped was derived from storage as opposed to about 40 percent during the period 1962–75.

Table 8. Cumulative mass balance
[Acre-feet, rounded]

	1913–61	1962–75	1913–75
Inflow:			
Natural recharge	1,800,000	520,000	2,300,000
Recirculated pumpage and spring flow	210,000	140,000	350,000
Total inflow (rounded)	2,000,000	660,000	2,700,000
Outflow:			
Evapotranspiration	540,000	60,000	600,000
Pumpage	460,000	540,000	1,100,000
Spring discharge	260,000	11,000	270,000
Subsurface outflow	880,000	250,000	1,100,000
Total outflow (rounded)	2,100,000	860,000	3,000,000
Difference	100,000	200,000	300,000
Storage depletion	156,000	219,000	375,000

Maximum Steady-State Pumping Rates

Ground water is the source of virtually the entire water supply in Pahrump Valley. Pumped water must be derived from the capture of natural discharge, from reuse of water recycled back to ground water, or from the depletion of ground-water storage. Depletion of ground-water storage will eventually be limited by the amount of storage economically recoverable or by environmental or legal constraints. Thus, the available water supply will ultimately be limited to the amount of natural discharge that can be captured by pumping.

The preceding analysis indicates that it will be very difficult to capture a significant amount of the subsurface outflow. Consequently, the maximum amount of natural discharge that feasibly can be captured by pumping is estimated as the total natural discharge (37,000 acre-ft/yr; table 7) minus subsurface outflow (18,000 acre-ft/yr), or about 19,000 acre-ft/yr. For practical purposes, this represents the maximum amount of water that can be withdrawn and consumed annually on an indefinite basis without creating a continuing draft on ground-water storage.

Generally, when water is used some of it is not consumed and ultimately recirculates back to ground water as return flow. This water is usually degraded in quality but may be suitable for some uses. If it is assumed that water quality will not be a problem or that quality problems can be handled by treatment, the maximum steady-state pumping rate that can be sustained is a function of both the amount of natural discharge that can be captured and the amount of pumpage recycled back to ground water.

The amount of natural discharge that can be captured is virtually a fixed quantity; however, the amount of water recycled back to ground water varies with the type of use. The type of use may change as the valley develops; consequently, the maximum steady-state pumping rate may change with time. Arteaga and Durbin (1978, p. 29) described a technique for estimating maximum steady-state pumping rates in Eagle Valley, Nev., that allows for different rates of return flow from various uses. The relationship that they derived includes use of both surface water and ground water and is not directly applicable to Pahrump Valley. However, the procedures were applied to conditions in an arid desert basin with no surface supplies, and the following general relationship between the maximum steady-state pumping rate, capturable natural discharge, and net pumpage was obtained:

$$SPR = \frac{CND}{1-[RFA(PCTA)+RFB(PCTB)+RFC(PCTC)+...RFN(PCTN)]},$$

in which

SPR = maximum steady-state pumping rate;
CND = maximum amount of natural discharge that can be captured by pumping;
PCTA = fraction of the total pumpage used for purpose A;
PCTB = fraction of the total pumpage used for purpose B;
PCTC = fraction of the total pumpage used for purpose C;
PCTN = fraction of the total pumpage used for purpose N, where PCTA through PCTN total 1.0;
RFA = fraction of pumpage for purpose A that is return flow;
RFB = fraction of pumpage for purpose B that is return flow;
RFC = fraction of pumpage for purpose C that is return flow; and
RFN = fraction of pumpage for purpose N that is return flow.

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Thus, [RFA(PCTA) + RFB(PCTB) + RFC(PCTC) + ... RFN(PCTN)] is the total annual return flow for the entire valley expressed as a decimal fraction of the total annual pumpage.

For Pahrump Valley, A is agricultural use, B is self-supplied domestic use, and C is public-supply and commercial use. Under 1975 conditions,

CND = 19,000 acre-ft/yr (see section on "Simulated Natural Conditions"),
PCTA = 0.93,
PCTB = about 0.02,
PCTC = 0.05,
RFA = 0.25
RFB = 0.70, and
RFC = 0.50.

Substituting into the equation and solving,

$$SPR = \frac{19{,}000}{1-[0.25(0.93)+0.70(0.02)+0.50(0.05)]}$$

$$= 26{,}000 \text{ acre-ft/yr.}$$

Thus, under 1975 conditions the maximum steady-state pumping rate for Pahrump Valley is 26,000 acre-ft/yr. This rate will undoubtably change in the future as public supply and domestic use increase and the average return flow changes. Figure 23 shows the relation between the maximum steady-state pumping rate and the average return flow. It can be used to estimate the maximum steady-state pumping rate as types of water use and the resulting return flow change in the future.

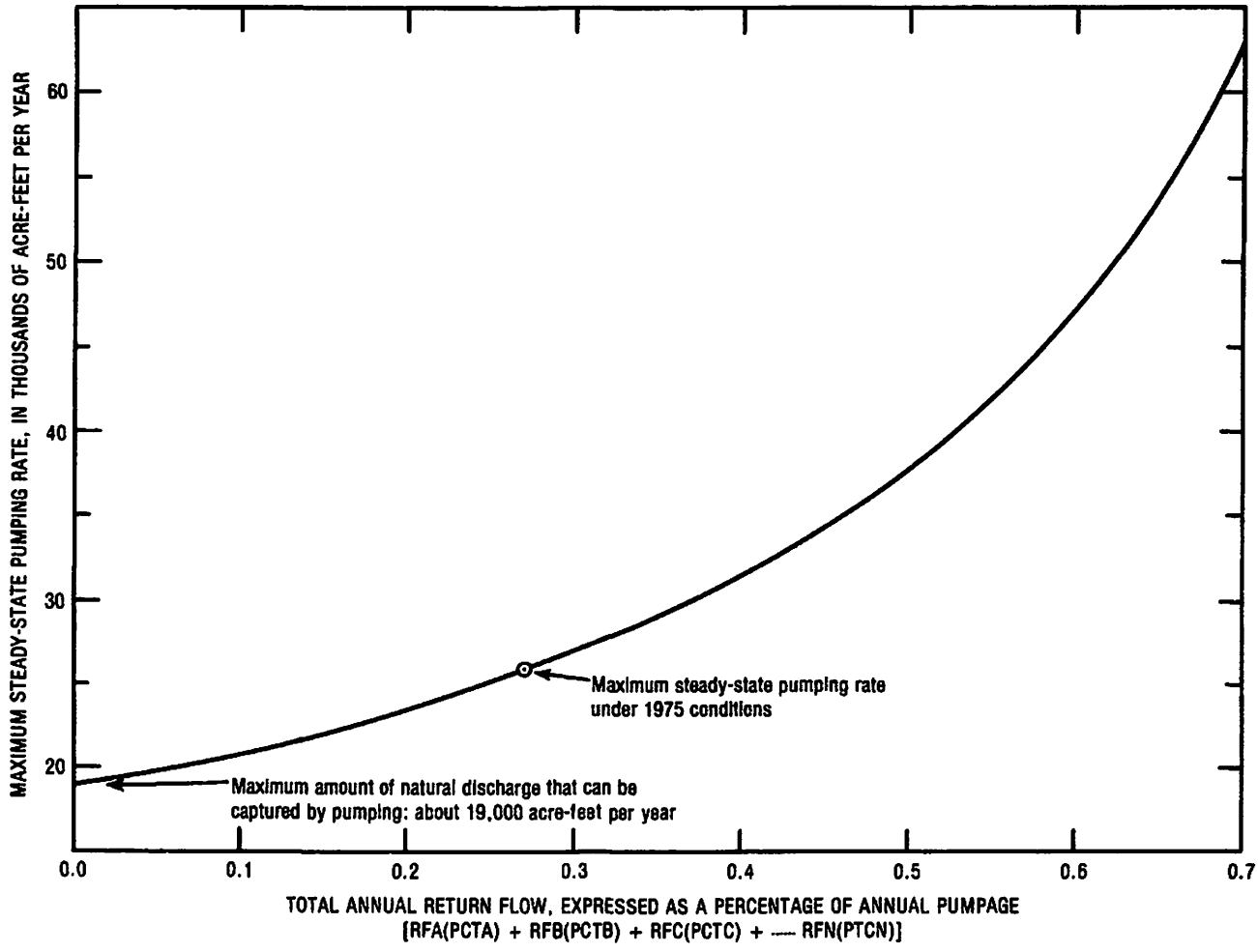

Figure 23. Relation between maximum steady-state pumping rate and average return flow.

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Field conditions should be carefully evaluated before the general concept of a maximum steady-state pumping rate is applied to a specific area. Items such as the maintenance of suitable water quality, the areal distribution of pumping, the degree of continuity between shallow and deeper parts of the ground-water reservoir, and the possibility of localized overpumping in areas of low transmissivity should all be considered. Problems in any of these areas could cause adverse effects at pumping rates substantially less than the maximum steady-state pumping rate.

Overdraft

When an area having previously had a stable ground-water system is developed, water is withdrawn from storage until resulting water-level declines alter the flow system sufficiently to either reduce the discharge or induce additional inflow. Water levels stabilize when the system reaches a new equilibrium, that is when pumpage plus the reduced natural discharge (the quantity can be reduced to zero) equals the natural recharge plus any additional recharge induced as a result of development. If ground water is withdrawn from a source more rapidly than it is replenished, an overdraft develops. Ultimately resulting water-level declines cause pumping lifts to become prohibitive or lead to other undesirable results.

Two generalized types of overdraft are possible: basinwide and localized. Basinwide overdrafts occur when net ground-water pumpage exceeds inflow to the system over a sustained period of time. In this case, water levels will continue to decline as long as pumping exceeds recharge, although the rate of decline will decrease as natural discharge is captured by pumping. Thus, even though wells may be ideally located, the cumulative effects of gradual but sustained water-level declines will eventually result in excessive pumping costs or other undesirable effects. At this point, additional water must be imported or pumping must be reduced. A more common occurrence in Nevada valleys is localized overdraft, which results from pumping being concentrated in a localized area. Water-level declines in these areas are accelerated, and pumping lifts and associated detrimental effects may become intolerable before enough discharge is captured to stabilize water levels.

The analysis made in this report indicates that it will be very difficult to capture a significant amount of subsurface outflow by pumping from the valley-fill reservoir in the general vicinity of existing areas of development. This evaluation of overdraft assumes that future pumping will be primarily from the valley fill and, for the most part, will be concentrated in the same general areas as shown in figures 8 and 9. It is beyond the scope of this report to determine whether deep pumping located near the Nopah Range could economically capture a significant amount of subsurface outflow.

A basinwide overdraft has existed in Pahrump Valley for many years. As of 1975 the general level of pumping of about 40,800 acre-ft/yr resulted in a net draft on the system of about 30,000 acre-ft/yr (total pumpage minus recirculation). The maximum amount of natural discharge that can be captured by pumping has been estimated as 19,000 acre-ft/yr. The difference between these two quantities (30,000-19,000, or 11,000 acre-ft/yr) is the magnitude of the existing overdraft. The magnitude of the overdraft can also be estimated from the maximum steady-state pumping rate by using the following relationship:

$$OD = \frac{(APR-SPR)(CND)}{SPR},$$

in which OD is the overdraft rate, APR is the actual pumping rate, SPR is the maximum steady-state pumping rate, and CND is the maximum amount of natural discharge that can be captured by pumping. Using 1975 pumping conditions:

$$OD = \frac{(41{,}000-26{,}000)(19{,}000)}{26{,}000},$$

$$= 11{,}000 \text{ acre-ft/yr}.$$

Eventually, either pumping in Pahrump Valley will have to be curtailed or additional water will have to be imported to alleviate the overdraft problem. However, at the present and probable future rates of water-level decline (fig. 23) considerable time may elapse before either action becomes necessary. One reason the present rates of water-level decline have been only moderate in terms of the level of pumping and the amount of overdraft on the basin is that the existing pumping is situated to capture spring discharge rather effectively. The consequent capture of about 10,000 acre-ft/yr of spring discharge and about 6,000 acre-ft/yr of other evapotranspiration by pumping has helped reduce the rate of water-level decline.

CONCLUSIONS

The principal conclusions regarding the ground-water resources of Pahrump Valley are as follows:

1. The ground-water system consists of two reservoirs: (1) the valley-fill reservoir, which consists of unconsolidated materials and occurs only within the study area, and (2) a consolidated-rock reservoir, which is composed primarily of carbonate-rock aquifers and extends beyond the boundary of Pahrump Valley to form a multivalley flow system that partly drains the ground-water resources of Pahrump Valley.

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2. Although the scope of this study did not allow detailed delineation of the consolidated-rock reservoir, two statements are supported by the results of this evaluation: (1) the system, as conceived in this study, does not contribute appreciable subsurface inflow to the adjacent Amargosa Desert, and (2) the most probable discharge area for subsurface outflow from Pahrump Valley is along the flood plain of the Amargosa River between the towns of Shoshone and Tecopa, some 12 to 15 mi southeast of Pahrump Valley. Additional fieldwork is needed to confirm or disprove the latter hypothesis.
3. Analysis of the system suggests that natural ground-water recharge and predevelopment discharge are within the range of 37,000 to 26,000 acre-ft/yr. The value at the high end of the range was chosen because it provided the best fit to information available at the time of this study. About 18,000 acre-ft/yr of this quantity leaves the valley as subsurface outflow. Precise determination of these quantities is hindered by a lack of knowledge about hydrologic conditions in the consolidated-rock reservoir.
4. Ground water supplies virtually all the water used in Pahrump Valley. During the period 1962-75, ground-water withdrawals from springs or wells increased from about 29,000 acre-ft/yr in 1962 to a maximum of 48,000 acre-ft/yr in 1968 and then declined to about 41,000 acre-feet in 1975. The decrease was due primarily to the transition from agricultural to real estate development. Pumping may approach the maximum historical rate in the future when land taken out of agricultural production becomes fully developed for residential purposes. As of 1975, all but a few acre-feet of pumpage was from the Nevada part of the valley.
5. Substantial water-level declines have occurred in deeper wells along the lower parts of the Pahrump and Manse alluvial fans where heavy pumping has been concentrated. Maximum observed declines since development began have been slightly greater than 100 ft in localized areas. Maximum observed declines during the period 1962-75 were slightly more than 60 feet. Water-level declines were substantially less in the central part of the valley. During the period 1962-75, water levels along the fan generally declined at rates between 1 and 4½ ft/yr, while water levels in the central part of the valley declined less than 1 ft/yr. The rate of water-level decline was generally much less in shallow wells than in deeper wells. In some areas the water level in shallow wells rose as the result of local recharge from irrigated land.
6. There are no leveling data that will allow an accurate evaluation of the amount of land subsidence; however, the analysis made in this study suggests that land subsidence is active in the valley. A network of strategically located benchmarks should be established and periodically releveled to determine the extent and rate of subsidence.
7. Pumping during the period 1962-75 has resulted in a total ground-water storage depletion of 219,000 acre-ft, which was about 40 percent of the total pumpage. About 155,000 acre-ft of this storage depletion was derived from drainage of unconsolidated deposits, about 46,000 acre-ft was probably from the compaction of fine-grained sediments, and about 18,000 acre-ft was from the elastic response of the aquifer and the water.
8. Pumpage not derived from storage was supplied by the capture of spring discharge and natural ground-water evapotranspiration and from secondary recharge that consists mainly of infiltration from irrigated fields. During the period 1962-75, spring discharge declined from 1,400 to 200 acre-ft/yr, ground-water evapotranspiration declined from 4,900 to 2,600 acre-ft/yr, and recharge from recirculated pumpage and spring flow increased from 5,900 to 11,000 acre-ft/yr. Very little subsurface outflow had been captured by pumping.
9. The model analysis made during the study indicates that the maximum amount of natural discharge that might ultimately be captured by pumping is about 19,000 acre-ft/yr. This represents the amount of water that the valley could yield on a sustained basis without continually depleting ground-water storage. This amount is larger than the 12,000 acre-ft estimated by Malmberg (1967, p. 39). The difference in estimates is due primarily to different techniques used in the analysis.
10. The maximum amount of water that can be pumped on a sustained basis depends on both the amount of natural discharge that can be captured by pumping and the amount of pumped water that is recirculated back to ground water. Under 1975 conditions, about 27 percent of the pumpage was recirculated back to ground water. Under these conditions the maximum steady-state pumping rate is 26,000 acre-ft/yr. If the type of use and amount of water recirculated back to ground water change in the future, maximum steady-state pumping rate will change also.
11. There is significant uncertainty in estimates that attempt to quantify the ground-water budget in Pahrump Valley; however, all estimates indicate a substantial overdraft on the ground-water reservoir. Using the estimates generated by this study, overdraft on the system in 1975 was about 11,000 acre-ft/yr. Under these conditions, no new equilibrium is possible and water levels will continue to decline as long as this high level of pumping is sustained. Results from simulated pumping of the ground-

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water model until the year 2040 also indicate this trend.

12. The valley-fill reservoir contains vast amounts of stored ground water. Geophysical techniques were used to estimate the total thickness of the valley fill. With this information, it was also possible to estimate that there may be as much as 57 million acre-ft of recoverable ground water stored in the valley-fill reservoir. Most of this cannot be economically recovered with existing technology because of high pumping costs. There is also the environmental factor of land subsidence to be considered. The amount of water stored in the upper 200 ft of saturated valley fill in and adjacent to the area of development, as of 1975, is about 2.3 million acre-ft. This quantity probably better represents the amount of ground water stored within economic pumping lifts, using the general distribution of pumping as of 1975. Depletion of even this amount of ground-water storage would probably cause significant land subsidence in the central part of the valley.
13. Ground water currently is the sole source for large-scale development in Pahrump Valley and will probably remain so for the foreseeable future. The overdraft that exists will result in a sustained depletion of stored ground water, and continuing water-level declines are anticipated. However, the amount of ground-water storage is large in relation to the magnitude of the annual overdraft, and pumping can remain at the 1975 level for many years before the reservoir of stored ground water is seriously depleted. If serious problems arise they will probably not be related to running out of water on a valleywide basis but, instead, to situations such as deteriorating water quality, land subsidence, or too closely spaced pumping.

REFERENCES CITED

Arteaga, F.E., and Durbin, T.J., 1978, Development of a relation for steady-state pumping rate for Eagle Valley ground-water basin, Nevada: U.S. Geological Survey Open-File Report 79-261, 45 p.

California Division of Water Resources, 1956, Office report on water wells and ground-water data in Pahrump, Mesquite, Ivanpah, Lanfair, Fenner, Chuckawalla, and Jacumba Valleys: California Division of Water Resources report, 58 p.

Chapman, R.H., Healy, D.L., and Troxel, B.W., 1971, Bouguer gravity map of California, Death Valley sheet: California Division of Mines and Geology map.

Chow, Ven Te, ed., 1964, Handbook of applied hydrology: New York, McGraw-Hill, 1,453 p.

Cooper, H.H., Jr., 1966, The equation of ground water flow in fixed and deforming coordinates: Journal of Geophysical Research, v. 71, no. 20, p. 4785-4790.

Cornwall, H.R., 1972, Geology and mineral deposits of southern Nye County, Nevada: Nevada Bureau of Mines and Geology Bulletin 77, 49 p.

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

Eakin, T.E., Maxey, G.B., Robinson, T.W., Fredericks, J.C., and Loeltz, O.J., 1951, Contributions to the hydrology of eastern Nevada: Nevada State Engineer, Water Resources Bulletin 12, 171 p.

Glancy, P.A., 1968, Water-resources appraisal of Mesquite-Ivanpah Valley area, Nevada and California: Nevada Division of Water Resources Reconnaissance Report 46, 57 p.

Hardman, George, and Mason, H.S., 1949, Irrigated lands of Nevada: University of Nevada-Reno, Agricultural Experiment Station Bulletin 183, 57 p.

Hardman, George, and Miller, M.R., 1934, The quality of the waters of southeastern Nevada, drainage basins and water resources: University of Nevada-Reno, Agricultural Experimental Station Bulletin 136, 62 p.

Harrill, J.R., 1976, Pumping and ground-water storage depletion in Las Vegas Valley, Nevada, 1955-74: Nevada Division of Water Resources Bulletin 44, 70 p.

Healey, D.L., 1973, Bouguer gravity map of California, Kingman sheet: California Division of Mines and Geology map.

Healey, D.L., and Miller, C.H., 1965, Gravity survey of the Amargosa Desert area of Nevada and California: U.S. Geological Survey Technical Letter NTS-99, 32 p.

Hughes, J.L., 1966, Some aspects of the hydrogeology of the Spring Mountains and Pahrump Valley, Nevada, and environs, as determined by spring evaluation: University of Nevada-Reno, unpublished M.S. thesis, 116 p.

Jacob, C.E., 1950, Flow of ground water, *in* Rouse, Hunter, ed., Engineering Hydraulics: New York, John Wiley, p. 321-386.

Jennings, C.W., 1958, Geologic map of California, Death Valley sheet: California Division of Mines and Geology map.

———1961, Geologic map of California, Kingman sheet: California Division of Mines and Geology map.

Jennings, C.W., Burnett, J.L., and Troxel, B.W., 1962, Geologic map of California, Trona sheet: California Division of Mines and Geology map.

Kane, M.F., and Carlson, J.E., 1964, Bouguer gravity anamoly map of Clark County, Nevada: U.S. Geological Survey open-file report, 1 sheet.

Lofgren, B.E., 1977, Changes in aquifer-system properties with ground-water depletion: Paper presented at 11th Biennial Groundwater Conference, Fresno, Calif., Sept. 15-16, 1977, typewritten, 46 p.

Lohman, S.W. and others, 1972, Definitions of selected ground-water terms—Revisions and conceptual refinements: U.S. Geological Survey Water-Supply Paper 1988, p. 21.

Longwell, C.R., Pampeyan, E.H., Bowyer, Ben, and Roberts, R.J., 1965, Geology and mineral deposits for Clark County, Nevada: Nevada Bureau of Mines Bulletin 62, 218 p.

Malmberg, G.T., 1965, Available water supply of the Las Vegas ground-water basin, Nevada: U.S. Geological Survey Water-Supply Paper 1780, 116 p.

———1967, Hydrology of the valley-fill and carbonate-rock reservoirs, Pahrump Valley, Nevada-California: U.S. Geological Survey Water-Supply Paper 1832, 47 p.

Malmberg, G.T., and Eakin, T.E., 1962, Ground-water appraisal of Sarcobatus Flat and Oasis Valley, Nye and Esmeralda Counties, Nevada: Nevada Department of Conservation and Natural Resources Reconnaissance Report 10, 39 p.

Maxey, G.B., and Jameson, C.H., 1948, Geology and water resources of Las Vegas, Pahrump, and Indian Spring Valleys, Clark and Nye Counties, Nevada: Nevada Water Resources Bulletin 5, 292 p.

Maxey, G.B., and Robinson, T.W., 1947, Ground water in Las Vegas, Pahrump, and Indian Spring Valleys, Nevada (a summary): Nevada State Engineer, Water Resources Bulletin 6, 23 p.

Mendenhall, W.C., 1909, Some desert watering places in southeastern California and southwestern Nevada: U.S. Geological Survey Water-Supply Paper 224, 98 p.

Meyers, J.S., 1962, Evaporation from the 17 Western States: U.S. Geological Survey Professional Paper 272-D, 30 p.

Nevada West and Pahrump Valley Times, 1974, Survey shows PV growth continues: v. 4, no. 8, p. 1, 11.

———1975, PV population is 53% above 1970's: v. 5, no. 5, p. 4.

———1977, Home hookups up 18.5% yearly: v. 7, no. 16, p. 1.

Nilsen, T.H., and Chapman, R.H., 1971, Bouguer gravity map of California, Trona sheet: California Division of Mines and Geology map.

Robinson, T.W., Maxey, G.B., Fredericks, J.G., and Jameson, C.H., 1947, Water levels and artesian pressure in wells in Las Vegas Valley and in other valleys in Nevada, 1913-1945: Nevada State Engineer, Water Resources Bulletin 3, 77 p.

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

Talwani, Manik, Worzel, J.L., and Landisman, Mark, 1959, Rapid gravity computations for two-dimensional bodies with application to the Mendocino submarine fracture zone: Journal of Geophysical Research, v. 64, no. 1, p. 49-59.

Trescott, P.C., 1975, Documentation of finite-difference model for simulation of three-dimensional ground-water flow: U.S. Geological Survey Open-File Report 75-438, 30 p.

Trescott, P.C., and Larson, S.P., 1976, Supplement to open-file report 75-438, Documentation of finite-difference model for simulation of three-dimensional ground-water flow: U.S. Geological Survey Open-File Report 76-591, 17 p.

U.S. Bureau of Reclamation, 1969, Inland basins projects, Pahrump-Mesquite Valleys, California-Nevada: U.S. Bureau of Reclamation Interim Report, 70 p.

———1972, Inland basin projects, California-Nevada: U.S. Bureau of Reclamation Summary Report, 363 p.

Walker, G.E., and Eakin, T.E., 1963, Ground-water resources of Amargosa Desert, Nevada-California: Nevada Department of Conservation and Natural Resources Reconnaissance Report 14, 45 p.

Waring, G.A., 1921, Ground water in Pahrump, Mesquite, and Ivanpah Valleys, Nevada and California, *in* Contributions to the hydrology of the United States: U.S. Geological Survey Water-Supply Paper 450-C, p. 51-86.

Winograd, I.J., and Thordarson, William, 1975, Hydrogeologic and hydrochemical framework, south-central Great Basin, Nevada-California, with special reference to the Nevada test site: U.S. Geological Survey Professional Paper 712-C, 126 p.

Wright, L.A., Troxel, B.W., Burchfiel, B.C., Chapman, R.H., and Labotka, T.C., 1981, Geologic cross section from the Sierra Nevada to the Las Vegas Valley, Eastern California to Southern Nevada: Geological Society of America Map and Chart Series, MC-28M.

Zietz, Isidore, Gilbert, F.P., and Kirby, J.R., 1978, Aeromagnetic map of Nevada: U.S. Geological Survey Geophysical Investigations Map GP-922.

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METRIC CONVERSION FACTORS

Only the inch-pound system of measure is used in this report. Abbreviations and conversion factors from inch-pound to International System of Units (metric) are listed below.

Multiply	By	To obtain
acre	4,047	m^2 (square meters)
acre-ft (acre-feet)	1,233	m^3 (cubic meters)
ft^3/s (cubic feet per second)	0.02832	m^3/s (cubic meters per second)
ft (feet)	0.3048	m (meters)
ft/d (feet per day)	0.3048	m/d (meters per day)
ft^2/d (feet squared per day)	0.0929	m^2/d (meters squared per day)
gal/min (gallons per minute)	0.06309	L/s (liters per second)
mi (miles)	1.609	km (kilometers)
mi^2 (square miles)	2.590	km^2 (square kilometers)

*U.S. GOVERNMENT PRINTING OFFICE: 1986-491-405:40027

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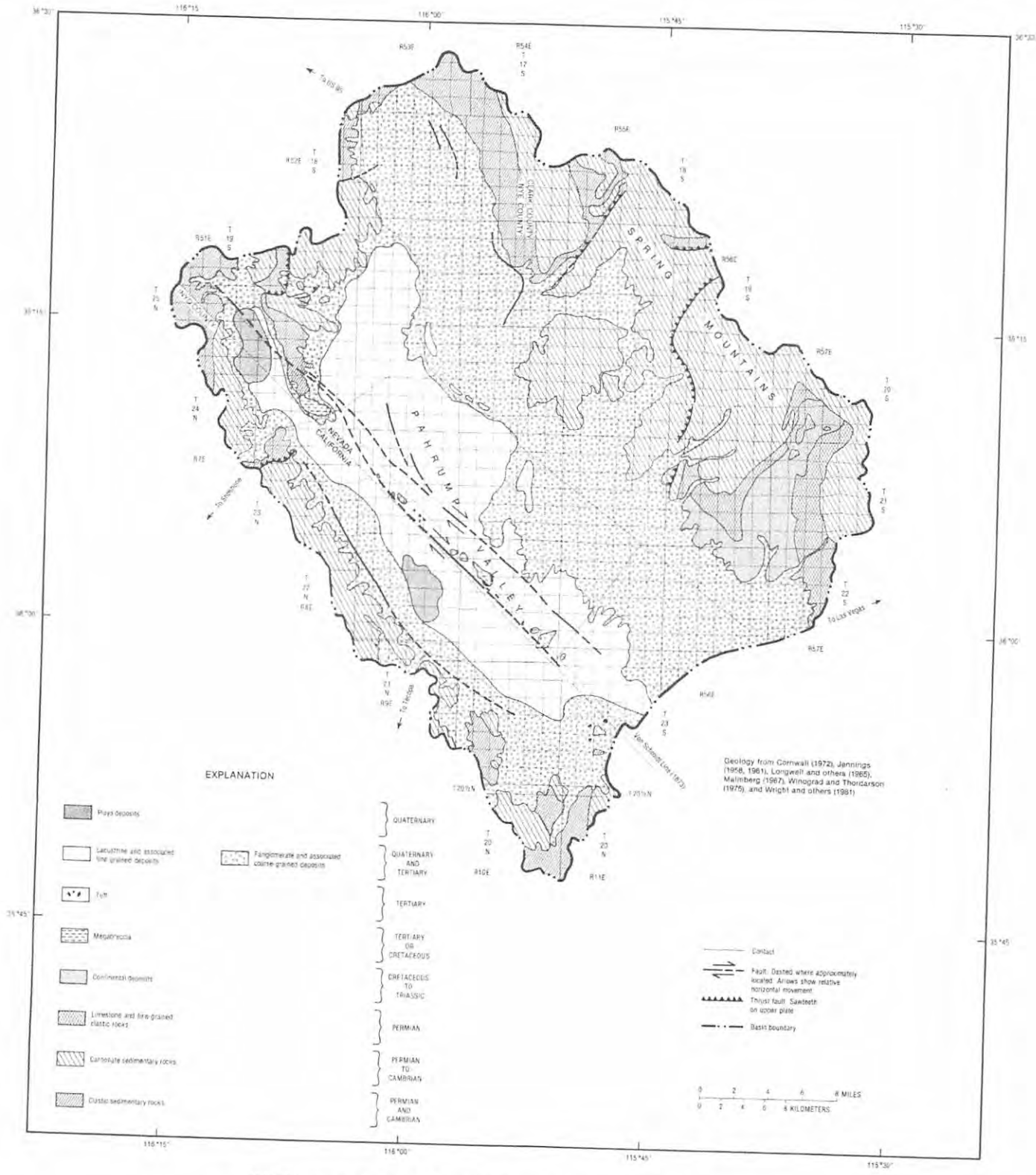
UNITED STATES DEPARTMENT OF THE INTERIOR
GEOLOGICAL SURVEY

Prepared in cooperation with the
NEVADA DEPARTMENT OF CONSERVATION AND NATURAL RESOURCES
DIVISION OF WATER RESOURCES

WATER-SUPPLY PAPER 2279
PLATE 1



GENERALIZED GEOLOGY OF PAHRUMP VALLEY, NEVADA AND CALIFORNIA

UNITED STATES DEPARTMENT OF THE INTERIOR
GEOLOGICAL SURVEY

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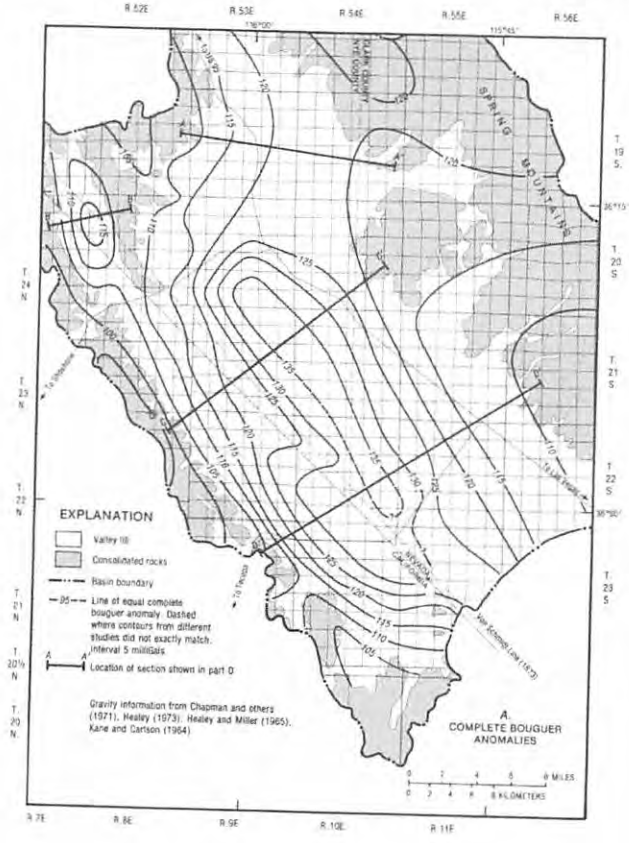
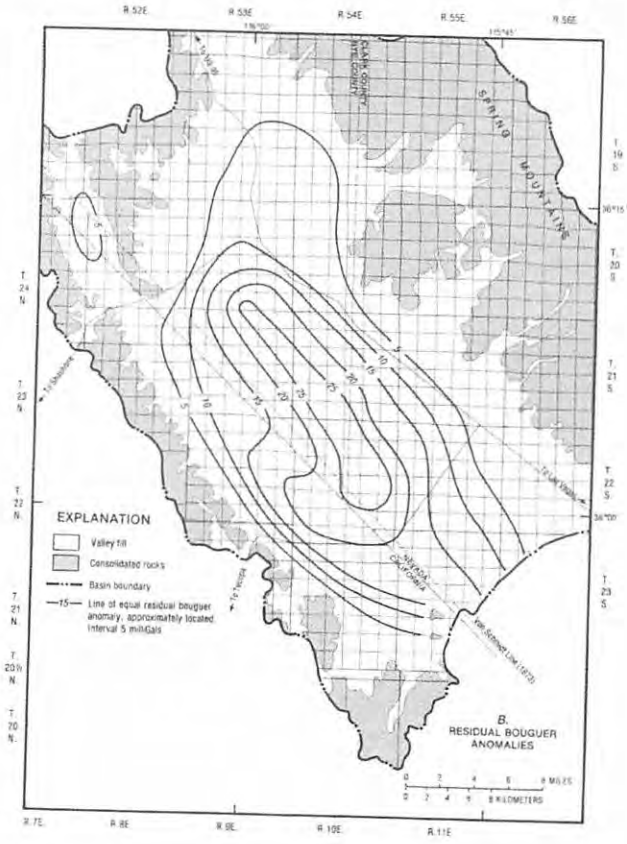
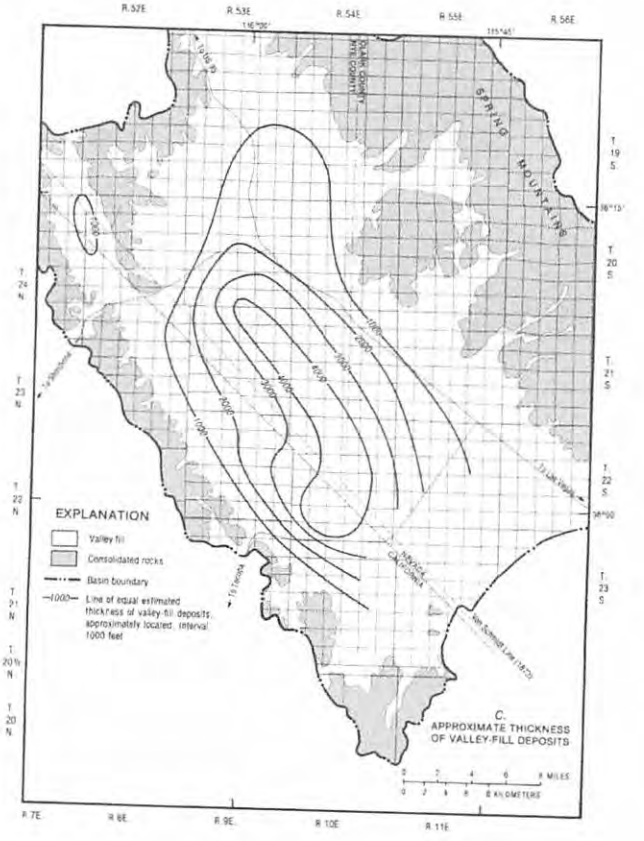
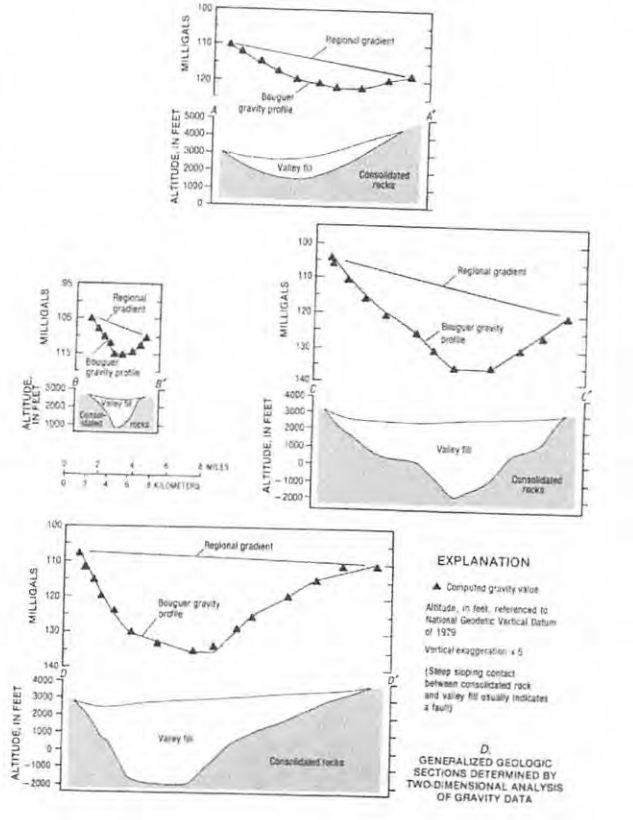
DIVISION OF WATER RESOURCES

WATER-SUPPLY PAPER 2279
PLATE 2







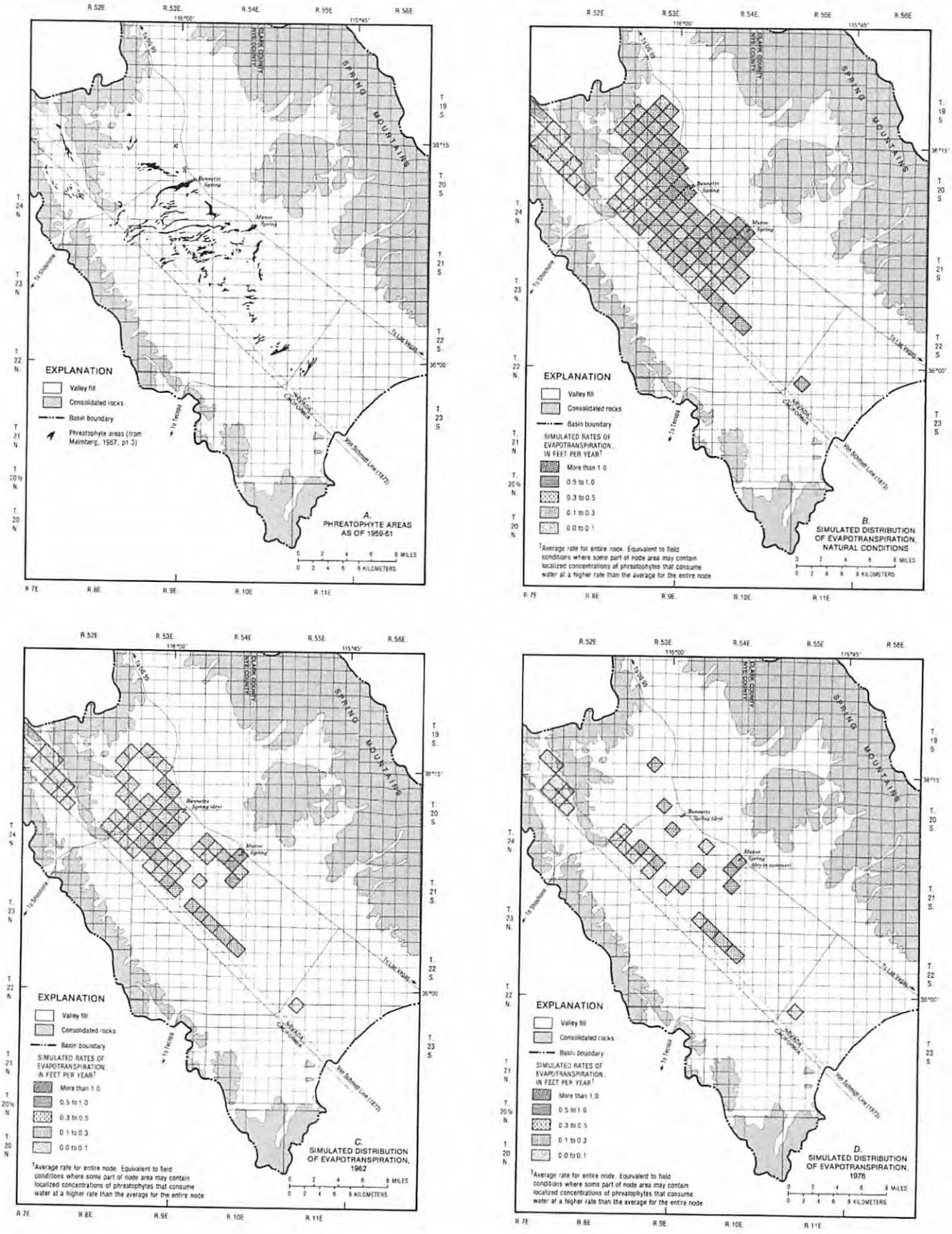


GRAVITY INFORMATION AND THICKNESS OF VALLEY FILL, PAHRUMP VALLEY, NEVADA AND CALIFORNIA

UNITED STATES DEPARTMENT OF THE INTERIOR
GEOLOGICAL SURVEY

Prepared in cooperation with the
NEVADA DEPARTMENT OF CONSERVATION AND NATURAL RESOURCES
DIVISION OF WATER RESOURCES

WATER-SUPPLY PAPER 2279
PLATE 3



DISTRIBUTION OF PHREATOPHYTES AND SIMULATED DISTRIBUTION OF EVAPOTRANSPIRATION
PAHRUMP VALLEY, NEVADA AND CALIFORNIA

RICHARD H. BRYAN
Governor

STATE OF NEVADA

ROLAND D. WESTERGARD
Director

PETER G. MORROS
State Engineer

DEPARTMENT OF CONSERVATION AND NATURAL RESOURCES

DIVISION OF WATER RESOURCES
Capitol Complex
201 S. Fall Street
Carson City, Nevada 89710

June 1, 1987

MEMORANDUM

To: Roland D. Westergard, Director

From: Peter G. Morros, State Engineer

Subject: Pahrump Valley Ground Water Basin

You have requested that I review the ground water availability and demand in the Pahrump Valley Ground Water Basin, specifically in the area of the Pahrump and Manse alluvial fans on the east side of the valley. We have completed that evaluation and this summary is provided in response to your request.

Historically, there have been approximately 20 previous technical studies made on the various elements of hydrology and geology in Pahrump Valley. The most recent study addressed ground water storage depletion during the period 1962-75. As you know, this water supply paper (No. 2279) was prepared cooperatively by our Department and the U.S. Geological Survey. The objectives of this latest study were to:

1. Determine the extent and amount of water level decline, magnitude of ground water storage depletion and the annual pumpage.

2. Evaluate the additional impacts of development on the Pahrump Valley hydrologic system.

3. To the extent possible, through computer modeling, demonstrate general long-term effects if pumping is maintained at the 1975 rate.

During the course of this study effort all records, data and information relating to water levels, historic pumpage, well records and aquifer characteristics were evaluated.

In addition, the study accomplished:

1. A thorough review of all published information.

2. Compiled information available on well construction, water levels and pumpage.

3. Collected a comprehensive set of water level mesurements.

4. The drilling of several small diameter water level observation wells.

5. Conducted short-term pumping tests on selected wells.

6. Evaluated and analyzed all information and data obtained and utilized a digital ground water flow model to gain insight into possible long-term effects under certain pumping conditions.

Pahrump Valley ground water basin was originally designated on March 11, 1941 as a basin in need of additional administration under the provisions of NRS Chapter 534. On January 15, 1948 and January 23, 1953, the designated areas within the ground water basin were expanded. On May 4, 1953 an order was issued by the State Engineer requiring the installation of suitable measuring devices under all existing rights within the designated basin. Subsequently an additional order was issued on June 1, 1970, excluding irrigation as a preferred use of the limited resource within the basin.

The perennial yield of a ground water reservoir is defined as the maximum amount of water of useable chemical quality that can be withdrawn and consumed economically for an indefinite period of time. Perennial yield is limited and controlled by a comparison analysis of ground water recharge (inflow) and the maximum amount of natural discharge (outflow) available for recapture. In Pahrump Valley virtually all inflow consists of recharge by precipitation. Proven scientific methods have been utilized to estimate the natural recharge to and discharge from the ground water system. We have determined that approximately 18,000 acre-feet annually exits Pahrump Valley as subsurface outflow through deep carbonate rock aquifers, which is one element of a large multi valley flow system. We have also determined that it would be extremely difficult to capture any appreciable amounts of this subsurface outflow from Pahrump Valley. It was estimated in 1976 that only 200 acre-feet of the 18,000 acre-feet annually was being captured and that ultimately by the year 2040 we may be able to rely on a capture of 700 acre-feet. Consequently, the maximum amount of natural discharge available for capture and therefore the perennial yield does not exceed 19,000 acre-feet annually. The perennial yield probably is more on the order of 12,000 acre-feet annually based on an additional outflow to the Amargosa Ash Meadows area of some 7,000 acre-feet.

Since most of the naturally occurring spring discharge was located near areas where heavy pumping centers developed, this type of natural discharge was most readily captured by pumping and has ceased to be a

significant outflow since 1975. Spring discharge decreased from 9,800 acre-feet annually under natural conditions (non-pumping) to about 1,400 acre-feet annually in 1962 and to about 200 acre-feet annually in 1975 (from Manse Spring during winter months only). Ground water evapotranspiration however, is being captured more slowly by pumping than was spring discharge. As of 1976, about 2,600 acre-feet annually of ground water evapotranspiration remained of the estimated 14,000 acre-feet annually discharged under natural conditions. The capture of all ground water evapotranspiration by pumping will probably not occur in the foreseeable future because some remaining areas of active evapotranspiration are too remote from the concentrated pumping areas. Withdrawals of ground water in excess of the perennial yield contribute to adverse conditions such as water quality degradation, storage depletion, diminishing yield of wells, increased economic pumping lifts, land subsidence and possible reversal of ground water gradients which could result in significant changes in the recharge/discharge relationship. These conditions have developed in several other ground water basins within the State of Nevada where storage depletion and declining water tables have been recorded and documented and provide substantial evidence of the adverse effect of these conditions.

Overdraft may be defined as the amount by which the net pumping draft exceeds the perennial yield. In Pahrump Valley a substantial basin-wide overdraft exists on the ground water reservoir. Overdraft on the system in 1985 was approximately 11,000 acre-feet and, under the present conditions, no new equilibrium is possible. Water levels will continue to decline as long as this high level of pumping is sustained. During the period from February 1962 to February 1975, pumping in Pahrump Valley has resulted in a depletion of approximately 219,000 acre-feet of water from storage and a total depletion of 375,000 acre-feet since 1913. Of this depletion, 155,000 acre-feet was from the draining of unconsolidated material, 46,000 acre-feet from the compaction of fine-grained sediments and 18,000 acre-feet from the elastic response of the aquifer and water. In the period 1976 to 1985 an additional 189,000 acre-feet was depleted from storage for a total through 1985 of 564,000 acre-feet. It is estimated that 2.3 million acre-feet of water stored in the upper 200 feet of saturated valley fill is within economic pumping lifts. Consequently, approximately 25% of this storage is gone and 8% has been used in the last 10 years. The availability of this water is on a <u>one-time</u> basis only. Once the depletion occurs it cannot be recovered and if land subsidence is active the ground water reservoir will loose its ability to store water.

The greatest declines of ground water levels in Pahrump Valley have occurred along the base of the Pahrump and Manse fans located in the east side of the basin. Maximum declines of about 100 feet were observed between predevelopment in the basin and February 1976 levels, with up to 60 feet of decline occurring from 1962 to 1975.

During the period 1962-1975, water levels along the fans generally declined at rates between one and four and a half feet annually while the central part of the valley declined at less than one foot annually. Water levels have continued to decline from 1976 through 1986.

Permits and certificates have been issued in Pahrump Valley that could be used to withdraw over 85,000 acre-feet of ground water per year when fully developed. Of this amount, 65,000 acre-feet annually is for irrigation purposes and 20,000 acre-feet annually represents municipal, quasi-municipal and commercial usage.

Several applications to appropriate ground water for irrigation, quasi-municipal and commercial purposes have been previously denied.

Based upon records and information available to the Office of the State Engineer, Pahrump Valley is experiencing a large real estate development phase, especially within the Calvada area. There is currently a total of 39,830 lots within the Nye County portion of Pahrump Valley, of which 26,063 approved lots are in the Calvada area consisting of the Calvada Meadows, Calvada North and Calvada Valley subdivisions. Ground water is the sole source of water for large scale development in Pahrump Valley, and will remain so in the future. During the period 1962-1985, ground water withdrawals increased from 29,000 acre-feet annually in 1962 to a maximum of 48,000 acre-feet annually in 1968 and then steadily declined from about 44,500 acre-feet annually in 1976 to a minimum of 23,053 acre-feet annually in 1985. The decrease in pumpage is due primarily to the transitional change of agricultural land to real estate development. In 1985 irrigation water usage was 19,140 acre-feet and non-irrigation usage 3,913 acre-feet.

A substantial basin-wide overdraft on the ground water reservoir exists in Pahrump Valley as the net pumping draft continues to exceed the perennial yield. The observed rates of static water level decline presently are cause for serious concern in view of the pumping level and amount of overdraft on the ground water reservoir. To date the magnitude of the declining static water levels has been largely mitigated by the capture of spring discharge and phreatophyte evapotranspiration. Since most of this available natural discharge has already been captured, future water level declines are not expected to be moderated by any additional capture of natural discharge. Approximately 75% of the total amount of existing water rights committed within the Pahrump Valley Ground Water Basin remains under irrigation use. As additional land is taken out of agriculture production and becomes fully developed for residential purposes, future pumpage rates will again rise causing additional stress on the ground water reservoir and an increase in the rate of static water level declines. Even in the absence of increases in pumpage, the present basin-wide overdraft will continue to create a sustained depletion of stored ground water and continued static water level declines.

1993

SB 19 By Finance COLORADO RIVER COMM

Makes various changes to provisions governing water. (BDR 48-528)

Fiscal Note: Effect on Local Government: No. Effect on the State or on Industrial Insurance: No.

01/19	2	Read first time. Referred to Committee on Finance. To printer.
01/20	3	From printer. To committee.
01/20	5	Dates discussed in Committee: 4/28, 6/5, 6/11 (A&DP)
06/23	101	From committee: Amend, and do pass as amended.
06/23	101	(Amendment number 885.)
06/24	102	Read second time. Amended. To printer.
06/25	103	From printer. To engrossment.
06/25	103	Engrossed. First reprint. Placed on General File.
06/25	103	Read third time. Passed, as amended. Title approved. (21 Yeas, 0 Nays, 0 Absent, 0 Excused, 0 Not Voting.) To Assembly.
06/25	104	In Assembly.
06/25	104	Read first time. Referred to Committee on Government Affairs. To committee.
06/25	104	Dates discussed in committee: 6/28 (A&DP)
06/29	108	From committee: Amend, and do pass as amended.
06/29	108	(Amendment number 1152.)
06/29	108	Placed on Second Reading File.
06/29	108	Read second time. Amended. To printer.
06/30	109	From printer. To re-engrossment.
06/30	109	Re-engrossed. Second reprint.
06/30	109	Placed on General File.
06/30	109	Read third time. Passed, as amended. Title approved, as amended. (42 Yeas, 0 Nays, 0 Absent, 0 Excused, 0 Not Voting.) To Senate.

06/30 107 In Senate.
07/01 108 Assembly amendment not concurred in. To Assembly.
07/02 111 In Assembly.
07/02 111 Assembly amendment not receded from. Conference requested. First Committee on Conference appointed by Assembly. To Senate.

07/02 111 The Speaker appoints Assemblymen Dini, Garner, and Marvel as a first Committee on Conference.

07/02 109 In Senate.
07/02 109 First Committee on Conference appointed by Senate. To committee.

07/02 109 The President appoints Senators Rawson, Jacobsen, and Callister as a First Committee on Conference.

07/02 109 From committee: Concur in Assembly amendment and further amend.

07/02 109 First Conference report adopted by Senate.
07/02 111 First Conference report adopted by Assembly.
07/02 109 To printer.
07/07 0 From printer. To re-engrossment.
07/07 0 Re-engrossed. Third reprint.
07/07 0 To enrollment.
07/07 0 Enrolled and delivered to Governor.
07/13 0 Approved by the Governor. Chapter 631.
Effective October 1, 1993.
Additional Committee Information.
7/1-After passage discussion, do not concur, Senate Finance.

(* = instrument from prior session)

NEVADA LEGISLATURE

SIXTY-SEVENTH SESSION

1993

SUMMARY OF LEGISLATION

PREPARED BY

RESEARCH DIVISION

LEGISLATIVE COUNSEL BUREAU

S.B. 19 (Chapter 631)

Senate Bill 19 makes various changes to provisions concerning the protection for domestic water wells and bonds issued by the Colorado River Commission and the Las Vegas Valley Water District.

With respect to the protection of domestic wells, the measure applies to an application or permit for a proposed well:

1. In counties whose population is less than 400,000;

2. For municipal, quasi-municipal or industrial use; and

3. Whose reasonably expected rate of diversion is one-half cubic foot per second or more.

When an application for such a well is filed, the bill requires that the applicant notify owners of domestic wells within 2,500 feet of the well. The measure also directs the State Engineer to include a condition on the approval of these larger wells indicating that pumping may be limited or prohibited to prevent unreasonable adverse effects on existing domestic wells. It further directs the State Engineer to require periodic reports concerning the effects of these types of wells on existing wells in the vicinity.

In addition, Senate Bill 19 increases the maximum limitation on bonds that may be issued by the Colorado River Authority for acquiring, improving, and equipping certain laboratory, maintenance, and administrative facilities and for improving or replacing the computer system relating to the treatment, processing, and delivery of water.

Further, S.B. 19 authorizes the Las Vegas Valley Water District, at the request of the Southern Nevada Water Authority, to issue special obligations of the district to pay all or any part of the cost of one or more specified water projects. The measure outlines the procedures that must be followed in issuing these obligations. In particular, the bill requires that the obligations be secured by:

1. Revenue of any water project owned, constructed, or improved by the authority;

2. Revenue made available to the district for payment of debt service by the authority; or

3. Any combination thereof.

Referred to Senate Committee on Finance
SENATE VOTE: 21-0-0
Referred to Assembly Committee on Government Affairs
ASSEMBLY VOTE: 42-0-0
Effective October 1, 1993

002

SENATE BILL NO. 19—COMMITTEE ON FINANCE

JANUARY 19, 1993

Referred to Committee on Finance

SUMMARY—Revises authority of Colorado River commission to issue bonds. (BDR S-528)

FISCAL NOTE: Effect on Local Government: No.
Effect on the State or on Industrial Insurance: No.

EXPLANATION—Matter in italics is new; matter in brackets [ ] is material to be omitted.

AN ACT relating to the Colorado River commission; authorizing the issuance of additional bonds; repealing the commission's authority to issue certain bonds; and providing other matters properly relating thereto.

THE PEOPLE OF THE STATE OF NEVADA, REPRESENTED IN SENATE AND ASSEMBLY, DO ENACT AS FOLLOWS:

Section 1. Section 7 of chapter 482, Statutes of Nevada 1975, as last amended by chapter 198, Statutes of Nevada 1991, at page 368, is hereby amended to read as follows:

Sec. 7. 1. The commission, on the behalf and in the name of the state, may:

(a) Acquire, hold, improve and equip the facilities;

(b) Acquire, hold, improve, equip and dispose of properties appertaining to the facilities, including without limitation water and water rights, for the benefit and welfare of the people of the state;

(c) Acquire, improve and equip the facilities and electric properties, wholly or in part, directly by construction contract or indirectly by contract with the Federal Government, or otherwise, or any combination thereof, as the commission may from time to time determine; and

(d) Borrow money and otherwise become obligated in a total principal amount:

(1) Not exceeding $63,000,000 to defray wholly or in part the cost of acquiring, improving and equipping the state facilities, and issue state securities to evidence such obligations;

(2) Not exceeding $11,000,000 to defray wholly or in part the cost of improving a section of the Las Vegas Valley Lateral, a conduit of the Robert B. Griffith Water Project supplying water for industrial and municipal use, in order to protect it from erosion, and issue state securities to evidence such obligations;

(3) Not exceeding $10,000,000 to defray wholly or in part the cost of emergency replacement or repair of the facilities or any properties appertaining to the facilities, and issue state securities to evidence such obligations;

003

(4) Not exceeding [$8,910,000] *$11,000,000* to defray wholly or in part the cost of acquiring, improving and equipping additional and existing laboratory, maintenance, operations and administrative facilities at the state facility;

(5) [Not exceeding $3,930,000 to defray wholly or in part the cost of restoring and replacing the communications network of the Southern Nevada Water System;

(6)] Not exceeding $100,000,000 to repay in full to the Federal Government at a discount the remaining unpaid reimbursable costs of the federal facilities;

[(7)] *(6)* Not exceeding $175,000,000 to defray wholly or in part the cost of acquiring, improving and equipping existing and supplemental state and federal facilities;

[(8)] *(7)* Not exceeding $40,000,000 to defray wholly or in part the cost of acquiring, improving and equipping existing and additional facilities to disinfect the water supply so that the quality of the water will comply with federal requirements regarding water quality; and

[(9)] *(8)* Not exceeding [$4,000,000] *$10,000,000* to defray wholly or in part the cost of acquiring, improving, equipping or replacing computers, computer programs and equipment for the treatment, testing, processing and delivery of water in and through the facilities.

2. The power to issue securities in a principal amount not more than $11,000,000 under subparagraph (2) of paragraph (d), $10,000,000 under subparagraph (3) of paragraph (d), [$8,910,000] *$11,000,000* under subparagraph (4) of paragraph (d), [$3,930,000 under subparagraph (5) of paragraph (d),] $175,000,000 under subparagraph [(7)] *(6)* of paragraph (d), $40,000,000 under subparagraph [(8)] *(7)* of paragraph (d) and [$4,000,000] *$10,000,000* under subparagraph [(9)] *(8)* of paragraph (d) respectively, of subsection 1 increases or decreases to the extent justified by reason of changes in procurement costs between:

(a) December 31, 1984, for the purposes of subparagraphs (2) and (3) of paragraph (d) of subsection 1;

(b) December 31, [1988,] *1992,* for the purposes of [subparagraphs (4) and (5)] *subparagraph (4)* of paragraph (d) of subsection 1; and

(c) December 31, 1990, for the purposes of subparagraphs [(7), (8) and (9)] *(6), (7) and (8)* of paragraph (d) of subsection 1,

and the date of procurement as indicated by engineering cost indexes applicable to this type of procurement. The power to issue such securities for the purposes of subparagraphs (2), (3), (4), [(5), (7), (8) and (9)] *(6), (7) and (8)* of paragraph (d) of subsection 1 decreases to the extent that the Congress by federal act appropriates money, the Bureau of Reclamation allots money and the Federal Government is obligated to pay earnings under contract for the purposes specified in those subparagraphs or any part thereof.

Sec. 2. Any money borrowed or any other obligation incurred by the Colorado River commission, acting on the behalf and in the name of the State of Nevada, before October 1, 1993, pursuant to subparagraph (5) of paragraph (d) of subsection 1 of section 7 of chapter 482, Statutes of Nevada

1975, and any state securities issued to evidence such obligations, are recognized as continuing obligations of the State of Nevada, acting by and through the Colorado River commission, on or after October 1, 1993.

(30)

MINUTES OF THE SENATE COMMITTEE ON FINANCE

Sixty-seventh Session
April 28, 1993

The Senate Committee on Finance was called to order by Chairman William J. Raggio, at 8:28 a.m., on Wednesday, April 28, 1993, in Room 223 of the Legislative Building, Carson City, Nevada. Exhibit A is the Meeting Agenda. Exhibit B is the Attendance Roster.

COMMITTEE MEMBERS PRESENT:

Senator William J. Raggio, Chairman
Senator Raymond D. Rawson, Vice Chairman
Senator Lawrence E. Jacobsen
Senator Bob Coffin
Senator Diana Glomb
Senator William R. O'Donnell
Senator Matthew Q. Callister

STAFF MEMBERS PRESENT:

Dan Miles, Fiscal Analyst
Bob Guernsey, Principal Deputy Fiscal Analyst
Marion Entrekin, Committee Secretary

OTHERS PRESENT:

Thomas E. Cahill, Director, Colorado River Commission
Douglas Beatty, Chief Financial Manager, Colorado River Commission
Gerald Lopez, Deputy Attorney General, Colorado River Commission
Judy Matteucci, Director, Department of Administration
Robert Dickens, Director of Government Relations, University of Nevada, Reno
Arthur Anderson, Concerned Citizen

Senator Raggio opened the meeting for discussion of Senate Bill (S.B.) 19.

SENATE BILL 19: Revises authority of Colorado River commission to issue bonds.

Thomas E. Cahill, Director, Colorado River Commission, expressed his support of S.B. 19 to increase the maximum amount of bonds the commission may issue for two projects at the Southern Nevada Water System. His written testimony (Exhibit C) was read for the record.

Referring to Mr. Cahill's testimony in which he stated the language should be retained in the existing subsection 1(d)(5) of section 1, page 2, of S.B. 19, Senator Raggio asked if the language of the bill must be retained since the bonds have been lawfully issued.

Gerald Lopez, Deputy Attorney General, Colorado River Commission, replied from a legal standpoint the language is not needed, but the commission feels it will give the bondholders some comfort to have the language retained until the bonds have been fully retired.

Senator Raggio referred to item 2, line 18, of S.B. 19 authorizing $10 million and asked what the commission has determined the cost actually will be for new hardware and software needed for the treatment, testing, processing and delivery of water.

Douglas Beatty, Chief Financial Manager, Colorado River Commission, replied it will cost $10 million to fully acquire, equip, replace, and improve computers and computer programs so that the quality of

water will comply with federal requirements regarding water quality.

Senator O'Donnell was curious to know what type of computer system would cost $10 million.

Mr. Beatty said this will be a very large and sophisticated computer system that will control 27 pumping stations located throughout the valley.

Mr. Lopez pointed out to Senator O'Donnell that he should not think of one piece of equipment located at the water treatment facility but parts of equipment located at each of the 27 pumping stations. These computers tell the pumps to turn on and off and inform the operators how much water is flowing through the pumps while constantly monitoring the volume of water in the reservoirs.

Senator O'Donnell commented this amounts to $330,000 for each of the 27 pumping stations.

Senator Raggio requested the commission present the committee with the actual estimate of costs and a detailed outline of the type of equipment and where it will be placed so that the committee will understand why this system will cost $10 million. He indicated S.B. 19 will be held pending receipt of this information.

Mr. Beatty stated they will provide this information.

Senator Callister said he is troubled over spending $10 million on computer hardware out of bonded indebtedness and another $1 million for a communication system, maintenance costs, and repairs. He asked, "Why do you want to use bonded indebtedness to service those kinds of operational expenditures?"

Mr. Beatty answered the commission does not bond for operation and maintenance costs. Section 1 (2) refers to the facilities that upgrade for this purpose.

Senator Callister commented there is some very broad and general language in the bill that would appear to authorize general indebtedness for a wide variety of things, not just facilities.

Mr. Beatty responded the commission had never contemplated using bond indebtedness for operational costs, and the customers are the ones that repay these bonds and approve all of the major capital projects.

Senator Raggio indicated if the bill is amended, the issue of the language can be clarified at that time.

Referring to section 2 of S.B. 19 mentioning the continuing obligations of the State of Nevada, Senator Raggio asked Mr. Lopez if this referred to revenue bonds.

Mr. Lopez answered, "They are partially revenue bonds and partially general obligation bonds."

Senator Raggio questioned, "Are these included when we ascertain the total obligation of the state and our concern about the ratio of general obligation to revenue? Does this factor into that determination?"

Judy Matteucci, Director, Department of Administration, replied the bonds are considered to be self-supporting bonds and are excluded from the calculation of debt ratios.

Mr. Lopez concurred they are self-supporting bonds and they also support the state's natural resources.

Senator Raggio closed the hearing on S.B. 19 and opened the hearing on Senate Bill (S.B.) 361.

SENATE BILL 361: Establishes office of science, engineering and technology within the commission on economic development.

Senator Rawson distributed (Exhibit D), amendment to S.B. 361. General discussion followed among the committee members concerning sections 2, 3, and 5 of the amendment covered in detail by Senator Rawson.

Exhibit E, another amendment to S.B. 361, was distributed and Senator Rawson reviewed its contents with the committee.

Senator Rawson pointed out the amendments (Exhibits D and E) are an attempt to describe a high-level individual experienced and capable of directing advance programs in science, engineering, and technology. This position would also involve the coordination of all these types of programs within the state as well as serious economic development and diversification.

Senator Coffin referred to section 3,(4),(b) of Exhibit D recommending alternative uses of the Nevada Test Site that will most effectively utilize the technology that is available at the site. He suggested the language be broadened to include technology available throughout the entire state.

Robert Dickens, Director of Government Relations, University of Nevada, Reno, suggested the language, "or other federal facilities" be added to section 3,(4),(b).

Senator Rawson suggested adding, "or other federal facilities or projects" so that this section will read:

> Recommend alternative uses of the Nevada Test Site that most effectively utilize the technology that is available at the site or other federal facilities or projects.

Mr. Dickens stated he believed this would provide the scope suggested by Senator Coffin.

Senator O'Donnell commented he believed the new director position was supposed to be unbiased and not a political appointment. He referred to section 2, (1) of Exhibit D that states the Office of Science, Engineering and Technology would be established within the Office of the Governor. He remarked:

> ....if we are going to put this [position] under the Governor's office, we are going to be contaminating this scientist politically. I think we ought to be as apolitical about this as we possible can, and putting this position under the Governor's office and not the Desert Research Institute is ludicrous.

Senator Raggio stated when this bill was requested by this committee a decision was made at that time to move this office as proposed from the new Department of Museums, Library and Art into the Commission on Economic Development. He recalled the Governor had acquiesced in that decision; and [United States] Senator Harry Reid, upon addressing the joint session of the legislature recently, recommended that this position should be depoliticized and placed under the direction of the Commission on Economic

C

TESTIMONY BEFORE SENATE COMMITTEE ON FINANCE

APRIL 28, 1993

S.B. 19

Mr. Chairman, members of the committee, I am Tom Cahill, Director of the Colorado River Commission. With me is Doug Beatty, the commission's Chief of Financial Management. We are here to support S.B. 19 and answer any questions you have concerning it.

This bill increases the maximum amount of bonds the Commission may issue for two projects at the Southern Nevada Water System. The system, which consists of state and federal facilities, delivers water to the cities of Boulder City, Henderson and North Las Vegas and to the Las Vegas Valley Water District and Nellis Air Force Base.

The first increase raises our bonding authority from $8,910,000 to $11,000,000 to pay the cost of expanding and modifying the existing laboratory and administration building at the state facilities. This is shown at page 2, lines 1 through 4, of the bill. The expanded and modified spaces, which are presently under construction, will provide additional laboratory and office facilities to meet the requirements of the Safe Drinking Water Act for more stringent water sampling and testing and more detailed recordkeeping.

We have already issued $9,815,000 in bonds for this spatial modification project, escalated for increased procurement costs as provided in our bonding authority. We anticipate that additional money may be required to complete this project and we would like to have the option of issuing additional bonds rather than depleting

EXHIBIT C 273.009

our capital reserves. These reserves may be needed for other necessary improvements and contingencies.

The second increase is shown on page 2, lines 18 through 21 of the bill. This change would raise our bonding authority from $4,000,000 to $11,000,000 to pay the cost of acquiring a new computer system at the state facilities. The existing system is over 10 years old and nearing the end of its useful life. At first we thought we could salvage some of the existing hardware for use in the new computer system, but it is now clear that replacement parts for that equipment are not available and they would have a limited ability to meet the increased need for computer capability created by the more stringent requirements of the Safe Water Drinking Act. So entirely new hardware and software will need to be acquired. This project is now in the design phase: we anticipate issuing bonds around October of this year.

We find that existing subsection 1(d)(5) of section 1 of the bill--on page 2, lines 5 through 7--is being deleted. We think that language should be retained. Although we have issued these bonds for the communications network and have completed the project, the bonds have not yet been completely paid off. That is also the case with bonds we issued under subsection 1(d)(1) and (2) and they are not being deleted. We believe it offers our bondholders some comfort to retain evidence of our bonding authority in the law until the bonds are fully repaid.

This concludes my testimony. We will be happy to answer any question you may have.

MINUTES OF THE
SENATE COMMITTEE ON FINANCE

Sixty-seventh Session
June 11, 1993

The Senate Committee on Finance was called to order by Chairman William J. Raggio, at 8:10 a.m., on Friday, June 11, 1993, in Room 223 of the Legislative Building, Carson City, Nevada. Exhibit A is the Meeting Agenda. Exhibit B is the Attendance Roster.

COMMITTEE MEMBERS PRESENT:

Senator William J. Raggio, Chairman
Senator Raymond D. Rawson, Vice Chairman
Senator Lawrence E. Jacobsen
Senator Bob Coffin
Senator Diana M. Glomb
Senator William R. O'Donnell
Senator Matthew Q. Callister

STAFF MEMBERS PRESENT:

Dan Miles, Fiscal Analyst
Bob Guernsey, Principal Deputy Fiscal Analyst
Jeanne Botts, Program Analyst
Dee Crawford, Committee Secretary

GUEST LEGISLATORS PRESENT:

Senator Raymond Shaffer, Clark County Senatorial District No. 2
Senator Leonard Nevin, Washoe County Senatorial District No. 2

OTHERS PRESENT:

Randy Day, Commissioner, Office of the Nevada Commissioner for Veteran Affairs
Donna Varin, Chief, Driver's License Division, Department of Motor Vehicles and Public Safety
Ray Sparks, Chief, Registration Division, Department of Motor Vehicles and Public Safety
Enrico Togneri, Captain, Forensic Science Division, Washoe County Sheriff's Office
Frank Barker, Captain, Las Vegas Metropolitan Police Department
Judy Matteucci, Director, Department of Administration

Due to lack of a quorum, the Senate Committee on Finance was called to order as a subcommittee by Senator Raggio at 8:10 a.m.

Senator Raggio opened the hearing on Senate Bill 414.

Senator Glomb joined the meeting at 8:12 a.m., providing a quorum. Senator Raggio announced the Senate Subcommittee on Finance was meeting as a full committee of the Senate Committee on Finance .

SENATE BILL (S.B.) 414: Creates legislative committee on veteran affairs.

Senator Raymond Shaffer, Clark County Senatorial District No. 2, testified briefly in support of S.B. 414.

Randy Day, Commissioner, Office of the Nevada Commissioner for Veteran Affairs, testified in support of S.B. 414. He explained the bill creates a legislative committee, consisting of three members of the assembly and two members of the senate, appointed by the legislative commission to provide appropriate attention to the status of veterans. The committee's role is to study and evaluate issues concerning Nevada veterans as well as assist the Nevada Veterans' Advisory Commission in any capacity the committee deems appropriate. The committee may recommended appropriate legislation to the legislature, he summarized.

laboratory is also contracting to conduct DNA testing for Alaska, Oregon, Idaho and Washington.

Captain Barker explained the application is extensive for the DNA testing in the areas of identification of missing children, sexual assault, and homicides. "We would be doing a great deal more if we could do it in-house in a more economical way," he urged.

Captain Togneri pointed out the most successful case in Washoe County was identification of a serial rapist which would not have been identified without the use of the DNA testing.

Senator Raggio closed the hearing on S.B. 459 and opened the hearing on Senate Bill 475.

SENATE BILL (S.B.) 475: Eliminates Nevada racing commission and transfers responsibilities to Nevada gaming commission.

SENATOR RAWSON MOVED TO AMEND AND DO PASS S.B. 475 WITH AMENDMENT NO. 882.

SENATOR JACOBSEN SECONDED THE MOTION.

THE MOTION CARRIED. (SENATORS CALLISTER AND O'DONNELL WERE ABSENT FOR THE VOTE.)

* * * * *

SENATE BILL (S.B.) 19: Makes various changes to provisions governing water.

SENATOR RAWSON MOVED TO AMEND AND DO PASS S.B. 19 WITH AMENDMENT NO. 885.

SENATOR JACOBSEN SECONDED THE MOTION.

THE MOTION CARRIED. (SENATORS CALLISTER AND O'DONNELL WERE ABSENT FOR THE VOTE.)

* * * * *

Consumer Affairs - Page 428

Bob Guernsey, Principal Deputy Fiscal Analyst, distributed Exhibit E, Budget Closing Action dated June 6, 1993, to the committee and testified while referencing that document. He recommended to restore the commissioner position located in southern Nevada and offset that amount with vacancy savings. Mr. Guernsey referenced the commissioner position, the supervisory position in southern Nevada, and explained the Executive Budget recommends the former director of the Department of Commerce be moved to the Consumer Affairs Division and be retitled chief of consumer services, with a recommended salary of $68,687. He pointed out there would be two supervisory positions within the agency.

Continuing, he explained the half-time deputy director of the Department of Commerce would be reduced to .25 FTE (full-time equivalency). The remaining .75 FTE of the position would be shown in the Housing Division budget, to be supported as follows: .25 FTE from bond revenue transferred from Business and Industry and the remaining .50 FTE be supported from the Housing Division program. Action taken by the Assembly Committee on Ways and Means, he explained, was to move the deputy director of the Department of Commerce position with .50 FTE in the new Business and Industry budget and .50 FTE of the position with the Housing Division.

0112

Senator Jacobsen moved that all rules be suspended and that Senate Concurrent Resolution No. 53 be immediately transmitted to the Assembly.

Motion carried unanimously.

Senator O'Donnell moved that Assembly Bill No. 229 be taken from the General File and placed on the Secretary's desk.

Remarks by Senator O'Donnell.

Motion carried.

Senate Concurrent Resolution No. 50.

Senator Rhoads moved the adoption of the resolution.

Remarks by Senator Rhoads.

Resolution adopted.

INTRODUCTION, FIRST READING AND REFERENCE

By the Committee on Finance:

Senate Bill No. 562—An Act relating to public works; delaying the effective and expiration dates of Assembly Bill No. 407 of this session; and providing other matters properly relating thereto.

Senator Raggio moved that all rules be suspended, reading so far had considered first reading, rules further suspended, bill considered engrossed, declared an emergency measure under the Constitution and placed on third reading and final passage.

Remarks by Senator Raggio.

Motion carried unanimously.

By Senator Jacobsen:

Senate Bill No. 563—An Act relating to the administration of motor vehicle laws; transferring the highway patrol special account from the state general fund to the state highway fund; and providing other matters properly relating thereto.

Senator Jacobsen moved that the bill be referred to the Committee on Finance.

Motion carried.

SECOND READING AND AMENDMENT

Senate Bill No. 19.

Bill read second time.

The following amendment was proposed by the Committee on Finance:

Amendment No. 885.

Amend section 1, page 2, line 5, by deleting the bracket.

Amend section 1, page 2, line 8, by deleting the bracket.

Amend section 1, page 2, line 11, by deleting "[(7)] *(6)*" and inserting "(7)".

Amend section 1, page 2, line 14, by deleting "[(8)] *(7)*" and inserting "(8)".

Amend section 1, page 2, line 18, by deleting "[(9)] *(8)*" and inserting "(9)".

Amend section 1, page 2, line 25, by deleting the bracket.

Amend section 1, page 2, by deleting line 26 and inserting: "graph (5) of paragraph (d), $175,000,000 under subparagraph (7)".

Amend section 1, page 2, line 27, by deleting "[(8)] *(7)*" and inserting "(8)".

Amend section 1, page 2, line 28, by deleting "[(9)] *(8)*" and inserting "(9)".

Amend section 1, page 2, lines 33 and 34, by deleting: "[subparagraphs (4) and (5)] *subparagraph (4)*" and inserting: "subparagraphs (4) and (5)".

Amend section 1, page 2, lines 35 and 36, by deleting: "[(7), (8) and (9)] *(6), (7) and (8)*" and inserting: "(7), (8) and (9)".

Amend section 1, page 2, lines 39 and 40, by deleting: "[(5), (7), (8) and (9)] *(6), (7) and (8)*" and inserting: "(5), (7), (8) and (9)".

Amend the bill as a whole by deleting sec. 2.

Senator Rawson moved the adoption of the amendment.

Remarks by Senators Rawson, Adler, Raggio, Neal and Smith.

Amendment adopted.

Bill ordered reprinted, engrossed and to third reading.

Senate Bill No. 376.

Bill read second time.

The following amendment was proposed by the Committee on Government Affairs:

Amendment No. 345.

Amend section 1, page 1, line 23, by deleting "*If*" and inserting: "*Except as otherwise provided in subsection 5, if*".

Amend section 1, page 1, after line 26, by inserting:

"*5. Except as otherwise provided in subsection 7, if a bid is submitted by a joint venture and one or more of the joint venturers has responsibility for the performance of the contract as described in subsection 6, the provisions of subsection 2 apply only to those joint venturers who have such responsibility.*

6. For the purposes of subsection 5, a joint venturer has responsibility for the performance of a contract if he has at least one of the following duties or obligations are delegated to him in writing in the contract creating the joint venture:

(a) Supplying the labor necessary to perform the contract and paying the labor and any related taxes and benefits;

(b) Supplying the equipment necessary to perform the contract and paying any charges related to the equipment;

(c) Contracting with and making payments to any subcontractors; or

(d) Performing the recordkeeping for the joint venture and making any payments to persons who provide goods or services related to the performance of the contract.

7. The provisions of subsection 5 do not apply to a joint venture which is formed for the sole purpose of circumventing any of the requirements of this section.".

Amend sec. 2, page 2, line 29, by deleting "If" and inserting: "[If] *Except as otherwise provided in subsection 5, if*".

SENATE BILL NO. 19—COMMITTEE ON FINANCE

JANUARY 19, 1993

Referred to Committee on Finance

SUMMARY—Revises authority of Colorado River commission to issue bonds. (BDR S-528)

FISCAL NOTE: Effect on Local Government: No.
Effect on the State or on Industrial Insurance: No.

EXPLANATION—Matter in italics is new; matter in brackets [ ] is material to be omitted.

AN ACT relating to the Colorado River commission; authorizing the issuance of additional bonds; repealing the commission's authority to issue certain bonds; and providing other matters properly relating thereto.

THE PEOPLE OF THE STATE OF NEVADA, REPRESENTED IN SENATE AND ASSEMBLY, DO ENACT AS FOLLOWS:

Section 1. Section 7 of chapter 482, Statutes of Nevada 1975, as last amended by chapter 198, Statutes of Nevada 1991, at page 368, is hereby amended to read as follows:

Sec. 7. 1. The commission, on the behalf and in the name of the state, may:

(a) Acquire, hold, improve and equip the facilities;

(b) Acquire, hold, improve, equip and dispose of properties appertaining to the facilities, including without limitation water and water rights, for the benefit and welfare of the people of the state;

(c) Acquire, improve and equip the facilities and electric properties, wholly or in part, directly by construction contract or indirectly by contract with the Federal Government, or otherwise, or any combination thereof, as the commission may from time to time determine; and

(d) Borrow money and otherwise become obligated in a total principal amount:

(1) Not exceeding $63,000,000 to defray wholly or in part the cost of acquiring, improving and equipping the state facilities, and issue state securities to evidence such obligations;

(2) Not exceeding $11,000,000 to defray wholly or in part the cost of improving a section of the Las Vegas Valley Lateral, a conduit of the Robert B. Griffith Water Project supplying water for industrial and municipal use, in order to protect it from erosion, and issue state securities to evidence such obligations;

(3) Not exceeding $10,000,000 to defray wholly or in part the cost of emergency replacement or repair of the facilities or any properties

appertaining to the facilities, and issue state securities to evidence such obligations;

(4) Not exceeding [$8,910,000] *$11,000,000* to defray wholly or in part the cost of acquiring, improving and equipping additional and existing laboratory, maintenance, operations and administrative facilities at the state facility;

(5) Not exceeding $3,930,000 to defray wholly or in part the cost of restoring and replacing the communications network of the Southern Nevada Water System;

(6) Not exceeding $100,000,000 to repay in full to the Federal Government at a discount the remaining unpaid reimbursable costs of the federal facilities;

(7) Not exceeding $175,000,000 to defray wholly or in part the cost of acquiring, improving and equipping existing and supplemental state and federal facilities;

(8) Not exceeding $40,000,000 to defray wholly or in part the cost of acquiring, improving and equipping existing and additional facilities to disinfect the water supply so that the quality of the water will comply with federal requirements regarding water quality; and

(9) Not exceeding [$4,000,000] *$10,000,000* to defray wholly or in part the cost of acquiring, improving, equipping or replacing computers, computer programs and equipment for the treatment, testing, processing and delivery of water in and through the facilities.

2. The power to issue securities in a principal amount not more than $11,000,000 under subparagraph (2) of paragraph (d), $10,000,000 under subparagraph (3) of paragraph (d), [$8,910,000] *$11,000,000* under subparagraph (4) of paragraph (d), $3,930,000 under subparagraph (5) of paragraph (d), $175,000,000 under subparagraph (7) of paragraph (d), $40,000,000 under subparagraph (8) of paragraph (d) and [$4,000,000] *$10,000,000* under subparagraph (9) of paragraph (d) respectively, of subsection 1 increases or decreases to the extent justified by reason of changes in procurement costs between:

(a) December 31, 1984, for the purposes of subparagraphs (2) and (3) of paragraph (d) of subsection 1;

(b) December 31, [1988,] *1992,* for the purposes of subparagraphs (4) and (5) of paragraph (d) of subsection 1; and

(c) December 31, 1990, for the purposes of subparagraphs (7), (8) and (9) of paragraph (d) of subsection 1,

and the date of procurement as indicated by engineering cost indexes applicable to this type of procurement. The power to issue such securities for the purposes of subparagraphs (2), (3), (4), (5), (7), (8) and (9) of paragraph (d) of subsection 1 decreases to the extent that the Congress by federal act appropriates money, the Bureau of Reclamation allots money and the Federal Government is obligated to pay earnings under contract for the purposes specified in those subparagraphs or any part thereof.

Amend sec. 2, page 1, line 23, by deleting "*range*".

Amend sec. 2, page 2, line 2, by deleting the period and inserting: "*as certified by a registered state water right surveyor.*".

Amend sec. 3, page 2, line 4, by deleting: "*take into account*" and inserting "*recognize*".

Amend sec. 4, page 2, line 12, after "livestock" by inserting: "*or other purposes*".

Amend sec. 4, page 2, by deleting line 13 and inserting: "laws of this state or [to] *by decree or* impair any existing vested *or decreed* right to the use of water".

Amend the title of the bill, second line, by deleting: "take all such rights into account;" and inserting: "recognize all such rights;".

Senator Rhoads moved the adoption of the amendment.

Remarks by Senator Rhoads.

Amendment adopted.

Bill ordered reprinted, re-engrossed and to third reading.

Senate Bill No. 461.

Bill read third time.

Roll call on Senate Bill No. 461:

YEAS—21.

NAYS—None.

Senate Bill No. 461 having received a constitutional majority, Madam President declared it passed, as amended.

Bill ordered transmitted to the Assembly.

Senate Joint Resolution No. 2 of the 66th Session.

Resolution read third time.

Roll call on Senate Joint Resolution No. 2 of the 66th Session:

YEAS—20.

NAYS—Hickey.

Senate Joint Resolution No. 2 of the 66th Session having received a constitutional majority, Madam President declared it passed.

Resolution ordered transmitted to the Assembly.

Senate Bill No. 19.

Bill read third time.

Roll call on Senate Bill No. 19:

YEAS—21.

NAYS—None.

Senate Bill No. 19 having received a constitutional majority, Madam President declared it passed, as amended.

Bill ordered transmitted to the Assembly.

Senate Bill No. 268.

Bill read third time.

Remarks by Senators Brown and James.

JT APP 771
SE ROA 724

MINUTES OF MEETING
ASSEMBLY COMMITTEE ON GOVERNMENT AFFAIRS

Sixty-seventh Session
June 28, 1993

The Assembly Committee on Government Affairs was called to order by Chairman Val Z. Garner at 9:06 a.m. Monday, June 28, 1993, in Room 330 of the Legislative Building, Carson City, Nevada. Exhibit A is the Meeting Agenda. Exhibit B is the Attendance Roster.

COMMITTEE MEMBERS PRESENT:

Mr. Val Z. Garner, Chairman
Mr. Rick C. Bennett, Vice Chairman
Mrs. Kathy M. Augustine
Mr. Douglas A. Bache
Mrs. Marcia de Braga
Mr. Pete Ernaut
Mr. Lynn Hettrick
Mrs. Erin Kenny
Mrs. Joan A. Lambert
Mr. James W. McGaughey
Mrs. Gene W. Segerblom
Mr. Wendell P. Williams

COMMITTEE MEMBERS ABSENT:

Mrs. Vivian L. Freeman, Excused
Mr. Roy Neighbors, Excused

GUEST LEGISLATORS PRESENT:

None.

STAFF MEMBERS PRESENT:

Mrs. Dana Bennett, Senior Research Analyst.

OTHERS PRESENT:

Mr. Bob Crowell, Vice Chairman of the Colorado River Commission (CRC); Mr. Richard J. Wimmer, Southern Nevada Water Authority and Las Vegas Valley Water District; Mr. John Swendseid, Bond Counsel for Las Vegas Valley Water District; Mr. Doug Busselman, Executive Vice President of Nevada Farm Bureau.

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Chairman Garner indicated Mrs. Dana Bennett, Senior Research Analyst, had handed out a report submitted by the Washoe County Board of County Commissioners pursuant to ACR 62 study committee which had been adopted by the 66th session of the Legislature (Exhibit C). Chairman Garner stated the full text of the report was available in his office.

SENATE BILL 19 - Revises authority of Colorado River commission to issue bonds.

Mr. Bob Crowell, Vice Chairman of the Colorado River Commission (CRC), testified SB 19 was a critical bill for the continued and efficient operation of the Southern Nevada Water System. He indicated there was a proposed amendment which would make two changes to the bill (Exhibit D).

Mr. Crowell said the first change was under subsection 4, the CRC was asking that the bonding authority be expanded from $8,910,000 to $11 million. He said the purpose was to provide a safety net for the potential funding for change orders relating to modification contracts which were already in existence and ongoing with respect to the development and rehabilitation of laboratory facilities, administration facilities and maintenance operation facilities of the Southern Nevada Water System. Mr. Crowell pointed out those contracts were already under way, and while there might be enough funds already in existence under the current bonding authority to complete them, the additional amount would be prudent in order to cover any change orders necessary to complete the projects.

Mr. Crowell commented the second change under subparagraph 9 was asking the bonding authority to be increased from $4 million to $10 million. He said this was critical authority for the efficient operation of the system, as it would allow the CRC to bond and fund the replacement of existing, outdated computer control systems for the operation of the Southern Nevada Water System. The computer control systems were the ones which allowed the operation of the Southern Nevada Water System both onsite and remote sources for data acquisition.

Mr. Richard J. Wimmer, Southern Nevada Water Authority and Las Vegas Valley Water District, testified the proposed amendment to SB 19 did not change any language which had come over from the Senate. He said it would add a provision to amend Chapter 167 of the Nevada Statutes, the Las Vegas Valley Water District Act, to allow the water district to issue bonds for the Southern Nevada Water Authority at its request. Mr. Wimmer gave further testimony on how the amendment would affect the water district.

Mr. John Swendseid, Bond Counsel for Las Vegas Valley Water District, brought up a technical matter regarding the title of the bill. He felt it would have to be amended and should say it was an act, "Relating to the financing of water projects authorizing Colorado River Commission to issue additional bonds, repealing the commission's authority to issue certain bonds, authorizing the Las Vegas Valley Water District to issue bonds at the request of and for the benefit of Southern Nevada Water Authority, and providing other matters properly relating thereto." Mr. Swendseid reiterated testimony on the purpose of the bill.

Chairman Garner indicated as there was no further testimony and all parties were in agreement with the amendment, he would accept a motion to amend and do pass SB 19.

ASSEMBLYMAN MCGAUGHEY MOVED TO AMEND AND DO PASS S.B. 19.

ASSEMBLYMAN HETTRICK SECONDED THE MOTION.

THE MOTION CARRIED.

Chairman Garner requested Mr. McGaughey handle SB 19 on the floor.

SENATE BILL 512 - Provides alternative method of showing subsisting right to water livestock.

Mrs. Freeman stated she had just called Mr. Mike Turnipseed's office as he was supposed to testify. Mr. Turnipseed indicated he was unable to attend the hearing but felt SB 512 was acceptable.

Mr. Doug Busselman, Executive Vice President of Nevada Farm Bureau, testified in support of SB 512 as it was his understanding the bill would provide a method of proving up on beneficial use for livestock water, especially in areas which had not been fully adjudicated.

ASSEMBLYMAN ERNAUT MOVED TO DO PASS S.B. 512.

ASSEMBLYMAN DE BRAGA SECONDED THE MOTION.

THE MOTION CARRIED.

Chairman Garner requested Mrs. de Braga handle SB 512 on the floor.

SENATE BILL 19
(First Reprint)

ASSEMBLYMAN GARNER

PROPOSED AMENDMENT

Add the following new section 2 to the bill.

Sec. 2. Chapter 167, Statutes of Nevada 1947, as last amended by chapter 544, Statutes of Nevada 1991, at page 1710, is hereby amended by adding thereto new sections designated sections 27 and 28, inclusive to read as follows:

Sec. 27. As used in sections 27 and 28, inclusive, of this act unless the context otherwise requires,

1. "Member" means a member of the Southern Nevada Water Authority.

2. "Water project" means facilities pertaining to a water system for the collection, transportation, treatment, purification and distribution of water, including, without limitation, springs, wells, ponds, lakes, water rights, other raw water sources, basin cribs, dams, spillways, retarding basins, detention basins, reservoirs, towers and other storage facilities, pumping plants, infiltration galleries, filtration plants, purification systems, other water treatment facilities, waterworks plants, pumping stations, gauging stations, ventilating facilities, stream gauges, rain gauges, valves, standpipes, connections, hydrants, conduits, flumes, sluices, canals, channels, ditches, pipes, lines, laterals, service pipes, force mains, submains, syphons, other water transmission and distribution mains, engines, boilers, pumps, meters, apparatus, tools, equipment, fixtures, structures, buildings and other facilities or the acquisition, transportation, treatment, purification and distribution of untreated water or potable water for domestic, commercial and industrial use and irrigation, or any combination thereof.

Sec. 28. 1. At the request of the Southern Nevada Water Authority, to pay all or any part of the cost of one or more water projects, the district may issue special obligations of the district which are secured by, or general obligations of, the district which are additionally secured by:

(a) Revenue of any water project owned, constructed, acquired or improved by the Southern Nevada Water Authority;

(b) Revenue made available to the district for payment of debt service by the Southern Nevada Water Authority or any member; or

(c) Any combination of paragraphs (a) and (b).

Any revenue pledged by the Southern Nevada Water Authority or any member pursuant to this subsection may be treated as pledged revenues of the project for the purposes of subsection 2 of NRS 350.020.

2. The Southern Nevada Water Authority or any member may contract with the district to make specified revenues available to the district for payment of debt

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EXHIBIT D

021

service. Such a contract must be irrepealable for the term of the obligations secured thereby or any obligations refunding those obligations.

3. Chapter 350 of NRS applies to the issuance of general or special obligations pursuant to this section. Subject to any lien imposed for the benefit of the bond owners:

(a) The proceeds of any bonds issued pursuant to this section must be expended at the direction of the Southern Nevada Water Authority; and

(b) Title to any water project financed with obligations issued pursuant to this section must be held by the Southern Nevada Water Authority.

4. To ensure payment, wholly or in part, of the special or general obligations of the district issued under this section, the payment of which is secured by a pledge of the revenue derived from a water project, the Southern Nevada Water Authority must establish, maintain and if necessary, from time to time revise, a schedule or schedules of fees, rates and charges for services and facilities provided by the water project. The fees, rates and charges must be set so that the revenue is sufficient to ensure the payment of the general or special obligations of the district and to discharge any covenant in the proceedings of the district authorizing the issuance of any of those obligations, including any covenant for the establishment of reasonable reserve funds. In addition, the fees, rates and charges must produce sufficient revenues to pay the operating and maintenance expenses of the works and properties of the Southern Nevada Water Authority, the expenses of providing services and the general expenses of the Southern Nevada Water Authority.

Assemblyman Spitler moved the adoption of the amendment.

Remarks by Assemblyman Spitler.

Amendment adopted.

Bill ordered reprinted, re-engrossed and to third reading.

Senate Bill No. 190.

Bill read second time and ordered to third reading.

Senate Bill No. 19.

Bill read second time.

The following amendment was proposed by the Committee on Government Affairs:

Amendment No. 1152.

Amend the bill as a whole by renumbering section 1 as sec. 2 and adding a new section designated section 1, following the enacting clause, to read as follows:

"Section 1. Chapter 167, Statutes of Nevada 1947, as last amended by chapter 544, Statutes of Nevada 1991, at page 1714, is hereby amended by adding thereto a new section to be designated as section 27 to read as follows:

Sec. 27. 1. At the request of the Southern Nevada Water Authority, to pay all or any part of the cost of one or more water projects, the district may issue special obligations of the district which are secured by, or general obligations of the district which are additionally secured by:

(a) Revenue derived from any water project owned, constructed, acquired or improved by the Southern Nevada Water Authority;

(b) Revenue made available to the district for payment of debt service by the Southern Nevada Water Authority or any member; or

(c) Any combination of paragraphs (a) and (b) of this subsection.

Any revenue pledged by the Southern Nevada Water Authority or any member pursuant to this subsection may be treated as pledged revenue of the water project for the purpose of subsection 2 of NRS 350.020.

2. The Southern Nevada Water Authority or any member may contract with the district to make specified revenue available to the district for the payment of debt service. Such a contract must be irrevocable for the term of the obligations secured by the contract or any obligations refunding those obligations.

3. The provisions of chapter 350 of NRS govern the issuance of general or special obligations pursuant to this section.

4. Subject to any lien imposed for the benefit of the owners of bonds:

(a) The proceeds of any bonds issued pursuant to this section must be expended at the direction of the Southern Nevada Water Authority; and

(b) Title to any water project financed with obligations issued pursuant to this section must be held by the Southern Nevada Water Authority.

5. To ensure whole or partial payment of the special or general obligations of the district issued pursuant to this section, the payment of which is secured by a pledge of the revenue derived from a water

project, the Southern Nevada Water Authority shall establish, maintain, and if necessary, periodically revise a schedule or schedules of fees, rates and charges for services and facilities provided by the water project. The fees, rates and charges must:

(a) Produce sufficient revenue to ensure the payment of the general or special obligations of the district and to discharge any covenant in the proceedings of the district authorizing the issuance of any of those obligations, including any covenant for the establishment of reasonable reserve funds; and

(b) Produce sufficient revenue to pay the:

(1) Expenses associated with the operation and maintenance of works and properties;

(2) Expenses associated with providing services; and

(3) General expenses,

of the Southern Nevada Water Authority.

6. As used in this section, unless the context otherwise requires:

(a) "Member" means a member of the Southern Nevada Water Authority.

(b) "Water project" means facilities pertaining to a water system for the collection, transportation, treatment, purification and distribution of water, including, without limitation, springs, wells, ponds, lakes, water rights, other raw water sources, basin cribs, dams, spillways, retarding basins, detention basins, reservoirs, towers and other storage facilities, pumping plants, infiltration galleries, filtration plants, purification systems, other water treatment facilities, waterworks plants, pumping stations, gauging stations, ventilating facilities, stream gauges, rain gauges, valves, standpipes, connections, hydrants, conduits, flumes, sluices, canals, channels, ditches, pipes, lines, laterals, service pipes, force mains, submains, syphons, other water transmission and distribution mains, engines, boilers, pumps, meters, apparatus, tools, equipment, fixtures, structures, buildings and other facilities for the acquisition, transportation, treatment, purification and distribution of untreated water or potable water for domestic, commercial and industrial use and irrigation, or any combination thereof.".

Amend the title of the bill to read as follows:

"An Act relating to the financing of water projects; authorizing the Las Vegas Valley water district to issue bonds at the request of the Southern Nevada Water Authority; authorizing the Colorado River commission to issue additional bonds; repealing the Colorado River commission's authority to issue certain bonds; and providing other matters properly relating thereto.".

Amend the summary of the bill to read as follows:

"Summary—Makes various changes to the authority of the Colorado River commission and the Las Vegas Valley water district to issue bonds. (BDR S-528)".

Assemblyman Garner moved the adoption of the amendment.

Remarks by Assemblyman Garner.

Amendment adopted.

Bill ordered reprinted, re-engrossed and to third reading.

GENERAL FILE AND THIRD READING

Assembly Bill No. 788.

Bill read third time.

Remarks by Assemblyman Arberry.

Roll call on Assembly Bill No. 788:

YEAS—42.

NAYS—None.

Assembly Bill No. 788 having received a constitutional majority, Mr. Speaker declared it passed.

Assemblyman Porter moved that all rules be suspended and that Assembly Bill No. 788 be immediately transmitted to the Senate.

Motion carried unanimously.

Assembly Bill No. 193.

Bill read third time.

The following amendment was proposed by the Committee on Ways and Means:

Amendment No. 1191.

Amend the bill as a whole by deleting sections 1 through 3 and adding new sections designated sections 1 through 7, following the enacting clause, to read as follows:

"Section 1. Chapter 449 of NRS is hereby amended by adding thereto the provisions set forth as sections 2 to 5, inclusive, of this act.

Sec. 2. *"Home for individual residential care" means a home in which a natural person furnishes food, shelter, assistance and limited supervision to not more than two persons who are aged, infirm, mentally retarded or handicapped, unless the persons receiving those services are related within the third degree of consanguinity or affinity to the person providing those services.*

Sec. 3. *1. The board shall adopt regulations establishing a procedure for the registration by the health division of homes for individual residential care.*

2. The health division shall register any home for individual residential care that:

(a) Complies with the regulations adopted pursuant to subsection 1; and

(b) Pays to the health division a registration fee of $50. Any money received by the health division pursuant to this paragraph must be forwarded to the state treasurer for deposit in the state general fund.

Sec. 4. *The health division and the aging services division of the department of human resources may:*

JT APP 779
SE ROA 732

SENATE BILL NO. 19—COMMITTEE ON FINANCE

JANUARY 19, 1993

Referred to Committee on Finance

SUMMARY—Makes various changes to the authority of the Colorado River commission and the Las Vegas Valley water district to issue bonds. (BDR S-528)

FISCAL NOTE: Effect on Local Government: No.
Effect on the State or on Industrial Insurance: No.

EXPLANATION—Matter in italics is new; matter in brackets [ ] is material to be omitted.

AN ACT relating to the financing of water projects; authorizing the Las Vegas Valley water district to issue bonds at the request of the Southern Nevada Water Authority; authorizing the Colorado River commission to issue additional bonds; repealing the Colorado River commission's authority to issue certain bonds; and providing other matters properly relating thereto.

THE PEOPLE OF THE STATE OF NEVADA, REPRESENTED IN SENATE AND ASSEMBLY, DO ENACT AS FOLLOWS:

Section 1. Chapter 167, Statutes of Nevada 1947, as last amended by chapter 544, Statutes of Nevada 1991, at page 1714, is hereby amended by adding thereto a new section to be designated as section 27 to read as follows:

Sec. 27. 1. At the request of the Southern Nevada Water Authority, to pay all or any part of the cost of one or more water projects, the district may issue special obligations of the district which are secured by, or general obligations of the district which are additionally secured by:

(a) Revenue derived from any water project owned, constructed, acquired or improved by the Southern Nevada Water Authority;

(b) Revenue made available to the district for payment of debt service by the Southern Nevada Water Authority or any member; or

(c) Any combination of paragraphs (a) and (b) of this subsection.

Any revenue pledged by the Southern Nevada Water Authority or any member pursuant to this subsection may be treated as pledged revenue of the water project for the purpose of subsection 2 of NRS 350.020.

2. The Southern Nevada Water Authority or any member may contract with the district to make specified revenue available to the district for the payment of debt service. Such a contract must be irrevocable for the term of the obligations secured by the contract or any obligations refunding those obligations.

3. The provisions of chapter 350 of NRS govern the issuance of general or special obligations pursuant to this section.

4. Subject to any lien imposed for the benefit of the owners of bonds:

(a) The proceeds of any bonds issued pursuant to this section must be expended at the direction of the Southern Nevada Water Authority; and

(b) Title to any water project financed with obligations issued pursuant to this section must be held by the Southern Nevada Water Authority.

5. To ensure whole or partial payment of the special or general obligations of the district issued pursuant to this section, the payment of which is secured by a pledge of the revenue derived from a water project, the Southern Nevada Water Authority shall establish, maintain, and if necessary, periodically revise a schedule or schedules of fees, rates and charges for services and facilities provided by the water project. The fees, rates and charges must:

(a) Produce sufficient revenue to ensure the payment of the general or special obligations of the district and to discharge any covenant in the proceedings of the district authorizing the issuance of any of those obligations, including any covenant for the establishment of reasonable reserve funds; and

(b) Produce sufficient revenue to pay the:

(1) Expenses associated with the operation and maintenance of works and properties;

(2) Expenses associated with providing services; and

(3) General expenses,

of the Southern Nevada Water Authority.

6. As used in this section, unless the context otherwise requires:

(a) "Member" means a member of the Southern Nevada Water Authority.

(b) "Water project" means facilities pertaining to a water system for the collection, transportation, treatment, purification and distribution of water, including, without limitation, springs, wells, ponds, lakes, water rights, other raw water sources, basin cribs, dams, spillways, retarding basins, detention basins, reservoirs, towers and other storage facilities, pumping plants, infiltration galleries, filtration plants, purification systems, other water treatment facilities, waterworks plants, pumping stations, gauging stations, ventilating facilities, stream gauges, rain gauges, valves, standpipes, connections, hydrants, conduits, flumes, sluices, canals, channels, ditches, pipes, lines, laterals, service pipes, force mains, submains, syphons, other water transmission and distribution mains, engines, boilers, pumps, meters, apparatus, tools, equipment, fixtures, structures, buildings and other facilities for the acquisition, transportation, treatment, purification and distribution of untreated water or potable water for domestic, commercial and industrial use and irrigation, or any combination thereof.

Sec. 2. Section 7 of chapter 482, Statutes of Nevada 1975, as last amended by chapter 198, Statutes of Nevada 1991, at page 368, is hereby amended to read as follows:

Sec. 7. 1. The commission, on the behalf and in the name of the state, may:

(a) Acquire, hold, improve and equip the facilities;

(b) Acquire, hold, improve, equip and dispose of properties appertaining to the facilities, including without limitation water and water rights, for the benefit and welfare of the people of the state;

(c) Acquire, improve and equip the facilities and electric properties, wholly or in part, directly by construction contract or indirectly by contract with the Federal Government, or otherwise, or any combination thereof, as the commission may from time to time determine; and

(d) Borrow money and otherwise become obligated in a total principal amount:

(1) Not exceeding $63,000,000 to defray wholly or in part the cost of acquiring, improving and equipping the state facilities, and issue state securities to evidence such obligations;

(2) Not exceeding $11,000,000 to defray wholly or in part the cost of improving a section of the Las Vegas Valley Lateral, a conduit of the Robert B. Griffith Water Project supplying water for industrial and municipal use, in order to protect it from erosion, and issue state securities to evidence such obligations;

(3) Not exceeding $10,000,000 to defray wholly or in part the cost of emergency replacement or repair of the facilities or any properties appertaining to the facilities, and issue state securities to evidence such obligations;

(4) Not exceeding [$8,910,000] *$11,000,000* to defray wholly or in part the cost of acquiring, improving and equipping additional and existing laboratory, maintenance, operations and administrative facilities at the state facility;

(5) Not exceeding $3,930,000 to defray wholly or in part the cost of restoring and replacing the communications network of the Southern Nevada Water System;

(6) Not exceeding $100,000,000 to repay in full to the Federal Government at a discount the remaining unpaid reimbursable costs of the federal facilities;

(7) Not exceeding $175,000,000 to defray wholly or in part the cost of acquiring, improving and equipping existing and supplemental state and federal facilities;

(8) Not exceeding $40,000,000 to defray wholly or in part the cost of acquiring, improving and equipping existing and additional facilities to disinfect the water supply so that the quality of the water will comply with federal requirements regarding water quality; and

(9) Not exceeding [$4,000,000] *$10,000,000* to defray wholly or in part the cost of acquiring, improving, equipping or replacing computers, computer programs and equipment for the treatment, testing, processing and delivery of water in and through the facilities.

2. The power to issue securities in a principal amount not more than $11,000,000 under subparagraph (2) of paragraph (d), $10,000,000 under subparagraph (3) of paragraph (d), [$8,910,000] *$11,000,000* under subparagraph (4) of paragraph (d), $3,930,000 under subparagraph (5) of paragraph (d), $175,000,000 under subparagraph (7) of paragraph (d), $40,000,000 under subparagraph (8) of paragraph (d)

and [$4,000,000] *$10,000,000* under subparagraph (9) of paragraph (d) respectively, of subsection 1 increases or decreases to the extent justified by reason of changes in procurement costs between:

(a) December 31, 1984, for the purposes of subparagraphs (2) and (3) of paragraph (d) of subsection 1;

(b) December 31, [1988,] *1992,* for the purposes of subparagraphs (4) and (5) of paragraph (d) of subsection 1; and

(c) December 31, 1990, for the purposes of subparagraphs (7), (8) and (9) of paragraph (d) of subsection 1,

and the date of procurement as indicated by engineering cost indexes applicable to this type of procurement. The power to issue such securities for the purposes of subparagraphs (2), (3), (4), (5), (7), (8) and (9) of paragraph (d) of subsection 1 decreases to the extent that the Congress by federal act appropriates money, the Bureau of Reclamation allots money and the Federal Government is obligated to pay earnings under contract for the purposes specified in those subparagraphs or any part thereof.

(30)

MOTIONS, RESOLUTIONS AND NOTICES

Assemblyman Wendell Williams moved that Senate Bill No. 16 be taken from the Chief Clerk's desk and placed on the General File.

Remarks by Assemblyman Wendell Williams.

Motion carried.

Assemblyman Wendell Williams moved that Senate Bill No. 91 be taken from the General File and placed on the Chief Clerk's desk.

Remarks by Assemblyman Wendell Williams.

Motion carried.

GENERAL FILE AND THIRD READING

Senate Bill No. 4.

Bill read third time.

Remarks by Assemblyman Schneider.

Roll call on Senate Bill No. 4:

YEAS—34.

NAYS—Anderson, Carpenter, Gregory, Haller, Humke, Porter, Sader, Spitler—8.

Senate Bill No. 4 having received a constitutional majority, Mr. Speaker declared it passed, as amended.

Bill ordered transmitted to the Senate.

Senate Bill No. 6.

Bill read third time.

Remarks by Assemblyman Regan.

Roll call on Senate Bill No. 6:

YEAS—42.

NAYS—None.

Senate Bill No. 6 having received a constitutional majority, Mr. Speaker declared it passed, as amended.

Bill ordered transmitted to the Senate.

Senate Bill No. 19.

Bill read third time.

Remarks by Assemblyman McGaughey.

Roll call on Senate Bill No. 19:

YEAS—42.

NAYS—None.

Senate Bill No. 19 having received a constitutional majority, Mr. Speaker declared it passed, as amended.

Bill ordered transmitted to the Senate.

Senate Bill No. 41.

Bill read third time.

Remarks by Assemblyman Price.

Roll call on Senate Bill No. 41:

YEAS—42.

NAYS—None.

MINUTES OF THE
SENATE COMMITTEE ON FINANCE

Sixty-seventh Session
July 1, 1993

The Senate Committee on Finance was called to order by Chairman William J. Raggio, at 3:45 p.m., on Thursday, July 1, 1993, on the Senate Floor of the Legislative Building, Carson City, Nevada. There was no Meeting Agenda. There was no Attendance Roster.

COMMITTEE MEMBERS PRESENT:

Senator William J. Raggio, Chairman
Senator Raymond D. Rawson, Vice Chairman
Senator Lawrence E. Jacobsen
Senator Bob Coffin
Senator Diana Glomb
Senator William R. O'Donnell
Senator Matthew Q. Callister

Senator Raggio requested committee introduction of the following bill draft request (BDR):

BILL DRAFT REQUEST R-2193: Urges commission on professional standards in education to establish licensure standards and require training for teachers concerning pupils with disabilities.

Senator Raggio stated this senate resolution replaces Senate Bill (S.B.) 153.

SENATE BILL 153: Redesignates pupils with disabilities and requires training for teachers.

SENATOR RAWSON MOVED TO INTRODUCE BDR R-2193.

SENATOR JACOBSEN SECONDED THE MOTION.

THE MOTION CARRIED. (SENATOR CALLISTER, SENATOR COFFIN, AND SENATOR GLOMB WERE ABSENT FOR THE VOTE.)

* * * * *

Senator Raggio briefly discussed Amendment No. 1152 to Senate Bill (S.B.) 19.

SENATE BILL 19: Revises authority of Colorado River commission to issue bonds.

SENATOR RAWSON MOVED DO NOT CONCUR WITH AMENDMENT NO. 1152.

SENATOR JACOBSEN SECONDED THE MOTION.

THE MOTION CARRIED. (SENATOR CALLISTER, SENATOR COFFIN, AND SENATOR GLOMB WERE ABSENT FOR THE VOTE.)

* * * * *

There was brief discussion by the committee Amendment No. 1206 to Senate Bill (S.B.) 6.

SENATE BILL 6: Requires department of parole and probation to pay costs of detaining parolee in county jail for

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and that Madam President appoint a first Committee on Conference consisting of three members to meet with a like committee of the Assembly.

Remarks by Senators McGinness, Smith and Titus.

Motion carried.

APPOINTMENT OF CONFERENCE COMMITTEES

Madam President appointed Senators McGinness, Smith and Titus as a first Committee on Conference to meet with a like committee of the Assembly for the further consideration of Assembly Concurrent Resolution No. 45.

REPORTS OF CONFERENCE COMMITTEES

Madam President:

The second Committee on Conference concerning Assembly Joint Resolution No. 11, consisting of the undersigned members, has met, and reports that:

No decision was reached.

MIKE MCGINNESS	JOSEPH E. DINI, JR.
WILLIAM J. RAGGIO	GENE T. PORTER
ERNEST E. ADLER	JAN EVANS
Senate Committee on Conference	*Assembly Committee on Conference*

Senator McGinness moved that the Senate adopt the report of the second Committee on Conference concerning Assembly Joint Resolution No. 11.

Remarks by Senator McGinness and Brown.

Motion carried.

Madam President:

The first Committee on Conference concerning Senate Bill No. 19, consisting of the undersigned members, has met, and reports that:

It has agreed to recommend that the amendment of the Assembly be concurred in.

It has agreed to recommend that the bill be further amended as set forth in Conference Amendment No. 23, which is attached to and hereby made a part of this report.

Conference Amendment No. 23.

Amend the bill as a whole by renumbering sections 1 and 2 as sections 4 and 5 and adding new sections designated sections 1 through 3, following the enacting clause, to read as follows:

"Section 1. NRS 533.024 is hereby amended to read as follows:

533.024 The legislature declares that it is the policy of this state [to] :

1. To encourage and promote the use of effluent, where [such] *that* use is not contrary to the public health, safety or welfare, and where [such] *that* use does not interfere with federal obligations to deliver [Colorado River water.] *water of the Colorado River.*

2. In a county whose population is less than 400,000, to recognize the importance of domestic wells as appurtenances to private homes, to create a protectible interest in such wells and to protect their supply of water from unreasonable adverse effects caused by municipal, quasi-municipal or industrial uses.

Sec. 2. NRS 533.360 is hereby amended to read as follows:

533.360 1. Except as otherwise provided in subsection [3,] *4*, NRS 533.345 and subsection 3 of NRS 533.370, when an application is filed in compliance with this chapter the state engineer shall, within 30 days, publish or cause to be published for a period of 4 consecutive weeks, in a newspaper of general circulation and printed and published in the county where the water is sought to be appropriated, a notice of the application, which sets forth:

(a) That the application has been filed.

(b) The date of the filing.

(c) The name and address of the applicant.

(d) The name of the source from which the appropriation is to be made.

(e) The location of the place of diversion [.] , *described by legal subdivision or metes and bounds and by a physical description of that place of diversion.*

(f) The purpose for which the water is to be appropriated.

The publisher shall add thereto the date of the first publication and the date of the last publication.

2. Except as otherwise provided in subsection [3,] *4*, proof of publication must be filed within 30 days after the final day of publication. The state engineer shall pay for the publication from the application fee. If the application is canceled for any reason before publication, the state engineer shall return to the applicant that portion of the application fee collected for publication.

3. *If the application is for a proposed well:*

(a) In a county whose population is less than 400,000;

(b) For municipal, quasi-municipal or industrial use; and

(c) Whose reasonably expected rate of diversion is one-half cubic foot per second or more,

the applicant shall mail a copy of the notice of application to each owner of real property containing a domestic well that is within 2,500 feet of the proposed well, to his address as shown in the latest records of the county assessor. If there are not more than six such wells, notices must be sent to each owner by certified mail, return receipt requested. If there are more than six such wells, at least six notices must be sent to owners by certified mail, return receipt requested. The return receipts from these notices must be filed with the state engineer before he may consider the application.

4. The provisions of this section do not apply to an environmental permit.

Sec. 3. NRS 534.110 is hereby amended to read as follows:

534.110 1. The state engineer shall administer this chapter and shall prescribe all necessary [rules and] regulations within the terms of this chapter for [such] *its* administration.

2. The state engineer may:

(a) Require periodical statements of water elevations, water used, and acreage on which water was used from all holders of permits and claimants of vested rights.

(b) Upon his own initiation, conduct pumping tests to determine if overpumping is indicated, to determine the specific yield of the aquifers and to determine permeability characteristics.

3. The state engineer shall determine [if] *whether* there is unappropriated water in the area affected and may issue permits only if [such] *the* determination is affirmative. *The state engineer shall require each applicant to whom a permit is issued for a well:*

(a) In a county whose population is less than 400,000;

(b) For municipal, quasi-municipal or industrial use; and

(c) Whose reasonably expected rate of diversion is one-half cubic foot per second or more,

to report periodically to the state engineer concerning the effect of that well on other previously existing wells that are located within 2,500 feet of the well.

4. It [shall be an express] *is a* condition of each appropriation of ground water acquired under this chapter that the right of the appropriator [shall relate] *relates* to a specific quantity of water and that [such] *the* right must allow for a reasonable lowering of the static water level at the appropriator's point of diversion. In determining [such] *a* reasonable lowering of the static water level in a particular area, the state engineer shall consider the economics of pumping water for the general type of crops growing and may also consider the effect of [water use] *using water* on the economy of the area in general.

5. [Nothing herein shall be so construed as to] *This section does not* prevent the granting of permits to applicants later in time on the ground that the diversions under [such] *the* proposed later appropriations may cause the water level to be lowered at the point of diversion of a prior appropriator, so long as the rights of holders of existing appropriations can be satisfied under such express conditions. *At the time a permit is granted for a well:*

(a) In a county whose population is less than 400,000;

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(b) For municipal, quasi-municipal or industrial use; and

(c) Whose reasonably expected rate of diversion is one-half cubic foot per second or more,

the state engineer shall include as a condition of the permit that pumping water pursuant to the permit may be limited or prohibited to prevent any unreasonable adverse effects on an existing domestic well located within 2,500 feet of the well, unless the holder of the permit and the owner of the domestic well have agreed to alternative measures that mitigate those adverse affects.

6. The state engineer shall conduct investigations in any basin or portion thereof where it appears that the average annual replenishment to the ground water supply may not be adequate for the needs of all permittees and all vested-right claimants, and if his findings so indicate the state engineer may order that withdrawals be restricted to conform to priority rights.

7. In any basin or portion thereof in the state designated by the state engineer, the state engineer may restrict drilling of wells in any portion thereof if he determines that additional wells would cause an undue interference with existing wells. Any order or decision of the state engineer so restricting drilling of such wells may be reviewed by the district court of the county pursuant to NRS 533.450.".

Amend the title of the bill, by deleting the first line and inserting:

"An Act relating to water; providing in certain counties for the protection of domestic wells from impairment for other uses and for the redress of impairment if it occurs; authorizing the Las Vegas Valley water".

Amend the summary of the bill to read as follows:

"Summary—Makes various changes to provisions governing water. (BDR 48-528)".

RAYMOND D. RAWSON	JOSEPH E. DINI, JR.
LAWRENCE E. JACOBSEN	VAL Z. GARNER
MATTHEW Q. CALLISTER	JOHN W. MARVEL
Senate Committee on Conference	*Assembly Committee on Conference*

Senator Raggio moved that the Senate adopt the report of the first Committee on Conference concerning Senate Bill No. 19.

Remarks by Senator Raggio.

Motion carried.

Madam President:

The second Committee on Conference concerning Senate Bill No. 61, consisting of the undersigned members, has met, and reports that:

It has agreed to recommend that the amendment of the Assembly be concurred in.

LORI LIPMAN BROWN	STEPHANIE SMITH
WILLIAM J. RAGGIO	DEAN A. HELLER
Senate Committee on Conference	*Assembly Committee on Conference*

Senator Raggio moved that the Senate adopt the report of the second Committee on Conference concerning Senate Bill No. 61.

Remarks by Senator Raggio.

Motion carried.

Madam President:

The first Committee on Conference concerning Senate Bill No. 298, consisting of the undersigned members, has met, and reports that:

It has agreed to recommend that the amendment of the Assembly be concurred in.

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"Summary—Makes various changes relating to lobbying. (BDR 17-13)".

Assemblyman Sader moved that the Assembly adopt the report of the first Committee on Conference concerning Assembly Bill No. 4.

Remarks by Assemblyman Sader.

Motion carried.

Mr. Speaker:

The first Committee on Conference concerning Assembly Bill No. 427, consisting of the undersigned members, has met, and reports that:

It has agreed to recommend that the amendment of the Senate be concurred in.

WENDELL P. WILLIAMS	RAYMOND D. RAWSON
MORSE ARBERRY, JR.	WILLIAM R. O'DONNELL
VONNE CHOWNING	DIANA M. GLOMB
Assembly Committee on Conference	*Senate Committee on Conference*

Assemblyman Arberry moved that the Assembly adopt the report of the first Committee on Conference concerning Assembly Bill No. 427.

Remarks by Assemblyman Arberry.

Motion carried.

Mr. Speaker:

The first Committee on Conference concerning Senate Bill No. 19, consisting of the undersigned members, has met, and reports that:

It has agreed to recommend that the amendment of the Assembly be concurred in.

It has agreed to recommend that the bill be further amended as set forth in Conference Amendment No. 23, which is attached to and hereby made a part of this report

JOSEPH E. DINI, JR.	RAYMOND D. RAWSON
VAL Z. GARNER	LAWRENCE E. JACOBSEN
JOHN W. MARVEL	MATTHEW Q. CALLISTER
Assembly Committee on Conference	*Senate Committee on Conference*

Conference Amendment No. 23.

Amend the bill as a whole by renumbering sections 1 and 2 as sections 4 and 5 and adding new sections designated sections 1 through 3, following the enacting clause, to read as follows:

"Section 1. NRS 533.024 is hereby amended to read as follows:

533.024 The legislature declares that it is the policy of this state [to] *:*

1. To encourage and promote the use of effluent, where [such] *that* use is not contrary to the public health, safety or welfare, and where [such] *that* use does not interfere with federal obligations to deliver [Colorado River water.] *water of the Colorado River.*

2. In a county whose population is less than 400,000, to recognize the importance of domestic wells as appurtenances to private homes, to create a protectible interest in such wells and to protect their supply of water from unreasonable adverse effects caused by municipal, quasi-municipal or industrial uses.

Sec. 2. NRS 533.360 is hereby amended to read as follows:

533.360 1. Except as otherwise provided in subsection [3,] *4,* NRS 533.345 and subsection 3 of NRS 533.370, when an application is filed in compliance with this chapter the state engineer shall, within 30 days, publish or cause to be published for a period of 4 consecutive weeks, in a

newspaper of general circulation and printed and published in the county where the water is sought to be appropriated, a notice of the application, which sets forth:

(a) That the application has been filed.

(b) The date of the filing.

(c) The name and address of the applicant.

(d) The name of the source from which the appropriation is to be made.

(e) The location of the place of diversion [.] , *described by legal subdivision or metes and bounds and by a physical description of that place of diversion.*

(f) The purpose for which the water is to be appropriated.

The publisher shall add thereto the date of the first publication and the date of the last publication.

2. Except as otherwise provided in subsection [3,] *4*, proof of publication must be filed within 30 days after the final day of publication. The state engineer shall pay for the publication from the application fee. If the application is canceled for any reason before publication, the state engineer shall return to the applicant that portion of the application fee collected for publication.

3. *If the application is for a proposed well:*

(a) In a county whose population is less than 400,000;

(b) For municipal, quasi-municipal or industrial use; and

(c) Whose reasonably expected rate of diversion is one-half cubic foot per second or more,

the applicant shall mail a copy of the notice of application to each owner of real property containing a domestic well that is within 2,500 feet of the proposed well, to his address as shown in the latest records of the county assessor. If there are not more than six such wells, notices must be sent to each owner by certified mail, return receipt requested. If there are more than six such wells, at least six notices must be sent to owners by certified mail, return receipt requested. The return receipts from these notices must be filed with the state engineer before he may consider the application.

4. The provisions of this section do not apply to an environmental permit.

Sec. 3. NRS 534.110 is hereby amended to read as follows:

534.110 1. The state engineer shall administer this chapter and shall prescribe all necessary [rules and] regulations within the terms of this chapter for [such] *its* administration.

2. The state engineer may:

(a) Require periodical statements of water elevations, water used, and acreage on which water was used from all holders of permits and claimants of vested rights.

(b) Upon his own initiation, conduct pumping tests to determine if overpumping is indicated, to determine the specific yield of the aquifers and to determine permeability characteristics.

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3. The state engineer shall determine [if] *whether* there is unappropriated water in the area affected and may issue permits only if [such] *the* determination is affirmative. *The state engineer shall require each applicant to whom a permit is issued for a well:*

(a) In a county whose population is less than 400,000;

(b) For municipal, quasi-municipal or industrial use; and

(c) Whose reasonably expected rate of diversion is one-half cubic foot per second or more,

to report periodically to the state engineer concerning the effect of that well on other previously existing wells that are located within 2,500 feet of the well.

4. It [shall be an express] *is a* condition of each appropriation of ground water acquired under this chapter that the right of the appropriator [shall relate] *relates* to a specific quantity of water and that [such] *the* right must allow for a reasonable lowering of the static water level at the appropriator's point of diversion. In determining [such] *a* reasonable lowering of the static water level in a particular area, the state engineer shall consider the economics of pumping water for the general type of crops growing and may also consider the effect of [water use] *using water* on the economy of the area in general.

5. [Nothing herein shall be so construed as to] *This section does not* prevent the granting of permits to applicants later in time on the ground that the diversions under [such] *the* proposed later appropriations may cause the water level to be lowered at the point of diversion of a prior appropriator, so long as the rights of holders of existing appropriations can be satisfied under such express conditions. *At the time a permit is granted for a well:*

(a) In a county whose population is less than 400,000;

(b) For municipal, quasi-municipal or industrial use; and

(c) Whose reasonably expected rate of diversion is one-half cubic foot per second or more,

the state engineer shall include as a condition of the permit that pumping water pursuant to the permit may be limited or prohibited to prevent any unreasonable adverse effects on an existing domestic well located within 2,500 feet of the well, unless the holder of the permit and the owner of the domestic well have agreed to alternative measures that mitigate those adverse affects.

6. The state engineer shall conduct investigations in any basin or portion thereof where it appears that the average annual replenishment to the ground water supply may not be adequate for the needs of all permittees and all vested-right claimants, and if his findings so indicate the state engineer may order that withdrawals be restricted to conform to priority rights.

7. In any basin or portion thereof in the state designated by the state engineer, the state engineer may restrict drilling of wells in any portion thereof if he determines that additional wells would cause an undue interference with existing wells. Any order or decision of the state engineer so restricting drilling of such wells may be reviewed by the district court of the county pursuant to NRS 533.450.".

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Amend the title of the bill, by deleting the first line and inserting:

"An Act relating to water; providing in certain counties for the protection of domestic wells from impairment for other uses and for the redress of impairment if it occurs; authorizing the Las Vegas Valley water".

Amend the summary of the bill to read as follows:

"Summary—Makes various changes to provisions governing water. (BDR 48-528)".

Assemblyman Garner moved that the Assembly adopt the report of the first Committee on Conference concerning Senate Bill No. 19.

Remarks by Assemblyman Garner.

Assemblyman Garner requested that his remarks be entered in the Journal.

I am requesting that this statement be made part of the record. The addition to NRS 534.110(5) is intended to make it clear that existing domestic wells are protected from unreasonable adverse affects caused by pumping from a subsequently drilled well. However, it is not intended to change or limit the state engineers's authority to protect other types of wells from similar unreasonable adverse affects caused by pumping from a subsequently drilled well. Thank you, very much.

Motion carried.

Mr. Speaker:

The first Committee on Conference concerning Senate Bill No. 298, consisting of the undersigned members, has met, and reports that:

It has agreed to recommend that the amendment of the Assembly be concurred in.

It has agreed to recommend that the bill be further amended as set forth in Conference Amendment No. 16, which is attached to and hereby made a part of this report.

ROBERT M. SADER	MARK A. JAMES
GENE T. PORTER	MATTHEW Q. CALLISTER
WILLIAM DAVID GREGORY	MIKE MCGINNESS
Assembly Committee on Conference	*Senate Committee on Conference*

Conference Amendment No. 16.

Amend the bill as a whole by deleting sec. 7.

Assemblyman Sader moved that the Assembly adopt the report of the first Committee on Conference concerning Senate Bill No. 298.

Remarks by Assemblyman Sader.

Motion carried.

Mr. Speaker:

The first Committee on Conference concerning Senate Bill No. 497, consisting of the undersigned members, has met, and reports that:

It has agreed to recommend that the amendment of the Assembly be concurred in.

BERNIE ANDERSON	WILLIAM R. O'DONNELL
LARRY L. SPITLER	LEONARD V. NEVIN
WILLIAM DAVID GREGORY	THOMAS J. HICKEY
Assembly Committee on Conference	*Senate Committee on Conference*

Assemblyman Anderson moved that the Assembly adopt the report of the first Committee on Conference concerning Senate Bill No. 497.

Remarks by Assemblyman Anderson.

Motion carried.

SENATE BILL NO. 19—COMMITTEE ON FINANCE

JANUARY 19, 1993

Referred to Committee on Finance

SUMMARY—Makes various changes to provisions governing water. (BDR 48-528)

FISCAL NOTE: Effect on Local Government: No.
Effect on the State or on Industrial Insurance: No.

EXPLANATION—Matter in italics is new; matter in brackets [ ] is material to be omitted.

AN ACT relating to water; providing in certain counties for the protection of domestic wells from impairment for other uses and for the redress of impairment if it occurs; authorizing the Las Vegas Valley water district to issue bonds at the request of the Southern Nevada Water Authority; authorizing the Colorado River commission to issue additional bonds; repealing the Colorado River commission's authority to issue certain bonds; and providing other matters properly relating thereto.

THE PEOPLE OF THE STATE OF NEVADA, REPRESENTED IN SENATE AND ASSEMBLY, DO ENACT AS FOLLOWS:

Section 1. NRS 533.024 is hereby amended to read as follows:

533.024 The legislature declares that it is the policy of this state [to] *:*

1. To encourage and promote the use of effluent, where [such] *that* use is not contrary to the public health, safety or welfare, and where [such] *that* use does not interfere with federal obligations to deliver [Colorado River water.] *water of the Colorado River.*

2. In a county whose population is less than 400,000, to recognize the importance of domestic wells as appurtenances to private homes, to create a protectible interest in such wells and to protect their supply of water from unreasonable adverse effects caused by municipal, quasi-municipal or industrial uses.

Sec. 2. NRS 533.360 is hereby amended to read as follows:

533.360 1. Except as otherwise provided in subsection [3,] *4,* NRS 533.345 and subsection 3 of NRS 533.370, when an application is filed in compliance with this chapter the state engineer shall, within 30 days, publish or cause to be published for a period of 4 consecutive weeks, in a newspaper of general circulation and printed and published in the county where the water is sought to be appropriated, a notice of the application, which sets forth:

(a) That the application has been filed.
(b) The date of the filing.
(c) The name and address of the applicant.
(d) The name of the source from which the appropriation is to be made.

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(e) The location of the place of diversion [.] , *described by legal subdivision or metes and bounds and by a physical description of that place of diversion.*

(f) The purpose for which the water is to be appropriated.

The publisher shall add thereto the date of the first publication and the date of the last publication.

2. Except as otherwise provided in subsection [3,] *4,* proof of publication must be filed within 30 days after the final day of publication. The state engineer shall pay for the publication from the application fee. If the application is canceled for any reason before publication, the state engineer shall return to the applicant that portion of the application fee collected for publication.

3. If the application is for a proposed well:

(a) In a county whose population is less than 400,000;

(b) For municipal, quasi-municipal or industrial use; and

(c) Whose reasonably expected rate of diversion is one-half cubic foot per second or more,

the applicant shall mail a copy of the notice of application to each owner of real property containing a domestic well that is within 2,500 feet of the proposed well, to his address as shown in the latest records of the county assessor. If there are not more than six such wells, notices must be sent to each owner by certified mail, return receipt requested. If there are more than six such wells, at least six notices must be sent to owners by certified mail, return receipt requested. The return receipts from these notices must be filed with the state engineer before he may consider the application.

4. The provisions of this section do not apply to an environmental permit.

Sec. 3. NRS 534.110 is hereby amended to read as follows:

534.110 1. The state engineer shall administer this chapter and shall prescribe all necessary [rules and] regulations within the terms of this chapter for [such] *its* administration.

2. The state engineer may:

(a) Require periodical statements of water elevations, water used, and acreage on which water was used from all holders of permits and claimants of vested rights.

(b) Upon his own initiation, conduct pumping tests to determine if overpumping is indicated, to determine the specific yield of the aquifers and to determine permeability characteristics.

3. The state engineer shall determine [if] *whether* there is unappropriated water in the area affected and may issue permits only if [such] *the* determination is affirmative. *The state engineer shall require each applicant to whom a permit is issued for a well:*

(a) In a county whose population is less than 400,000;

(b) For municipal, quasi-municipal or industrial use; and

(c) Whose reasonably expected rate of diversion is one-half cubic foot per second or more,

to report periodically to the state engineer concerning the effect of that well on other previously existing wells that are located within 2,500 feet of the well.

4. It [shall be an express] *is a* condition of each appropriation of ground water acquired under this chapter that the right of the appropriator [shall relate] *relates* to a specific quantity of water and that [such] *the* right must allow for a reasonable lowering of the static water level at the appropriator's point of diversion. In determining [such] *a* reasonable lowering of the static water level in a particular area, the state engineer shall consider the economics of pumping water for the general type of crops growing and may also consider the effect of [water use] *using water* on the economy of the area in general.

5. [Nothing herein shall be so construed as to] *This section does not* prevent the granting of permits to applicants later in time on the ground that the diversions under [such] *the* proposed later appropriations may cause the water level to be lowered at the point of diversion of a prior appropriator, so long as the rights of holders of existing appropriations can be satisfied under such express conditions. *At the time a permit is granted for a well:*

(a) In a county whose population is less than 400,000;

(b) For municipal, quasi-municipal or industrial use; and

(c) Whose reasonably expected rate of diversion is one-half cubic foot per second or more,

the state engineer shall include as a condition of the permit that pumping water pursuant to the permit may be limited or prohibited to prevent any unreasonable adverse effects on an existing domestic well located within 2,500 feet of the well, unless the holder of the permit and the owner of the domestic well have agreed to alternative measures that mitigate those adverse affects.

6. The state engineer shall conduct investigations in any basin or portion thereof where it appears that the average annual replenishment to the ground water supply may not be adequate for the needs of all permittees and all vested-right claimants, and if his findings so indicate the state engineer may order that withdrawals be restricted to conform to priority rights.

7. In any basin or portion thereof in the state designated by the state engineer, the state engineer may restrict drilling of wells in any portion thereof if he determines that additional wells would cause an undue interference with existing wells. Any order or decision of the state engineer so restricting drilling of such wells may be reviewed by the district court of the county pursuant to NRS 533.450.

Sec. 4. Chapter 167, Statutes of Nevada 1947, as last amended by chapter 544, Statutes of Nevada 1991, at page 1714, is hereby amended by adding thereto a new section to be designated as section 27 to read as follows:

Sec. 27. 1. At the request of the Southern Nevada Water Authority, to pay all or any part of the cost of one or more water projects, the district may issue special obligations of the district which are secured by, or general obligations of the district which are additionally secured by:

(a) Revenue derived from any water project owned, constructed, acquired or improved by the Southern Nevada Water Authority;

(b) Revenue made available to the district for payment of debt service by the Southern Nevada Water Authority or any member; or

(c) Any combination of paragraphs (a) and (b) of this subsection.

Any revenue pledged by the Southern Nevada Water Authority or any member pursuant to this subsection may be treated as pledged revenue of the water project for the purpose of subsection 2 of NRS 350.020.

2. The Southern Nevada Water Authority or any member may contract with the district to make specified revenue available to the district for the payment of debt service. Such a contract must be irrevocable for the term of the obligations secured by the contract or any obligations refunding those obligations.

3. The provisions of chapter 350 of NRS govern the issuance of general or special obligations pursuant to this section.

4. Subject to any lien imposed for the benefit of the owners of bonds:

(a) The proceeds of any bonds issued pursuant to this section must be expended at the direction of the Southern Nevada Water Authority; and

(b) Title to any water project financed with obligations issued pursuant to this section must be held by the Southern Nevada Water Authority.

5. To ensure whole or partial payment of the special or general obligations of the district issued pursuant to this section, the payment of which is secured by a pledge of the revenue derived from a water project, the Southern Nevada Water Authority shall establish, maintain, and if necessary, periodically revise a schedule or schedules of fees, rates and charges for services and facilities provided by the water project. The fees, rates and charges must:

(a) Produce sufficient revenue to ensure the payment of the general or special obligations of the district and to discharge any covenant in the proceedings of the district authorizing the issuance of any of those obligations, including any covenant for the establishment of reasonable reserve funds; and

(b) Produce sufficient revenue to pay the:

(1) Expenses associated with the operation and maintenance of works and properties;

(2) Expenses associated with providing services; and

(3) General expenses,

of the Southern Nevada Water Authority.

6. As used in this section, unless the context otherwise requires:

(a) "Member" means a member of the Southern Nevada Water Authority.

(b) "Water project" means facilities pertaining to a water system for the collection, transportation, treatment, purification and distribution of water, including, without limitation, springs, wells, ponds, lakes, water rights, other raw water sources, basin cribs, dams, spillways, retarding basins, detention basins, reservoirs, towers and other storage facilities, pumping plants, infiltration galleries, filtration plants, purification systems, other water treatment facilities, waterworks plants, pumping stations, gauging stations, ventilating facilities, stream gauges, rain gauges, valves, standpipes, connections, hydrants, conduits, flumes, sluices, canals, channels, ditches, pipes, lines, laterals, service pipes,

force mains, submains, syphons, other water transmission and distribution mains, engines, boilers, pumps, meters, apparatus, tools, equipment, fixtures, structures, buildings and other facilities for the acquisition, transportation, treatment, purification and distribution of untreated water or potable water for domestic, commercial and industrial use and irrigation, or any combination thereof.

Sec. 5. Section 7 of chapter 482, Statutes of Nevada 1975, as last amended by chapter 198, Statutes of Nevada 1991, at page 368, is hereby amended to read as follows:

Sec. 7. 1. The commission, on the behalf and in the name of the state, may:

(a) Acquire, hold, improve and equip the facilities;

(b) Acquire, hold, improve, equip and dispose of properties appertaining to the facilities, including without limitation water and water rights, for the benefit and welfare of the people of the state;

(c) Acquire, improve and equip the facilities and electric properties, wholly or in part, directly by construction contract or indirectly by contract with the Federal Government, or otherwise, or any combination thereof, as the commission may from time to time determine; and

(d) Borrow money and otherwise become obligated in a total principal amount:

(1) Not exceeding $63,000,000 to defray wholly or in part the cost of acquiring, improving and equipping the state facilities, and issue state securities to evidence such obligations;

(2) Not exceeding $11,000,000 to defray wholly or in part the cost of improving a section of the Las Vegas Valley Lateral, a conduit of the Robert B. Griffith Water Project supplying water for industrial and municipal use, in order to protect it from erosion, and issue state securities to evidence such obligations;

(3) Not exceeding $10,000,000 to defray wholly or in part the cost of emergency replacement or repair of the facilities or any properties appertaining to the facilities, and issue state securities to evidence such obligations;

(4) Not exceeding **[**$8,910,000**]** *$11,000,000* to defray wholly or in part the cost of acquiring, improving and equipping additional and existing laboratory, maintenance, operations and administrative facilities at the state facility;

(5) Not exceeding $3,930,000 to defray wholly or in part the cost of restoring and replacing the communications network of the Southern Nevada Water System;

(6) Not exceeding $100,000,000 to repay in full to the Federal Government at a discount the remaining unpaid reimbursable costs of the federal facilities;

(7) Not exceeding $175,000,000 to defray wholly or in part the cost of acquiring, improving and equipping existing and supplemental state and federal facilities;

(8) Not exceeding $40,000,000 to defray wholly or in part the cost of acquiring, improving and equipping existing and additional facilities

to disinfect the water supply so that the quality of the water will comply with federal requirements regarding water quality; and

(9) Not exceeding [$4,000,000] *$10,000,000* to defray wholly or in part the cost of acquiring, improving, equipping or replacing computers, computer programs and equipment for the treatment, testing, processing and delivery of water in and through the facilities.

2. The power to issue securities in a principal amount not more than $11,000,000 under subparagraph (2) of paragraph (d), $10,000,000 under subparagraph (3) of paragraph (d), [$8,910,000] *$11,000,000* under subparagraph (4) of paragraph (d), $3,930,000 under subparagraph (5) of paragraph (d), $175,000,000 under subparagraph (7) of paragraph (d), $40,000,000 under subparagraph (8) of paragraph (d) and [$4,000,000] *$10,000,000* under subparagraph (9) of paragraph (d) respectively, of subsection 1 increases or decreases to the extent justified by reason of changes in procurement costs between:

(a) December 31, 1984, for the purposes of subparagraphs (2) and (3) of paragraph (d) of subsection 1;

(b) December 31, [1988,] *1992,* for the purposes of subparagraphs (4) and (5) of paragraph (d) of subsection 1; and

(c) December 31, 1990, for the purposes of subparagraphs (7), (8) and (9) of paragraph (d) of subsection 1,

and the date of procurement as indicated by engineering cost indexes applicable to this type of procurement. The power to issue such securities for the purposes of subparagraphs (2), (3), (4), (5), (7), (8) and (9) of paragraph (d) of subsection 1 decreases to the extent that the Congress by federal act appropriates money, the Bureau of Reclamation allots money and the Federal Government is obligated to pay earnings under contract for the purposes specified in those subparagraphs or any part thereof.

(30)

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STATUTES OF NEVADA 1993

Senate Bill No. 19—Committee on Finance

CHAPTER 631

AN ACT relating to water; providing in certain counties for the protection of domestic wells from impairment for other uses and for the redress of impairment if it occurs; authorizing the Las Vegas Valley water district to issue bonds at the request of the Southern Nevada Water Authority; authorizing the Colorado River commission to issue additional bonds; repealing the Colorado River commission's authority to issue certain bonds; and providing other matters properly relating thereto.

[Approved July 13, 1993]

THE PEOPLE OF THE STATE OF NEVADA, REPRESENTED IN SENATE AND ASSEMBLY, DO ENACT AS FOLLOWS:

Section 1. NRS 533.024 is hereby amended to read as follows:

533.024 The legislature declares that it is the policy of this state [to] :

1. To encourage and promote the use of effluent, where [such] *that* use is not contrary to the public health, safety or welfare, and where [such] *that* use does not interfere with federal obligations to deliver [Colorado River water.] *water of the Colorado River.*

2. In a county whose population is less than 400,000, to recognize the importance of domestic wells as appurtenances to private homes, to create a protectible interest in such wells and to protect their supply of water from unreasonable adverse effects caused by municipal, quasi-municipal or industrial uses.

Sec. 2. NRS 533.360 is hereby amended to read as follows:

533.360 1. Except as otherwise provided in subsection [3,] *4,* NRS 533.345 and subsection 3 of NRS 533.370, when an application is filed in compliance with this chapter the state engineer shall, within 30 days, publish or cause to be published for a period of 4 consecutive weeks, in a newspaper of general circulation and printed and published in the county where the water is sought to be appropriated, a notice of the application, which sets forth:

(a) That the application has been filed.

(b) The date of the filing.

(c) The name and address of the applicant.

(d) The name of the source from which the appropriation is to be made.

(e) The location of the place of diversion [.] , *described by legal subdivision or metes and bounds and by a physical description of that place of diversion.*

(f) The purpose for which the water is to be appropriated.

The publisher shall add thereto the date of the first publication and the date of the last publication.

2. Except as otherwise provided in subsection [3,] *4,* proof of publication must be filed within 30 days after the final day of publication. The state engineer shall pay for the publication from the application fee. If the application is canceled for any reason before publication, the state engineer shall return to the applicant that portion of the application fee collected for publication.

3. *If the application is for a proposed well:*

(a) In a county whose population is less than 400,000;

(b) For municipal, quasi-municipal or industrial use; and

(c) Whose reasonably expected rate of diversion is one-half cubic foot per second or more,

the applicant shall mail a copy of the notice of application to each owner of real property containing a domestic well that is within 2,500 feet of the proposed well, to his address as shown in the latest records of the county assessor. If there are not more than six such wells, notices must be sent to each owner by certified mail, return receipt requested. If there are more than six such wells, at least six notices must be sent to owners by certified mail, return receipt requested. The return receipts from these notices must be filed with the state engineer before he may consider the application.

4. The provisions of this section do not apply to an environmental permit.

Sec. 3. NRS 534.110 is hereby amended to read as follows:

534.110 1. The state engineer shall administer this chapter and shall prescribe all necessary [rules and] regulations within the terms of this chapter for [such] *its* administration.

2. The state engineer may:

(a) Require periodical statements of water elevations, water used, and acreage on which water was used from all holders of permits and claimants of vested rights.

(b) Upon his own initiation, conduct pumping tests to determine if overpumping is indicated, to determine the specific yield of the aquifers and to determine permeability characteristics.

3. The state engineer shall determine [if] *whether* there is unappropriated water in the area affected and may issue permits only if [such] *the* determination is affirmative. *The state engineer shall require each applicant to whom a permit is issued for a well:*

(a) In a county whose population is less than 400,000;

(b) For municipal, quasi-municipal or industrial use; and

(c) Whose reasonably expected rate of diversion is one-half cubic foot per second or more,

to report periodically to the state engineer concerning the effect of that well on other previously existing wells that are located within 2,500 feet of the well.

4. It [shall be an express] *is a* condition of each appropriation of ground water acquired under this chapter that the right of the appropriator [shall relate] *relates* to a specific quantity of water and that [such] *the* right must allow for a reasonable lowering of the static water level at the appropriator's point of diversion. In determining [such] *a* reasonable lowering of the static water level in a particular area, the state engineer shall consider the economics of pumping water for the general type of crops growing and may also consider the effect of [water use] *using water* on the economy of the area in general.

5. [Nothing herein shall be so construed as to] *This section does not* prevent the granting of permits to applicants later in time on the ground that the diversions under [such] *the* proposed later appropriations may cause the water level to be lowered at the point of diversion of a prior appropriator, so long as the rights of holders of existing appropriations can be satisfied under such express conditions. *At the time a permit is granted for a well:*

(a) In a county whose population is less than 400,000;

(b) For municipal, quasi-municipal or industrial use; and

(c) Whose reasonably expected rate of diversion is one-half cubic foot per second or more,

the state engineer shall include as a condition of the permit that pumping water pursuant to the permit may be limited or prohibited to prevent any unreasonable adverse effects on an existing domestic well located within 2,500 feet of the well, unless the holder of the permit and the owner of the domestic well have agreed to alternative measures that mitigate those adverse affects.

6. The state engineer shall conduct investigations in any basin or portion thereof where it appears that the average annual replenishment to the ground water supply may not be adequate for the needs of all permittees and all vested-right claimants, and if his findings so indicate the state engineer may order that withdrawals be restricted to conform to priority rights.

7. In any basin or portion thereof in the state designated by the state engineer, the state engineer may restrict drilling of wells in any portion thereof if he determines that additional wells would cause an undue interference with existing wells. Any order or decision of the state engineer so restricting drilling of such wells may be reviewed by the district court of the county pursuant to NRS 533.450.

Sec. 4. Chapter 167, Statutes of Nevada 1947, as last amended by chapter 544, Statutes of Nevada 1991, at page 1714, is hereby amended by adding thereto a new section to be designated as section 27 to read as follows:

Sec. 27. 1. At the request of the Southern Nevada Water Authority, to pay all or any part of the cost of one or more water projects, the district may issue special obligations of the district which are secured by, or general obligations of the district which are additionally secured by:

(a) Revenue derived from any water project owned, constructed, acquired or improved by the Southern Nevada Water Authority;

(b) Revenue made available to the district for payment of debt service by the Southern Nevada Water Authority or any member; or

(c) Any combination of paragraphs (a) and (b) of this subsection.

Any revenue pledged by the Southern Nevada Water Authority or any member pursuant to this subsection may be treated as pledged revenue of the water project for the purpose of subsection 2 of NRS 350.020.

2. The Southern Nevada Water Authority or any member may contract with the district to make specified revenue available to the district for the payment of debt service. Such a contract must be irrevocable for the term of the obligations secured by the contract or any obligations refunding those obligations.

3. The provisions of chapter 350 of NRS govern the issuance of general or special obligations pursuant to this section.

4. Subject to any lien imposed for the benefit of the owners of bonds:

(a) The proceeds of any bonds issued pursuant to this section must be expended at the direction of the Southern Nevada Water Authority; and

(b) Title to any water project financed with obligations issued pursuant to this section must be held by the Southern Nevada Water Authority.

5. To ensure whole or partial payment of the special or general obligations of the district issued pursuant to this section, the payment of which is secured by a pledge of the revenue derived from a water project, the Southern Nevada Water Authority shall establish, maintain, and if necessary, periodically revise a schedule or schedules of fees, rates and charges for services and facilities provided by the water project. The fees, rates and charges must:

(a) Produce sufficient revenue to ensure the payment of the general or special obligations of the district and to discharge any covenant in the proceedings of the district authorizing the issuance of any of those obligations, including any covenant for the establishment of reasonable reserve funds; and

(b) Produce sufficient revenue to pay the:

(1) Expenses associated with the operation and maintenance of works and properties;

(2) Expenses associated with providing services; and

(3) General expenses,

of the Southern Nevada Water Authority.

6. As used in this section, unless the context otherwise requires:

(a) "Member" means a member of the Southern Nevada Water Authority.

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(b) "Water project" means facilities pertaining to a water system for the collection, transportation, treatment, purification and distribution of water, including, without limitation, springs, wells, ponds, lakes, water rights, other raw water sources, basin cribs, dams, spillways, retarding basins, detention basins, reservoirs, towers and other storage facilities, pumping plants, infiltration galleries, filtration plants, purification systems, other water treatment facilities, waterworks plants, pumping stations, gauging stations, ventilating facilities, stream gauges, rain gauges, valves, standpipes, connections, hydrants, conduits, flumes, sluices, canals, channels, ditches, pipes, lines, laterals, service pipes, force mains, submains, syphons, other water transmission and distribution mains, engines, boilers, pumps, meters, apparatus, tools, equipment, fixtures, structures, buildings and other facilities for the acquisition, transportation, treatment, purification and distribution of untreated water or potable water for domestic, commercial and industrial use and irrigation, or any combination thereof.

Sec. 5. Section 7 of chapter 482, Statutes of Nevada 1975, as last amended by chapter 198, Statutes of Nevada 1991, at page 368, is hereby amended to read as follows:

Sec. 7. 1. The commission, on the behalf and in the name of the state, may:

(a) Acquire, hold, improve and equip the facilities;

(b) Acquire, hold, improve, equip and dispose of properties appertaining to the facilities, including without limitation water and water rights, for the benefit and welfare of the people of the state;

(c) Acquire, improve and equip the facilities and electric properties, wholly or in part, directly by construction contract or indirectly by contract with the Federal Government, or otherwise, or any combination thereof, as the commission may from time to time determine; and

(d) Borrow money and otherwise become obligated in a total principal amount:

(1) Not exceeding $63,000,000 to defray wholly or in part the cost of acquiring, improving and equipping the state facilities, and issue state securities to evidence such obligations;

(2) Not exceeding $11,000,000 to defray wholly or in part the cost of improving a section of the Las Vegas Valley Lateral, a conduit of the Robert B. Griffith Water Project supplying water for industrial and municipal use, in order to protect it from erosion, and issue state securities to evidence such obligations;

(3) Not exceeding $10,000,000 to defray wholly or in part the cost of emergency replacement or repair of the facilities or any properties appertaining to the facilities, and issue state securities to evidence such obligations;

(4) Not exceeding [$8,910,000] *$11,000,000* to defray wholly or in part the cost of acquiring, improving and equipping additional and existing laboratory, maintenance, operations and administrative facilities at the state facility;

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SE ROA 756

(5) Not exceeding $3,930,000 to defray wholly or in part the cost of restoring and replacing the communications network of the Southern Nevada Water System;

(6) Not exceeding $100,000,000 to repay in full to the Federal Government at a discount the remaining unpaid reimbursable costs of the federal facilities;

(7) Not exceeding $175,000,000 to defray wholly or in part the cost of acquiring, improving and equipping existing and supplemental state and federal facilities;

(8) Not exceeding $40,000,000 to defray wholly or in part the cost of acquiring, improving and equipping existing and additional facilities to disinfect the water supply so that the quality of the water will comply with federal requirements regarding water quality; and

(9) Not exceeding **[**$4,000,000**]** *$10,000,000* to defray wholly or in part the cost of acquiring, improving, equipping or replacing computers, computer programs and equipment for the treatment, testing, processing and delivery of water in and through the facilities.

2. The power to issue securities in a principal amount not more than $11,000,000 under subparagraph (2) of paragraph (d), $10,000,000 under subparagraph (3) of paragraph (d), **[**$8,910,000**]** *$11,000,000* under subparagraph (4) of paragraph (d), $3,930,000 under subparagraph (5) of paragraph (d), $175,000,000 under subparagraph (7) of paragraph (d), $40,000,000 under subparagraph (8) of paragraph (d) and **[**$4,000,000**]** *$10,000,000* under subparagraph (9) of paragraph (d) respectively, of subsection 1 increases or decreases to the extent justified by reason of changes in procurement costs between:

(a) December 31, 1984, for the purposes of subparagraphs (2) and (3) of paragraph (d) of subsection 1;

(b) December 31, **[**1988,**]** *1992,* for the purposes of subparagraphs (4) and (5) of paragraph (d) of subsection 1; and

(c) December 31, 1990, for the purposes of subparagraphs (7), (8) and (9) of paragraph (d) of subsection 1,

and the date of procurement as indicated by engineering cost indexes applicable to this type of procurement. The power to issue such securities for the purposes of subparagraphs (2), (3), (4), (5), (7), (8) and (9) of paragraph (d) of subsection 1 decreases to the extent that the Congress by federal act appropriates money, the Bureau of Reclamation allots money and the Federal Government is obligated to pay earnings under contract for the purposes specified in those subparagraphs or any part thereof.

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SE ROA 757

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REPORT OF THE TECHNICAL ADVISORY COMMITTEE TO THE SUBCOMMITTEE TO STUDY DOMESTIC AND MUNICIPAL WATER WELLS

(Assembly Bill 408, Chapter 636, *Statutes of Nevada 1999*)

Prepared by:

Linda Eissmann, Senior Research Analyst
Research Division
Legislative Counsel Bureau

Adopted June 22, 2000

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SUMMARY OF RECOMMENDATIONS

TECHNICAL ADVISORY COMMITTEE TO THE SUBCOMMITTEE TO STUDY DOMESTIC AND MUNICIPAL WATER WELLS

(Assembly Bill 408, Chapter 636, *Statutes of Nevada 1999*)

Following is a summary of the recommendations adopted by the Technical Advisory Committee (TAC) to the Subcommittee to Study Domestic and Municipal Water Wells. These recommendations and the issues they address are more fully described in the Technical Advisory Committee's report to the Subcommittee, adopted June 22, 2000. The report and recommendations will be presented to the Subcommittee at its meeting on July 14, 2000.

Of 12 issues considered and discussed by the Technical Advisory Committee, five resulted in recommendations for new legislation or Subcommittee action. On three more, the Technical Advisory Committee voted to provide the Subcommittee with additional comment or information.

RECOMMENDATIONS

Recommendations for New Legislation

- Under *Nevada Revised Statutes* 534.024, "Protectible Interest" is currently extended to Nevada domestic well owners in counties with populations less than 400,000 (all but Clark County). There is concern that "protectible interest" should be extended to all well owners. Testimony also revealed that the current statutory notification requirements have no scientific basis. The Technical Advisory Committee recommends removing the 400,000 population limit, eliminating the notification requirements, and requiring the State Engineer to consider the "protectible interest" of domestic wells.

- The statutes and regulations affecting water quality and quantity are not always compatible and appropriately linked. In some areas, well problems are the result of water quality, not water quantity. The Technical Advisory Committee recommends that the Legislature direct an interim study to: (a) determine if there are sufficient controls in place to protect groundwater quality, specifically with respect to individual wastewater disposal systems; (b) evaluate the availability and adequacies of groundwater quality data; and (c) examine the manner in which land division laws under Chapter 278 of *Nevada Revised Statutes* affect groundwater quality and quantity.

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- Regarding water quality and quantity, the Technical Advisory Committee further recommends legislation that would authorize the Health Division to confirm with the State Engineer that sufficient water rights exist before a public water system is expanded.

Recommendations for Subcommittee Action

- There is concern that prospective buyers of property served by wells on temporary permits are unaware that the permits are subject to revocation. The Technical Advisory Committee recommends that the Subcommittee send a letter urging the Real Estate Division, in consultation with the State Engineer, to ensure that information is provided to potential buyers of property served by domestic, community, and quasi-municipal wells, including consideration of appropriate disclosure procedures.

- There is concern that many well owners are unfamiliar with groundwater dynamics, water quality protection, and well management, and are similarly unaware that their permits may be subject to revocation. The Technical Advisory Committee recognizes that information on domestic wells tends to be geographically related, and the best distribution of information should come from local governments to address well issues specific to their counties. The Technical Advisory Committee recommends that the Subcommittee prepare a letter requesting county governments disseminate domestic well information as typically provided through the Cooperative Extension Service to their domestic well owners. The Technical Advisory Committee further suggests that the Subcommittee's letter include a bibliography of available information (provided by the Technical Advisory Committee).

SPECIFIC COMMENTS AND INFORMATION

- Well owners are often surprised by the costs associated with hook-up to municipal water systems. As a result, the State Engineer has agreed to add language to the affidavit he files with the County Recorder, indicating that there are significant costs involved in hooking up to municipal water and that proper water authorities should be contacted for estimates of those costs. No legislation or further Subcommittee action is needed at this time.

- It may be more cost effective to artificially recharge the water table to benefit well owners in a given area, rather than hooking them up to municipal water. Consequently, "Replenishment District" legislation may be an issue for future consideration on a basin-by-basin case. No legislation or further Subcommittee action is needed at this time.

- There is concern that the statutory maximum limit of 1,800 gallons per day for domestic wells should be lowered to promote water conservation.

The Technical Advisory Committee recognizes the ability of local jurisdictions to set a figure not to exceed 1,800 gallons per day for domestic well use, and believes this is sufficient. No legislation or further Subcommittee action is needed at this time.

OTHER ISSUES CONSIDERED

- Concern was expressed that the statutory authority to revoke temporary permits is inappropriate. The Technical Advisory Committee voted not to recommend any change to the State Engineer's ability to issue temporary permits, nor to recommend modification of his authority to require connection to municipal water when it becomes available.

- The State Engineer is currently authorized (under *Nevada Revised Statutes* 534.180) to require the plugging of certain wells only if the charge for making the connection to municipal water is less than $200. Although concern was expressed that this dollar amount should be raised, the Technical Advisory Committee voted not to recommend changes to *Nevada Revised Statutes* 534.180.

- Certain provisions of A.B. 408, which prohibit the State Engineers from revoking temporary permits unless specific conditions are met, will "sunset" on July 1, 2005. The Technical Advisory Committee voted not to recommend removal of the sunset provision in A.B. 408, stating that it is premature to determine the usefulness of the conditions, and that the Groundwater Management Program and Financial Assistance Guidelines will not end in five years.

- There is concern that while A.B. 408 authorizes grants of not more than 85 percent toward the costs of connecting to municipal water, it establishes no minimum amount. The Technical Advisory Committee requested a letter from the Southern Nevada Water Authority reaffirming its Financial Assistance Guidelines, which set funding at 85 percent (with a minimum of 50 percent if grant funds are limited at a future date). As a result, the Technical Advisory Committee voted not to recommend a statutory requirement for a minimum amount.

REPORT OF THE TECHNICAL ADVISORY COMMITTEE TO THE SUBCOMMITTEE TO STUDY DOMESTIC AND MUNICIPAL WATER WELLS

(Assembly Bill 408, Chapter 636, *Statutes of Nevada 1999*)

Adopted June 22, 2000

I. INTRODUCTION

The 1999 Legislature enacted Assembly Bill 408 (Chapter 636, *Statutes of Nevada 1999*), which charged the Legislative Committee on Public Lands to conduct a study of issues related to residential, municipal, and quasi-municipal water wells in the State of Nevada, and to report its findings to the 71st Session of the Nevada Legislature. The Legislative Commission appointed a Subcommittee to oversee this study. Assembly Bill 408 also authorized appointment of a Technical Advisory Committee (TAC) to assist the Subcommittee in conducting the study, with representation from urban and rural areas, well owners, suppliers of municipal water, holders of water rights, and ratepayers. A copy of A.B. 408 is included in Attachment A.

The Legislative Commission appointed the following five members to the Subcommittee:

Senator Dean A. Rhoads, Chair
Senator Maggie Carlton
Senator Jon Porter
Assemblyman Douglas A. Bache
Assemblywoman Kathy Von Tobel

As Chair, Senator Rhoads appointed the following 13 members to the TAC:

Roland Westergard, Carson City, Chair
Jay Bingham, Las Vegas (holder of water rights)
Kay Brothers, Las Vegas Southern Nevada Water Authority (a purveyor of water)
Paula Brown, North Las Vegas (ratepayer)
Don Dickson, Las Vegas (well owner)
Tim Hafen, Pahrump (well owner)
Bruce Hamilton, Las Vegas (Nevada Well Owners' Association and well owner)
John Hiatt, Las Vegas (Advisory Committee for Groundwater Management)
Ferron Konakis, Elko (Elko City Engineer)
Mark Russell, Las Vegas (Mirage Resorts, a holder of water rights)*
Bjorn Selinder, Fallon (Churchill County Manager)
Mike Turnipseed, Carson City (State Engineer)
Steve Walker, Reno (Washoe County Water Resources, a purveyor of water

* Served until his resignation from the TAC.

Staff services from the Legislative Counsel Bureau (LCB) were provided by:

Linda Eissmann, Senior Research Analyst
Kimberly Guinasso, Principal Deputy Legislative Counsel
Randall Stephenson, Senior Deputy Legislative Counsel
Paige Clyde, Senior Research Secretary
Sally Kennedy, Senior Research Secretary

The TAC held six monthly meetings, all in Las Vegas, Nevada. In addition to TAC members, background information and recommendations were received from the public, the Nevada Well Owners' Association, and representatives of the Divisions of Environmental Protection, Water Planning and Water Resources; the Health Division; and the Real Estate Division.

The TAC was charged by the Subcommittee with four specific goals:

1. Review in detail the recent legislation of the three bills passed concerning domestic water wells, and suggest any new language or legislation that should be introduced in the next legislative session.

   The TAC received updates on the implementation of three measures enacted by the 1999 Legislature: Assembly Bills 237, 347, and 408 (Attachment A). They are described under the section titled "Water Wells Legislation Enacted by the 1999 Legislature," to follow.

2. Develop credible statistics on the number of domestic wells in the state and the number of temporary permits issued in Clark County.

   The State Engineer reports that there are 70,000 domestic well logs in his database statewide, although not all may be active. In the Las Vegas Valley, there are 7,200 domestic well logs, with 5,100 confirmed as active. Currently, 14,736 acre-feet of water are under revocable (temporary) permits in Las Vegas, representing 948 quasi-municipal and 161 other (i.e., domestic, industrial, and commercial) permits subject to revocation. These numbers, however, are constantly changing and reflect only the conditions as they currently exist.

3. Specifically identify issues relating to wells, for example, to identify both current and future problems.

   A total of 31 issues were raised either by members of the TAC or during public comment. Following initial explanation and discussion of each issue, several were combined and a total of 12 were eventually selected for further consideration. Attachment B contains a list of the 31 issues with a brief summary of the committee's discussion and action. The 12 issues for further consideration are described under the section titled "Issues and Recommendations Identified by the TAC," to follow.

4. Make recommendations to address these issues and problems.

   In summary, the advisory committee adopted five specific recommendations; three for new language or legislation that should be introduced in the next legislative session, and two for other action by the Subcommittee. Additionally, while some issues did not result in such recommendations, the TAC voted to advise the Subcommittee of the status or background of three other issues for future consideration and reference. The TAC's recommendations are described under the section titled "Issues and Recommendations Identified by the TAC," to follow.

The Subcommittee further directed the TAC to expand its issues, as necessary, to other areas of the state and not focus only on issues relevant to Las Vegas.

II. WATER WELLS LEGISLATION ENACTED BY THE 1999 LEGISLATURE

Three measures were passed by the 1999 Legislature directly addressing domestic water wells. Prior to consideration of any issues raised, the TAC assessed the implementation of each measure. The following is a summary of these measures and their status (a copy of each bill is found in Attachment A).

ASSEMBLY BILL 237

This measure expands the activities that may receive funds from the state's grant program for assisting public water systems, to include the costs associated with connection to municipal water systems. The bill limits these grants to projects involving wells drilled on or before October 1, 1999. Eligible recipients are defined in Section 2 as "a political subdivision of this state, including without limitation, a city, county, unincorporated town, water authority, conservation district, irrigation district, water district or water conservancy district."

Status:

- The Division of Water Planning has solicited Letters of Interest from potential grant applicants, to determine the types of projects which might be considered and how best to structure the forthcoming regulations. The division has also begun research and review of similar programs and related regulations in other states. The Board for Financing Water Projects is considering this information, and will develop regulations for adoption in the *Nevada Administrative Code*. These regulations will likely define the application, project selection, and payment processes. However, no funds have been awarded to date.

ASSEMBLY BILL 347

This measure specifically authorizes the Southern Nevada Water Authority (SNWA) to establish a deferred payment program to assist property owners in paying the cost of abandoning their wells and connecting to a public water system. The bill also authorizes the

SNWA to operate a project for recharge or underground storage of water for the benefit of well owners in the Las Vegas Valley groundwater basin.

Status:

- The fees have been established and the recharge program is being implemented. Recharge wells are currently under construction.

- In 1998 and 1999, only municipal well pumpers were billed. However, beginning with the first quarter of 2000, domestic and quasi-municipal well pumpers were also billed. Currently, about 75 percent of well owners have paid and the SNWA is still working to verify the well database.

- Criteria for grants programs have been adopted by the SNWA Board, a quarterly newsletter to the well community has been developed, and a Public Information Fair was held in December 1999, with over 300 attendees.

ASSEMBLY BILL 408

This measure specifies the conditions under which the State Engineer can revoke a temporary well permit or deny the deepening or repair of a domestic well, thereby requiring the well owner to connect with a municipal water supply. It further requires the State Engineer to notify the county recorder when a temporary permit is approved and when a new domestic well is drilled after October 1, 1999. Finally, the bill requires a study of domestic and municipal water wells by the Legislative Committee on Public Lands, including appointment of a Technical Advisory Committee.

Status:

- A Memorandum of Understanding has been adopted between the State Engineer and the SNWA to establish a process for the revocation of well permits and for information sharing between the two entities.

- The SNWA has developed a Financial Assistance Program, which provides 85 percent of the eligible costs for mandatory and voluntary connections. If the well user qualifies for "public assistance" as defined in statute, SNWA will pay up to 100 percent of eligible costs. Further, SNWA approved its Abandoned Well Program and plugs and abandons wells at no cost to the well user(s).

- Finally, the State Engineer is notifying county Recorders as required under A.B. 408, and the Technical Advisory Committee has completed its review of well issues, resulting in several recommendations.

III. ISSUES AND RECOMMENDATIONS IDENTIFIED BY THE TAC

A total of 31 issues were brought before the TAC for its consideration. They were considered with the following criteria in mind:

- Is this an exclusive issue?
- Should this issue be expanded?
- What public comment addresses this issue?
- What will the priority of this issue be?
- Should this issue be eliminated because it is outside the scope of the TAC?

Each issue was discussed and several were eliminated for a variety of reasons. For a detailed list of the issues and their fate, please refer to Attachment B.

Several issues were grouped under common subject headings, as necessary. In the end, the committee agreed to retain 12 issues for further consideration and possible action. Of these, five resulted in recommendations for new legislation or action by the Subcommittee (the two education issues were addressed by a single recommendation and the water quality/quantity issue resulted in two recommendations). The remainder of the issues did not result in recommendations for new legislation or Subcommittee action, but the advisory committee voted to provide the Subcommittee with specific comment and information on three others.

ISSUES RESULTING IN RECOMMENDATIONS

The following five issues resulted in recommendations for new legislation or action by the Subcommittee:

Issue of Domestic Wells

1. **Some people question what type of "protectible interest" in domestic wells is contemplated through the statement of policy in *Nevada Revised Statutes* (NRS) 533.024, and whether this provision should be extended to domestic wells in counties of more than 400,000 (Clark County).**

   Background - Nevada Revised Statutes 533.024 states that "It is the policy of this state, in a county whose population is less than 400,000, to recognize the importance of domestic wells as appurtenances to private homes, to create a protectible interest in such wells and to protect their supply of water from unreasonable adverse effects caused by municipal, quasi-municipal or industrial uses." Nevada Congressman Jim Gibbons submitted a letter urging revision of NRS 533.024 to extend the "protectible interest" to all well owners in Nevada (Attachment C).

The advisory committee heard considerable testimony on this issue, both regarding the 400,000 population cap and the notification requirements which state that an applicant for municipal, quasi-municipal or industrial wells must notify each domestic well owner within 2,500 feet of the proposed well. These provisions were added to statute following Senate Bill 19 (Chapter 631, *Statutes of Nevada*) enacted by the 1993 Legislature. A representative of Sierra Pacific (water purveyor servicing the Reno-Sparks area of Washoe County, Nevada), reported on how their policies address the practical application of the provisions of S.B. 19, questioned the scientific basis of the notification requirements, and suggested further review of those requirements.

Representatives of Congressman Gibbons' office and the Nevada Well Owners' Association supported extending "protectible interest" to all well owners in Nevada. They stated that Clark County residents do not get equal protection under the law and that a house has no property value without water servicing it.

Representatives of the SNWA opposed removal of the 400,000 population cap in NRS 533.024, citing impacts caused by draw downs between domestic and quasi-municipal wells, and an apparent conflict which would provide "protectible interest" to wells on temporary permits. Others opposing expansion of "protectible interest," noted that these provisions have not benefited well owners in other parts of the state and would accomplish nothing by extending it to include Clark County.

The advisory committee agreed on three basic alternatives:

a. No Action. Under this alternative, there would be no change to the "protectible interest" provisions described in NRS 533.024 and the notification requirements in NRS 533.360 and 534.110. The provisions adopted in S.B. 19 would remain unchanged.

b. Eliminate the Provisions of S.B. 19. Under this alternative, the provisions of S.B. 19 would be repealed, thereby eliminating "protectible interest" as described in NRS 533.024 and the notification requirements in NRS 533.360 and 534.110.

c. Modify the Provisions of S.B. 19. Under this alternative, certain modifications would be made to NRS 533.024, 533.360, 533.370, and 534.110. The modifications would: (1) remove the 400,000 population limit, thereby extending "protectible interest" to all Nevada well owners; (2) eliminate the requirement that the applicant must notify domestic well owners within 2,500 feet (including the stipulation that six such owners must be notified); and (3) require the State Engineer to consider the "protectible interest" of domestic wells in reviewing applications.

The TAC further discussed what is meant by "protectible interest." There was general agreement that it means protection of the domestic well's water supply from unreasonable adverse impacts. Advisory committee members similarly agreed that it is not intended to limit the State Engineer's ability to regulate and manage the state's water resources.

Recommendation: The advisory committee voted to recommend Alternative No. 3, previously described, which would remove the 400,000 population limit, eliminate the notification requirements, and require the State Engineer to consider the "protectible interest" of domestic wells when reviewing applications. This recommendation would modify NRS 533.024, 533.360, 533.370, and 534.110.

Issue of Notification and Temporary Permits

2. **There is a concern that prospective buyers of property served by existing wells on temporary permits are unaware that the permits can be revoked, and should be notified before they decide to purchase the property.**

Background: Prospective buyers of property with domestic wells are often unaware that permission to have a domestic well is temporary and revocable by state law. There is general consensus that real estate agents should be required to tell prospective buyers that temporary water well permits are revocable.

Discussion: The TAC considered several alternatives to address this issue, including: (a) inspection and certification of the well prior to sale; (b) educational training for real estate agents so they may adequately inform prospective buyers; (c) modification of the Real Property Disclosure Form or comparable form required by the State's Real Estate Division; and (d) distribution of an educational pamphlet to prospective buyers, with basic information about water wells and Nevada water law. There was concern that the method chosen must be required in any sale, including those by owner (in which no real estate agent is involved), and that the information is provided in such a way that it is not buried among multiple forms used in real estate transactions.

Testimony from the Real Estate Division indicated support for a two-pronged approach to this issue: (a) modification of the Real Property Disclosure Form, in consultation with the State Engineer and other appropriate individuals; and (b) an education outreach effort to both consumers and real estate agents.

Recommendation: The advisory committee voted to recommend that the Subcommittee urge the Real Estate Division, in consultation with the State Engineer, to ensure that information is provided to potential buyers of property served by domestic, community and quasi-municipal wells, including consideration of appropriate disclosure procedures. The TAC agreed that the best vehicle for enacting this recommendation might be a letter from the Subcommittee to the Real Estate Division.

Issue of Water Quality versus Quantity

3. **Although water quantity and quality are naturally linked, the relevant statutory and regulatory provisions are not logically brought together or cross-referenced.**

   Background: There is a need to check the compatibility of public health and water law statutes. In some areas (such as portions of Churchill, Elko, Nye, and Washoe Counties), the problem with wells is not the quantity of water but the quality. Statutes should be compatible or combined if possible.

   Discussion: The TAC agreed that this is an important issue statewide, and will likely become more important in the future, especially as growth continues in areas served by septic systems. Several members noted that there is evidence of environmental issues affecting domestic and municipal wells. Testimony from the Division of Environmental Protection and the Health Division about the water quality programs administered by those agencies focused on a general lack of data on groundwater quality for individual well systems, and particularly the impact of septic systems on groundwater.

   Further, there is no statutory requirement for the Health Division to verify with the State Engineer that sufficient water rights exist before a public water system is expanded. While there are construction standards for the infrastructure of new or existing public water systems, there is no regulatory or statutory requirement to check for appropriate water rights prior to issuance by the Health Division of a permit for a public water system.

   It was also noted that current land division laws under Chapter 278 of the *Nevada Revised Statutes* are problematic insofar as they require review and approval by the Division of Environmental Protection, the Division of Water Resources/State Engineer, and the Health Division. For example, in 1971, the Legislature granted the State Engineer authority over municipal type subdivisions served by municipal or domestic wells. The Legislature did not give the State Engineer authority over land divisions by parcel map or large land divisions. In regards to water quality, the Division of Environmental Protection reviews parcel maps, while the Health Division or local Health Department is responsible for reviewing subdivisions. The TAC also heard testimony that many counties have adopted ordinances requiring the water right to be attached to new parcel creations, but that existing parcels are exempt from this requirement.

   Recommendation: Two recommendations were made to address this issue:

   a. The TAC recommends that the Legislature direct an interim study to: (a) determine if there are sufficient controls in place to protect groundwater quality, specifically with respect to individual wastewater disposal systems; (b) evaluate the availability and adequacies of groundwater quality data; and (c) examine the manner in which land division laws under Chapter 278 of

Nevada Revised Statutes affect groundwater quality and quantity. A new Advisory Committee should be appointed to this interim study with representation from the State Engineer's office, the Division of Environmental Protection, the Health Division, a County Manager, a rural county planning department, an urban county planning department, residential well owners, and residential housing developments typically served by domestic wells and septic tanks.

b. The TAC also recommends legislation that would authorize the Health Division to confirm with the State Engineer that sufficient water rights exist before a public water system is expanded.

Issues of Education

The TAC voted to make a single recommendation to address both education issues.

4. **Compile a list of information and identify needs for additional information on domestic wells, and make recommendations on the distribution of it.**

Background: Existing and potential water well owners need to be educated that water is a finite resource, there are no guarantees of what the result will be when you drill, and there are risks in drilling a well. It is important to educate the media because many people question why new development and new golf courses are being approved when people on domestic wells are losing their permits and the water table is dropping. The media needs to be educated about this issue to disseminate accurate information.

Discussion: Members of the TAC agreed that information needs to be sent to well owners regarding water quality protection and well management, and that each county should take responsibility for distributing appropriate information to its well owners. Due to geographic differences, appropriate information will vary from county to county.

One of the TAC members offered to investigate existing publications to determine if adequate information already exists. It was later determined that considerable information is available from the Cooperative Extension Service, and simply needs to be better distributed. A bibliography of available information was prepared by the TAC, for distribution to well owners (Attachment D).

Recommendation: The TAC recognizes that information on domestic wells tends to be geographically related, and the best distribution of information should come from local governments, to address issues specific to their domestic well owners. The TAC recommends that the Subcommittee prepare a letter requesting that county governments disseminate domestic well information as typically provided through the Cooperative Extension Service to their domestic well owners, as

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appropriate. The Subcommittee will provide each county with a bibliography of available information (Attachment D).

5. **There is a potential conflict between domestic wells and larger production wells in that new domestic well owners often do not drill deep enough, causing their wells to go dry when larger, nearby wells enter their production cycle.**

   Background: The State Engineer is hearing complaints that are contractual between homeowners and well drillers. Homeowners who are new to the state do not know to drill deep enough. A well driller will hit water, and the homeowner tells him to go another 5 or 10 feet and stop. Then an irrigation well goes into production nearby and drops the water table, causing the homeowner's well to go dry. The State Engineer recommends to rural counties to go 50 feet into the water table. Notice requirements should be considered.

   Discussion: Discussion on this issue was similar to the previous education issue. Members of the TAC agreed that well owners need to be educated about water quality protection and well management. Further, because water quality and well management will differ by geographic location, each county should take responsibility for distributing appropriate information to its well owners.

   Recommendation: Please refer to the recommendation described for the previous education issue.

ISSUES RESULTING IN ADDITIONAL INFORMATION AND COMMENT

While specific recommendations for legislative action were not made for the following three issues, the advisory committee voted to provide the Subcommittee with additional information.

1. **Water well owners should be notified of the costs involved with hook-up to municipal water. The affidavit process does not currently include notification of costs.**

   Background: While the affidavit used by the State Engineer notifies new well owners that their permits are temporary, they often have little idea of the costs involved, which can be as much as $20,000.

   Discussion: Members of the advisory committee agreed that well owners should be made aware of the connection costs, and that any information added to the affidavit would be beneficial. However, these costs will vary from case to case, so no specific details are appropriate.

Recommendation: Because the State Engineer has agreed to add language to the affidavit he files with the County Recorder, indicating that there are significant costs involved in hooking up to municipal water and that proper water authorities should be contacted for estimates of those costs, the TAC has determined that no legislation is necessary at this time.

2. **Rather than hooking up all domestic wells to municipal water as it becomes available, some would contend that it may be more cost-effective to artificially recharge the water table to benefit all well owners within the area of recharge influence. Those who benefit from the recharge program should be responsible for funding it.**

   Background: Depending upon whether there are more or fewer domestic wells in the future, it may not make sense to hook-up new wells without a recharge program. Replenishment District legislation may be valuable.

   Discussion: Members agreed that if private well owners are benefiting from a replenishment program, they should help to pay for it. A determination is needed of an economic benefit by recharging the aquifer versus hooking up to municipal wells. They further agreed that this is a complicated issue because the answers vary from basin-to-basin and would depend on who owned the water that could be used for recharge. A general statewide policy would be inappropriate. Rather, a basin-by-basin discussion and determination is necessary.

   Recommendation: Although the TAC has determined that legislation is not necessary at this time, "Replenishment District" legislation may be an issue for future consideration on a basin-by-basin case.

3. **Some people believe that certain water policies do not encourage water conservation. Specifically the statutory maximum limit of 1,800 gallons per day for an exemption as a domestic well should be lowered, the requirement to hook-up to a public water system should be further evaluated, and there should be a comparison of service from municipal systems and domestic wells.**

   Background: This issue addresses several water conservation concerns. The State Engineer has never undertaken a survey of domestic well production to determine the average amount of water used from domestic wells. However, it is believed that most domestic wells do not pump 1,800 gallons per day. Nevertheless, their right to do so must be recognized. Additionally, where water rights exist, water must be used or the water right is lost. As a result, many holders of water rights waste water to maintain their water right. This takes away any incentive to conserve water.

Discussion: Members of the TAC noted that unless there is some supervision and enforcement on domestic wells, the maximum daily limit of pumpage is almost irrelevant regardless of the statutory limit. The TAC generally agreed that it was outside its realm to address this issue. Further, individual jurisdictions such as counties or towns with their own regional water planning program, have the ability to assign a figure deemed appropriate to their areas up to and including 1,800 gallons per day.

The statutory limit of 1,800 gallons per day was raised from 1,440 gallons per day in 1971 (Assembly Bill 325, Chapter 448, *Statutes of Nevada 1971*). Testimony at the 1971 hearings on A.B. 325 indicated that the limit was raised to permit small landowners, with large gardens and domestic animals, to draw additional water for such purposes.

Concern was also expressed that the "use it or lose it" nature of current water law encourages wasteful water practices. It was generally agreed that while dumping water to retain water rights does sometimes occur, the economic reality is that such practices would ultimately force the farmer or well owner out of business.

Recommendation: No legislation is necessary at this time because the TAC recognizes the ability of local jurisdictions to set a figure not to exceed 1,800 gallons per day for domestic well use, and believes this is sufficient.

ISSUES NOT RESULTING IN RECOMMENDATIONS

Following consideration and discussion of the following four issues, the TAC voted not to recommend any changes to current policy or statute at this time:

1. **Some people believe that the statutory authority is inappropriate which allows revocation of temporary permits when water from a public supplier is at the property even though an adequate supply of groundwater is available to sustain the private well.**

   Background: It should be determined whether it is sound policy to assume that if a person does not have a water right and is on a well, forcing him on to a municipal system is best. For example, if the integrity of the well's casing is the problem and not the water depth, the mere fact that a drilling rig will be needed to fix it mandates that the well be abandoned and the home be connected to a municipal supply. Further, there are instances in which a group of lots on a cul-de-sac share a well, but not all of the lots have been developed and diverted the water to beneficial use. The permits for the undeveloped lots are being canceled.

   Discussion: The first wells were drilled in the Las Vegas Valley after the turn of the century between 1905 and 1908. They were drilled to supplement the Las Vegas Springs, which were being used for municipal use, railroad use, and some irrigation. In 1941, the State Engineer designated the Las Vegas basin as an area in which the

groundwater was being depleted, but it was not until 1955 that the Legislature allowed the issuance of temporary permits. Since 1945, the SNWA reports that water levels have dropped from about 50 feet to almost 200 feet in some areas. Currently, the State Engineer estimates that 72,000 acre-feet of water is being pumped from the Las Vegas Valley. Natural groundwater recharge is estimated at about 35,000 to 50,000 acre-feet.

Beginning in 1955, the State Engineer's office issued revocable permits with the intent of "weaning" the valley off groundwater by forcing new and existing development onto Colorado River water when it became available. The first permit was revoked on January 1, 1972, and as of this writing, approximately 109,900 acre-feet of water have been revoked. In 1992, temporary permits were no longer being issued with three exceptions:

- Small commercial wells that would take less water than a domestic well;
- Homeowners who were refiling for an application where a developer had allowed a permit to be cancelled; and
- Applicants who began the development process prior to March 23, 1992.

Permit revocations continued after 1992 until the passage of A.B. 408 in 1999, which placed a moratorium on the State Engineer's ability to revoke any more permits unless three conditions are met:

- The water line must be within 180 feet from an existing well;
- A financial package must be made available; and
- The well must fail.

At this time, there are about 14,736 acre-feet of water in revocable permits remaining, and total pumpage in the valley today is still about twice the natural recharge. This does not include the recharge program begun in 1989 by the SNWA, which takes Colorado River water during off peak times and puts it into the ground through recharge wells. From 1990 to 1998, water levels across the valley have risen since the artificial recharge program was initiated. In some areas, the level has risen 50 feet.

The advisory committee heard testimony that in the Las Vegas Valley, 80 percent of the revoked permits are a result of a dropping water table, while only 20 percent are due to the need for well repairs or replacement. The TAC members generally agreed that revocation is necessary for successful groundwater management, and is within the statutory authority of the State Engineer to issue temporary permits where groundwater is being depleted, and to revoke those permits when a municipal water supply is available.

Action: The TAC voted not to recommend any change to the State Engineer's ability to issue temporary permits, nor to recommend modification of his authority to require connection to municipal water when it becomes available, as authorized in NRS 534.120.

2. **Change in Nevada's water law is necessary due to the cost of hooking up to municipal water supplies. Increasing costs are placing an unfair burden on well owners. (Reference: NRS 534.180)**

   Background: Currently, NRS 534.180 authorizes the State Engineer to require the plugging of a well drilled on or after July 1, 1981, at any time not sooner than one year after water can be furnished to the site by a political subdivision or public utility, but only if the charge for making the connection to the service is less than $200.

   Discussion: The advisory committee heard testimony that the State Engineer has not forced anyone off of an existing well that was currently in use. Members also discussed water management policies and agreed that the connection cost in NRS 534.180 is irrelevant.

   Action: Following additional discussion, the committee voted not to recommend changes to NRS 534.180.

3. **The five-year sunset provision for well protection should be removed from A.B. 408.**

   Background: Section 2 of A.B. 408 expires by act of limitation on July 1, 2005. This section provides that the State Engineer may revoke a temporary permit issued for residential use only if: (a) the distance from the property line to the pipes of the proposed water sources is not more than 180 feet; (b) the well providing water under temporary permit needs to be re-drilled or have repairs that require the use of a well-drilling rig; and (c) the permit holder will be offered financial assistance to pay not more than 85 percent of the cost of connection fees and capital improvements needed for the connection. He may also limit the depth of a domestic well, prohibit repairs, and require the use of water obtained from a water district or municipality in an area in which he has issued temporary permits, if the same conditions are met.

   Section 2 also provides that in a basin served by a water authority with a groundwater management program, the permit cannot be revoked unless the water authority abandons and plugs the well and pays the associated costs. If such a groundwater program does not exist, the person must abandon and plug his well in accordance with the rules of the State Engineer.

Discussion: Representatives of the Nevada Well Owners' Association testified that the sunset provisions offer protection to well owners, and should be continued. If those provisions end, well permits could be revoked without regard to the location of the municipal water supply and without funding assistance. Others argued, however, that A.B. 408 was passed in 1999 and it is premature to change its provisions before any usefulness could be determined. Revocation of temporary permits is necessary over the long term to protect the groundwater basin. Further, the funding assistance is in place and will not end in five years.

Action: Following additional discussion, the committee voted not to recommend removal of the sunset provision in A.B. 408.

4. **Modified language is needed to set a reasonable minimum amount of funding available from the 85 percent grant.**

Background: There is concern that while A.B. 408 authorizes grants of not more than 85 percent toward the costs of connecting to municipal water, it establishes no minimum grant award.

Discussion: Representatives of the SNWA explained the Financial Assistance Guidelines adopted by the SNWA Board of Directors on November 18, 1999, and how these guidelines applied to mandatory and voluntary connections. For both types of connections, the Board approved funding at the full 85 percent. In the event that money is not available to pay the 85 percent in the future, a minimum grant of 50 percent is guaranteed by the Board. A change to these guidelines would require an act by the Board. Additionally, SNWA reports that the mechanism is in place such that if there is no financial assistance available, failed well owners would be allowed to do what they need to maintain their wells, including re-drilling or relocating.

Representatives of the Nevada Well Owners' Association argued that if SNWA has guaranteed a minimum 50 percent funding, it should be placed in statute as a legally binding mechanism. Members of the advisory committee commented that a recent letter submitted by the SNWA, reaffirming its commitment to the approved funding levels, is sufficient guarantee of the 50 percent minimum grant award (Attachment E). Other members questioned the appropriateness of making a local funding policy a statewide issue.

Action: Following additional discussion, the TAC voted not to recommend a statutory requirement for a minimum grant amount.

ATTACHMENT A

Assembly Bills 237, 347, and 408

Assembly Bill No. 237--Assemblymen Dini, de Braga and Hettrick

Joint Sponsors: Senators Amodei, McGinness and Jacobsen

CHAPTER.....

AN ACT relating to water; authorizing grants for certain costs associated with connections to municipal water systems and for certain improvements to conserve water; increasing the amount of general obligation bonds that the state board of finance may issue to provide the grants; and providing other matters properly relating thereto.

THE PEOPLE OF THE STATE OF NEVADA, REPRESENTED IN SENATE AND ASSEMBLY, DO ENACT AS FOLLOWS:

Section 1. NRS 349.980 is hereby amended to read as follows:

349.980 As used in NRS 349.980 to 349.987, inclusive, unless the context otherwise requires:

1. "Board" means the board for financing water projects created pursuant to NRS 349.957.

2. "Community water system" means a public water system which:

(a) Has 15 or more service connections; or

(b) Serves 25 or more persons,

at places which are intended for year-round occupancy.

3. "Costs of capital improvements to community water systems and nontransient water systems" means the costs traditionally associated with capital improvements to such systems and includes costs associated with the:

(a) Consolidation of existing systems; and

(b) Transfer and connection of a public water system to a system owned by a purveyor of water or a public utility.

4. "Fund" means the fund for grants ~~[to certain purveyors of water.]~~ ***for water conservation and capital improvements to certain water systems.***

5. "Nontransient water system" means a public water system that regularly serves 25 or more of the same persons for more than 6 months per year, but which is not a community water system.

6. "Public water system" has the meaning ascribed to it in NRS 445A.840.

7. "Purveyor of water" means a political subdivision ***of this state*** engaged in the business of furnishing water, for compensation, to persons within the political subdivision.

Sec. 2. NRS 349.981 is hereby amended to read as follows:

349.981 ***1.*** There is hereby established a program to provide grants of money to ~~[purveyors]~~ ***:***

(a) A purveyor of water to pay for costs of capital improvements to publicly owned community water systems and publicly owned nontransient water systems required or made necessary by the state board of health pursuant to NRS 445A.800 to 445A.955, inclusive, or made necessary by

the Safe Drinking Water Act, ~~[(]~~ 42 U.S.C. §§ 300f et seq., ~~[)]~~ and the regulations adopted pursuant thereto.

(b) An eligible recipient to pay for the cost of improvements to conserve water, including, without limitation:

(1) Piping or lining of an irrigation canal;

(2) Recovery or recycling of wastewater or tailwater;

(3) Scheduling of irrigation;

(4) Measurement or metering of the use of water;

(5) Improving the efficiency of irrigation operations; and

(6) Improving the efficiency of the operation of a facility for the storage of water, including, without limitation, efficiency in diverting water to such a facility.

(c) An eligible recipient, to pay the following costs associated with connecting a domestic well or well with a temporary permit to a municipal water system, if the well was in existence on or before October 1, 1999, and the well is located in an area designated by the state engineer pursuant to NRS 534.120 as an area where the ground water basin is being depleted:

(1) Any local or regional fee for connection to the municipal water system.

(2) The cost of any capital improvement that is required to comply with a decision or regulation of the state engineer.

2. Except as otherwise provided in NRS 349.983, the determination of who is to receive a grant is solely within the discretion of the board.

3. As used in this section, "eligible recipient" means a political subdivision of this state, including, without limitation, a city, county, unincorporated town, water authority, conservation district, irrigation district, water district or water conservancy district.

Sec. 3. NRS 349.982 is hereby amended to read as follows:

349.982 1. The board shall administer the program and shall adopt regulations necessary for that purpose.

2. The regulations must provide such requirements for participation in the program as the board deems necessary.

3. ***The money in the fund may be used to defray, in whole or in part, the costs of administering the fund and the expenses of the board in administering the program.***

4. The board may, by regulation, impose an administrative fee which must be collected from each recipient of a grant from the fund. If such a fee is imposed, all revenue derived from the fee must be used to defray, ***in whole or in part,*** the costs of administering the fund and the expenses of the board in administering the program.

Sec. 4. NRS 349.983 is hereby amended to read as follows:

349.983 1. Grants may be made ~~[to purveyors of water under the program]~~ ***pursuant to paragraph (a) of subsection 1 of NRS 349.981*** only for those community and nontransient water systems that:

(a) Were in existence on January 1, 1995; and

(b) Are currently publicly owned.

2. In making its determination of which purveyors of water are to receive grants ~~[,]~~ ***pursuant to paragraph (a) of subsection 1 of NRS 349.981,*** the board shall give preference to those purveyors of water whose public water systems regularly serve fewer than 6,000 persons.

3. Each recipient of a grant ***pursuant to paragraph (a) of subsection 1 of NRS 349.981*** shall provide an amount of money for the same purpose. The board shall develop a scale to be used to determine that amount, but the recipient must not be required to provide an amount less than 15 percent or more than 75 percent of the amount of the grant. The scale must be based upon the average household income of the customers of the recipient, and provide adjustments for the demonstrated economic hardship of those customers, the existence of an imminent risk to public health and any other factor that the board determines to be relevant.

~~[4. Except as otherwise provided in subsections 1 and 2, the determination of which purveyors of water are to receive grants is solely within the discretion of the board.]~~

Sec. 5. NRS 349.984 is hereby amended to read as follows:

349.984 1. The fund for grants ~~[to certain purveyors of water]~~ ***for water conservation and capital improvements to certain water systems*** is hereby created.

2. Except as otherwise provided by ~~[subsection]~~ ***subsections*** 3 ***and 4*** of NRS 349.982, the money in the fund must be used only to make grants in furtherance of the program.

3. All claims against the fund must be paid as other claims against the state are paid.

Sec. 6. NRS 349.986 is hereby amended to read as follows:

349.986 The state board of finance shall issue general obligation bonds of the State of Nevada in the face amount of not more than ~~[$40,000,000]~~ ***$50,000,000*** to support the purposes of the program. The net proceeds from the sale of the bonds must be deposited in the fund. The bonds must be redeemed through the consolidated bond interest and redemption fund.

Assembly Bill No. 347–Committee on Government Affairs

CHAPTER.....

AN ACT relating to the Southern Nevada Water Authority; authorizing the Southern Nevada Water Authority, under specified circumstances, to increase certain fees; authorizing the Southern Nevada Water Authority to assist certain property owners to connect their property to a public water system; authorizing the Southern Nevada Water Authority to operate a project for the recharge and recovery or underground storage and recovery of water; and providing other matters properly relating thereto.

THE PEOPLE OF THE STATE OF NEVADA, REPRESENTED IN SENATE AND ASSEMBLY, DO ENACT AS FOLLOWS:

Section 1. Chapter 572, Statutes of Nevada 1997, at page 2799, is hereby amended by adding thereto new sections to be designated as sections 14.3 and 14.5, immediately following section 14, to read respectively as follows:

Sec. 14.3. *1. The Southern Nevada Water Authority may, in consultation with the advisory committee, establish a program under which it may enter into an agreement with an owner of real property located in the basin to:*

(a) Abandon or plug a well located on the real property;

(b) Install pipes and other appurtenances to deliver water to the real property; and

(c) Pay fees related to the connection of the property to a public water system.

2. An agreement entered into pursuant to subsection 1 must:

(a) Provide for the repayment, over time, to the Southern Nevada Water Authority by the owner of the real property all money expended by the Southern Nevada Water Authority pursuant to the agreement;

(b) Provide that all money to be repaid to the Southern Nevada Water Authority pursuant to the agreement be due and payable upon the sale or other transfer of the real property;

(c) Be secured by a lien upon the real property; and

(d) Be acknowledged and recorded in the same manner as conveyances affecting real property are required to be acknowledged and recorded pursuant to chapter 111 of NRS.

3. An abandonment or plugging of a well pursuant to an agreement entered into pursuant to subsection 1 must be conducted in a manner approved by the State Engineer.

4. As used in this section, "public water system" has the meaning ascribed to it in NRS 445A.840.

Sec. 14.5. ***The Southern Nevada Water Authority may, in consultation with the advisory committee, operate a project for the recharge and recovery or underground storage and recovery of water pursuant to chapter 534 of NRS for the benefit of owners of wells in the basin.***

Sec. 2. Section 1 of chapter 572, Statutes of Nevada 1997, at page 2799, is hereby amended to read as follows:

Section 1. As used in sections 2 to 16, inclusive, ***and sections 14.3 and 14.5*** of this act, unless the context otherwise requires, the words and terms defined in sections 2 to 6, inclusive, of this act have the meanings ascribed to them in those sections.

Sec. 3. Section 13 of chapter 572, Statutes of Nevada 1997, at page 2802, is hereby amended to read as follows:

Sec. 13. 1. The Southern Nevada Water Authority may establish and collect each calendar year a fee to be assessed on users of ground water in the basin. Money raised from the fees must be used as provided in section 14 of this act.

2. Except as otherwise provided in this section:

(a) Users of ground water, other than owners of domestic wells, may be assessed a fee each calendar year of not more than ~~[$10]~~ *$13* per acre-foot, or its equivalent, of ground water in the basin to which they have a water right in that year.

(b) Owners of domestic wells may be assessed a flat fee each calendar year of not more than ~~[$10.]~~ *$13.*

3. ***Except as otherwise provided in subsections 4 and 5, if the Southern Nevada Water Authority operates a project for the recharge and recovery or underground storage and recovery of water pursuant to section 14.5 of this act:***

(a) Users of ground water, other than owners of domestic wells, may be assessed a fee each calendar year of not more than $30 per acre-foot, or its equivalent, of ground water in the basin to which they have a water right in that year.

(b) Owners of domestic wells may be assessed a flat fee each calendar year of not more than $30.

4. The maximum fees specified in ~~[subsection]~~ ***subsections*** 2 ***and 3*** may be adjusted once each year for inflation. The maximum amount of the adjustment must be determined by multiplying the respective amounts of the fees by the percentage of inflation, if any. The Consumer Price Index published by the United States Department of Labor for July preceding the year for which the adjustment is made must be used in determining the percentage of inflation.

~~[4.]~~ *5.* The maximum fees may be increased by an amount ~~[which]~~ ***that*** is greater than the amount of the adjustment for inflation as calculated pursuant to subsection ~~[3]~~ *4* only if ~~[:~~

~~(a) A majority of all of the voting members of the advisory committee recommends the change;~~

~~(b) The board of directors approves the recommendation; and~~

~~(c) The~~] *the* increase is approved by the Legislature.

~~[5.]~~ *6.* As used in this section, "water right" means the legal right to use water that has been appropriated pursuant to chapters 533 and 534 of NRS by means of application, permit, certificate, decree or claim of vested right.

Sec. 4. Section 14 of chapter 572, Statutes of Nevada 1997, at page 2802, is hereby amended to read as follows:

Sec. 14. Money collected pursuant to section 13 of this act must be used to:

1. Develop and distribute information promoting education and the conservation of ground water in the basin.

2. Perform such comprehensive inventories of wells of all types located within the basin as may be needed. Such inventories must be done in conjunction with the State Engineer.

3. Prepare, for use by the advisory committee, such cost-benefit analyses relating to the recharge ***and recovery or underground storage and recovery*** of ~~[the ground]~~ water in the basin as may be needed.

4. Develop recommendations for additional activities for the management of the basin and the protection of the aquifer in which the basin is located ~~[.]~~ ***, and to conduct such activities if the activities have been approved by the board of directors.***

5. Develop and implement a program to provide financial assistance to owners of real property served by:

(a) Domestic wells; or

(b) Wells that are operated pursuant to temporary permits, in existence before October 1, 1999, who are required by the state engineer to connect the real property to a public water system.

6. Perform such other duties as are necessary for the Southern Nevada Water Authority and the advisory committee to carry out the provisions of this act. ~~[related to the management program.]~~

Sec. 5. Section 20 of chapter 572, Statutes of Nevada 1997, at page 2803, is hereby amended to read as follows:

Sec. 20. ~~[1.]~~ This act becomes effective upon passage and approval.

~~[2. If the Advisory Committee for the Management of Ground Water in the Las Vegas Valley Ground Water Basin pursuant to section 18 of this act includes in the joint report to the 70th session of the Nevada Legislature the advisory committee's recommendation that the management program be terminated, this act expires by limitation 90 days after the date on which the report is submitted to the Director of the Legislative Counsel Bureau pursuant to section 12 of this act.]~~

Sec. 6. Section 18 of chapter 572, Statutes of Nevada 1997, at page 2803, is hereby repealed.

Sec. 7. The amendatory provisions of subsection 3 of section 13 of chapter 572, Statutes of Nevada 1997, as amended by this act, do not apply to a state agency in the Las Vegas Valley Ground Water Basin until July 1, 2001.

Sec. 8. This act becomes effective upon passage and approval.

Assembly Bill No. 408–Committee on Government Affairs

CHAPTER.....

AN ACT relating to water; establishing the circumstances under which certain temporary permits for the appropriation of ground water may be revoked; restricting the authority of the state engineer to limit the depth of or prohibit the repair of certain wells; requiring the state engineer to file certain notices with the county recorder; revising the method for calculating the fee charged to a user of water for the beautification of the City of North Las Vegas; requiring the legislative committee on public lands to conduct a study of water wells; and providing other matters properly relating thereto.

THE PEOPLE OF THE STATE OF NEVADA, REPRESENTED IN SENATE AND ASSEMBLY, DO ENACT AS FOLLOWS:

Section 1. Chapter 534 of NRS is hereby amended by adding thereto a new section to read as follows:

If the state engineer issues a temporary permit pursuant to NRS 534.120 or if a well for domestic use is drilled in an area in which he has issued such a temporary permit, he shall file a notice with the county recorder of the county in which the permit is issued or the well is drilled. The notice must include a statement indicating that, if and when water can be furnished by an entity such as a water district or a municipality engaged in furnishing water to the inhabitants of the designated area:

1. A temporary permit may be revoked;

2. The owner of a domestic well may be prohibited from deepening or repairing the well; and

3. The owner of the property served by the well may be required to connect to this water source at his own expense.

Sec. 2. NRS 534.120 is hereby amended to read as follows:

534.120 1. Within an area that has been designated by the state engineer, as provided for in this chapter where, in his judgment, the ground water basin is being depleted, the state engineer in his administrative capacity is herewith empowered to make such rules, regulations and orders as are deemed essential for the welfare of the area involved.

2. In the interest of public welfare, the state engineer is authorized and directed to designate preferred uses of water within the respective areas so designated by him and from which the ground water is being depleted, and in acting on applications to appropriate ground water he may designate such preferred uses in different categories with respect to the particular areas involved within the following limits: Domestic, municipal, quasi-municipal, industrial, irrigation, mining and stock-watering uses and any uses for which a county, city, town, public water district or public water company furnishes the water.

3. ~~[The]~~ ***Except as otherwise provided in subsection 5, the*** state engineer may:

(a) Issue temporary permits to appropriate ground water which can be limited as to time and which may , *except as limited by subsection 4,* be revoked if and when water can be furnished by an entity such as a water district or a municipality presently engaged in furnishing water to the inhabitants thereof.

(b) Deny applications to appropriate ground water for any ~~[purpose]~~ *use* in areas served by such an entity.

(c) Limit *the* depth of domestic wells.

(d) Prohibit the drilling of wells for domestic use, as defined in NRS *534.013 and* 534.0175 , ~~[and 534.180,]~~ in areas where water can be furnished by an entity such as a water district or a municipality presently engaged in furnishing water to the inhabitants thereof.

4. *The state engineer may revoke a temporary permit issued pursuant to subsection 3 for residential use, and require a person to whom ground water was appropriated pursuant to the permit to obtain water from an entity such as a water district or a municipality engaged in furnishing water to the inhabitants of the designated area, only if:*

(a) The distance from the property line of any parcel served by a well pursuant to a temporary permit to the pipes and other appurtenances of the proposed source of water to which the property will be connected is not more than 180 feet;

(b) The well providing water pursuant to the temporary permit needs to be redrilled or have repairs made which require the use of a well-drilling rig; and

(c) The holder of the permit will be offered financial assistance to pay not more than 85 percent, as determined by the entity providing the financial assistance, of the cost of the local and regional connection fees and capital improvements necessary for making the connection to the proposed source of water.

In a basin that has a water authority that has a ground water management program, the state engineer shall not revoke the temporary permit unless the water authority abandons and plugs the well and pays the costs related thereto. If there is not a water authority in the basin that has a ground water management program, the person shall abandon and plug his well in accordance with the rules of the state engineer.

5. *The state engineer may, in an area in which he has issued temporary permits pursuant to subsection 3, limit the depth of a domestic well pursuant to paragraph (c) of subsection 3 or prohibit repairs from being made to a well, and may require the person proposing to deepen or repair the well to obtain water from an entity such as a water district or a municipality engaged in furnishing water to the inhabitants of the designated area, only if:*

(a) The distance from the property line of any parcel served by the well to the pipes and other appurtenances of the proposed source of water to which the property will be connected is not more than 180 feet;

(b) The deepening or repair of the well would require the use of a well-drilling rig; and

(c) The person proposing to deepen or repair the well will be offered financial assistance to pay not more than 85 percent, as determined by the entity providing the financial assistance, of the cost of the local and regional connection fees and capital improvements necessary for making the connection to the proposed source of water.

In a basin that has a water authority that has a ground water management program, the state engineer shall not prohibit the deepening or repair of a well unless the water authority abandons and plugs the well and pays the costs related thereto. If there is not a water authority in the basin that has a ground water management program, the person shall abandon and plug his well in accordance with the rules of the state engineer.

6. For good and sufficient reasons the state engineer may exempt the provisions of this section with respect to public housing authorities.

Sec. 3. Section 2.280 of the charter of the City of North Las Vegas, being chapter 573, Statutes of Nevada 1971, as last amended by chapter 565, Statutes of Nevada 1997, at page 2758, is hereby amended to read as follows:

Sec. 2.280 Powers of city council: Provision of utilities.

1. Except as otherwise provided in subsection 3 and section 2.285, the city council may:

(a) Provide, by contract, franchise and public enterprise, for any utility to be furnished to the city for residents located ~~[either]~~ within or without the city.

(b) Provide for the construction and maintenance of any facilities necessary for the provision of all such utilities.

(c) Prescribe, revise and collect rates, fees, tolls and charges for the services, facilities or commodities furnished by any municipally operated or municipally owned utility or undertaking. Notwithstanding any provision of this charter to the contrary or in conflict herewith, no rates, fees, tolls or charges for the services, facilities or commodities furnished by any municipally operated or municipally owned utility or undertaking may be prescribed, revised, amended or altered, increased or decreased, without this procedure first being followed:

(1) There must be filed with the city clerk schedules of rates, fees, tolls or charges which must be open to public inspection, showing all rates, fees, tolls or charges which the city has established and which are in force at the time for any service performed or product furnished in connection therewith by any utility controlled and operated by the city.

(2) No changes may be made in any schedule so filed with the city clerk except upon 30 days' notice to the inhabitants of the city and a public hearing held thereon. Notice of the proposed change or

changes must be given by at least two publications in a newspaper published in the city during the 30-day period before the hearing thereon.

(3) At the time set for the hearing on the proposed change, any person may appear and be heard and offer any evidence in support of or against the proposed change.

(4) Every utility operated by the city shall furnish reasonably adequate service and facilities, and the charges made for any service rendered or to be rendered, or for any service in connection therewith or incidental thereto, must be just and reasonable.

(d) Provide, by ordinance, for an additional charge to each ***business*** customer ***and for each housing unit*** within the city to which water is provided by a utility of up to 25 cents per month. If such a charge is provided for, the city council shall, by ordinance, provide for the expenditure of that money for any purpose relating to the beautification of the city.

2. Any charges due for services, facilities or commodities furnished by the city or by any utility operated by the city pursuant to this section is a lien upon the property to which the service is rendered and must be perfected by filing with the county recorder of Clark County of a statement by the city clerk stating the amount due and unpaid and describing the property subject to the lien. Each such lien must:

(a) Be coequal with the latest lien thereon to secure the payment of general taxes.

(b) Not be subject to extinguishment by the sale of any property on account of the nonpayment of general taxes.

(c) Be prior and superior to all liens, claims, encumbrances and titles other than the liens of assessments and general taxes.

3. The city council:

(a) Shall not sell telecommunications service to the general public.

(b) May purchase or construct facilities for providing telecommunications that intersect with public rights of way if the governing body:

(1) Conducts a study to evaluate the costs and benefits associated with purchasing or constructing the facilities; and

(2) Determines from the results of the study that the purchase or construction is in the interest of the general public.

4. Any information relating to the study conducted pursuant to subsection 3 must be maintained by the city clerk and made available for public inspection during the business hours of the office of the city clerk.

5. Notwithstanding the provisions of paragraph (a) of subsection 3, an airport may sell telecommunications service to the general public.

6. As used in this section:

(a) ***"Housing unit" means a:***

(1) Single-family dwelling;

(2) Townhouse, condominium or cooperative apartment;

(3) Unit in a multiple-family dwelling or apartment complex; or

(4) Mobile home.

(b) "Telecommunications" has the meaning ascribed to it in 47 U.S.C. § 153(43), as that section existed on July 16, 1997.

~~[(b)]~~ ***(c)*** "Telecommunications service" has the meaning ascribed to it in 47 U.S.C. § 153(46), as that section existed on July 16, 1997.

Sec. 4. The legislative committee on public lands shall conduct a study of issues related to residential, municipal and quasi-municipal water wells in the State of Nevada and report its findings and recommendations to the 71st session of the Nevada legislature. The legislative commission shall appoint two additional senators and two additional assemblymen to the legislative committee on public lands for the purposes of this study. The chairman of the legislative committee on public lands shall appoint a technical advisory committee to assist in conducting the study with representation from urban and rural areas, well owners, suppliers of municipal water, holders of water rights, and ratepayers.

Sec. 5. 1. This section and sections 2 and 4 of this act become effective on July 1, 1999.

2. Sections 1 and 3 of this act become effective on October 1, 1999.

3. Section 2 of this act expires by limitation on July 1, 2005.

ATTACHMENT B

List of Issues Considered by the Technical Advisory Committee

LIST OF ISSUES CONSIDERED BY TECHNICAL ADVISORY COMMITTEE:

The following 31 specific issues were considered by the TAC and were raised either by its members or during public comment. Each issue was discussed and considered by the TAC, and where subject matter was similar, some issues were combined. The committee voted to accept 12 issues for further consideration and discussion.

The following is a summary of all 31 issues, the testimony or discussion that took place, and their fate. The name of the individual who raised the issue is noted in parentheses.

The first group of 18 issues was raised by members of the TAC at its first meeting on January 12, 2000. They were grouped and sometimes combined due to common subject matter.

Domestic Well Issues

- **There should be equal protection Chapter 533, of the *Nevada Revised Statutes (NRS)* with protectible property rights for well owners.** (Hamilton)

  Explanation: Nevada Revised Statutes 533.024 states that "It is the policy of this state, in a county whose population is less than 400,000, to recognize the importance of domestic wells as appurtenances to private homes, to create a protectible interest in such wells and to protect their supply of water from unreasonable adverse effects caused by municipal, quasi-municipal or industrial uses." Nevada Congressman Jim Gibbons submitted a letter urging revision of NRS 533.024 to extend the "protectible interest" to all well owners in Nevada.

  Discussion: The committee heard considerable testimony on this issue, both regarding the 400,000 population cap and the notification requirements which state that an applicant for municipal, quasi-municipal or industrial wells must notify each domestic well owner within 2,500 feet of the proposed well. These provisions were added to the statute following Senate Bill 19 (Chapter 631, *Statutes of Nevada*) enacted by the 1993 Legislature. A representative of Sierra Pacific Power (water purveyor servicing the Reno-Sparks area of Washoe County, Nevada), reported on how its policies address the practical application of the provisions of S.B. 19, questioned the scientific basis of the notification requirements, and suggested further review of those requirements.

  Representatives of Congressman Gibbons' office and the Nevada Well Owners' Association supported extending "protectible interest" to all well owners in Nevada. They stated that Clark County residents do not get equal protection under the law and that a house has no property value without water servicing it.

  Representatives of the Southern Nevada Water Authority opposed removal of the 400,000 population cap in NRS 533.024; citing impacts caused by draw downs between

domestic and quasi-municipal wells, and an apparent conflict which would provide "protectible interest" to domestic wells on temporary permits. Others opposing expansion of "protectible interest," noted that these provisions have not benefited well owners in other parts of the state and would accomplish nothing by extending it to include Clark County.

The committee agreed on three basic alternatives: (a) the "no action" alternative; (b) rescission of the provisions of S.B. 19; or (c) specific modifications to NRS 533.024, 533.360, 533.370, and 534.110.

Action/Recommendation: Final action will be taken on this issue on June 22.

- **The statutory provision that domestic wells may use up to 1,800 gallons/day should be examined.** (Hafen)

  Explanation: The State Engineer has never undertaken a survey of domestic well production. However, it is believed that most domestic wells do not pump 1,800 gallons per day. Nevertheless, the State Engineer has to recognize their right to do so.

  Discussion: Members noted that unless there is some supervision and enforcement on domestic wells, the maximum daily limit of pumpage is almost irrelevant regardless of the statutory requirement. Further, individual jurisdictions such as counties, or towns with their own regional water planning, have the ability to assign a figure deemed appropriate to their areas up to and including 1,800 gallons per day.

  The statutory limit of 1,800 gallons per day was raised from 1,440 gallons per day in 1971 (Assembly Bill 325, Chapter 448, *Statutes of Nevada 1971*). Testimony during the 1971 hearings on A.B. 325 indicated that the limit was raised to permit small landowners, with large gardens and domestic animals, to draw additional water for such purposes.

  Action/Recommendation: The committee voted not to recommend changing the statutory limit, but to recognize the ability of local jurisdictions to set a figure not to exceed 1,800 gallons per day for domestic well use.

- **There is currently no incentive for conservation in Nevada water use.** (Hiatt)

  Explanation: Currently, water must be used or the water right is lost. As a result, many holders of water rights waste water to maintain their water right. This takes away any incentive to conserve water.

  Discussion: This issue was combined with the previous issue for a discussion of water conservation. Concern was expressed that the "use it or lose it" nature of current water law encourages wasteful water practices. It was generally agreed that while

pumping water to retain water rights does exist in some instances, the economic reality is that such practices would ultimately force the farmer or well owner out of business.

Action/Recommendation: The committee voted not to recommend any change to Nevada water law.

- **Artificial groundwater recharge may be necessary in other areas of the state. Replenishment District legislation may be needed.** (Walker)

  Explanation: Depending upon whether or not there are more or less domestic wells in the future, it may not make sense to hook-up new wells without a recharge program.

  Discussion: Members agreed that if private well owners are benefiting from a replenishment program, they should help to pay for it. A determination is needed of an economic benefit by recharging the aquifer versus hooking up to municipal wells. They further agreed that this is a complicated issue because the answers vary from basin-to-basin and would depend on who owned the water that could be used for recharge. A general statewide policy would be inappropriate. Rather, a basin-by-basin discussion and determination is necessary.

  Action/Recommendation: The committee later voted not to make a recommendation, but rather to report that in the future, a groundwater replenishment district for domestic wells might be necessary on an individual basis.

Education Issues

- **There are conflicts between domestic wells and larger production wells that require notification to the domestic well owner.** (Turnipseed)

  Explanation: The State Engineer is hearing complaints that are contractual between homeowners and well drillers. Homeowners who are new to the state do not know how deep to drill. A well driller will hit water and the homeowner tells him to go another five or ten feet and stop. Then an irrigation well goes into production nearby and drops the water table, causing the homeowner's well to go dry. Domestic well owners need to be informed about how deep they should drill.

  Discussion: A pamphlet was produced by the SNWA in cooperation with the State Engineer and the Clark County Conservation District. The committee agreed that a similar pamphlet would satisfy this issue if modified to address water wells statewide and if distributed to well owners statewide.

  Action/Recommendation: One recommendation was made by the committee to address the combined education issues. Members of the TAC will prepare a bibliography of domestic well information available from the Cooperative Extension Service and will compile mailing lists of domestic, community, and quasi-municipal well owners.

Members of the TAC will distribute this bibliography to well owners within their jurisdiction and will encourage others to do the same. Further, the TAC recommends that the Subcommittee urge the Cooperative Extension Service to renew its efforts in disseminating well information statewide.

- **Long-term education and dissemination of information is needed about water and the use of water wells in Nevada.** (Hiatt)

  Explanation: Existing and potential water well owners need to be educated that water is a finite resource, there are no guarantees of what the result will be when you drill, and there are risks in drilling a well.

  Discussion: Members of the TAC agreed to provide a mailing list of domestic water well owners within their jurisdictions, and to seek assistance from other areas to develop a comprehensive, statewide mailing list. It was agreed that a statewide pamphlet, such as the one described under the previous issue, should be distributed statewide. A member of the TAC also offered to investigate existing publications to determine if adequate information already exists and simply needs to be distributed to well owners. It was later determined that considerable information is available from the Cooperative Extension, and that along with a statewide publication similar to the one produced for southern Nevada, would be sufficient.

  Action/Recommendation: Please refer to the previous issue and the action taken.

- **Water education, particularly of the media, is very important.** (Brown)

  Explanation: Many people question why new development and new golf courses are being approved when people on domestic wells are losing their permits and the public is being told the water table is dropping. Residents and the media need to be educated about this issue to disseminate accurate information.

  Discussion: The committee combined this issue with the other education issues previously described. Emphasis was placed on educating well owners rather than educating the media.

  Action/Recommendation: Please refer to the previous issue and the action taken.

<u>Notification/Temporary Permit Issues</u>

- **State law should be changed so that the availability of water determines revocation of a well permit, not simply the passage of time and normal repairs to a functional well. People are losing access to groundwater due to the operation of state water law, not the condition of the water table.** (Hamilton)

Explanation: Is it sound policy to assume that if a person does not have a water right and is on a well, forcing him on to a municipal system is the best alternative? For example, if the integrity of the well's casing is the problem and not the water depth, the mere fact that a drilling rig will be needed to fix it mandates that the well be abandoned and the home be connected to a municipal supply.

Discussion: The committee heard testimony that in the Las Vegas Valley, 80 percent of the revoked permits are a result of a dropping water table, while only 20 percent are due to the need for well repairs or replacement. Members generally agreed that revocation is necessary for successful groundwater management, and is within the statutory authority of the State Engineer to issue temporary permits where groundwater is being depleted, and to revoke those permits when a municipal water supply is available.

Action/Recommendation: The TAC voted not to recommend any change to the State Engineer's ability to issue temporary permits, nor to recommend modification of his authority to require connection to municipal water when it becomes available.

- **Well permits should not be canceled on undeveloped lots.** (Hamilton)

Explanation: There are instances in which a group of lots on a cul-de-sac share a well, but not all of the lots have been developed and have diverted the water to beneficial use. As a result, the permits for the undeveloped lots are being canceled.

Discussion: This issue was combined with the previous issue for a general discussion about domestic wells and revocation of temporary permits. Members generally agreed that revocation is necessary for successful groundwater management. The State Engineer is within his statutory authority to issue temporary permits where groundwater is being depleted, and to revoke those permits when a municipal water supply is available.

Action/Recommendation: Please refer to the previous issue and the action taken.

- **Buyers should be aware of State law that authorizes revocation of well permits for domestic use.** (Hamilton)

Explanation: Real Estate Agents should be required to tell prospective buyers that temporary water well permits are revocable.

Discussion: The committee heard testimony that people are buying property with domestic wells, unaware that the wells are under temporary permit and can be revoked when municipal water becomes available. Several options were considered, including modification of the Real Property Disclosure Form or other appropriate form required by the State's Real Estate Division, training for real estate agents about this issue, certification of wells prior to sale, and distribution of a pamphlet to prospective buyers

educating them about what it means to own a well and that wells in the Las Vegas Valley are under temporary permit. There was concern that the method chosen must be required in any sale, including those by owner (in which no real estate agent is involved), and that the information is provided in such a way that it is not buried among the multiple forms used in real estate transactions.

Action/Recommendation: The committee voted to recommend that the Legislature pass a resolution urging the Real Estate Division to ensure than an informative pamphlet is provided to prospective purchasers of property served by domestic, community, and quasi-municipal wells, prepared by or in consultation with the State Engineer's office.

Water Quality versus Quantity Issues

- **Water quality and water quantity are inherently linked. There may be a need for state water policy to ensure that the two are linked in statute.** (Selinder/Walker)

Explanation: There is a need to check the compatibility of public health and water law statutes. Is there a mandate to hook up to municipal water for public health reasons? In some areas (like Washoe County), the problem with wells is not the quantity of water but the quality. Statutes should be compatible or combined if possible.

Discussion: The committee agreed that this is an important issue statewide, with several members noting that there is evidence of environmental issues affecting domestic and municipal wells. Testimony from the Division of Environmental Protection and the Health Division about the water quality programs administered by both agencies focused on a general lack of data on groundwater quality for individual well systems, and particularly the impact of septic systems on groundwater. It was also noted that there is no statutory requirement for the Health Division to verify with the State Engineer that sufficient water rights exist before a public water system is expanded.

Action/Recommendation: Two recommendations were made to address this issue:

1. The TAC recommends that the Legislature direct an interim study to: (a) determine if there are sufficient controls in place to protect groundwater quality, specifically with respect to individual wastewater disposal systems; (b) evaluate the availability and adequacies of groundwater quality data; and (c) examine the manner in which land division laws under NRS Chapter 278 affect groundwater quality and quantity. A new TAC should be appointed to this interim study with representation from the State Engineer's office, the Division of Environmental Protection, the Health Division, a County Manager, a rural county planning department, an urban county planning department, residential well owners, and residential housing developments typically served by domestic wells and septic tanks.

2. The TAC further recommends legislation that would authorize the Health Division to confirm with the State Engineer that sufficient water rights exist before a public water system is expanded.

- **Private water companies may take the place of individual wells, making domestic wells less relevant.** (Hafen)

  Explanation: There is a relationship between septic systems and the location of water wells, tying this issue into the issue of water quality versus quantity.

  Discussion: This issue was combined with the previous issue to address water quality and quantity issues.

  Action/Recommendation: Please refer to the previous issue and the action taken.

- **Individual well owners in Elko County are dealing with septic problems and the degradation of groundwater.** (Konakis)

  Explanation: Like in other areas, increasing use of septic systems is impacting the groundwater quality in the Elko area.

  Discussion: This issue was combined with the previous issue to address water quality and quantity issues.

  Action/Recommendation: Please refer to the previous issue and the recommendations made.

Other Issues

- **The Prior Appropriation Doctrine should be examined to determine if it is sound water policy.** (Hamilton)

  Explanation: If Nevada continues to solicit economic growth and other drains on water supply, perhaps water should go to where it is best used, and not simply to who had it first.

  Discussion: In support of this issue, some members noted that conservation issues should not be ignored and that unlimited development without adequate water should be addressed. Others argued that delving into the concept of basic water law would not be a good utilization of the committee's time because Nevada's water law is sound.

  Action/Recommendation: This issue was determined by the committee to be beyond the scope of its study. It was eliminated from further consideration.

- **There is a desire to maintain our "way of life" while accommodating the state's need to grow.** (Hamilton)

  Explanation: There are competing pressures of individual water rights in the face of population growth. Water is being wasted to preserve water rights. Preserving the tradition of "use it or lose it" and "first in line, first in right" is more backward than forward thinking.

  Discussion: The committee generally determined that attempts to change Nevada's basic water law were outside the intent of this study.

  Action/Recommendation: This issue was determined by the committee to be beyond the scope of its study. It was eliminated from further consideration.

- **Nevada's groundwater law is very good. Before changing it, look at neighboring states for comparison.** (Brothers)

  Explanation: While some would contend that Nevada's groundwater law should be changed to modify or eliminate the Prior Appropriation Doctrine, this type of water law is sound. Change may bring more problems than it is intended to solve.

  Discussion: The committee heard testimony that other states are moving toward the Prior Appropriation Doctrine, having experienced problems with other water appropriation methods. In addition, where changes have been attempted, they have often resulted in more misuse than they were intended to solve.

  Action/Recommendation: This issue was determined by the committee to be beyond the scope of its study. It was eliminated from further consideration.

- **Whether or not there is effective and informed oversight by the Clark County Commission over the Las Vegas Valley Water District as its Board of Directors should be looked into.** (Hamilton)

  Explanation: The County Commissioners do not always know why certain activities take place, and are not sufficiently knowledgeable to make informed decisions. There should be some mechanism in place or standards that must be met to see to it that the Commissioners are accountable.

  Discussion: There was general consensus that this is a parochial issue between the Clark County Commission and its citizens, and is not a statewide issue.

  Action/Recommendation: This issue was believed by the committee to be beyond the scope of the Study of Domestic and Municipal Water Wells. It was eliminated from further consideration.

- **Water policies of the State need to be applicable over the long term.** (Hiatt)

  Explanation: Water policies impact people, so mistakes made now will affect people in the future. The State Engineer must look over the long term for policy issues.

  Discussion: Members discussed the State's policy for water management with some arguing that the State's overall water policies need to be forward looking so water sources are not depleted and the lives or activities of people in an area are not negatively affected. Others stated that it is inappropriate for the TAC to question the State's policy on how it manages its water. Specifically, it was argued that this issue deals with perennial yield determinations and "macro" state water policy, which are beyond the scope of this study.

  Action/Recommendation: The committee voted to eliminate this issue from further consideration and discussion.

The second group of 13 issues was raised by members of the public either at the Subcommittee meeting on January 28, 2000, or the second TAC meeting on February 12, 2000. The name and association of the individual to whom the issue is attributed is shown in parentheses. Four of the 13 issues were retained by the committee for further consideration and discussion; all four were considered issues pertaining to "notification/temporary permits."

Notification/Temporary Permits Issues

- **Change in the water law is necessary due to the cost of hooking up to municipal water supplies. Increasing costs are placing an unfair burden on well owners.** (Robert Tretiak, Nevada Well Owners' Association)

  Explanation: Currently, NRS 534.180 authorizes the State Engineer to require the plugging of a well drilled on or after July 1, 1981, at any time not sooner than one year after water can be furnished to the site by a political subdivision or public utility, but only if the charge for making the connection to the service is less than $200.

  Discussion: The committee heard testimony that the State Engineer had not forced anyone off of an existing well that was currently in use. Members also discussed water management policies and agreed that the connection cost in NRS 534.180 is irrelevant.

  Action/Recommendation: The committee voted to retain this issue for further consideration. Following additional discussion, the committee voted not to recommend changes to NRS 534.180.

- **The five-year sunset provision should be removed from A.B. 408.** (Robert Tretiak, Nevada Well Owners' Association)

Explanation: Section 2 of A.B. 408 expires by act of limitation on July 1, 2005. This section provides that the State Engineer may revoke a temporary permit issued for residential use only if: (a) the distance from the property line to the pipes of the proposed water sources is not more than 180 feet; (b) the well providing water under temporary permit needs to be re-drilled or have repairs that require the use of a well-drilling rig; and (c) the permit holder will be offered financial assistance to pay not more than 85 percent of the cost of connection fees and capital improvements needed for the connection. He may also limit the depth of a domestic well, prohibit repairs, and require the use of water obtained from a water district or municipality in an area in which he has issued temporary permits, if the same conditions are met.

Section 2 also provides that in a basin served by a water authority with a groundwater management program, the permit cannot be revoked unless the water authority abandons and plugs the well and pays the associated costs. If such a groundwater program does not exist, the person must abandon and plug his well in accordance with the rules of the State Engineer.

Discussion: Representatives of the Nevada Well Owners' Association testified that the sunset provisions offer protection to well owners, and should be continued. If those provisions sunset, well permits could be revoked without regard to the location of the municipal water supply and without funding assistance. Others argued, however, that A.B. 408 was passed in 1999 and it is premature to change its provisions before any usefulness could be determined. Revocation of temporary permits is necessary over the long term to protect the groundwater basin. Further, the funding assistance is in place and will not end in five years.

Action/Recommendation: This issue was retained by the TAC for further consideration. Following additional discussion, the committee voted not to recommend removal of the sunset provision in A.B. 408. Bruce Hamilton cast the only dissenting vote.

- **Modified language is needed to set a reasonable minimum amount of funding available from the 85 percent grant authorized in A.B. 408.** (Robert Tretiak, Nevada Well Owners' Association)

Explanation: There is concern that while A.B. 408 authorizes grants of not more than 85 percent toward the costs of connecting to municipal water, it establishes no minimum grant award.

Discussion: Representatives of the SNWA explained the Financial Assistance Guidelines adopted by the SNWA Board of Directors on November 18, 1999, and how these guidelines applied to mandatory and voluntary connections. For both types of connections, the Board approved funding at the full 85 percent. In the event that money is not available to pay the 85 percent at some future date, a minimum grant of 50 percent is guaranteed by the Board. A change to these guidelines would require an act by the Board. Representatives of the Nevada Well Owners' Association argued that

if SNWA has guaranteed a minimum 50 percent funding, it should be placed in statute as a legally binding mechanism. Members of the committee commented that a recent letter submitted by the SNWA, reaffirming its commitment to the approved funding levels, is sufficient guarantee of the 50 percent minimum grant award. Other members questioned the appropriateness of making a local funding policy a statewide issue.

Action/Recommendation: The committee retained this issue for further consideration. Following additional discussion, the committee voted not to recommend a statutory requirement for a minimum grant amount. Bruce Hamilton cast the only dissenting vote.

- **Water well owners should be notified of the costs involved with hook-up. The affidavit process does not currently include notification of costs.** (Ray Preston, Nevada Well Owners' Association)

  Explanation: While the affidavit used by the State Engineer notifies new well owners that their permits are temporary, they often have little idea of the costs involved, which can be as much as $20,000.

  Discussion: Members of the committee agreed that well owners should be made aware of the connection costs, and anything that could be added to the affidavit would be helpful. However, these costs will vary from case to case, so no specific details are appropriate.

  Action/Recommendation: This issue was retained by the TAC for further consideration. Following additional discussion, the TAC voted to report to the Subcommittee that the State Engineer should consider adding language to the affidavit which generally states that there will be significant costs involved with hook-up and appropriate water authorities should be contacted for estimates of these costs.

Other Issues

- **The affidavit used by the State Engineer is cumbersome. An alternative is needed to prevent a well driller from getting a notarized affidavit in emergencies.** (Robert Tretiak, Nevada Well Owners' Association)

  Explanation: There is concern that the current affidavit is "over-reaching" the mandates of A.B. 408. Specifically, the signed affidavit requirement prior to work on a well would cause a hardship for people who are unable to obtain all relevant well owners' signatures.

  Discussion: The committee heard testimony that A.B. 408 does not specify how well owners must be notified, and that the affidavit could be problematic in emergency situations where one owner on a community or quasi-municipal well is unavailable for signature. In such situations, emergency repairs could be delayed. However, the State

Engineer's office reported that emergencies could be addressed on a case-by-case basis, by filing an "Intent to Drill" card. A waiver to eliminate the three-day wait can be requested and work to deepen a well can begin within a day. The committee concluded that a problem did not exist and that no solution was necessary.

Action/Recommendation: This issue was eliminated from further consideration.

- **Residential water well management is not a water conservation management problem. The Nevada Well Owners' Association believes the Water District is operating on an agenda to shut down all the residential well users in Clark County.** (Robert Tretiak, Nevada Well Owners' Association)

  Explanation: It is believed that water well owners use 10 percent less water than their counterparts on municipal water systems. There is also a correlation between the summer months when the Water District is drawing down a significant portion from the aquifer and a 50-foot drop in the aquifer.

  Discussion: Members of the committee stated that water conservation is an issue for everyone, including domestic water well owners, and there is a lack of hard data to support the assumption that well owners use less water than others. A recent study by the State Engineer's Las Vegas office found that water well owners might actually use as much or more water than those on municipal systems.

  Action/Recommendation: This issue was eliminated from further consideration.

- **The Southern Nevada Water Authority should recharge the water they pull from the aquifer every year.** (Robert Tretiak, Nevada Well Owners' Association)

  Explanation: The Las Vegas Valley Water District reports that they are recharging effectively what they draw from the aquifer, but the figures indicate they do not. The Water District should be required to recharge the 40,000 acre-feet they pull from the aquifer every year.

  Discussion: Members of the committee argued that this issue would constitute a revocation of the SNWA's and Water District's water rights, which is beyond the ability of the TAC. The SNWA has some of the oldest water rights in the valley, and is not required to recharge the water it use uses under these rights. Further, SNWA stated that the pumping and recharge figures are not equal, but are getting closer.

  Action/Recommendation: This issue was eliminated from further consideration.

- **The State Engineer needs an Ombudsman to interface with the public on water well issues.** (Robert Tretiak, Nevada Well Owners' Association)

Explanation: It was suggested that an Ombudsman would be an effective means of assistance to the State Engineer, to take calls and respond to questions about laws and regulations concerning water wells.

Discussion: Representatives of the Nevada Well Owners' Association testified that due to the severity of water problems and issues needing the State Engineer's attention, an Ombudsman would serve as a lightning rod to field calls from well owners. Staff from the State Engineer's office responded that they could receive as many as 200 inquiries per day, but that the Las Vegas office could handle the calls from southern Nevada while staff in Carson City can respond to those from northern Nevada. The committee agreed that an Ombudsman might be needed in the future, depending upon the responses to A.B. 408 and the lifting of the sunset provisions, but that it did not appear to be a current problem needing attention at this time.

Action/Recommendation: This issue was eliminated from further consideration.

- **The Las Vegas Valley Water District should be under the jurisdiction of the Public Utilities Commission of Nevada.** (Ray Preston, Nevada Well Owners' Association)

Explanation: The Public Utilities Commission should preside over the Water District, consistent with the oversight of Sierra Pacific Power in the north.

Discussion: Members of the committee expressed concern that the Public Utilities Commission of Nevada did not have anything positive to contribute in terms of managing the Las Vegas Valley Water District. Further, it was noted that the SNWA and the Water District are two separate entities.

Action/Recommendation: This issue was eliminated from further consideration.

- **There is concern for the ecologic destruction of the Las Vegas Valley as a result of the maximum withdrawal of water from the Colorado River.** (Assemblyman Harry Mortenson)

Explanation: When the full allocation of Colorado River water is exhausted, Nevada will increase the usage of groundwater, resulting in further draw down of the aquifer and ecological impacts to the valley.

Discussion: Representatives of SNWA stated that all water users depend on higher water levels and assured the TAC that SNWA does not intend to allow the aquifer to drop precipitously. Once the maximum allocation of Colorado River water is achieved, there are other options available to access needed water. The SNWA is looking into those options now.

Action/Recommendation: This issue was eliminated from further consideration.

- **Local entities served by private utilities should be allowed to qualify for grant funds.** (Tom Boqu, Hydrogeologist, Nye County)

  Explanation: Certain areas of the state are being served by private utilities, thereby making them ineligible from grant money that might help to address problems concerning groundwater.

  Discussion: The committee questioned the eligibility requirements for grant funds under existing programs, and agreed that this is not a significant problem warranting attention at this time.

  Action/Recommendation: This issue was eliminated from further consideration.

- **Water conservation should be mandated.** (Tom Boqu, Hydrogeologist, Nye County)

  Explanation: In many areas, groundwater is the primary water supply to sustain existing and planned development. For locations such as Pahrump where there is no access to Colorado River water, the only water resources available are those within the hydrologic basin. Alternative supplies are desperately being sought, but water conservation must also be pursued.

  Discussion: Committee members noted that in areas such as Washoe County, there are mandates in place requiring low flow toilets for new homeowners and lawn water restrictions, but water conservation is a generic term that does not carry specific meaning and should be made a local issue.

  Action/Recommendation: This issue was eliminated from further consideration.

- **Legislation is needed to assist Pahrump in de-privatizing the public water supply system.** (Tom Boqu, Hydrogeologist, Nye County)

  Explanation: There are constraints on Pahrump Valley in terms of water resources planning because there is no large single publicly owned water supply system. There are 20 or more individually owned water supply systems.

  Discussion: No further discussion took place.

  Action/Recommendation: The committee agreed that this issue is not within the scope of the study, and eliminated it from further consideration.

ATTACHMENT C

Letter from Nevada Congressman Jim Gibbons

JIM GIBBONS
2ND DISTRICT, NEVADA

COMMITTEE ON RESOURCES
SUBCOMMITTEE ON NATIONAL PARKS AND PUBLIC LANDS
SUBCOMMITTEE ON ENERGY AND MINERAL RESOURCES
COMMITTEE ON ARMED SERVICES
SUBCOMMITTEE ON MILITARY PROCUREMENT
SUBCOMMITTEE ON MILITARY READINESS

Congress of the United States
House of Representatives

SELECT COMMITTEE ON INTELLIGENCE
SUBCOMMITTEE ON TECHNICAL AND TACTICAL INTELLIGENCE
COMMITTEE ON VETERANS' AFFAIRS
SUBCOMMITTEE ON BENEFITS.
MINING CAUCUS, Co-Chairman
GAMING CAUCUS, Vice Chairman
SPORTSMEN'S CAUCUS
AIR POWER CAUCUS
NATIONAL GUARD AND RESERVE COMPONENTS CAUCUS

January 27, 2000

Dear Chairman Rhoads and Water Well Subcommittee:

I would like to thank the Interim Legislative Subcommittee for holding this hearing on the important issue of well protection. As you may know, when I was in the State Assembly, we fought hard to protect the property rights of domestic well owners.

In the closing hours of the 67th legislative session, NRS 533 was amended by Senate Bill 19 in the Assembly, and accepted by the Senate. This language stated that when a commercial well was drilled within 2,500 feet of a domestic well, and a reduction in private water resulted, then the commercial well owner was required to provide their well services at no charge to the domestic well owner. However, the language excluded wells in population concentrations of 400,000 people or more. Because of political pressure, and the reality of the entire amendment being defeated, this language was accepted to ensure that private property protections were given to as many Nevadans as possible.

I believe that the protection of private property should be one of our government's greatest responsibilities. It is my hope that the 71st legislative session will expand private property rights and include protection for all domestic well owners within the state. As a State Assemblyman I championed this legislation and as a Member of Congress I offer my strong support and any assistance that you may need.

Thank you for allowing me to express my views on this very important issue.

Sincerely,

Jim Gibbons
Member of Congress

CONGRESSIONAL OFFICES:

100 CANNON HOUSE OFFICE BUILDING
WASHINGTON, DC 20515
(202) 225-6155
FAX: (202) 225-5679

400 SOUTH VIRGINIA STREET, SUITE 502
RENO, NEVADA 89501
(775) 686-5760
FAX: (775) 686-5711

850 SOUTH DURANGO DRIVE, SUITE 107
LAS VEGAS, NEVADA 89145
(702) 255-1651
FAX: (702) 255-1927

WESTERN FOLKLIFE CENTER
501 RAILROAD STREET, SUITE 202
ELKO, NEVADA 89801
(775) 777-7920
FAX: (775) 777-7922

Website: http://www.house.gov/gibbons/

E-mail: mail.gibbons@mail.house.gov

ATTACHMENT D

Bibliography of Water Wells Information

BIBLIOGRAPHY OF AVAILABLE INFORMATION CONCERNING DOMESTIC WELLS IN NEVADA

Southern Nevada Water Authority, 1998. *Groundwater and Wells in the Las Vegas Valley.* Prepared by Clark County Conservation District.

University of Nevada, Reno Cooperative Extension, 1997. *Protecting Nevada's Water – Work Sheet SP-98-03H(2) Water Well Condition.*

University of Nevada, Reno Cooperative Extension, 1999. *Protect Your Well Water - Fact Sheet 99-25.*

University of Nevada, Reno Cooperative Extension, 1999. *Drinking Water Testing for Private Well Owners – Fact Sheet 99-24.*

University of Nevada, Reno Cooperative Extension, 1999. *How to Test Your Well Water and Understand the Results – Fact Sheet 99-23.*

University of Nevada, Reno Cooperative Extension, 1994. *Protecting our Water Resources,* Chapters 12 & 14.

University of Nevada, Reno Cooperative Extension, 1992. *Small Ranch Manual: A Guide to Management for Green Pastures and Clean Water,* Chapter 8*: Wells – How to Maintain the Purity of Your Drinking Water, pg. 53-56.*

United States Geological Survey, 1986. General Interest Publications of the U.S. Geological Survey. *Ground Water.*

United States Geological Survey, 1988. General Interest Publications of the U.S. Geological Survey. *Ground Water and the Rural Homeowner.*

ATTACHMENT E

Letter from the Southern Nevada Water Authority

SOUTHERN NEVADA
WATER AUTHORITY

Administrative Offi
1001 S. Valley View Blv
Las Vegas, Nevada 8915
Telephone: (702) 258-393
Fax: (702) 258-326

Project Offi
1900 E. Flamingo, Ste. 17
Las Vegas, Nevada 8911
Telephone: (702) 862-340
Fax: (702) 862-347

Southern Nevada Water Syste
243 Lakeshore Roa
Boulder City, NV 8900
Telephone: (702) 564-769
Fax: (702) 564-722

April 28, 2000

Mr. Roland Westergard, Chairman
Technical Advisory Committee
to the Assembly Bill 408 Subcommittee
207 Carville Circle
Carson City, Nevada 89703

Dear Roland,

On November 18, 1999, the Southern Nevada Water Authority (SNWA) Board of Directors voted unanimously to adopt Financial Assistance Guidelines to meet the requirements of Assembly Bills 347 and 408 of the 70th Nevada Legislature. The guidelines provide grants to well owners who are required by the State Engineer to connect to a municipal water system. They also allow for grants in cases of voluntary connection.

As Chair of the SNWA Board, I want to reaffirm to your committee our commitment to these guidelines and the percentages therein. The guidelines adhere to the intent of the Nevada Legislature and we are committed to administering them fairly and impartially, as written. They also fully reflect the spirit and intent of the Las Vegas Valley Groundwater Management Program, which in only three years has made tremendous strides in identifying and addressing the concerns of well users within our basin.

Since 1996, the SNWA has involved average citizens in formulating and implementing a management program that realistically deals with the groundwater issue in our valley. In cooperation with well users, the Division of Water Resources, and the citizen-based Advisory Committee for Groundwater Management, we have worked in good faith to find solutions that will protect the aquifer and benefit those on wells. Despite the complexity of the issues, we have been successful in doing this – and in a very short time.

BOARD OF DIRECTORS

Mary J. Kincaid, Chair
County Commissioner

Amanda M. Cyphers, Vice Chair
Henderson Councilman

Shari Buck
North Las Vegas Councilman

Lance Malone
County Commissioner

Michael McDonald
Las Vegas Councilman

Bryan Nix
Boulder City Councilman

Myrna Williams
County Commissioner

Patricia Mulroy
General Manager

We welcome and appreciate the work of your committee and hope this letter clarifies any questions concerning the Financial Assistance Program. A copy of the agenda item and guidelines is enclosed for your records. Thank you for the opportunity to emphasize our commitment to this program and the types of activities that benefit well users.

Sincerely,

Mary J. Kincaid

Mary J. Kincaid, Chair
Board of Directors

cc: Legislative Committee on Public Lands
Senator Dean Rhoads, Chair
Assemblyman John Marvel, Vice-Chair
Senator Terry Care
Senator Mark James
Assemblyman Jerry Claborn
Assemblyman Roy Neighbors
Alex Dufurrena, Humboldt County Commissioner
Senator Mike McGinness (alternate)
Senator Ray Shaffer (alternate)
Assemblyman Tom Collins (alternate)
Assemblyman Don Gustavson (alternate)
Assemblywoman Kathy Von Tobel (alternate)
Legislative Subcommittee to Study Domestic and Municipal Wells
Senator Dean Rhoads, Chair
Senator Maggie Carlton
Senator Jon Porter
Assemblyman Doug Bache
Assemblywoman Kathy Von Tobel
Senator Ann O'Connell
Linda Eissmann, Senior Research Analyst, Legislative Counsel Bureau
Jean Rice, Field Representative, Office of U.S. Congressman Jim Gibbons
Michael Stewart, Senior Research Analyst, Legislative Counsel Bureau

Enclosures a/s

SOUTHERN NEVADA WATER AUTHORITY
BOARD OF DIRECTORS
AGENDA ITEM

November 18, 1999

Subject: Groundwater Management Program	**Director's Backup**
Petitioner: Richard J. Wimmer, Deputy General Manager, Administration	

Recommendations:
That the Board of Directors approve guidelines for financial assistance to be provided as part of the Las Vegas Valley Groundwater Management Program, and direct staff accordingly.

Fiscal Impact:
None by this action.

Background:
The 70th Nevada Legislature passed three bills concerning groundwater and wells in the Las Vegas Valley. Assembly Bills 237, 347 and 408 codified the mandatory connection policies of the Nevada State Engineer and authorized the implementation of financial assistance to help pay a portion of connection costs for well owners who are required by the State Engineer to connect to a municipal water system. As required by statute, the Authority is the entity responsible for implementing and managing the Las Vegas Valley Groundwater Management Program, including any financial assistance associated with the program. Assembly Bill 347 also gave the Authority Board of Directors the ability to implement additional activities to support the goals of the Las Vegas Valley Groundwater Management Program.

Financial assistance funds will be provided from the Nevada Small Systems Grant Program and from fees charged to well owners and users, including municipal water systems. The funding will be managed and disbursed by the Authority through the Las Vegas Valley Groundwater Management Program. As allowed under Assembly Bill 408, well users who are mandated to connect to municipal water by the State Engineer will be offered financial assistance to pay 85% of the costs for connection. In addition, similar financial assistance will be offered to voluntary connections, subject to available funding. The provision of financial assistance for voluntary connections is recommended pursuant to the authority granted to the SNWA in Section 14, subsections 4 and 5, of Chapter 572, Statutes of Nevada 1997, as amended by Assembly Bill 347 of the 70th Nevada Legislature. This authority permits the SNWA Board to implement any additional activities or recommendations to meet the goals of the Las Vegas Valley Groundwater Management Program.

To help low-income individuals on wells, the guidelines allow for financial assistance to pay 100% of the connection costs if the well user meets a means test, which in this instance means receiving public assistance. The provision of financial assistance in excess of 85% is also recommended pursuant to the authority granted to the SNWA in Section 14, subsections 4 and 5, of Chapter 572, Statutes of Nevada 1997, as amended by Assembly Bill 347 of the 70th Nevada Legislature. The assistance percentages and general guideline concepts were reviewed and supported by the Advisory Committee for Groundwater Management at a meeting on November 5, 1999.

AGENDA ITEM # 8

At this time, the Board is being asked to approve the recommended guidelines and to direct staff to implement the financial assistance program accordingly.

Respectfully submitted:

for Patricia Mulroy, General Manager
PM:RJW:JAW:CDW:AMB:amb
Attachment

SOUTHERN NEVADA
WATER AUTHORITY

Las Vegas Valley
Groundwater Management Program

Financial Assistance Guidelines

November 1999

Financial Assistance Guidelines

Las Vegas Valley Groundwater Management Program

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Financial Assistance Guidelines

Las Vegas Valley Groundwater Management Program

I. Introduction

Under 1999 legislation, the Office of the State Engineer can revoke a temporary permit or require the user of a domestic or temporary-permit well to connect to municipal water only if all three of the following conditions apply:

1. If any part of the well's place of use is within 180 feet of a municipal water line ("place of use" is generally defined as the property using a domestic well, or any of the multiple properties using a community well with a temporary permit).

2. If the well fails, which means it needs work that requires use of a drilling rig.

3. If the well user is provided financial assistance to pay up to 85 percent of the costs of connection.

This standard only applies in a groundwater basin where temporary permits have been issued -- in this case, the Las Vegas Valley groundwater basin. If connection is required for any reason, the well cannot be retained for other uses, but must be permanently abandoned.

This document outlines the principal guidelines for the financial assistance to be offered to well users by the Southern Nevada Water Authority (SNWA) as part of the Las Vegas Valley Groundwater Management Program. This financial assistance program incorporates standards contained in legislation passed by the 1999 Nevada Legislature, as well as recommendations made by the Advisory Committee for Groundwater Management and approved by the SNWA Board of Directors, as allowed by statute.

Financial assistance will take the form of funding that does not need to be repaid. In addition, a payment program may be available in the case of mandatory connections, as described in Section XIII, Payment Program.

II. Availability of Assistance

The Las Vegas Valley Groundwater Management Program will provide a financial assistance program to help well users pay for mandatory and voluntary well connections. The SNWA will be responsible for implementing and managing the financial assistance program. The provision of financial assistance will be subject to available funding as determined by the SNWA. Sources of funding will be:

1. The annual groundwater management fee collected by the SNWA.

2. Any grant monies available through the Small Systems Grant Program of the Nevada Division of Water Planning.

3. Any other grants or program funds made available to the Las Vegas Valley Groundwater Management Program, where appropriate.

The financial assistance program will be governed by the rules outlined in Assembly Bill 408 of the 70th Nevada Legislature, as well as by program authorities given to the SNWA in Nevada Revised Statutes (NRS) Chapter 572, Statutes of Nevada 1997, as amended by Assembly Bill 347 of the 70th Nevada Legislature.

III. Application for Assistance

Well owners or well users may apply voluntarily to SNWA for financial assistance. They may also apply upon receiving a notice of permit cancellation or potential revocation from the Office of the State Engineer. To be considered for financial assistance, the well user must be in good standing in terms of payments of the annual groundwater management fee collected by the SNWA.

IV. Required Agreements

All applicants for financial assistance must agree to the abandonment of the well as a condition for receiving financial assistance. Prior to approval of any financial assistance, the property owner must sign the appropriate easement, promissory note, approval for the plugging and abandonment of the well, and other agreements required by SNWA and the applicable purveyor. Approval of any financial assistance under the Las Vegas Valley Groundwater Management Program shall be contingent on receipt of such signatures.

V. Capital Improvement Options

The SNWA may elect to issue a master contract to perform all or part of any connections funded under this financial assistance program. If a master contract is issued, the SNWA may use the cost criteria in the awarded contract to develop standardized rates for making the estimates cited in Section VI, Eligible Costs.

Off-site and on-site capital improvements may be performed by one of the following parties, at the option of the well user:

1. A private contractor chosen by the well user.

2. The SNWA master contractor, if such a contractor is established by the SNWA.

3. The applicable purveyor, if the purveyor has a residential main extension program.

VI. Eligible Costs

Only legally created parcels that contain a dwelling unit or commercial business which is occupied and presently supplied by water from a well will be considered by the SNWA for financial assistance, subject to the guidelines contained herein. Vacant land will not be eligible for financial assistance.

Unless otherwise noted in these guidelines, eligible costs will include capital improvements, fees, and charges related to connection of the dwelling unit or structure to the nearby municipal water line. This will include off-site improvements from the municipal water line to the property line, on-site improvements from the meter box at the property line to the on-site connection point on the property, and any local or regional connection fees and charges associated with the connection.

In all cases, the SNWA will plug and abandon the well at no cost to the well user(s).

VII. Limitations on Eligible Costs and Financial Assistance

For mandatory connections, eligible costs for off-site improvements will be limited to the costs estimated by the applicable purveyor, SNWA, or SNWA designated contractor; or, if the well user elects to use a private contractor, the private contractor's bid quote, whichever is lower.

For voluntary connections, eligible costs for off-site improvements will be limited to the costs associated with up to 180 feet of off-site improvements, using the cost estimate provided by the applicable purveyor, SNWA, or SNWA designated contractor; or, if a private contractor is used, the private contractor's bid quote, whichever is lower.

For both mandatory and voluntary connections, reimbursement for eligible on-site improvement costs will be limited to the percentages cited in Section IX, Assistance Amounts for Connections, or $500 per approved connection, whichever is lower.

To facilitate the calculation of off-site and on-site improvement costs, the SNWA through the actions of its General Manager or her designee may develop additional guidelines based on local purveyor costs and experience, and use those guidelines for managing this element of the financial assistance program.

VIII. Priorities

All financial assistance under these guidelines is subject to available funding as determined by the SNWA. In the event funding is not available, financial assistance will not be provided. In the event limited funding is available for financial assistance and multiple requests for assistance are made, SNWA will make the assistance available to mandatory connections first, and then to voluntary connections.

These priorities notwithstanding, financial assistance for any connection will be at the discretion of the SNWA. In determining whether a potential connection receives

assistance, the SNWA may consider factors such as well location (whether the well is in an area of aquifer concern), water quality, individual hydrologic concerns, the need to maintain adequate funding within the Las Vegas Valley Groundwater Management Program to assist with potential mandatory or emergency connections, and any other relevant issues.

The SNWA will determine the areas of aquifer concern on the basis of existing data, discussions with the Office of the State Engineer, and any other factors relevant to aquifer control, as determined by the SNWA General Manager or her designee with the overall goal of groundwater management.

IX. Assistance Amounts for Connections

For mandatory and voluntary connections, the financial assistance will be equal to 85 percent of the eligible costs. If the well user(s) meets a means test, the financial assistance will be increased to 100 percent of the eligible costs. In both instances, the assistance will not have to be repaid.

The provision of financial assistance in excess of 85 percent is being implemented pursuant to the authority granted to the SNWA in Section 14, subsections 4 and 5, of Chapter 572, Statutes of Nevada 1997, as amended by Assembly Bill 347 of the 70th Nevada Legislature.

The means test shall be whether the property owner qualifies for any of the programs set forth under the definition of public assistance pursuant to NRS 422.050. The burden for providing evidence of receipt of public assistance will reside with the property owner.

Eligible costs and financial assistance will be limited as described in Section VII, Limitations on Eligible Costs and Financial Assistance. Any costs in excess of the financial assistance will be the responsibility of the property owner. To pay for costs in excess of the financial assistance, the property owner may be eligible for a time payment program, if one is offered through the SNWA (see Section XIII, Payment Program).

X. Community Wells

In the event a community well with both developed and vacant parcels is required to connect to municipal water, only the developed parcels will be eligible for financial assistance. Any costs associated with the future connection of the vacant parcels will have to be paid by the parcel owners at the time the parcels are developed, and at the connection rates in effect at the time of connection.

In the case of a voluntary connection of a community well, the property owners of all the developed parcels using the well must agree to connect to municipal water and abandon the well in order to qualify for financial assistance.

Reimbursement of eligible costs for community well connections will be subject to the conditions outlined in Section IX, Assistance Amounts for Connections.

The allocation of appropriate fees, construction costs, and any other charges due to a conversion from a community well to municipal service will be determined by meter size and whether the same meter size is chosen by all the parcels receiving a physical connection to the municipal water line.

If the same meter size is chosen by all the parcels, the fees, costs, and other charges that apply to the well's place of use will be prorated among the parcels receiving a physical connection to the municipal water line. If any parcel(s) select(s) another meter size, then that parcel will be allocated whatever additional fees, costs, or other charges apply to the meter size chosen by the applicant.

Application of frontage fees shall be in accordance with the rules, regulations, ordinances, and policies of the applicable purveyor. Any potential for refunds of frontage fees will be retained by the purveyor.

XI. Wells with Permanent Water Rights

Wells with permanent water rights may volunteer for connection under the Las Vegas Valley Groundwater Management Program. Terms of any financial assistance will be determined on a case-by-case basis, and may include abandonment of the well and of the underlying water rights to the applicable purveyor.

XII. Disbursement of Financial Assistance

If the applicable purveyor or an SNWA master contractor performs the work, the capital improvement costs, fees, and charges will be reimbursed directly to the purveyor or contractor by the SNWA. Potential frontage fee refunds may not be used to collateralize a loan to build the water service.

If the well user employs a private contractor, arrangements will be made among the well user, private contractor, purveyor, and SNWA for reimbursement of the applicable assistance amounts. The SNWA will not provide progress payments on work performed by a well user's private contractor.

In addition, before any money is disbursed to a private contractor, proof of work completion must be provided to the SNWA. Work conducted on improvements that will become part of the purveyor's water system, maintained by the purveyor, shall not be considered as complete until inspected and approved by the purveyor.

XIII. Payment Program

The SNWA may provide a property owner with a low-interest payment program to pay the remaining costs of a connection. The availability of a payment program shall be at the discretion of the SNWA and the offer of a payment program will be subject to any requirements the SNWA implements for such a program.

XIV. Other Circumstances

If available funding is insufficient to provide financial assistance for a mandatory connection at the percentages and amounts indicated in Section IX, Assistance Amounts for Connections, the SNWA may provide alternative assistance equal to at least 50 percent of the eligible costs. If this situation occurs, the property owner may apply to the SNWA for a low-interest payment program to pay the remaining costs of connection.

XV. Interpretation and Application

The SNWA General Manager will have the power of discretion in the interpretation and application of these guidelines. This discretion shall be exercised based on reasonable judgement and with full documentation, which will accomplish the intent of the guidelines and support the goals of groundwater management and aquifer protection set forth by the Las Vegas Valley Groundwater Management Program. Any actions taken by the SNWA General Manager under this item will be documented for the benefit of the Advisory Committee on Groundwater Management and the SNWA Board of Directors.

Appendix A – Means Test

The means test to qualify for 100 percent financial assistance, as described and limited in the preceding guidelines, shall be whether the well user receives public assistance under any of the programs set forth in the following section of Nevada Revised Statutes, Chapter 422, Administration of Welfare Programs:

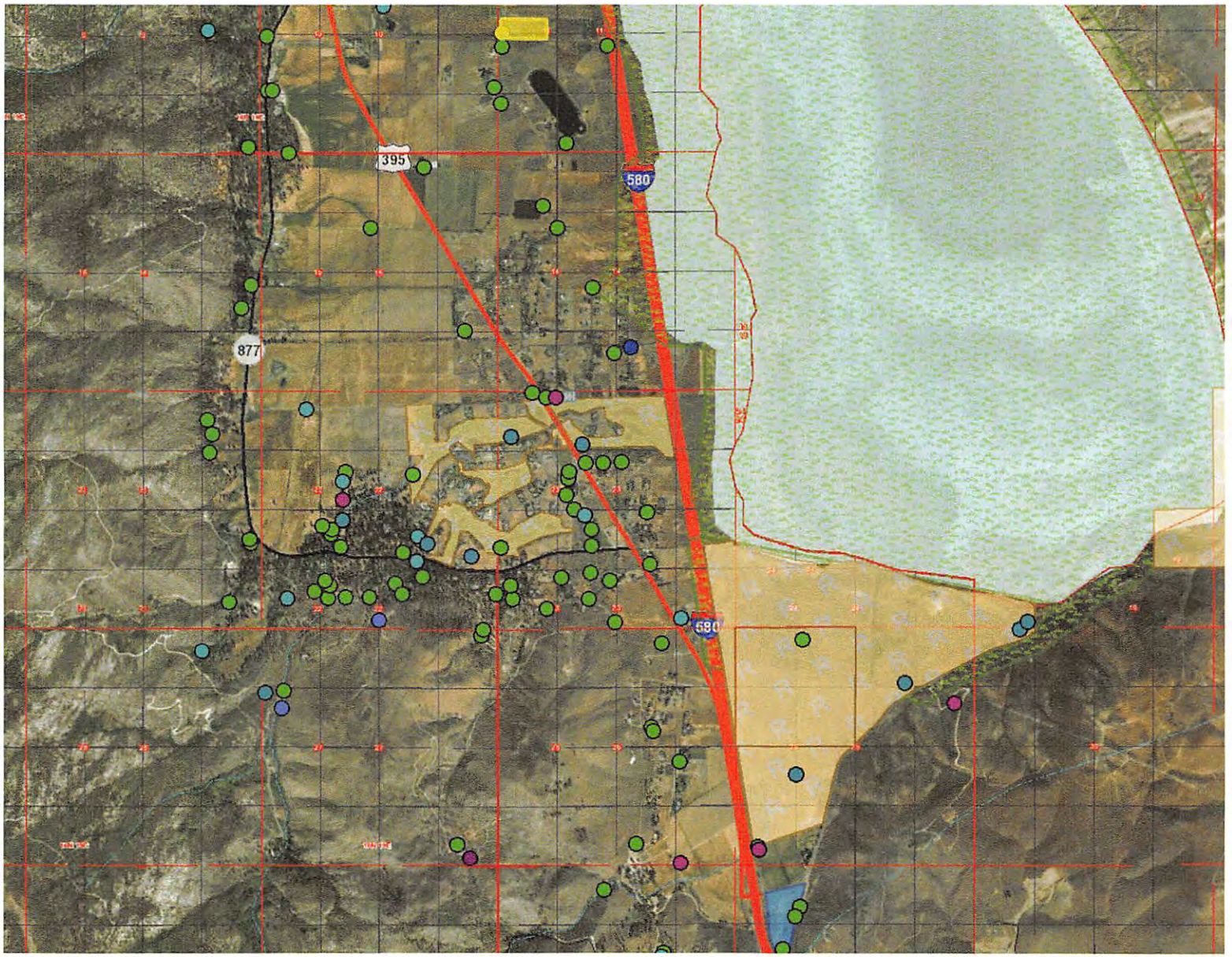
NRS 422.050 "Public assistance" defined. [Effective June 30, 1999.] "Public assistance" includes:

1. *State supplementary assistance;*
2. *Temporary assistance for needy families;*
3. *Medicaid;*
4. *Food stamp assistance;*
5. *Low-income home energy assistance;*
6. *The program for child care and development; and*
7. *Benefits provided pursuant to any other public welfare program administered by the welfare division pursuant to such additional federal legislation as is not inconsistent with the purposes of this chapter.*

[Part 12a:327:1949; added 1951, 296; A 1953, 333] — (NRS A 1959, 518; 1975, 1007; 1981, 1909; 1993, 2059; 1995, 724; 1997, 1237, 2233, 2615, effective June 30, 1999)

As noted in the financial assistance guidelines, the burden for providing evidence of receipt of this public assistance shall reside with the well user or property owner. The provision of financial assistance in excess of 85 percent has been implemented pursuant to the authority granted to the SNWA in Section 14, subsections 4 and 5, of Chapter 572, Statutes of Nevada 1997, as amended by Assembly Bill 347 of the 70th Nevada Legislature.

State of Nevada
Division of Water Resources



Legend

- POD Wildlife
- POD Storage
- POD Stockwater
- POD Recreation
- POD Power
- POD Other
- POD Municipal
- POD Mining
- POD Irrigation
- POD Industrial
- POD Environmental
- POD Decreed
- POD Construction
- POD Commercial
- POU Stockwater
- POU Commercial
- POU Construction
- POU Decreed
- POU Mining, Milling
- POU Environmental
- POU Recreational
- POU Wildlife

Major Roads

- Interstate
- State Route
- US Highway

1.6 0 0.79 1.6 Miles

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This map is a user generated static output from an Internet mapping site and is for reference only. Data layers that appear on this map may or may not be accurate, current, or otherwise reliable.

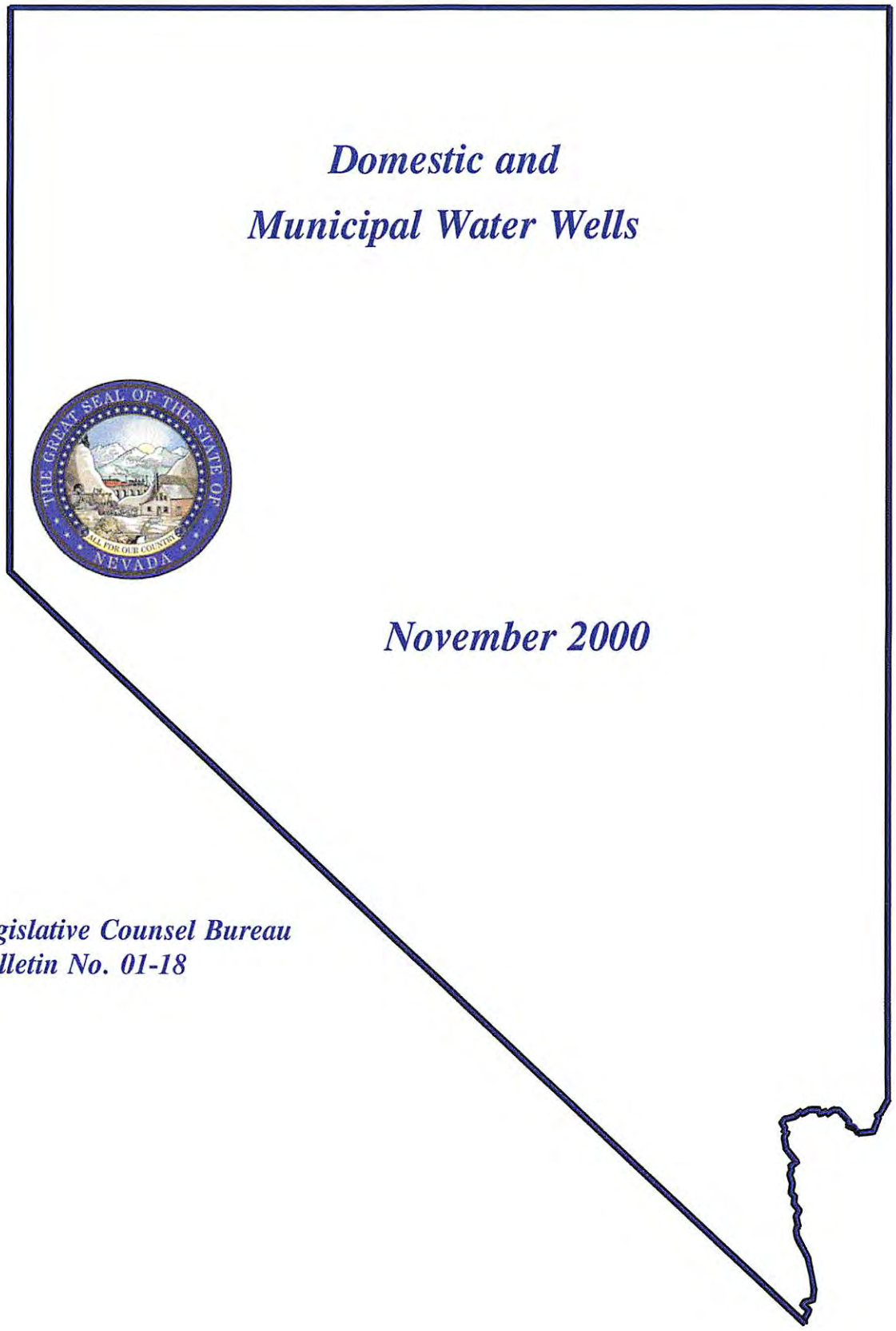
THIS MAP IS NOT TO BE USED FOR NAVIGATION

1: 50,019

JT APP 870
SE ROA 823

Domestic and Municipal Water Wells

November 2000



Legislative Counsel Bureau
Bulletin No. 01-18

DOMESTIC AND MUNICIPAL WATER WELLS

BULLETIN NO. 01-18

NOVEMBER 2000

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SUMMARY OF RECOMMENDATIONS

THE STUDY OF DOMESTIC AND MUNICIPAL WATER WELLS (1999-2000) (A.B. 408)

This summary presents the recommendations approved by the Subcommittee to Study Domestic and Municipal Water Wells during the 1999-2000 legislative interim and at its final meeting on July 14, 2000, in Las Vegas, Nevada. The study was undertaken by a subcommittee of Nevada's Legislative Committee on Public Lands, through a Technical Advisory Committee appointed by Chairman Dean A. Rhoads (as authorized by Section 4 of Assembly Bill 408, Chapter 636, *Statutes of Nevada 1999*). The corresponding bill draft request (BDR) number follows each recommendation for legislation.

Recommendations for Legislation

1. Enact legislation to extend the "protectible interest" provisions of *Nevada Revised Statutes* (NRS) 533.024 to all domestic well owners in Nevada (BDR 48-309) by:

    a. Removing the population limit from NRS 533.024, which restricts "protectible interest" to domestic well owners only in counties with populations less than 400,000 (thereby excluding domestic well owners in Clark County);

    b. Eliminating the requirement that an applicant for a municipal, quasi-municipal, or industrial well, whose rate of diversion is one half cubic foot per second or more, must notify domestic well owners within 2,500 feet (including the stipulation that six such owners must be notified); and

    c. Requiring the State Engineer to consider the "protectible interest" of domestic wells in reviewing applications for municipal, quasi-municipal, or industrial wells.

2. Authorize an interim study and report its findings to the 72nd Session of the Nevada Legislature, evaluating the statutes and regulations affecting water quality and water quantity (BDR R-310) by:

    a. Determining if there are sufficient controls in place to protect groundwater quality, specifically with respect to individual wastewater disposal systems;

    b. Evaluating the availability and adequacies of groundwater quality data; and

    c. Examining the manner in which land division laws under Chapter 278 of *Nevada Revised Statutes* affect groundwater quality and quantity.

3. Enact legislation authorizing the State's Health Division, Department of Human Resources, to confirm with the State Engineer of the Division of Water Resources, State Department of Conservation and Natural Resources, that sufficient water rights exist before a public water system is expanded (BDR 40-308).

Recommendations for Subcommittee Action

4. Transmit a letter to the State's Real Estate Division, Department of Business and Industry, urging it, in consultation with the State Engineer, to ensure that information is provided to potential buyers of property served by domestic, community, and quasi-municipal wells, including consideration of appropriate disclosure procedures.

5. Transmit a letter to each of Nevada's 17 county commissions, requesting that they disseminate domestic well information as typically provided through the Cooperative Extension Service to their domestic well owners. The letter should include a bibliography of available information as compiled by the study's Technical Advisory Committee.

REPORT TO THE 71ST SESSION OF THE NEVADA LEGISLATURE BY THE SUBCOMMITTEE TO STUDY DOMESTIC AND MUNICIPAL WATER WELLS

I. INTRODUCTION

The Subcommittee to Study Domestic and Municipal Water Wells was created by Assembly Bill 408 (Chapter 636, *Statutes of Nevada 1999*), under the Legislative Committee on Public Lands. The Legislative Commission appointed the following members:

Senator Dean A. Rhoads, Chairman
Senator Maggie Carlton
Senator Jon C. Porter, Sr.
Assemblyman Douglas A. Bache
Assemblywoman Kathy A. Von Tobel

The Subcommittee was charged by A.B. 408 to conduct a study of issues related to residential, municipal, and quasi-municipal water wells in the State of Nevada, and to report its findings to the 71st Session of the Nevada Legislature. The measure further authorized the Subcommittee's chairman to appoint a Technical Advisory Committee (TAC) to assist it in conducting the study. Members of the advisory committee represented urban and rural areas, well owners, suppliers of municipal water, holders of water rights, and ratepayers, as stipulated by A.B. 408. (A copy of A.B. 408 is located in Appendix A.)

Members of the TAC were:

Roland Westergard, Carson City, Chairman
Jay Bingham, Las Vegas, Water Rights Holder
Kay Brothers, Las Vegas, Southern Nevada Water Authority, Resources Director
Paula Brown, North Las Vegas, Ratepayer
Don Dickson, Las Vegas, Well Owner
Tim Hafen, Pahrump, Well Owner
Bruce Hamilton, Las Vegas, Nevada Well Owners Association, Well Owner
John Hiatt, Las Vegas, Advisory Committee for Groundwater Management Chair
Ferron Konakis, Elko, Elko City Engineer
Mark Russell, Las Vegas, Mirage Resorts, Water Rights Holder*
Bjorn Selinder, Fallon, Churchill County Manager
R. Michael Turnipseed, Carson City, Division of Water Resources, State Engineer
Steve Walker, Reno, Washoe County Water Resources, Water Management Planner

*Served until his resignation from the TAC.

Staff services from the Legislative Counsel Bureau were provided by Linda Eissmann, Senior Research Analyst; Kimberly Marsh Guinasso, Principal Deputy Legislative Counsel; J. Randall Stephenson, Senior Deputy Legislative Counsel; Paige Clyde, Senior Research Secretary; and Kennedy, Senior Research Secretary.

A total of nine meetings were held throughout the study, including three meetings of the Subcommittee and six meetings of the TAC, all in Las Vegas. The Subcommittee met initially to appoint members of its advisory committee and hear initial public comment. It also directed the TAC to:

1. Review in detail the recent legislation of three bills passed by the Legislature in 1999 concerning domestic water wells (Assembly Bills 237, 347, and 408), and suggest any new language or legislation that should be introduced in the next legislative session.

2. Develop credible statistics on the number of domestic wells in the state and the number of temporary permits issued in Clark County.

3. Specifically identify issues relating to wells, for example, to identify both current and future problems.

4. Make recommendations to address these issues and problems.

The Subcommittee met a second time after the TAC's first meeting, to review the advisory committee's preliminary list of issues and to assess its progress. At this time, the advisory committee was further directed to expand its issues as necessary to other areas of the state and not focus only on issues relevant to Las Vegas.

The TAC held six monthly meetings from January through June 2000. In addition to TAC members, background information and recommendations were received from the public, the Nevada Well Owners Association, and representatives of the State's Divisions of Environmental Protection, Water Planning, and Water Resources of the Department of Conservation and Natural Resources; the Health Division within the Department of Human Resources; and the Real Estate Division of the Department of Business and Industry.

A total of 31 issues were raised either by members of the TAC or during public comment. Following initial explanation and discussion of each issue, several were combined and others were eliminated for a variety of reasons. In the end, 12 issues were selected for further consideration and possible action. Appendix B contains a list of the 31 issues with a brief summary of the advisory committee's discussion and action. The 12 issues retained for further consideration are identified and described later in this bulletin. They resulted in five specific TAC recommendations.

JT APP 878
SE ROA 831

The advisory committee's chairman, Roland Westergard, presented the TAC's report and recommendations at the Subcommittee's final meeting on July 14, 2000. Following additional public comment, the Subcommittee adopted all five recommendations, three resulting in proposed legislation and two resulting in letters from the Subcommittee.

II. BACKGROUND

The impetus for the Study of Domestic and Municipal Water Wells was the existence of temporary permits issued to certain wells for domestic use in the Las Vegas Valley, and the active and potential revocation of those permits by the State Engineer as municipal water is made available.

In 1941, the State Engineer designated the Las Vegas Groundwater Basin as an area in which the groundwater was being depleted, in accordance with the authority defined in NRS 534.120. However, it was not until 1955 that the Legislature allowed the issuance of temporary permits (Senate Bill 104, Chapter 212, *Statutes of Nevada 1955*), and the State Engineer began issuing them that year (although the first permit was not revoked until 1972). The intent of the temporary permits was to eventually shift the dependence of new and existing development away from groundwater and onto Colorado River water when it became available through the Southern Nevada Water Project.

During the period 1945 to 2000, the Southern Nevada Water Authority (SNWA) estimates that groundwater levels in the Las Vegas Valley dropped from about 50 feet in some locations, to almost 200 feet in others. Currently, the State Engineer estimates that 72,000 acre-feet of water is being pumped from the Las Vegas Valley, outpacing the natural groundwater recharge of 35,000 to 50,000 acre-feet. (This does not include the recharge program begun in 1989 by the SNWA, which takes Colorado River water during off-peak times and puts it into the ground through recharge wells. From 1990 to 1998, water levels across the valley benefited from the artificial recharge program by as much as 50 feet in some areas.)

The first temporary permit was revoked by the State Engineer on January 1, 1972. In 1992, temporary permits ceased to be issued with three exceptions:

1. Small commercial wells that would take less water than a well for domestic use;

2. Homeowners who were refiling for an application where a developer had allowed a permit to be cancelled; and

3. Applicants who began the development process prior to March 23, 1992.

Permit revocations continued after 1992 until the passage of A.B. 408 in 1999. This measure limited the State Engineer's ability to revoke any more permits unless three conditions are met:

1. The water line must be within 180 feet from an existing well;

2. A financial package must be made available to pay not more than 85 percent of the connection and capital improvement costs; and

3. The well needs to be redrilled or is in need of repairs requiring the use of a well-drilling rig.

As of June 2000, temporary permits for approximately 109,900 acre-feet of water have been revoked with about 14,736 acre-feet of water remaining under temporary permit in the Las Vegas Valley.

III. WATER WELLS LEGISLATION OF THE 1999 LEGISLATIVE SESSION AND THE STATUS OF IMPLEMENTATION

Three measures were enacted by the 1999 Legislature relating to domestic water wells. As directed by the Subcommittee, the TAC reviewed the status of each bill and considered the need for new legislation or language in its deliberation of the issues raised throughout the study. The following is a summary of these measures and their status. (A copy of A.B. 408 is located in Appendix A. Copies of A.B. 237 and A.B. 347 are found in Appendix C.)

A. Assembly Bill 237

Assembly Bill 237 (Chapter 456, *Statutes of Nevada 1999*) expands the authorized activities that may receive funds from the state's grant program for assisting public water systems. The bill authorizes the Board for Financing Water Projects to issue grants for capital improvements and water conservation to certain water systems. Water conservation projects include piping or lining irrigation canals; recovering or recycling wastewater or tailwater; irrigation scheduling; measuring or metering water use; improving the efficiency of irrigation operations; and improving the efficiency of the operation of a facility for water storage. In addition, these grants may be issued to eligible recipients in a designated water basin to assist in paying costs when owners of domestic wells or wells on temporary permits connect to municipal water systems (the connections costs can be as much as $20,000 per household). The bill limits these grants, however, to projects involving wells which were drilled on or before October 1, 1999.

(Note: Eligible recipients are defined in Section 2 as "a political subdivision of this state, including without limitation, a city, county, unincorporated town, water authority, conservation district, irrigation district, water district or water conservancy district.")

Further, the bill expands general obligation bonding capacity for the overall grant program from $40 million to $50 million. The measure also allows the money in the fund to be used to defray, in whole or part, the costs of administering the fund and the expenses of the board.

Status:

- The Division of Water Planning solicited Letters of Interest from potential grant applicants, to determine the types of projects which might be considered and how best to structure the forthcoming regulations. The division also researched and reviewed similar programs and related regulations in other states. The Board for Financing Water Projects is considering this information, and will develop regulations for adoption in the *Nevada Administrative Code*. These regulations will likely define the application, project selection, and payment processes. However, no funds have been awarded to date. Following reassignment of the duties of the Division of Water Planning, responsibility for A.B. 237 was given to the Division of Environmental Protection (further reassignment to the Health Division is being considered and may take place at a later date).

B. Assembly Bill 347

Assembly Bill 347 (Chapter 468, *Statutes of Nevada 1999*) authorizes the Southern Nevada Water Authority to establish a deferred payment program to assist property owners in paying the cost of abandoning their wells and connecting to a public water system. Money to be repaid by the property owner under the program is due and payable upon the sale or transfer of the real property and is secured by a lien upon the property.

This measure also authorizes the Southern Nevada Water Authority to operate a project for recharge or underground storage of water for the benefit of well owners in the Las Vegas Valley Groundwater Basin. If the authority operates such a project, it may assess holders of water rights an annual fee of not more than $27 per acre-foot, and may assess owners of domestic wells a flat annual fee of not more than $27. The money collected may be used to prepare cost-benefit analyses and to conduct activities for the management of the artesian basin and protection of the aquifer.

In addition, the bill adds $3 per acre-foot and $3 per domestic well annually to the groundwater management program and specifically allocates this money to assist the owners of private wells in existence before October 1, 1999, if they are required to abandon their wells and connect to a public water system.

Finally, A.B. 347 deletes a provision adopted in 1997 that would have terminated the groundwater management program for the Las Vegas Valley groundwater basin upon the recommendation of the Advisory Committee for the Management of Groundwater.

Status:

- The recharge program is being implemented and fees have been established. Recharge wells are currently under construction.

- In 1998 and 1999, only municipal well pumpers were billed. However, beginning with the first quarter of 2000, domestic and quasi-municipal well pumpers were also billed. Response to the fee program has been good, and the SNWA is continuing to verify the well database.

- Criteria for grants programs (paid for by the $3 fee previously described) were adopted by the SNWA Board, a quarterly newsletter to the well community was developed, and a Public Information Fair was held in December 1999, with over 300 attendees. However, no grants have been awarded.

C. Assembly Bill 408

Assembly Bill 408 (Chapter 636, *Statutes of Nevada 1999*) establishes the conditions under which the State Engineer can revoke a temporary well permit or deny the deepening or repair of a domestic well, thereby requiring the well owner to connect with a municipal water supply. These conditions apply in a basin in which temporary permits are issued. Currently, only the Las Vegas Valley groundwater basin meets this definition.

The conditions prescribed in the bill are as follows:

1. The property on which the well is located must be within 180 feet of a municipal water line;

2. The well must need to be redrilled or have repairs made that require the use of a well-drilling rig; and

3. The well users must be offered financial assistance to help them connect to the municipal water line. This assistance is up to 85 percent of the connection costs and is to be provided by an appropriate local agency with access to funding for this assistance. In Las Vegas, it is anticipated that the Southern Nevada Water Authority will fill this role. The Authority must also cover the costs of plugging the abandoned well.

These conditions "sunset" on July 1, 2005.

The bill also adds a new section to Chapter 534 of *Nevada Revised Statutes* requiring the State Engineer to notify the county recorder when he approves a temporary permit and when a domestic well is drilled after October 1, 1999. The purpose is to establish a notification that will be tied to the deed for the property, so that a purchaser of the property will know his property is served by a domestic well or a temporary permit that is subject to revocation.

In addition, the measure directs the Legislative Committee on Public Lands to conduct a review during the interim of issues relating to residential, municipal, and quasi-municipal wells. The results of that review are to be provided to the 2001 Nevada Legislature.

Status:

- A Memorandum of Understanding was adopted between the State Engineer and the SNWA to establish a process for the revocation of well permits and for information sharing between the two entities.

- The SNWA developed a Financial Assistance Program, which provides 85 percent of the eligible costs for mandatory and voluntary connections. If the well user qualifies for "public assistance" as defined in statute, SNWA will pay up to 100 percent of the eligible costs. Further, SNWA approved its Abandoned Well Program and plugs and abandons wells at no cost to the well user(s).

- Finally, the State Engineer is notifying county recorders as required under A.B. 408, and the Technical Advisory Committee has completed its review of well issues, resulting in several recommendations.

IV. ISSUES CONSIDERED AND DISCUSSION OF RECOMMENDATIONS

As previously mentioned, 31 issues were initially considered and discussed during the Study of Domestic and Municipal Water Wells. The TAC considered each issue with the following criteria in mind:

- Is this an exclusive issue?

- Should this issue be expanded?

- What public comment addresses this issue?

- What will be the priority of this issue?

- Should this issue be eliminated because it is outside the scope of the study and its advisory committee?

Several of the 31 issues were eliminated for a variety of reasons by the TAC. Many others were grouped under common subject headings, as necessary. For a detailed list of the issues and their fate, please refer to Appendix B.

In the end, the TAC agreed to retain 12 issues for further consideration and possible action. However, not all of them resulted in recommendation. After further deliberation, the advisory committee voted to make five recommendations to the Subcommittee, three for new legislation and two for other Subcommittee action. The remainder of the issues did not result in recommendations for new legislation or action, but the advisory committee voted to provide the Subcommittee with specific comment and information on three of them.

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The Subcommittee voted to adopt all five recommendations made by the TAC.

Following are the 12 issues deliberated by the advisory committee, including a summary of each issue and the advisory committee's recommendation or conclusion. For additional information about the testimony given, please refer to the meeting minutes and the "Report of the Technical Advisory Committee to the Subcommittee to Study Domestic and Municipal Water Wells," available from the Legislative Counsel Bureau's Research Library.

A. Recommendations for Bill Draft Requests

Copies of the bill draft requests (BDRs) to address the following issues are found in Appendix D. (Please note that the second issue resulted in two recommendations.)

Protectible Interest

- **Some people question what type of "protectible interest" in domestic wells is contemplated through the statement of policy in *Nevada Revised Statutes* (NRS) 533.024, and whether this provision should be extended to all domestic well owners.**

  Nevada Revised Statutes 533.024 states that "It is the policy of this state, in a county whose population is less than 400,000, to recognize the importance of domestic wells as appurtenances to private homes, to create a protectible interest in such wells and to protect their supply of water from unreasonable adverse effects caused by municipal, quasi-municipal or industrial uses."

  The advisory committee heard considerable testimony on this issue, regarding both the 400,000 population cap and the notification requirements, which state than an applicant for municipal, quasi-municipal or industrial wells must notify each domestic well owner within 2,500 feet of the proposed well. These provisions were added to statute as a result of Senate Bill 19 (Chapter 631, *Statutes of Nevada 1993*) enacted by the 1993 Legislature.

  The TAC also discussed what is meant by "protectible interest." There was general agreement that it means protection of the domestic well's water supply from unreasonable adverse impacts. Advisory committee members similarly agreed that it is not intended to limit the State Engineer's ability to regulate and manage the state's water resources.

  The TAC recommended removing the 400,000 population limit, eliminating the notification requirements, and requiring the State Engineer to consider the "protectible interest" of domestic wells when considering well applications. This recommendation would modify NRS 533.024, 533.360, 533.370, and 534.110. (BDR 48-309)

Relationship of Water Quality and Water Quantity

- **It is believed that although water quantity and quality are naturally linked, the relevant statutory and regulatory provisions are not logically brought together or cross-referenced.**

  Testimony revealed that statutes and regulations affecting water quality and quantity are not always compatible and appropriately linked. This can be significant because in some areas, well problems are the result of water quality concerns rather than issues relating to water quantity.

  The TAC agreed that this is an important issue statewide, and will likely become more important in the future, especially as growth continues in areas served by septic systems. Testimony from the Division of Environmental Protection and the Health Division about the water quality programs administered by these agencies focused on a general lack of data on groundwater quality for individual well systems, and particularly the impact of septic systems on groundwater.

  Further, it was pointed out that there is no statutory requirement for the Health Division to verify with the State Engineer that sufficient water rights exist before a public water system is expanded.

  It was also noted that current land division laws under Chapter 278 of the *Nevada Revised Statutes* are problematic insofar as they require review and approval of subdivisions by the Division of Environmental Protection, the Division of Water Resources (State Engineer), and the Health Division. Parcel maps and other types of land division, however, do not require similar approvals. Testimony indicated that many counties have adopted ordinances requiring the water right to be attached to new parcel creations, but that existing parcels are exempt from this requirement.

  Two recommendations address this issue:

  1. An interim study should be authorized to: (a) determine if there are sufficient controls in place to protect groundwater quality, specifically with respect to individual wastewater disposal systems; (b) evaluate the availability and adequacies of groundwater quality data; and (c) examine the manner in which land division laws under Chapter 278 of *Nevada Revised Statutes* affect groundwater quality and quantity. A new Advisory Committee should be appointed to this interim study with representation from the State Engineer's office, the Division of Environmental Protection, the Health Division, a county manager, a rural county planning department, an urban county planning department, residential well owners, and residential housing developments typically served by domestic wells and septic tanks. (BDR R-310)

2. Legislation is also suggested that would authorize the Health Division to confirm with the State Engineer that sufficient water rights exist before a public water system is expanded. (BDR 40-308)

B. Subcommittee Letters

Copies of the letters sent by the Subcommittee to address the following issues are located in Appendix E. (Please note that the latter two "education" issues are addressed by a single recommendation.)

Disclosure of Well Information to Prospective Buyers of Real Estate

- **There is a concern that prospective buyers of property served by existing wells on temporary permits are unaware that the permits can be revoked, and should be notified before they decide to purchase the property.**

  Several alternatives were considered to address this issue, including: (a) inspection and certification of the well prior to sale; (b) educational training for real estate agents so they may adequately inform prospective buyers; (c) modification of the Real Property Disclosure Form or comparable form required by the State's Real Estate Division; and (d) distribution of an educational pamphlet to prospective buyers, with basic information about water wells and Nevada water law. There was concern that the method chosen must be required in any sale, including those by owner (in which no real estate agent is involved), and that the information be provided in such a way that it is not buried among multiple forms used in real estate transactions.

  Testimony by the Real Estate Division indicated support for a two-pronged approach to this issue: (a) modification of the Real Property Disclosure Form, in consultation with the State Engineer and other appropriate individuals; and (b) an education outreach effort to both consumers and real estate agents.

  A letter from the Subcommittee was recommended, urging the Real Estate Division, in consultation with the State Engineer, to ensure that information is provided to potential buyers of property served by domestic, community, and quasi-municipal wells, including consideration of appropriate disclosure procedures.

Education of Well Owners

- **A list of existing water well information would be helpful to determine how best to educate current domestic well owners, and to identify needs for additional information.**

  There is concern that many well owners are unfamiliar with groundwater dynamics, water quality protection, and well management, and are similarly unaware that their

permits may be subject to revocation. The TAC recognized that information on domestic wells tends to be geographically related, and the best distribution of information should come from local governments to address well issues specific to their counties.

The TAC recommended a letter from the Subcommittee to each of Nevada's 17 county commissions, requesting that they disseminate domestic well information as typically provided through the Cooperative Extension Service to their domestic well owners. The letter should include a bibliography of available information (provided by the Technical Advisory Committee). This recommendation addresses both education issues.

- **There is a potential conflict between domestic wells and larger production wells in that new domestic well owners often do not drill deep enough, causing their wells to go dry when larger, nearby wells enter their production cycle.**

  The State Engineer has received complaints that are contractual between homeowners and well drillers. For example, homeowners new to the state often do not know how deep to drill their wells. A well driller may hit water and be told by the homeowner to go another five or ten feet and stop. Once a nearby irrigation well goes into production, the water table often drops, causing the homeowner's well to go dry. The State Engineer recommends that wells are drilled 50 feet into the water table.

  Discussion on this issue was similar to the previous education issue. Members of the TAC agreed that well owners need to be educated about groundwater dynamics, water quality protection, and well management. Further, because water quality and well management differ by geographic location, the TAC concluded that each county should take responsibility for distributing appropriate information to its well owners.

  A single recommendation was made to address both education issues. Please refer to the recommendation described for the previous issue.

C. Additional Information Provided by the Technical Advisory Committee to the Subcommittee

While specific recommendations were not made for the following three issues, the advisory committee agreed to provide additional information to the Subcommittee.

Notification of Connection Costs

- **The costs involved with hook-up to municipal water can be high, and are often unknown to the well owner. There is concern that the affidavit process does not currently include a notification of costs.**

Testimony indicated that well owners are often surprised by the costs associated with hook-up to municipal water systems. As a result, the State Engineer agreed to add language to the affidavit he files with the county recorder, indicating that there are significant costs involved in hooking up to municipal water and that proper water authorities should be contacted for estimates of those costs. Because this issue will be addressed directly by the State Engineer (following discussion by the TAC), no legislation or further action was recommended at this time.

Replenishment Districts

- **Rather than hooking up all domestic wells to municipal water as it becomes available, some would contend that it may be more cost-effective to artificially recharge the water table to benefit all well owners within the area of recharge influence.**

  The TAC discussed the scenario in which it may be more cost-effective to artificially recharge the water table to benefit well owners in a given area, rather than hooking them up to municipal water. Consequently, "Replenishment District" legislation may be an issue for future consideration on a basin-by-basin case. No legislation or further action was recommended at this time.

Water Conservation

- **Some people believe that certain water policies do not encourage water conservation. Specifically, they contend that the statutory maximum limit of 1,800 gallons per day for an exemption as a domestic well should be lowered, the requirement to hook up to a public water system should be further evaluated, and there should be a comparison of service from municipal systems and domestic wells.**

  Concern was expressed that the statutory maximum limit of 1,800 gallons per day for domestic wells should be lowered to promote water conservation. The TAC recognized the ability of local jurisdictions to set a figure not to exceed 1,800 gallons per day for domestic well use, and concluded that this authority is sufficient. While the advisory committee agreed that no legislation or further action was recommended at this time, it chose to bring this issue to the attention of the Subcommittee.

  (*Note:* The statutory limit of 1,800 gallons per day was raised from 1,440 gallons per day in 1971 [Assembly Bill 325, Chapter 448, *Statutes of Nevada 1971*]. Testimony at the 1971 hearings on A.B. 325 indicated that the limit was raised to permit small landowners, with large gardens and domestic animals, to draw additional water for such purposes.)

D. Other Issues Considered

Following consideration and discussion of the following four issues, the advisory committee voted not to recommend any changes to current policy or statute at this time.

Revocation of Temporary Permits

- **Some people believe that the statutory authority is inappropriate which allows revocation of temporary permits when water from a public supplier is at the property even though an adequate supply of groundwater is available to sustain the private well.** (Reference: NRS 534.120)

  Some have questioned if it is sound policy to assume that if a person does not have a water right and is on a well, requiring him to hook up to an available municipal system is best. For example, if the integrity of the well's casing is the problem and not the depth to water, it can be required that the well be abandoned and the home be connected to a municipal supply. Further, there are instances in which a group of lots on a cul-de-sac share a well, but because not all of the lots have been developed and have diverted the water to beneficial use, the permits for the undeveloped lots can be canceled.

  The advisory committee heard testimony from SNWA that in the Las Vegas Valley, 80 percent of the revoked permits are a result of a dropping water table, while only 20 percent are due to the need for well repairs or replacement. The TAC generally concluded that revocation is necessary for successful groundwater management. It further agreed that it is within the statutory authority of the State Engineer to issue temporary permits where groundwater is being depleted, and to revoke those permits when a municipal water supply is available.

Revision of Cost Threshold Identified in Statute

- **It has been suggested that change in Nevada's water law is necessary due to the cost of hooking up to municipal water supplies. There is concern that increasing costs are placing an unfair burden on well owners.** (Reference: NRS 534.180)

  The State Engineer is currently authorized (under NRS 534.180) to require the plugging of certain wells only if the charge for making the connection to municipal water is less than $200. Although concern was expressed that this dollar amount should be raised, testimony revealed that the State Engineer has not forced anyone off an existing well that was currently in use. As a result, the TAC voted not to recommend changes to the statute.

Sunset Provision of A.B. 408

- **The Nevada Well Owners Association would like to see the five-year sunset provision for well protection removed from A.B. 408, thereby making permanent the conditions under which the State Engineer can revoke a temporary permit.**

  Section 2 of A.B. 408 expires on July 1, 2005. This section provides that the State Engineer may revoke a temporary permit issued for residential use only if: (a) the distance from the property line to the pipes of the proposed water sources is not more than 180 feet; (b) the well providing water under temporary permit needs to be re-drilled or have repairs that require the use of a well-drilling rig; and (c) the permit holder will be offered financial assistance to pay not more than 85 percent of the cost of connection fees and capital improvements needed for the connection. He may also limit the depth of a domestic well, prohibit repairs, and require the use of water obtained from a water district or municipality in an area in which he has issued temporary permits, if the same conditions are met.

  Section 2 also provides that in a basin served by a water authority with a groundwater management program, the permit cannot be revoked unless the water authority abandons and plugs the well and pays the associated costs. If such a groundwater program does not exist, the person must abandon and plug his well in accordance with the rules of the State Engineer.

  The Nevada Well Owners Association argued that the conditions that must be met before a revocation can be ordered offer protection to well owners, and should be continued. They believe that if those provisions end, well permits could be revoked without regard to the location of the municipal water supply and without funding assistance. Others argued, however, that A.B. 408 was passed in 1999 and its usefulness has not been fully determined. They expressed their belief that revocation of temporary permits is necessary over the long term to protect the groundwater basin.

  The TAC voted not to recommend removal of the sunset provision in A.B. 408, stating that it is premature to determine the usefulness of the conditions, and noting that the Groundwater Management Program and Financial Assistance Guidelines will not end in five years.

Minimum Grant Award

- **The Nevada Well Owners Association supports modified language that would set a reasonable minimum amount of funding available from the 85 percent grant.**

  The Nevada Well Owners Association expressed concern that while A.B. 408 authorizes grants of not more than 85 percent toward the costs of connecting to municipal water, it establishes no minimum grant award. Representatives of the

SNWA explained that the Financial Assistance Guidelines were adopted by the SNWA Board of Directors on November 18, 1999. For both mandatory and voluntary connections, the Board approved funding at the full 85 percent. In the event that money is not available to pay the 85 percent in the future, a minimum grant of 50 percent is guaranteed by the Board. Additionally, SNWA reported that the mechanism is in place so that if there is no financial assistance available, owners of wells that fail would be allowed to do what they need to maintain their wells, including re-drilling or relocating.

Representatives of the Nevada Well Owners Association argued that if SNWA has guaranteed a minimum 50 percent funding, it should be placed in statute as a legally binding mechanism.

The TAC requested a letter from SNWA reaffirming its Financial Assistance Guidelines, which it provided (Appendix F). Members of the advisory committee commented that the letter is sufficient guarantee of the 50 percent minimum grant award. Other members questioned the appropriateness of making a local funding policy a statewide issue.

As a result, the TAC voted not to recommend a statutory requirement for a minimum grant amount.

V. CONCLUDING REMARKS

The participation of many people, agencies, and organizations has been crucial to the success of this study and the thoroughness of the deliberations that took place. The expertise and dedication of the advisory committee members (who served on their own time without compensation) merit special recognition. The Subcommittee wishes to express its sincere appreciation to them for their work.

Appreciation is also expressed to the many state agencies who provided insight into the statutes, regulations, and programs they administer, and to the many well owners who faithfully attended every meeting and offered insightful public comment.

Copies of the minutes from all Subcommittee and TAC meetings are available through the Legislative Counsel Bureau's Web site (www.leg.state.nv.us) and through its Research Library (775/684-6827). The "Report of the Technical Advisory Committee to the Subcommittee to Study Domestic and Municipal Water Wells" is also available for review at the Research Library.

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APPENDIX A

Assembly Bill 408
(Chapter 636, *Statutes of Nevada 1999*)

Assembly Bill No. 408–Committee on Government Affairs

CHAPTER 636

AN ACT relating to water; establishing the circumstances under which certain temporary permits for the appropriation of ground water may be revoked; restricting the authority of the state engineer to limit the depth of or prohibit the repair of certain wells; requiring the state engineer to file certain notices with the county recorder; revising the method for calculating the fee charged to a user of water for the beautification of the City of North Las Vegas; requiring the legislative committee on public lands to conduct a study of water wells; and providing other matters properly relating thereto.

[Approved June 11, 1999]

THE PEOPLE OF THE STATE OF NEVADA, REPRESENTED IN SENATE AND ASSEMBLY, DO ENACT AS FOLLOWS:

Section 1. Chapter 534 of NRS is hereby amended by adding thereto a new section to read as follows:

If the state engineer issues a temporary permit pursuant to NRS 534.120 or if a well for domestic use is drilled in an area in which he has issued such a temporary permit, he shall file a notice with the county recorder of the county in which the permit is issued or the well is drilled. The notice must include a statement indicating that, if and when water can be furnished by an entity such as a water district or a municipality engaged in furnishing water to the inhabitants of the designated area:

1. A temporary permit may be revoked;

2. The owner of a domestic well may be prohibited from deepening or repairing the well; and

3. The owner of the property served by the well may be required to connect to this water source at his own expense.

Sec. 2. NRS 534.120 is hereby amended to read as follows:

534.120 1. Within an area that has been designated by the state engineer, as provided for in this chapter where, in his judgment, the ground water basin is being depleted, the state engineer in his administrative capacity is herewith empowered to make such rules, regulations and orders as are deemed essential for the welfare of the area involved.

2. In the interest of public welfare, the state engineer is authorized and directed to designate preferred uses of water within the respective areas so designated by him and from which the ground water is being depleted, and in acting on applications to appropriate ground water he may designate such preferred uses in different categories with respect to the particular areas involved within the following limits: Domestic, municipal, quasi-municipal, industrial, irrigation, mining and stock-watering uses and

any uses for which a county, city, town, public water district or public water company furnishes the water.

3. [The] *Except as otherwise provided in subsection 5, the* state engineer may:

(a) Issue temporary permits to appropriate ground water which can be limited as to time and which may *, except as limited by subsection 4,* be revoked if and when water can be furnished by an entity such as a water district or a municipality presently engaged in furnishing water to the inhabitants thereof.

(b) Deny applications to appropriate ground water for any [purpose] *use* in areas served by such an entity.

(c) Limit *the* depth of domestic wells.

(d) Prohibit the drilling of wells for domestic use, as defined in NRS *534.013 and* 534.0175 *,* [and 534.180,] in areas where water can be furnished by an entity such as a water district or a municipality presently engaged in furnishing water to the inhabitants thereof.

4. *The state engineer may revoke a temporary permit issued pursuant to subsection 3 for residential use, and require a person to whom ground water was appropriated pursuant to the permit to obtain water from an entity such as a water district or a municipality engaged in furnishing water to the inhabitants of the designated area, only if:*

(a) The distance from the property line of any parcel served by a well pursuant to a temporary permit to the pipes and other appurtenances of the proposed source of water to which the property will be connected is not more than 180 feet;

(b) The well providing water pursuant to the temporary permit needs to be redrilled or have repairs made which require the use of a well-drilling rig; and

(c) The holder of the permit will be offered financial assistance to pay not more than 85 percent, as determined by the entity providing the financial assistance, of the cost of the local and regional connection fees and capital improvements necessary for making the connection to the proposed source of water. In a basin that has a water authority that has a ground water management program, the state engineer shall not revoke the temporary permit unless the water authority abandons and plugs the well and pays the costs related thereto. If there is not a water authority in the basin that has a ground water management program, the person shall abandon and plug his well in accordance with the rules of the state engineer.

5. The state engineer may, in an area in which he has issued temporary permits pursuant to subsection 3, limit the depth of a domestic well pursuant to paragraph (c) of subsection 3 or prohibit repairs from being made to a well, and may require the person proposing to deepen or repair the well to obtain water from an entity such as a water district or a municipality engaged in furnishing water to the inhabitants of the designated area, only if:

(a) The distance from the property line of any parcel served by the well to the pipes and other appurtenances of the proposed source of water to which the property will be connected is not more than 180 feet;

(b) The deepening or repair of the well would require the use of a well-drilling rig; and

(c) The person proposing to deepen or repair the well will be offered financial assistance to pay not more than 85 percent, as determined by the entity providing the financial assistance, of the cost of the local and regional connection fees and capital improvements necessary for making the connection to the proposed source of water. In a basin that has a water authority that has a ground water management program, the state engineer shall not prohibit the deepening or repair of a well unless the water authority abandons and plugs the well and pays the costs related thereto. If there is not a water authority in the basin that has a ground water management program, the person shall abandon and plug his well in accordance with the rules of the state engineer.

6. For good and sufficient reasons the state engineer may exempt the provisions of this section with respect to public housing authorities.

Sec. 3. Section 2.280 of the charter of the City of North Las Vegas, being chapter 573, Statutes of Nevada 1971, as last amended by chapter 565, Statutes of Nevada 1997, at page 2758, is hereby amended to read as follows:

Sec. 2.280 Powers of city council: Provision of utilities.

1. Except as otherwise provided in subsection 3 and section 2.285, the city council may:

(a) Provide, by contract, franchise and public enterprise, for any utility to be furnished to the city for residents located [either] within or without the city.

(b) Provide for the construction and maintenance of any facilities necessary for the provision of all such utilities.

(c) Prescribe, revise and collect rates, fees, tolls and charges for the services, facilities or commodities furnished by any municipally operated or municipally owned utility or undertaking. Notwithstanding any provision of this charter to the contrary or in conflict herewith, no rates, fees, tolls or charges for the services, facilities or commodities furnished by any municipally operated or municipally owned utility or undertaking may be prescribed, revised, amended or altered, increased or decreased, without this procedure first being followed:

(1) There must be filed with the city clerk schedules of rates, fees, tolls or charges which must be open to public inspection, showing all rates, fees, tolls or charges which the city has established and which are in force at the time for any service performed or product furnished in connection therewith by any utility controlled and operated by the city.

(2) No changes may be made in any schedule so filed with the city clerk except upon 30 days' notice to the inhabitants of the city and a public hearing held thereon. Notice of the proposed change or changes must be given by at least two publications in a newspaper published in the city during the 30-day period before the hearing thereon.

(3) At the time set for the hearing on the proposed change, any person may appear and be heard and offer any evidence in support of or against the proposed change.

(4) Every utility operated by the city shall furnish reasonably adequate service and facilities, and the charges made for any service rendered or to be rendered, or for any service in connection therewith or incidental thereto, must be just and reasonable.

(d) Provide, by ordinance, for an additional charge to each ***business*** customer ***and for each housing unit*** within the city to which water is provided by a utility of up to 25 cents per month. If such a charge is provided for, the city council shall, by ordinance, provide for the expenditure of that money for any purpose relating to the beautification of the city.

2. Any charges due for services, facilities or commodities furnished by the city or by any utility operated by the city pursuant to this section is a lien upon the property to which the service is rendered and must be perfected by filing with the county recorder of Clark County of a statement by the city clerk stating the amount due and unpaid and describing the property subject to the lien. Each such lien must:

(a) Be coequal with the latest lien thereon to secure the payment of general taxes.

(b) Not be subject to extinguishment by the sale of any property on account of the nonpayment of general taxes.

(c) Be prior and superior to all liens, claims, encumbrances and titles other than the liens of assessments and general taxes.

3. The city council:

(a) Shall not sell telecommunications service to the general public.

(b) May purchase or construct facilities for providing telecommunications that intersect with public rights of way if the governing body:

(1) Conducts a study to evaluate the costs and benefits associated with purchasing or constructing the facilities; and

(2) Determines from the results of the study that the purchase or construction is in the interest of the general public.

4. Any information relating to the study conducted pursuant to subsection 3 must be maintained by the city clerk and made available for public inspection during the business hours of the office of the city clerk.

5. Notwithstanding the provisions of paragraph (a) of subsection 3, an airport may sell telecommunications service to the general public.

6. As used in this section:

(a) ***"Housing unit" means a:***

(1) Single-family dwelling;

(2) Townhouse, condominium or cooperative apartment;

(3) Unit in a multiple-family dwelling or apartment complex; or

(4) Mobile home.

(b) "Telecommunications" has the meaning ascribed to it in 47 U.S.C. § 153(43), as that section existed on July 16, 1997.

[(b)] ***(c)*** "Telecommunications service" has the meaning ascribed to it in 47 U.S.C. § 153(46), as that section existed on July 16, 1997.

Sec. 4. The legislative committee on public lands shall conduct a study of issues related to residential, municipal and quasi-municipal water wells in the State of Nevada and report its findings and recommendations to the 71st session of the Nevada legislature. The legislative commission shall appoint two additional senators and two additional assemblymen to the legislative committee on public lands for the purposes of this study. The chairman of the legislative committee on public lands shall appoint a technical advisory committee to assist in conducting the study with representation from urban and rural areas, well owners, suppliers of municipal water, holders of water rights, and ratepayers.

Sec. 5. 1. This section and sections 2 and 4 of this act become effective on July 1, 1999.

2. Sections 1 and 3 of this act become effective on October 1, 1999.

3. Section 2 of this act expires by limitation on July 1, 2005.

APPENDIX B

List and Description of 31 Issues Considered

LIST OF ISSUES CONSIDERED BY TECHNICAL ADVISORY COMMITTEE

The following 31 specific issues were considered by the TAC and were raised either by its members or during public comment. Each issue was discussed and considered by the TAC, and where subject matter was similar, some issues were combined. The committee voted to accept 12 issues for further consideration and discussion.

The following is a summary of all 31 issues, the testimony or discussion that took place, and their fate. The name of the individual who raised the issue is noted in parentheses.

The first group of 18 issues was raised by members of the TAC at its first meeting on January 12, 2000. They were grouped and sometimes combined due to common subject matter.

Domestic Well Issues

- **There should be equal protection Chapter 533, of the *Nevada Revised Statutes* (NRS) with protectible property rights for well owners.** (Hamilton)

  Explanation: Nevada Revised Statutes 533.024 states that "It is the policy of this state, in a county whose population is less than 400,000, to recognize the importance of domestic wells as appurtenances to private homes, to create a protectible interest in such wells and to protect their supply of water from unreasonable adverse effects caused by municipal, quasi-municipal or industrial uses." Nevada Congressman Jim Gibbons submitted a letter urging revision of NRS 533.024 to extend the "protectible interest" to all well owners in Nevada.

  Discussion: The committee heard considerable testimony on this issue, both regarding the 400,000 population cap and the notification requirements which state that an applicant for municipal, quasi-municipal or industrial wells must notify each domestic well owner within 2,500 feet of the proposed well. These provisions were added to the statute following Senate Bill 19 (Chapter 631, *Statutes of Nevada*) enacted by the 1993 Legislature. A representative of Sierra Pacific Power (water purveyor servicing the Reno-Sparks area of Washoe County, Nevada), reported on how its policies address the practical application of the provisions of S.B. 19, questioned the scientific basis of the notification requirements, and suggested further review of those requirements.

  Representatives of Congressman Gibbons' office and the Nevada Well Owners Association supported extending "protectible interest" to all well owners in Nevada. They stated that Clark County residents do not get equal protection under the law and that a house has no property value without water servicing it.

  Representatives of the Southern Nevada Water Authority opposed removal of the 400,000 population cap in NRS 533.024; citing impacts caused by draw downs between

domestic and quasi-municipal wells, and an apparent conflict which would provide "protectible interest" to domestic wells on temporary permits. Others opposing expansion of "protectible interest," noted that these provisions have not benefited well owners in other parts of the state and would accomplish nothing by extending it to include Clark County.

The committee agreed on three basic alternatives: (a) the "no action" alternative; (b) rescission of the provisions of S.B. 19; or (c) specific modifications to NRS 533.024, 533.360, 533.370, and 534.110.

Action/Recommendation: Final action will be taken on this issue on June 22.

- **The statutory provision that domestic wells may use up to 1,800 gallons per day should be examined.** (Hafen)

  Explanation: The State Engineer has never undertaken a survey of domestic well production. However, it is believed that most domestic wells do not pump 1,800 gallons per day. Nevertheless, the State Engineer has to recognize their right to do so.

  Discussion: Members noted that unless there is some supervision and enforcement on domestic wells, the maximum daily limit of pumpage is almost irrelevant regardless of the statutory requirement. Further, individual jurisdictions such as counties, or towns with their own regional water planning, have the ability to assign a figure deemed appropriate to their areas up to and including 1,800 gallons per day.

  The statutory limit of 1,800 gallons per day was raised from 1,440 gallons per day in 1971 (Assembly Bill 325, Chapter 448, *Statutes of Nevada 1971*). Testimony during the 1971 hearings on A.B. 325 indicated that the limit was raised to permit small landowners, with large gardens and domestic animals, to draw additional water for such purposes.

  Action/Recommendation: The committee voted not to recommend changing the statutory limit, but to recognize the ability of local jurisdictions to set a figure not to exceed 1,800 gallons per day for domestic well use.

- **There is currently no incentive for conservation in Nevada water use.** (Hiatt)

  Explanation: Currently, water must be used or the water right is lost. As a result, many holders of water rights waste water to maintain their water right. This takes away any incentive to conserve water.

Discussion: This issue was combined with the previous issue for a discussion of water conservation. Concern was expressed that the "use it or lose it" nature of current water law encourages wasteful water practices. It was generally agreed that while pumping water to retain water rights does exist in some instances, the economic reality is that such practices would ultimately force the farmer or well owner out of business.

Action/Recommendation: The committee voted not to recommend any change to Nevada water law.

- **Artificial groundwater recharge may be necessary in other areas of the state. Replenishment District legislation may be needed.** (Walker)

  Explanation: Depending upon whether or not there are more or less domestic wells in the future, it may not make sense to hook up new wells without a recharge program.

  Discussion: Members agreed that if private well owners are benefiting from a replenishment program, they should help to pay for it. A determination is needed of an economic benefit by recharging the aquifer versus hooking up to municipal wells. They further agreed that this is a complicated issue because the answers vary from basin-to-basin and would depend on who owned the water that could be used for recharge. A general statewide policy would be inappropriate. Rather, a basin-by-basin discussion and determination is necessary.

  Action/Recommendation: The committee later voted not to make a recommendation, but rather to report that in the future, a groundwater replenishment district for domestic wells might be necessary on an individual basis.

Education Issues

- **There are conflicts between domestic wells and larger production wells that require notification to the domestic well owner.** (Turnipseed)

  Explanation: The State Engineer is hearing complaints that are contractual between homeowners and well drillers. Homeowners who are new to the state do not know how deep to drill. A well driller will hit water and the homeowner tells him to go another five or ten feet and stop. Then an irrigation well goes into production nearby and drops the water table, causing the homeowner's well to go dry. Domestic well owners need to be informed about how deep they should drill.

  Discussion: A pamphlet was produced by the SNWA in cooperation with the State Engineer and the Clark County Conservation District. The committee agreed that a similar pamphlet would satisfy this issue if modified to address water wells statewide and if distributed to well owners statewide.

Action/Recommendation: One recommendation was made by the committee to address the combined education issues. Members of the TAC will prepare a bibliography of domestic well information available from the Cooperative Extension Service and will compile mailing lists of domestic, community, and quasi-municipal well owners. Members of the TAC will distribute this bibliography to well owners within their jurisdiction and will encourage others to do the same. Further, the TAC recommends that the Subcommittee urge the Cooperative Extension Service to renew its efforts in disseminating well information statewide.

- **Long-term education and dissemination of information is needed about water and the use of water wells in Nevada.** (Hiatt)

  Explanation: Existing and potential water well owners need to be educated that water is a finite resource, there are no guarantees of what the result will be when you drill, and there are risks in drilling a well.

  Discussion: Members of the TAC agreed to provide a mailing list of domestic water well owners within their jurisdictions, and to seek assistance from other areas to develop a comprehensive, statewide mailing list. It was agreed that a statewide pamphlet, such as the one described under the previous issue, should be distributed statewide. A member of the TAC also offered to investigate existing publications to determine if adequate information already exists and simply needs to be distributed to well owners. It was later determined that considerable information is available from the Cooperative Extension, and that along with a statewide publication similar to the one produced for southern Nevada, would be sufficient.

  Action/Recommendation: Please refer to the previous issue and the action taken.

- **Water education, particularly of the media, is very important.** (Brown)

  Explanation: Many people question why new development and new golf courses are being approved when people on domestic wells are losing their permits and the public is being told the water table is dropping. Residents and the media need to be educated about this issue to disseminate accurate information.

  Discussion: The committee combined this issue with the other education issues previously described. Emphasis was placed on educating well owners rather than educating the media.

  Action/Recommendation: Please refer to the previous issue and the action taken.

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Notification/Temporary Permit Issues

- **State law should be changed so that the availability of water determines revocation of a well permit, not simply the passage of time and normal repairs to a functional well. People are losing access to groundwater due to the operation of state water law, not the condition of the water table.** (Hamilton)

  Explanation: Is it sound policy to assume that if a person does not have a water right and is on a well, forcing him on to a municipal system is the best alternative? For example, if the integrity of the well's casing is the problem and not the water depth, the mere fact that a drilling rig will be needed to fix it mandates that the well be abandoned and the home be connected to a municipal supply.

  Discussion: The committee heard testimony that in the Las Vegas Valley, 80 percent of the revoked permits are a result of a dropping water table, while only 20 percent are due to the need for well repairs or replacement. Members generally agreed that revocation is necessary for successful groundwater management, and is within the statutory authority of the State Engineer to issue temporary permits where groundwater is being depleted, and to revoke those permits when a municipal water supply is available.

  Action/Recommendation: The TAC voted not to recommend any change to the State Engineer's ability to issue temporary permits, nor to recommend modification of his authority to require connection to municipal water when it becomes available.

- **Well permits should not be canceled on undeveloped lots.** (Hamilton)

  Explanation: There are instances in which a group of lots on a cul-de-sac share a well, but not all of the lots have been developed and have diverted the water to beneficial use. As a result, the permits for the undeveloped lots are being canceled.

  Discussion: This issue was combined with the previous issue for a general discussion about domestic wells and revocation of temporary permits. Members generally agreed that revocation is necessary for successful groundwater management. The State Engineer is within his statutory authority to issue temporary permits where groundwater is being depleted, and to revoke those permits when a municipal water supply is available.

  Action/Recommendation: Please refer to the previous issue and the action taken.

- **Buyers should be aware of State law that authorizes revocation of well permits for domestic use.** (Hamilton)

  Explanation: Real estate agents should be required to tell prospective buyers that temporary water well permits are revocable.

  Discussion: The committee heard testimony that people are buying property with domestic wells, unaware that the wells are under temporary permit and can be revoked when municipal water becomes available. Several options were considered, including modification of the Real Property Disclosure Form or other appropriate form required by the State's Real Estate Division, training for real estate agents about this issue, certification of wells prior to sale, and distribution of a pamphlet to prospective buyers educating them about what it means to own a well and that wells in the Las Vegas Valley are under temporary permit. There was concern that the method chosen must be required in any sale, including those by owner (in which no real estate agent is involved), and that the information is provided in such a way that it is not buried among the multiple forms used in real estate transactions.

  Action/Recommendation: The committee voted to recommend that the Legislature pass a resolution urging the Real Estate Division to ensure than an informative pamphlet is provided to prospective purchasers of property served by domestic, community, and quasi-municipal wells, prepared by or in consultation with the State Engineer's office.

Water Quality versus Quantity Issues

- **Water quality and water quantity are inherently linked. There may be a need for state water policy to ensure that the two are linked in statute.** (Selinder/Walker)

  Explanation: There is a need to check the compatibility of public health and water law statutes. Is there a mandate to hook up to municipal water for public health reasons? In some areas (like Washoe County), the problem with wells is not the quantity of water but the quality. Statutes should be compatible or combined if possible.

  Discussion: The committee agreed that this is an important issue statewide, with several members noting that there is evidence of environmental issues affecting domestic and municipal wells. Testimony from the Division of Environmental Protection and the Health Division about the water quality programs administered by both agencies focused on a general lack of data on groundwater quality for individual well systems, and particularly the impact of septic systems on groundwater. It was also noted that there is no statutory requirement for the Health Division to verify with the State Engineer that sufficient water rights exist before a public water system is expanded.

Action/Recommendation: Two recommendations were made to address this issue:

1. The TAC recommends that the Legislature direct an interim study to: (a) determine if there are sufficient controls in place to protect groundwater quality, specifically with respect to individual wastewater disposal systems; (b) evaluate the availability and adequacies of groundwater quality data; and (c) examine the manner in which land division laws under NRS Chapter 278 affect groundwater quality and quantity. A new TAC should be appointed to this interim study with representation from the State Engineer's office, the Division of Environmental Protection, the Health Division, a County Manager, a rural county planning department, an urban county planning department, residential well owners, and residential housing developments typically served by domestic wells and septic tanks.

2. The TAC further recommends legislation that would authorize the Health Division to confirm with the State Engineer that sufficient water rights exist before a public water system is expanded.

- **Private water companies may take the place of individual wells, making domestic wells less relevant.** (Hafen)

  Explanation: There is a relationship between septic systems and the location of water wells, tying this issue into the issue of water quality versus quantity.

  Discussion: This issue was combined with the previous issue to address water quality and quantity issues.

  Action/Recommendation: Please refer to the previous issue and the action taken.

- **Individual well owners in Elko County are dealing with septic problems and the degradation of groundwater.** (Konakis)

  Explanation: Like in other areas, increasing use of septic systems is impacting the groundwater quality in the Elko area.

  Discussion: This issue was combined with the previous issue to address water quality and quantity issues.

  Action/Recommendation: Please refer to the previous issue and the recommendations made.

Other Issues

- **The Prior Appropriation Doctrine should be examined to determine if it is sound water policy.** (Hamilton)

  Explanation: If Nevada continues to solicit economic growth and other drains on water supply, perhaps water should go to where it is best used, and not simply to who had it first.

  Discussion: In support of this issue, some members noted that conservation issues should not be ignored and that unlimited development without adequate water should be addressed. Others argued that delving into the concept of basic water law would not be a good utilization of the committee's time because Nevada's water law is sound.

  Action/Recommendation: This issue was determined by the committee to be beyond the scope of its study. It was eliminated from further consideration.

- **There is a desire to maintain our "way of life" while accommodating the state's need to grow.** (Hamilton)

  Explanation: There are competing pressures of individual water rights in the face of population growth. Water is being wasted to preserve water rights. Preserving the tradition of "use it or lose it" and "first in line, first in right" is more backward than forward thinking.

  Discussion: The committee generally determined that attempts to change Nevada's basic water law were outside the intent of this study.

  Action/Recommendation: This issue was determined by the committee to be beyond the scope of its study. It was eliminated from further consideration.

- **Nevada's groundwater law is very good. Before changing it, look at neighboring states for comparison.** (Brothers)

  Explanation: While some would contend that Nevada's groundwater law should be changed to modify or eliminate the Prior Appropriation Doctrine, this type of water law is sound. Change may bring more problems than it is intended to solve.

  Discussion: The committee heard testimony that other states are moving toward the Prior Appropriation Doctrine, having experienced problems with other water appropriation methods. In addition, where changes have been attempted, they have often resulted in more misuse than they were intended to solve.

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Action/Recommendation: This issue was determined by the committee to be beyond the scope of its study. It was eliminated from further consideration.

- **Whether or not there is effective and informed oversight by the Clark County Commission over the Las Vegas Valley Water District as its Board of Directors should be looked into.** (Hamilton)

  Explanation: The County Commissioners do not always know why certain activities take place, and are not sufficiently knowledgeable to make informed decisions. There should be some mechanism in place or standards that must be met to see to it that the Commissioners are accountable.

  Discussion: There was general consensus that this is a parochial issue between the Clark County Commission and its citizens, and is not a statewide issue.

  Action/Recommendation: This issue was believed by the committee to be beyond the scope of the Study of Domestic and Municipal Water Wells. It was eliminated from further consideration.

- **Water policies of the State need to be applicable over the long term.** (Hiatt)

  Explanation: Water policies impact people, so mistakes made now will affect people in the future. The State Engineer must look over the long term for policy issues.

  Discussion: Members discussed the State's policy for water management with some arguing that the State's overall water policies need to be forward looking so water sources are not depleted and the lives or activities of people in an area are not negatively affected. Others stated that it is inappropriate for the TAC to question the State's policy on how it manages its water. Specifically, it was argued that this issue deals with perennial yield determinations and "macro" state water policy, which are beyond the scope of this study.

  Action/Recommendation: The committee voted to eliminate this issue from further consideration and discussion.

The second group of 13 issues was raised by members of the public either at the Subcommittee meeting on January 28, 2000, or the second TAC meeting on February 12, 2000. The name and association of the individual to whom the issue is attributed is shown in parentheses. Four of the 13 issues were retained by the committee for further consideration and discussion; all four were considered issues pertaining to "notification/temporary permits."

Notification/Temporary Permits Issues

- **Change in the water law is necessary due to the cost of hooking up to municipal water supplies. Increasing costs are placing an unfair burden on well owners.** (Robert Tretiak, Nevada Well Owners' Association)

  Explanation: Currently, NRS 534.180 authorizes the State Engineer to require the plugging of a well drilled on or after July 1, 1981, at any time not sooner than one year after water can be furnished to the site by a political subdivision or public utility, but only if the charge for making the connection to the service is less than $200.

  Discussion: The committee heard testimony that the State Engineer had not forced anyone off of an existing well that was currently in use. Members also discussed water management policies and agreed that the connection cost in NRS 534.180 is irrelevant.

  Action/Recommendation: The committee voted to retain this issue for further consideration. Following additional discussion, the committee voted not to recommend changes to NRS 534.180.

- **The five-year sunset provision should be removed from A.B. 408.** (Robert Tretiak, Nevada Well Owners' Association)

  Explanation: Section 2 of A.B. 408 expires by act of limitation on July 1, 2005. This section provides that the State Engineer may revoke a temporary permit issued for residential use only if: (a) the distance from the property line to the pipes of the proposed water sources is not more than 180 feet; (b) the well providing water under temporary permit needs to be re-drilled or have repairs that require the use of a well-drilling rig; and (c) the permit holder will be offered financial assistance to pay not more than 85 percent of the cost of connection fees and capital improvements needed for the connection. He may also limit the depth of a domestic well, prohibit repairs, and require the use of water obtained from a water district or municipality in an area in which he has issued temporary permits, if the same conditions are met.

  Section 2 also provides that in a basin served by a water authority with a groundwater management program, the permit cannot be revoked unless the water authority abandons and plugs the well and pays the associated costs. If such a groundwater program does not exist, the person must abandon and plug his well in accordance with the rules of the State Engineer.

  Discussion: Representatives of the Nevada Well Owners' Association testified that the sunset provisions offer protection to well owners, and should be continued. If those provisions sunset, well permits could be revoked without regard to the location of the municipal water supply and without funding assistance. Others argued, however, that A.B. 408 was passed in 1999 and it is premature to change its provisions before any

usefulness could be determined. Revocation of temporary permits is necessary over the long term to protect the groundwater basin. Further, the funding assistance is in place and will not end in five years.

Action/Recommendation: This issue was retained by the TAC for further consideration. Following additional discussion, the committee voted not to recommend removal of the sunset provision in A.B. 408. Bruce Hamilton cast the only dissenting vote.

- **Modified language is needed to set a reasonable minimum amount of funding available from the 85 percent grant authorized in A.B. 408.** (Robert Tretiak, Nevada Well Owners' Association)

  Explanation: There is concern that while A.B. 408 authorizes grants of not more than 85 percent toward the costs of connecting to municipal water, it establishes no minimum grant award.

  Discussion: Representatives of the SNWA explained the Financial Assistance Guidelines adopted by the SNWA Board of Directors on November 18, 1999, and how these guidelines applied to mandatory and voluntary connections. For both types of connections, the Board approved funding at the full 85 percent. In the event that money is not available to pay the 85 percent at some future date, a minimum grant of 50 percent is guaranteed by the Board. A change to these guidelines would require an act by the Board. Representatives of the Nevada Well Owners' Association argued that if SNWA has guaranteed a minimum 50 percent funding, it should be placed in statute as a legally binding mechanism. Members of the committee commented that a recent letter submitted by the SNWA, reaffirming its commitment to the approved funding levels, is sufficient guarantee of the 50 percent minimum grant award. Other members questioned the appropriateness of making a local funding policy a statewide issue.

  Action/Recommendation: The committee retained this issue for further consideration. Following additional discussion, the committee voted not to recommend a statutory requirement for a minimum grant amount. Bruce Hamilton cast the only dissenting vote.

- **Water well owners should be notified of the costs involved with hook-up. The affidavit process does not currently include notification of costs.** (Ray Preston, Nevada Well Owners Association)

  Explanation: While the affidavit used by the State Engineer notifies new well owners that their permits are temporary, they often have little idea of the costs involved, which can be as much as $20,000.

Discussion: Members of the committee agreed that well owners should be made aware of the connection costs, and anything that could be added to the affidavit would be helpful. However, these costs will vary from case to case, so no specific details are appropriate.

Action/Recommendation: This issue was retained by the TAC for further consideration. Following additional discussion, the TAC voted to report to the Subcommittee that the State Engineer should consider adding language to the affidavit which generally states that there will be significant costs involved with hook-up and appropriate water authorities should be contacted for estimates of these costs.

Other Issues

- **The affidavit used by the State Engineer is cumbersome. An alternative is needed to prevent a well driller from getting a notarized affidavit in emergencies.** (Robert Tretiak, Nevada Well Owners' Association)

  Explanation: There is concern that the current affidavit is "over-reaching" the mandates of A.B. 408. Specifically, the signed affidavit requirement prior to work on a well would cause a hardship for people who are unable to obtain all relevant well owners' signatures.

  Discussion: The committee heard testimony that A.B. 408 does not specify how well owners must be notified, and that the affidavit could be problematic in emergency situations where one owner on a community or quasi-municipal well is unavailable for signature. In such situations, emergency repairs could be delayed. However, the State Engineer's office reported that emergencies could be addressed on a case-by-case basis, by filing an "Intent to Drill" card. A waiver to eliminate the three-day wait can be requested and work to deepen a well can begin within a day. The committee concluded that a problem did not exist and that no solution was necessary.

  Action/Recommendation: This issue was eliminated from further consideration.

- **Residential water well management is not a water conservation management problem. The Nevada Well Owners' Association believes the Water District is operating on an agenda to shut down all the residential well users in Clark County.** (Robert Tretiak, Nevada Well Owners' Association)

  Explanation: It is believed that water well owners use 10 percent less water than their counterparts on municipal water systems. There is also a correlation between the summer months when the Water District is drawing down a significant portion from the aquifer and a 50-foot drop in the aquifer.

Discussion: Members of the committee stated that water conservation is an issue for everyone, including domestic water well owners, and there is a lack of hard data to support the assumption that well owners use less water than others. A recent study by the State Engineer's Las Vegas office found that water well owners might actually use as much or more water than those on municipal systems.

Action/Recommendation: This issue was eliminated from further consideration.

- **The Southern Nevada Water Authority should recharge the water they pull from the aquifer every year.** (Robert Tretiak, Nevada Well Owners' Association)

  Explanation: The Las Vegas Valley Water District reports that they are recharging effectively what they draw from the aquifer, but the figures indicate they do not. The Water District should be required to recharge the 40,000 acre-feet they pull from the aquifer every year.

  Discussion: Members of the committee argued that this issue would constitute a revocation of the SNWA's and Water District's water rights, which is beyond the ability of the TAC. The SNWA has some of the oldest water rights in the valley, and is not required to recharge the water it use uses under these rights. Further, SNWA stated that the pumping and recharge figures are not equal, but are getting closer.

  Action/Recommendation: This issue was eliminated from further consideration.

- **The State Engineer needs an Ombudsman to interface with the public on water well issues.** (Robert Tretiak, Nevada Well Owners' Association)

  Explanation: It was suggested that an Ombudsman would be an effective means of assistance to the State Engineer, to take calls and respond to questions about laws and regulations concerning water wells.

  Discussion: Representatives of the Nevada Well Owners' Association testified that due to the severity of water problems and issues needing the State Engineer's attention, an Ombudsman would serve as a lightning rod to field calls from well owners. Staff from the State Engineer's office responded that they could receive as many as 200 inquiries per day, but that the Las Vegas office could handle the calls from southern Nevada while staff in Carson City can respond to those from northern Nevada. The committee agreed that an Ombudsman might be needed in the future, depending upon the responses to A.B. 408 and the lifting of the sunset provisions, but that it did not appear to be a current problem needing attention at this time.

  Action/Recommendation: This issue was eliminated from further consideration.

- **The Las Vegas Valley Water District should be under the jurisdiction of the Public Utilities Commission of Nevada.** (Ray Preston, Nevada Well Owners' Association)

  Explanation: The Public Utilities Commission should preside over the Water District, consistent with the oversight of Sierra Pacific Power in the north.

  Discussion: Members of the committee expressed concern that the Public Utilities Commission of Nevada did not have anything positive to contribute in terms of managing the Las Vegas Valley Water District. Further, it was noted that the SNWA and the Water District are two separate entities.

  Action/Recommendation: This issue was eliminated from further consideration.

- **There is concern for the ecologic destruction of the Las Vegas Valley as a result of the maximum withdrawal of water from the Colorado River.** (Assemblyman Harry Mortenson)

  Explanation: When the full allocation of Colorado River water is exhausted, Nevada will increase the usage of groundwater, resulting in further draw down of the aquifer and ecological impacts to the valley.

  Discussion: Representatives of SNWA stated that all water users depend on higher water levels and assured the TAC that SNWA does not intend to allow the aquifer to drop precipitously. Once the maximum allocation of Colorado River water is achieved, there are other options available to access needed water. The SNWA is looking into those options now.

  Action/Recommendation: This issue was eliminated from further consideration.

- **Local entities served by private utilities should be allowed to qualify for grant funds.** (Tom Boqu, Hydrogeologist, Nye County)

  Explanation: Certain areas of the state are being served by private utilities, thereby making them ineligible from grant money that might help to address problems concerning groundwater.

  Discussion: The committee questioned the eligibility requirements for grant funds under existing programs, and agreed that this is not a significant problem warranting attention at this time.

  Action/Recommendation: This issue was eliminated from further consideration.

- **Water conservation should be mandated.** (Tom Boqu, Hydrogeologist, Nye County)

  Explanation: In many areas, groundwater is the primary water supply to sustain existing and planned development. For locations such as Pahrump where there is no access to Colorado River water, the only water resources available are those within the hydrologic basin. Alternative supplies are desperately being sought, but water conservation must also be pursued.

  Discussion: Committee members noted that in areas such as Washoe County, there are mandates in place requiring low flow toilets for new homeowners and lawn water restrictions, but water conservation is a generic term that does not carry specific meaning and should be made a local issue.

  Action/Recommendation: This issue was eliminated from further consideration.

- **Legislation is needed to assist Pahrump in de-privatizing the public water supply system.** (Tom Boqu, Hydrogeologist, Nye County)

  Explanation: There are constraints on Pahrump Valley in terms of water resources planning because there is no large single publicly owned water supply system. There are 20 or more individually owned water supply systems.

  Discussion: No further discussion took place.

  Action/Recommendation: The committee agreed that this issue is not within the scope of the study, and eliminated it from further consideration.

APPENDIX C

Assembly Bill 237 (Chapter 456, *Statutes of Nevada 1999*) and
Assembly Bill 347 (Chapter 468, *Statutes of Nevada 1999*)

Assembly Bill No. 237–Assemblymen Dini, de Braga and Hettrick

Joint Sponsors: Senators Amodei, McGinness and Jacobsen

CHAPTER 456

AN ACT relating to water; authorizing grants for certain costs associated with connections to municipal water systems and for certain improvements to conserve water; increasing the amount of general obligation bonds that the state board of finance may issue to provide the grants; and providing other matters properly relating thereto.

THE PEOPLE OF THE STATE OF NEVADA, REPRESENTED IN SENATE AND ASSEMBLY, DO ENACT AS FOLLOWS:

Section 1. NRS 349.980 is hereby amended to read as follows:

349.980 As used in NRS 349.980 to 349.987, inclusive, unless the context otherwise requires:

1. "Board" means the board for financing water projects created pursuant to NRS 349.957.

2. "Community water system" means a public water system which:

(a) Has 15 or more service connections; or

(b) Serves 25 or more persons,

at places which are intended for year-round occupancy.

3. "Costs of capital improvements to community water systems and nontransient water systems" means the costs traditionally associated with capital improvements to such systems and includes costs associated with the:

(a) Consolidation of existing systems; and

(b) Transfer and connection of a public water system to a system owned by a purveyor of water or a public utility.

4. "Fund" means the fund for grants ~~[to certain purveyors of water.]~~ *for water conservation and capital improvements to certain water systems.*

5. "Nontransient water system" means a public water system that regularly serves 25 or more of the same persons for more than 6 months per year, but which is not a community water system.

6. "Public water system" has the meaning ascribed to it in NRS 445A.840.

7. "Purveyor of water" means a political subdivision *of this state* engaged in the business of furnishing water, for compensation, to persons within the political subdivision.

Sec. 2. NRS 349.981 is hereby amended to read as follows:

349.981 *1.* There is hereby established a program to provide grants of money to ~~[purveyors]~~ *:*

(a) A purveyor of water to pay for costs of capital improvements to publicly owned community water systems and publicly owned nontransient water systems required or made necessary by the state board of health pursuant to NRS 445A.800 to 445A.955, inclusive, or made necessary by the Safe Drinking Water Act , ~~[(]~~ 42 U.S.C. §§ 300f et seq. , ~~[)]~~ and the regulations adopted pursuant thereto.

(b) An eligible recipient to pay for the cost of improvements to conserve water, including, without limitation:

(1) Piping or lining of an irrigation canal;

(2) Recovery or recycling of wastewater or tailwater;

(3) Scheduling of irrigation;

(4) Measurement or metering of the use of water;

(5) Improving the efficiency of irrigation operations; and

(6) Improving the efficiency of the operation of a facility for the storage of water, including, without limitation, efficiency in diverting water to such a facility.

(c) An eligible recipient, to pay the following costs associated with connecting a domestic well or well with a temporary permit to a municipal water system, if the well was in existence on or before October 1, 1999, and the well is located in an area designated by the state engineer pursuant to NRS 534.120 as an area where the ground water basin is being depleted:

(1) Any local or regional fee for connection to the municipal water system.

(2) The cost of any capital improvement that is required to comply with a decision or regulation of the state engineer.

2. Except as otherwise provided in NRS 349.983, the determination of who is to receive a grant is solely within the discretion of the board.

3. As used in this section, "eligible recipient" means a political subdivision of this state, including, without limitation, a city, county, unincorporated town, water authority, conservation district, irrigation district, water district or water conservancy district.

Sec. 3. NRS 349.982 is hereby amended to read as follows:

349.982 1. The board shall administer the program and shall adopt regulations necessary for that purpose.

2. The regulations must provide such requirements for participation in the program as the board deems necessary.

3. *The money in the fund may be used to defray, in whole or in part, the costs of administering the fund and the expenses of the board in administering the program.*

4. The board may, by regulation, impose an administrative fee which must be collected from each recipient of a grant from the fund. If such a fee is imposed, all revenue derived from the fee must be used to defray *, in whole or in part,* the costs of administering the fund and the expenses of the board in administering the program.

Sec. 4. NRS 349.983 is hereby amended to read as follows:

349.983 1. Grants may be made ~~[to purveyors of water under the program]~~ *pursuant to paragraph (a) of subsection 1 of NRS 349.981* only for those community and nontransient water systems that:

(a) Were in existence on January 1, 1995; and

(b) Are currently publicly owned.

2. In making its determination of which purveyors of water are to receive grants ~~[,]~~ *pursuant to paragraph (a) of subsection 1 of NRS 349.981,* the board shall give preference to those purveyors of water whose public water systems regularly serve fewer than 6,000 persons.

3. Each recipient of a grant *pursuant to paragraph (a) of subsection 1 of NRS 349.981* shall provide an amount of money for the same purpose. The board shall develop a scale to be used to determine that amount, but the recipient must not be required to provide an amount less than 15 percent or more than 75 percent of the amount of the grant. The scale must be based upon the average household income of the customers of the recipient, and provide adjustments for the demonstrated economic hardship of those customers, the existence of an imminent risk to public health and any other factor that the board determines to be relevant.

~~[4. Except as otherwise provided in subsections 1 and 2, the determination of which purveyors of water are to receive grants is solely within the discretion of the board.]~~

Sec. 5. NRS 349.984 is hereby amended to read as follows:

349.984 1. The fund for grants ~~[to certain purveyors of water]~~ *for water conservation and capital improvements to certain water systems* is hereby created.

2. Except as otherwise provided by ~~[subsection]~~ *subsections* 3 *and 4* of NRS 349.982, the money in the fund must be used only to make grants in furtherance of the program.

3. All claims against the fund must be paid as other claims against the state are paid.

Sec. 6. NRS 349.986 is hereby amended to read as follows:

349.986 The state board of finance shall issue general obligation bonds of the State of Nevada in the face amount of not more than ~~[$40,000,000]~~ *$50,000,000* to support the purposes of the program. The net proceeds from the sale of the bonds must be deposited in the fund. The bonds must be redeemed through the consolidated bond interest and redemption fund.

Assembly Bill No. 347–Committee on Government Affairs

CHAPTER 468

AN ACT relating to the Southern Nevada Water Authority; authorizing the Southern Nevada Water Authority, under specified circumstances, to increase certain fees; authorizing the Southern Nevada Water Authority to assist certain property owners to connect their property to a public water system; authorizing the Southern Nevada Water Authority to operate a project for the recharge and recovery or underground storage and recovery of water; and providing other matters properly relating thereto.

THE PEOPLE OF THE STATE OF NEVADA, REPRESENTED IN SENATE AND ASSEMBLY, DO ENACT AS FOLLOWS:

Section 1. Chapter 572, Statutes of Nevada 1997, at page 2799, is hereby amended by adding thereto new sections to be designated as sections 14.3 and 14.5, immediately following section 14, to read respectively as follows:

Sec. 14.3. *1. The Southern Nevada Water Authority may, in consultation with the advisory committee, establish a program under which it may enter into an agreement with an owner of real property located in the basin to:*

(a) Abandon or plug a well located on the real property;

(b) Install pipes and other appurtenances to deliver water to the real property; and

(c) Pay fees related to the connection of the property to a public water system.

2. An agreement entered into pursuant to subsection 1 must:

(a) Provide for the repayment, over time, to the Southern Nevada Water Authority by the owner of the real property all money expended by the Southern Nevada Water Authority pursuant to the agreement;

(b) Provide that all money to be repaid to the Southern Nevada Water Authority pursuant to the agreement be due and payable upon the sale or other transfer of the real property;

(c) Be secured by a lien upon the real property; and

(d) Be acknowledged and recorded in the same manner as conveyances affecting real property are required to be acknowledged and recorded pursuant to chapter 111 of NRS.

3. An abandonment or plugging of a well pursuant to an agreement entered into pursuant to subsection 1 must be conducted in a manner approved by the State Engineer.

4. As used in this section, "public water system" has the meaning ascribed to it in NRS 445A.840.

Sec. 14.5. *The Southern Nevada Water Authority may, in consultation with the advisory committee, operate a project for the recharge and recovery or*

underground storage and recovery of water pursuant to chapter 534 of NRS for the benefit of owners of wells in the basin.

Sec. 2. Section 1 of chapter 572, Statutes of Nevada 1997, at page 2799, is hereby amended to read as follows:

Section 1. As used in sections 2 to 16, inclusive, *and sections 14.3 and 14.5* of this act, unless the context otherwise requires, the words and terms defined in sections 2 to 6, inclusive, of this act have the meanings ascribed to them in those sections.

Sec. 3. Section 13 of chapter 572, Statutes of Nevada 1997, at page 2802, is hereby amended to read as follows:

Sec. 13. 1. The Southern Nevada Water Authority may establish and collect each calendar year a fee to be assessed on users of ground water in the basin. Money raised from the fees must be used as provided in section 14 of this act.

2. Except as otherwise provided in this section:

(a) Users of ground water, other than owners of domestic wells, may be assessed a fee each calendar year of not more than ~~[$10]~~ *$13* per acre-foot, or its equivalent, of ground water in the basin to which they have a water right in that year.

(b) Owners of domestic wells may be assessed a flat fee each calendar year of not more than ~~[$10.]~~ *$13.*

3. *Except as otherwise provided in subsections 4 and 5, if the Southern Nevada Water Authority operates a project for the recharge and recovery or underground storage and recovery of water pursuant to section 14.5 of this act:*

(a) Users of ground water, other than owners of domestic wells, may be assessed a fee each calendar year of not more than $30 per acre-foot, or its equivalent, of ground water in the basin to which they have a water right in that year.

(b) Owners of domestic wells may be assessed a flat fee each calendar year of not more than $30.

4. The maximum fees specified in ~~[subsection]~~ *subsections* 2 *and 3* may be adjusted once each year for inflation. The maximum amount of the adjustment must be determined by multiplying the respective amounts of the fees by the percentage of inflation, if any. The Consumer Price Index published by the United States Department of Labor for July preceding the year for which the adjustment is made must be used in determining the percentage of inflation.

~~[4.]~~ *5.* The maximum fees may be increased by an amount ~~[which]~~ *that* is greater than the amount of the adjustment for inflation as calculated pursuant to subsection ~~[3]~~ *4* only if ~~[:~~

~~(a) A majority of all of the voting members of the advisory committee recommends the change;~~

~~(b) The board of directors approves the recommendation; and~~

~~(c) The~~ *the* increase is approved by the Legislature.

~~[5.]~~ *6.* As used in this section, "water right" means the legal right to use water that has been appropriated pursuant to chapters 533 and 534 of NRS by means of application, permit, certificate, decree or claim of vested right.

Sec. 4. Section 14 of chapter 572, Statutes of Nevada 1997, at page 2802, is hereby amended to read as follows:

Sec. 14. Money collected pursuant to section 13 of this act must be used to:

1. Develop and distribute information promoting education and the conservation of ground water in the basin.

2. Perform such comprehensive inventories of wells of all types located within the basin as may be needed. Such inventories must be done in conjunction with the State Engineer.

3. Prepare, for use by the advisory committee, such cost-benefit analyses relating to the recharge *and recovery or underground storage and recovery* of ~~[the ground]~~ water in the basin as may be needed.

4. Develop recommendations for additional activities for the management of the basin and the protection of the aquifer in which the basin is located ~~[.]~~ *, and to conduct such activities if the activities have been approved by the board of directors.*

5. *Develop and implement a program to provide financial assistance to owners of real property served by:*

(a) Domestic wells; or

(b) Wells that are operated pursuant to temporary permits, in existence before October 1, 1999, who are required by the state engineer to connect the real property to a public water system.

6. Perform such other duties as are necessary for the Southern Nevada Water Authority and the advisory committee to carry out the provisions of this act . ~~[related to the management program.]~~

Sec. 5. Section 20 of chapter 572, Statutes of Nevada 1997, at page 2803, is hereby amended to read as follows:

Sec. 20. ~~[1.]~~ This act becomes effective upon passage and approval.

~~[2. If the Advisory Committee for the Management of Ground Water in the Las Vegas Valley Ground Water Basin pursuant to section 18 of this act includes in the joint report to the 70th session of the Nevada Legislature the advisory committee's recommendation that the management program be terminated, this act expires by limitation 90 days after the date on which the report is submitted to the Director of the Legislative Counsel Bureau pursuant to section 12 of this act.]~~

Sec. 6. Section 18 of chapter 572, Statutes of Nevada 1997, at page 2803, is hereby repealed.

Sec. 7. The amendatory provisions of subsection 3 of section 13 of chapter 572, Statutes of Nevada 1997, as amended by this act, do not apply to a state agency in the Las Vegas Valley Ground Water Basin until July 1, 2001.

Sec. 8. This act becomes effective upon passage and approval.

APPENDIX D

Suggested Legislation

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BDR 40-308	Requires applicant for permit to operate certain water systems to provide documentation that applicant possesses sufficient water rights to operate system	57
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SE ROA 876

SUMMARY—Requires applicant for permit to operate certain water systems to provide documentation that applicant possesses sufficient water rights to operate system. (BDR 40-308)

FISCAL NOTE: Effect on Local Government: No.

Effect on the State: No.

AN ACT relating to water controls; requiring an applicant for a permit to operate certain privately owned public water systems to provide documentation that the applicant possesses water rights that are sufficient to operate the system; and providing other matters properly relating thereto.

THE PEOPLE OF THE STATE OF NEVADA, REPRESENTED IN SENATE AND ASSEMBLY, DO ENACT AS FOLLOWS:

Section 1. NRS 445A.895 is hereby amended to read as follows:

445A.895 A permit to operate a water system may not be issued pursuant to NRS 445A.885 unless all ~~[of]~~ the following conditions are met:

1. Neither water provided by a public utility nor water provided by a municipality or other public entity is available to the persons to be served by the water system.

2. The applicant fully complies with all ~~[of]~~ the conditions of NRS 445A.885 to 445A.915, inclusive.

3. ***The applicant submits to the state board of health or the health authority designated by the state board of health documentation issued by the state engineer which sets forth that the applicant holds water rights that are sufficient to operate the water system.***

4. The local governing body assumes:

(a) Responsibility in case of default by the builder or developer of the water system for its continued operation and maintenance in accordance with all ~~[of]~~ the terms and conditions of the permit.

(b) The duty of assessing the lands served as provided in subsection ~~[5.]~~ ***6.***

~~[4.]~~ ***5.*** The applicant furnishes the local governing body sufficient surety in the form of a bond, certificate of deposit, investment certificate or any other form acceptable to the governing body, to ensure the continued maintenance and operation of the water system:

(a) For 5 years following the date the system is placed in operation; or

(b) Until 75 percent of the lots or parcels served by the system are sold,

whichever is later.

~~[5.]~~ ***6.*** The owners of the lands to be served by the water system record a declaration of covenants, conditions and restrictions, which is an equitable servitude running with the land and which must provide that each lot or parcel will be assessed by the local governing body for its proportionate share of the cost of continued operation and maintenance of the water system if

there is a default by the applicant or operator of the water system and a sufficient surety, as provided in subsection ~~[4,]~~ *5,* is not available.

~~[6.]~~ *7.* If the water system uses or stores ozone, the portion of the system where ozone is used or stored must be constructed not less than 100 feet from any existing residence, unless the owner and occupant of each residence located closer than 100 feet consent to the construction of the system at a closer distance.

~~[7.]~~ *8.* The declaration of covenants, conditions and restrictions recorded by the owners of the lands further provides that if the state board of health determines that:

(a) The water system is not satisfactorily serving the needs of its users; and

(b) Water provided by a public utility or a municipality or other public entity is reasonably available,

the local governing body may, pursuant to NRS 244.3655 or 268.4102, require all users of the water system to connect into the available water system provided by a public utility or a municipality or other public entity, and each lot or parcel will be assessed by the local governing body for its proportionate share of the costs associated with connecting into that water system. If the water system is being connected into a public utility, the public utilities commission of Nevada shall determine the amount of the assessments for the purposes of establishing a lien pursuant to NRS 445A.900.

~~[8.]~~ *9.* Provision has been made for disposition of the water system and the land on which it is situated after the local governing body requires all users to connect into an available water system provided by a public utility or a municipality or other public entity.

Sec. 2. NRS 445A.910 is hereby amended to read as follows:

445A.910 1. If the state board of health has found that any of the conditions of a permit to operate ~~[such]~~ a water system issued pursuant to NRS 445A.885 are being violated and has notified the holder of the permit that he must bring the water system into compliance, but the holder of the permit has failed to comply within a reasonable time after the date of the notice, the local governing body, if requested to do so in writing by the state board of health, may take the following actions independently of any further action by the state board of health:

(a) Give written notice, by certified mail, to the owner of the water system and the owners of the property served by the system that if the violation is not corrected within 30 days after the date of the notice, the local governing body will seek a court order authorizing it to assume control; and

(b) After the 30-day period has expired, if the water system has not been brought into compliance, apply to the district court for an order authorizing the local governing body to assume control of the system and assess the property for the continued operation and maintenance of the system as provided in subsection ~~[5]~~ *6* of NRS 445A.895.

2. If the local governing body determines at any time that immediate action is necessary to protect the public health and welfare, it may assume physical control and operation of a water system without complying with any of the requirements set forth in subsection 1. The local governing body may not maintain control of a water system pursuant to this subsection for a period greater than 30 days unless it obtains an order from the district court authorizing an extension.

Sec. 3. This act becomes effective on July 1, 2001.

SUMMARY—Makes various changes concerning protectible interests in domestic water wells.

(BDR 48-309)

FISCAL NOTE: Effect on Local Government: No.

Effect on the State: No.

AN ACT relating to water; extending to all counties the recognition of the importance of domestic wells as appurtenances to private homes and the creation of a protectible interest in such wells; eliminating the requirement for a copy of the notice of application for certain proposed wells to be mailed to certain owners of real property containing domestic wells; requiring the state engineer to reject certain applications to apply water to a beneficial use if the proposed use or change conflicts with protectible interests in existing domestic wells; eliminating certain provisions governing permits for wells; and providing other matters properly relating thereto.

THE PEOPLE OF THE STATE OF NEVADA, REPRESENTED IN SENATE AND ASSEMBLY, DO ENACT AS FOLLOWS:

Section 1. NRS 533.024 is hereby amended to read as follows:

533.024 The legislature declares that it is the policy of this state:

1. To encourage and promote the use of effluent, where that use is not contrary to the public health, safety or welfare, and where that use does not interfere with federal obligations to deliver water of the Colorado River.

2. ~~[In a county whose population is less than 400,000, to]~~ ***To*** recognize the importance of domestic wells as appurtenances to private homes, to create a protectible interest in such wells and to protect their supply of water from unreasonable adverse effects caused by municipal, quasi-municipal or industrial uses.

Sec. 2. NRS 533.360 is hereby amended to read as follows:

533.360 1. Except as otherwise provided in subsection ~~[4,]~~ ***3,*** NRS 533.345 and subsection 3 of NRS 533.370, when an application is filed in compliance with this chapter, the state engineer shall, within 30 days, publish or cause to be published once a week for 4 consecutive weeks in a newspaper of general circulation and printed and published in the county where the water is sought to be appropriated, a notice of the application, which sets forth:

(a) That the application has been filed.

(b) The date of the filing.

(c) The name and address of the applicant.

(d) The name of the source from which the appropriation is to be made.

(e) The location of the place of diversion, described by legal subdivision or metes and bounds and by a physical description of that place of diversion.

(f) The purpose for which the water is to be appropriated.

The publisher shall add thereto the date of the first publication and the date of the last publication.

2. Except as otherwise provided in subsection ~~[4,]~~ *3,* proof of publication must be filed within 30 days after the final day of publication. The state engineer shall pay for the publication from the application fee. If the application is canceled for any reason before publication, the state engineer shall return to the applicant that portion of the application fee collected for publication.

3. ~~[If the application is for a proposed well:~~

~~(a) In a county whose population is less than 400,000;~~

~~(b) For municipal, quasi-municipal or industrial use; and~~

~~(c) Whose reasonably expected rate of diversion is one-half cubic foot per second or more,~~

~~the applicant shall mail a copy of the notice of application to each owner of real property containing a domestic well that is within 2,500 feet of the proposed well, to his address as shown in the latest records of the county assessor. If there are not more than six such wells, notices must be sent to each owner by certified mail, return receipt requested. If there are more than six such wells, at least six notices must be sent to owners by certified mail, return receipt requested. The return receipts from these notices must be filed with the state engineer before he may consider the application.~~

~~4.]~~ The provisions of this section do not apply to an environmental permit.

Sec. 3. NRS 533.370 is hereby amended to read as follows:

533.370 1. Except as otherwise provided in this section and NRS 533.345, 533.371, 533.372 and 533.503, the state engineer shall approve an application submitted in proper form which contemplates the application of water to beneficial use if:

(a) The application is accompanied by the prescribed fees;

(b) The proposed use or change, if within an irrigation district, does not adversely affect the cost of water for other holders of water rights in the district or lessen the efficiency of the district in its delivery or use of water; and

(c) The applicant provides proof satisfactory to the state engineer of:

(1) His intention in good faith to construct any work necessary to apply the water to the intended beneficial use with reasonable diligence; and

(2) His financial ability and reasonable expectation actually to construct the work and apply the water to the intended beneficial use with reasonable diligence.

2. Except as otherwise provided in subsection 6, the state engineer shall approve or reject each application within 1 year after the final date for filing a protest. However:

(a) Action may be postponed by the state engineer upon written authorization to do so by the applicant or, if an application is protested, by the protestant and the applicant; and

(b) In areas where studies of water supplies have been determined to be necessary by the state engineer pursuant to NRS 533.368 or where court actions are pending, the state engineer may withhold action until it is determined there is unappropriated water or the court action becomes final.

3. Except as otherwise provided in subsection 6, where there is no unappropriated water in the proposed source of supply, or where its proposed use or change conflicts with existing rights ~~[,]~~ ***or with protectible interests in existing domestic wells as set forth in NRS 533.024,*** or threatens to prove detrimental to the public interest, the state engineer shall reject the application and refuse to issue the requested permit. If a previous application for a similar use of water within the same basin has been rejected on those grounds, the new application may be denied without publication.

4. In determining whether an application for an interbasin transfer of ground water must be rejected pursuant to this section, the state engineer shall consider:

(a) Whether the applicant has justified the need to import the water from another basin;

(b) If the state engineer determines that a plan for conservation of water is advisable for the basin into which the water is to be imported, whether the applicant has demonstrated that such a plan has been adopted and is being effectively carried out;

(c) Whether the proposed action is environmentally sound as it relates to the basin from which the water is exported;

(d) Whether the proposed action is an appropriate long-term use which will not unduly limit the future growth and development in the basin from which the water is exported; and

(e) Any other factor the state engineer determines to be relevant.

5. If a hearing is held regarding an application, the decision of the state engineer must be in writing and include findings of fact, conclusions of law and a statement of the underlying facts supporting the findings of fact. The written decision may take the form of a transcription of an

oral ruling. The rejection or approval of an application must be endorsed on a copy of the original application, and a record made of the endorsement in the records of the state engineer. The copy of the application so endorsed must be returned to the applicant. Except as otherwise provided in subsection 7, if the application is approved, the applicant may, on receipt thereof, proceed with the construction of the necessary works and take all steps required to apply the water to beneficial use and to perfect the proposed appropriation. If the application is rejected the applicant may take no steps toward the prosecution of the proposed work or the diversion and use of the public water while the rejection continues in force.

6. The provisions of subsections 1 to 4, inclusive, do not apply to an application for an environmental permit.

7. The provisions of subsection 5 do not authorize the recipient of an approved application to use any state land administered by the division of state lands of the state department of conservation and natural resources without the appropriate authorization for that use from the state land registrar.

8. As used in this section, "interbasin transfer of ground water" means a transfer of ground water for which the proposed point of diversion is in a different basin than the proposed place of beneficial use.

Sec. 4. NRS 534.110 is hereby amended to read as follows:

534.110 1. The state engineer shall administer this chapter and shall prescribe all necessary regulations within the terms of this chapter for its administration.

2. The state engineer may:

(a) Require periodical statements of water elevations, water used, and acreage on which water was used from all holders of permits and claimants of vested rights.

(b) Upon his own initiation, conduct pumping tests to determine if overpumping is indicated, to determine the specific yield of the aquifers and to determine permeability characteristics.

3. The state engineer shall determine whether there is unappropriated water in the area affected and may issue permits only if the determination is affirmative. ~~[The state engineer shall require each applicant to whom a permit is issued for a well:~~

~~(a) In a county whose population is less than 400,000;~~

~~(b) For municipal, quasi-municipal or industrial use; and~~

~~(c) Whose reasonably expected rate of diversion is one-half cubic foot per second or more,~~ ~~to report periodically to the state engineer concerning the effect of that well on other previously existing wells that are located within 2,500 feet of the well.]~~

4. It is a condition of each appropriation of ground water acquired under this chapter that the right of the appropriator relates to a specific quantity of water and that the right must allow for a reasonable lowering of the static water level at the appropriator's point of diversion. In determining a reasonable lowering of the static water level in a particular area, the state engineer shall consider the economics of pumping water for the general type of crops growing and may also consider the effect of using water on the economy of the area in general.

5. This section does not prevent the granting of permits to applicants later in time on the ground that the diversions under the proposed later appropriations may cause the water level to be lowered at the point of diversion of a prior appropriator, so long as ***any protectible interests in***

existing domestic wells as set forth in NRS 533.024 and the rights of holders of existing appropriations can be satisfied under such express conditions. ~~[At the time a permit is granted for a well:~~

~~(a) In a county whose population is less than 400,000;~~

~~(b) For municipal, quasi-municipal or industrial use; and~~

~~(c) Whose reasonably expected rate of diversion is one-half cubic foot per second or more,~~ ~~the state engineer shall include as a condition of the permit that pumping water pursuant to the permit may be limited or prohibited to prevent any unreasonable adverse effects on an existing domestic well located within 2,500 feet of the well, unless the holder of the permit and the owner of the domestic well have agreed to alternative measures that mitigate those adverse affects.]~~

6. The state engineer shall conduct investigations in any basin or portion thereof where it appears that the average annual replenishment to the ground water supply may not be adequate for the needs of all permittees and all vested-right claimants, and if his findings so indicate the state engineer may order that withdrawals be restricted to conform to priority rights.

7. In any basin or portion thereof in the state designated by the state engineer, the state engineer may restrict drilling of wells in any portion thereof if he determines that additional wells would cause an undue interference with existing wells. Any order or decision of the state engineer so restricting drilling of such wells may be reviewed by the district court of the county pursuant to NRS 533.450.

Sec. 5. This act becomes effective on July 1, 2001.

SUMMARY—Directs Legislative Commission to conduct interim study of quality and quantity of ground water within State of Nevada. (BDR R-310)

_____ CONCURRENT RESOLUTION—Directing the Legislative Commission to conduct an interim study concerning the quality and quantity of ground water within the State of Nevada.

WHEREAS, Nevada is located in an arid region where water is often in short supply; and

WHEREAS, A large quantity of the water of this state is in the form of ground water; and

WHEREAS, Many populated areas of this state rely upon domestic and municipal wells for their supplies of water; and

WHEREAS, Many populated areas of this state also rely upon septic tanks for the disposal of wastewater; and

WHEREAS, There are many areas within this state where the quantity of water is not as grave a problem as the availability of water that is suitable for public consumption; and

WHEREAS, A thorough examination of the laws and policies of this state governing the use of ground water is vital to the continued prosperity and public health of this state; now, therefore, be it

RESOLVED BY THE _____ OF THE STATE OF NEVADA, THE _____ CONCURRING, That the Legislative Commission is hereby directed to conduct an interim study of the quality and quantity of ground water in this state; and be it further

RESOLVED, That the Legislative Commission shall appoint a subcommittee, the members of which are representative of various geographical areas of the state, consisting of:

1. Three members of the Senate Standing Committee on Natural Resources; and

2. Three members of the Assembly Standing Committee on Natural Resources; and be it further

RESOLVED, That the study must include, without limitation, an examination of:

1. Whether there are sufficient controls in place to protect the quality of ground water, especially with respect to septic tanks;

2. The availability and adequacy of data concerning the quality of ground water;

3. The manner in which laws governing the division of land, including, without limitation, chapter 278 of NRS, affect the quality and quantity of ground water; and be it further

RESOLVED, That the Legislative Commission shall designate a chairman of the subcommittee from among the members of the Senate appointed to the subcommittee; and be it further

RESOLVED, That the subcommittee shall meet at least six times during the interim and consult with an advisory committee consisting of eight members who are representative of various geographical areas of the state and are appointed by the subcommittee as follows:

1. A member who represents the Division of Water Resources of the State Department of Conservation and Natural Resources;

2. A member who represents the Division of Environmental Protection of the State Department of Conservation and Natural Resources;

3. A member who represents the Health Division of the Department of Human Resources;

4. A member who represents the office of a county manager;

5. A member who represents a county whose population is less than 100,000 or the planning commission of such a county;

6. A member who represents a county whose population is 100,000 or more or the regional planning commission of such a county;

7. A member who represents residential well owners; and

8. A member who represents residential housing developments that are typically served by domestic wells and septic tanks; and be it further

RESOLVED, That the members of the advisory committee serve without compensation, per diem allowance, travel expenses or other reimbursement; and be it further

RESOLVED, That any recommended legislation proposed by the subcommittee must be approved by a majority of the members of the Senate and a majority of the members of the Assembly appointed to the subcommittee; and be it further

RESOLVED, That the Legislative Commission shall submit a report of the results of the study and any recommendations for legislation to the 72nd session of the Nevada Legislature.

APPENDIX E

Subcommittee Letters

Nevada Legislature

SEVENTIETH SESSION

DEAN A. RHOADS
SENATOR
Northern Nevada Senate District

COMMITTEES:
Chairman
Natural Resources
Public Lands
Vice Chairman
Taxation
Member
Commerce and Labor

October 9, 2000

Joan Buchanan, Administrator
Real Estate Division
2501 East Sahara Avenue
Las Vegas, NV 89104-4137

Dear Ms. Buchanan:

As you may know, the 1999 Nevada Legislature directed a Study of Domestic and Municipal Water Wells, to be conducted by a Subcommittee of the Legislative Committee on Public Lands. The study is described in Section 4 of Assembly Bill 408 (Chapter 636, *Statutes of Nevada*). I served as Chairman of both the Committee on Public Lands and the A.B. 408 Subcommittee. Other Subcommittee members are Senator Margaret A. Carlton, Senator Jon C. Porter Sr., Assemblyman Douglas A. Bache, and Assemblywoman Kathy A. Von Tobel.

A series of recommendations resulted from this study, including one pertaining to the disclosure of certain domestic, community, and quasi-municipal well information to prospective buyers of real estate. Concern was expressed that buyers of property served by a well for domestic use are often unaware that the well may be under temporary permit, and that the temporary permit is subject to revocation when municipal water becomes available. They are also unaware of the significant costs involved when hooking up to municipal water, and the financial assistance that may be available.

Nevada water law authorizes the State Engineer to issue temporary permits where groundwater is being depleted, and to revoke those permits when a municipal water supply is available. Although this situation currently exists only in the Las Vegas Valley (it is the only valley presently designated as depleting its groundwater), the authority of the State Engineer is statewide and established in statute (see *Nevada Revised Statutes* 534.120). Additionally, as Nevada's population continues to grow, other valleys may also be designated and face a similar situation. Therefore, the Subcommittee determined that it is necessary to address the disclosure issue at the State level, rather than delegating it to local jurisdictions.

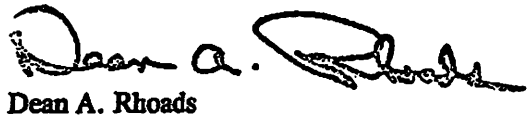
DISTRICT OFFICE:
Box 8, Tuscarora, Nevada 89834-0008 • Ranch (775) 756-6582 • Elko (775) 738-4490 • Cell (775) 742-7303 • Fax No. (775) 756-5544

LEGISLATIVE BUILDING:
401 S. Carson Street, Carson City, Nevada 89701-4747 • (775) 687-3648 or 687-5742 • Fax No. (775) 687-8206

Deliberation about this issue benefited greatly from the testimony of Matt Di Orio, Education and Information Officer, Real Estate Division. His participation at the June 22, 2000, meeting of the Water Wells Technical Advisory Committee was invaluable. As a result, the Subcommittee voted unanimously to address this issue by urging the Real Estate Division, in consultation with the State Engineer, to ensure that information is provided to potential buyers of property served by domestic, community and quasi-municipal wells, including consideration of appropriate disclosure procedures. Mr. Di Orio indicated that he believed minor modification to the Seller's Real Property Disclosure form may be a reasonable solution. We also understand that Continuing Education courses are periodically offered for real estate licensees, making this another avenue for improving awareness of the temporary permit issue.

Please consider this letter a formal request by the Subcommittee to consult with the State Engineer in addressing this issue (as previously described). Your cooperation in helping us to resolve this issue as quickly as possible is greatly appreciated. The State Engineer is Hugh Ricci at the Division of Water Resources (775-687-4037). Mr. Ricci was involved in the Study of Domestic and Municipal Water Wells and is familiar with the Subcommittee's recommendation. If you have any questions or need additional clarification, please also feel free to contact Linda Eissmann, Senior Research Analyst at the Legislative Counsel Bureau (775-684-6825).

Sincerely,



Dean A. Rhoads
Nevada State Senator

DAR/pc:W02736.53
cc: Mr. Matt Di Orio, Education/Information Officer, Real Estate Division
Mr. Hugh Ricci, State Engineer, Division of Water Resources
Ms. Sydney Wickliffe, Director, Department of Business and Industry

Nevada Legislature

SEVENTIETH SESSION

COMMITTEES:
Chairman
Natural Resources
Public Lands

Vice Chairman
Taxation

Member
Commerce and Labor

DEAN A. RHOADS
SENATOR
Northern Nevada Senate District

October 9, 2000

To Nevada's Seventeen County Commissions

Dear Chairman/Chairwoman:

As you may know, the 1999 Nevada Legislature directed a Study of Domestic and Municipal Water Wells, to be conducted by a Subcommittee of the Legislative Committee on Public Lands (Assembly Bill 408, Chapter 636, *Statutes of Nevada 1999*). I served as Chairman of both the Committee on Public Lands and the A.B. 408 Subcommittee. Other Subcommittee members are Senator Margaret A. Carlton, Senator Jon C. Porter Sr., Assemblyman Douglas A. Bache, and Assemblywoman Kathy A. Von Tobel.

A series of recommendations resulted from this study, including one pertaining to the education of domestic well owners in Nevada. In addressing this issue, we seek your support and participation.

Significant concern was expressed by members of the study's Technical Advisory Committee (a 12-member panel representing urban and rural areas, well owners, municipal water suppliers, water right holders, ratepayers, and other water experts) that many existing and potential water well owners are not adequately informed about groundwater dynamics, water quality protection, effective well management, and the risks involved in owning a domestic well.

For example, the State Engineer reported frequent calls from unsuspecting well owners whose wells have gone dry. Unfamiliar with groundwater dynamics, they often instruct the well driller to go only five or ten feet into the water table and stop. Then, when a nearby irrigation well goes into production and drops the water table, the homeowner's well often goes dry, a situation that could have been avoided if the well owner was more familiar with groundwater dynamics and knew to drill deeper. Other members of the advisory committee reported instances of frustrated well owners unable to locate potable water, or any water at all, and having expended considerable sums of money in the effort.

DISTRICT OFFICE:
Box 8, Tuscarora, Nevada 89834-0008 • Ranch (775) 756-6582 • Elko (775) 738-4490 • Cell (775) 742-7303 • Fax No. (775) 756-5544

LEGISLATIVE BUILDING:
401 S. Carson Street, Carson City, Nevada 89701-4747 • (775) 687-3648 or 687-5742 • Fax No. (775) 687-8206

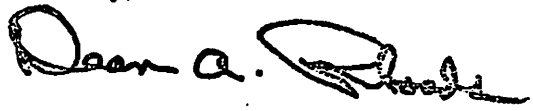
reported instances of frustrated well owners unable to locate potable water, or any water at all, and having expended considerable sums of money in the effort.

In an attempt to address this problem, the advisory committee developed a bibliography of existing pamphlets and brochures, typically available from the Cooperative Extension Service, on a wide range of water well topics. The advisory committee suggested that this information be made available to well owners statewide, but recognized that information on domestic wells tends to be geographically related, with specific information more relevant in some areas than in others. Therefore, we believe Nevada's counties are in a better position to determine what information is appropriate, and how best to educate their well owners.

The Subcommittee voted unanimously to seek your cooperation in addressing this issue. We urge you review the enclosed bibliography, determine the pamphlets that may be most appropriate for your area, and look at ways of disseminating this information to the well owners of your county. Perhaps you might consider advising them about the useful information readily available from the Cooperative Extension Service in your area, and encouraging them to learn more about groundwater dynamics, water quality protection, effective well management, and the risks involved in owning a domestic well. Or you may want to consider including a copy of the bibliography with a short statement about the importance of water well education with appropriate building permits for properties that will utilize wells for domestic purposes. Clearly, there are a number of options to disseminate this information, and we ask you to consider whichever avenue is most appropriate and effective in your area.

Your participation and cooperation in this educational effort will be greatly appreciated. If you have any questions about the study or this specific issue, please feel free to contact Linda Eissmann, Senior Research Analyst with the Legislative Counsel Bureau, at (775) 684-6825.

Sincerely,



Dean A. Rhoads
Nevada State Senator

DAR/pc:W02737.53
Enc.

APPENDIX F

Letter from Nevada Congressman Jim Gibbons

JIM GIBBONS
2ND DISTRICT, NEVADA

COMMITTEE ON RESOURCES
SUBCOMMITTEE ON NATIONAL PARKS AND PUBLIC LANDS
SUBCOMMITTEE ON ENERGY AND MINERAL RESOURCES
COMMITTEE ON ARMED SERVICES
SUBCOMMITTEE ON MILITARY PROCUREMENT
SUBCOMMITTEE ON MILITARY READINESS

Congress of the United States
House of Representatives

SELECT COMMITTEE ON INTELLIGENCE
SUBCOMMITTEE ON TECHNICAL AND TACTICAL INTELLIGENCE
COMMITTEE ON VETERANS' AFFAIRS
SUBCOMMITTEE ON BENEFITS.
MINING CAUCUS, Co-Chairman
GAMING CAUCUS, Vice Chairman
SPORTSMEN'S CAUCUS
AIR POWER CAUCUS
NATIONAL GUARD AND RESERVE COMPONENTS CAUCUS

January 27, 2000

Dear Chairman Rhoads and Water Well Subcommittee:

I would like to thank the Interim Legislative Subcommittee for holding this hearing on the important issue of well protection. As you may know, when I was in the State Assembly, we fought hard to protect the property rights of domestic well owners.

In the closing hours of the 67th legislative session, NRS 533 was amended by Senate Bill 19 in the Assembly, and accepted by the Senate. This language stated that when a commercial well was drilled within 2,500 feet of a domestic well, and a reduction in private water resulted, then the commercial well owner was required to provide their well services at no charge to the domestic well owner. However, the language excluded wells in population concentrations of 400,000 people or more. Because of political pressure, and the reality of the entire amendment being defeated, this language was accepted to ensure that private property protections were given to as many Nevadans as possible.

I believe that the protection of private property should be one of our government's greatest responsibilities. It is my hope that the 71st legislative session will expand private property rights and include protection for all domestic well owners within the state. As a State Assemblyman I championed this legislation and as a Member of Congress I offer my strong support and any assistance that you may need.

Thank you for allowing me to express my views on this very important issue.

Sincerely,

Jim Gibbons
Member of Congress

CONGRESSIONAL OFFICES:

100 CANNON HOUSE OFFICE BUILDING
WASHINGTON, DC 20515
(202) 225-6155
FAX: (202) 225-5679

400 SOUTH VIRGINIA STREET, SUITE 502
RENO, NEVADA 89501
(775) 686-5760
FAX: (775) 686-5711

850 SOUTH DURANGO DRIVE, SUITE 107
LAS VEGAS, NEVADA 89145
(702) 255-1651
FAX: (702) 255-1927

WESTERN FOLKLIFE CENTER
501 RAILROAD STREET, SUITE 202
ELKO, NEVADA 89801
(775) 777-7920
FAX: (775) 777-7922

Website: http://www.house.gov/gibbons/
E-mail: mail.gibbons@mail.house.gov

APPENDIX G

Bibliography of Water Well Information Available from Cooperative Extension Service

BIBLIOGRAPHY OF AVAILABLE INFORMATION CONCERNING DOMESTIC WELLS IN NEVADA

Southern Nevada Water Authority, 1998. *Groundwater and Wells in the Las Vegas Valley.* Prepared by Clark County Conservation District.

University of Nevada, Reno Cooperative Extension, 1997. *Protecting Nevada's Water – Work Sheet SP-98-03H(2) Water Well Condition.*

University of Nevada, Reno Cooperative Extension, 1999. *Protect Your Well Water - Fact Sheet 99-25.*

University of Nevada, Reno Cooperative Extension, 1999. *Drinking Water Testing for Private Well Owners – Fact Sheet 99-24.*

University of Nevada, Reno Cooperative Extension, 1999. *How to Test Your Well Water and Understand the Results – Fact Sheet 99-23.*

University of Nevada, Reno Cooperative Extension, 1994. *Protecting our Water Resources,* Chapters 12 & 14.

University of Nevada, Reno Cooperative Extension, 1992. *Small Ranch Manual: A Guide to Management for Green Pastures and Clean Water,* Chapter 8*: Wells – How to Maintain the Purity of Your Drinking Water, pg. 53-56.*

United States Geological Survey, 1986. General Interest Publications of the U.S. Geological Survey. *Ground Water.*

United States Geological Survey, 1988. General Interest Publications of the U.S. Geological Survey. *Ground Water and the Rural Homeowner.*

APPENDIX H

Letter from Southern Nevada Water Authority Concerning
Financial Assistance Guidelines

SOUTHERN NEVADA
WATER AUTHORITY

Administrative Office
1001 S. Valley View Blvd.
Las Vegas, Nevada 89153
Telephone: (702) 258-3939
Fax: (702) 258-3268

Project Office
1900 E. Flamingo, Ste. 170
Las Vegas, Nevada 89119
Telephone: (702) 862-3400
Fax: (702) 862-3470

Southern Nevada Water System
243 Lakeshore Road
Boulder City, NV 89005
Telephone: (702) 564-7697
Fax: (702) 564-7222

April 28, 2000

Mr. Roland Westergard, Chairman
Technical Advisory Committee
to the Assembly Bill 408 Subcommittee
207 Carville Circle
Carson City, Nevada 89703

Dear Roland,

On November 18, 1999, the Southern Nevada Water Authority (SNWA) Board of Directors voted unanimously to adopt Financial Assistance Guidelines to meet the requirements of Assembly Bills 347 and 408 of the 70th Nevada Legislature. The guidelines provide grants to well owners who are required by the State Engineer to connect to a municipal water system. They also allow for grants in cases of voluntary connection.

As Chair of the SNWA Board, I want to reaffirm to your committee our commitment to these guidelines and the percentages therein. The guidelines adhere to the intent of the Nevada Legislature and we are committed to administering them fairly and impartially, as written. They also fully reflect the spirit and intent of the Las Vegas Valley Groundwater Management Program, which in only three years has made tremendous strides in identifying and addressing the concerns of well users within our basin.

Since 1996, the SNWA has involved average citizens in formulating and implementing a management program that realistically deals with the groundwater issue in our valley. In cooperation with well users, the Division of Water Resources, and the citizen-based Advisory Committee for Groundwater Management, we have worked in good faith to find solutions that will protect the aquifer and benefit those on wells. Despite the complexity of the issues, we have been successful in doing this – and in a very short time.

BOARD OF DIRECTORS

Mary J. Kincaid, Chair
County Commissioner

Amanda M. Cyphers, Vice Chair
Henderson Councilman

Shari Buck
North Las Vegas Councilman

Lance Malone
County Commissioner

Michael McDonald
Las Vegas Councilman

Bryan Nix
Boulder City Councilman

Myrna Williams
County Commissioner

Patricia Mulroy
General Manager

We welcome and appreciate the work of your committee and hope this letter clarifies any questions concerning the Financial Assistance Program. A copy of the agenda item and guidelines is enclosed for your records. Thank you for the opportunity to emphasize our commitment to this program and the types of activities that benefit well users.

Sincerely,

Mary J. Kincaid

Mary J. Kincaid, Chair
Board of Directors

cc: Legislative Committee on Public Lands
Senator Dean Rhoads, Chair
Assemblyman John Marvel, Vice-Chair
Senator Terry Care
Senator Mark James
Assemblyman Jerry Claborn
Assemblyman Roy Neighbors
Alex Dufurrena, Humboldt County Commissioner
Senator Mike McGinness (alternate)
Senator Ray Shaffer (alternate)
Assemblyman Tom Collins (alternate)
Assemblyman Don Gustavson (alternate)
Assemblywoman Kathy Von Tobel (alternate)
Legislative Subcommittee to Study Domestic and Municipal Wells
Senator Dean Rhoads, Chair
Senator Maggie Carlton
Senator Jon Porter
Assemblyman Doug Bache
Assemblywoman Kathy Von Tobel
Senator Ann O'Connell
Linda Eissmann, Senior Research Analyst, Legislative Counsel Bureau
Jean Rice, Field Representative, Office of U.S. Congressman Jim Gibbons
Michael Stewart, Senior Research Analyst, Legislative Counsel Bureau

Enclosures a/s

SB 159 - 2001

Introduced on Feb 15, 2001
By Natural Resources,

Makes various changes concerning protectible interests in domestic water wells and appropriation of ground water. (BDR 48-309)

Fiscal Note
Effect On Local Government: *No.*
Effect on the State: *No.*

Hearings			
	Senate Natural Resources	Feb-26-2001	No Action
	Senate Natural Resources	Mar-26-2001	Amend, and do pass as amended
	Assembly Natural Resources, Agriculture, and Mining	Apr-25-2001	No Action
	Assembly Natural Resources, Agriculture, and Mining	May-02-2001	Do pass

Bill History

Feb-15-01 Read first time. Referred to Committee on Natural Resources. To printer.

Feb-16-01 From printer. To committee.

Apr-09-01 From committee: Amend, and do pass as amended.

✔Apr-11-01 Read second time. Amended. (Amend. No. 126). To printer.

Apr-12-01 From printer. To engrossment. Engrossed. First reprint.✔

✔Apr-13-01 Read third time. Passed, as amended. Title approved, as amended. (Yeas: 21, Nays: None). To Assembly.

Apr-17-01 In Assembly. Read first time. Referred to Committee on Natural Resources, Agriculture, and Mining. To committee.

May-03-01 From committee: Do pass.

May-04-01 Read second time.

✔May-07-01 Read third time. Passed. Title approved. (Yeas: 40, Nays: None, Excused: 2). To Senate.

May-09-01 In Senate. To enrollment.

May-11-01 Enrolled and delivered to Governor.

May-17-01 Approved by the Governor. Chapter 85.

Effective July 1, 2001. Section 5 of this act expires by limitation on July 1, 2005.

PREPARED BY
RESEARCH DIVISION
LEGISLATIVE COUNSEL BUREAU
Nonpartisan Staff of the Nevada State Legislature

BILL SUMMARY

71st REGULAR SESSION
OF THE NEVADA STATE LEGISLATURE

SENATE BILL 159
(Enrolled)

Topic

Senate Bill 159 expands the applicability of the law relating to protectible interests in domestic water wells.

Summary

This bill extends to all counties a recognition of the importance of domestic water wells and the creation of a protectible interest in these wells. Previous law provided this protectible interest for wells in all Nevada counties except Clark.

The measure also establishes a "floor" of 50 percent to go along with the existing "cap" of 85 percent of the hookup costs that must be provided to the owner of a domestic well or the holder of a revocable well permit who is required to connect to a municipal water system.

Effective Date

This measure is effective on July 1, 2001. The provisions relating to assistance with hookup costs expire on July 1, 2005, as is the case under the current law.

Background Information

A person generally does not have to obtain a permit to drill a domestic well to serve a single-family residence. Thus, however, the well owner does not receive a water right in the traditional sense. For this reason, in the early 1990s, the Legislature created a "protectible interest" for these domestic wells, ensuring that the owners have a degree of protection when a new larger well is proposed which may infringe on their water supply.

The original "protectible interest" applied everywhere in the State except Clark County. This bill extends the provision to Clark County also.

As part of a package of measures designed to assist the owners of wells in Clark County that are required to hook up to a municipal water supply when it becomes available, the Legislature last session set up a financial assistance program through which the water supplier must provide funds to cover "up to 85 percent" of the connection fees. The Southern Nevada Water Authority by regulation has determined that it will pay at least 50 percent of the costs up to a maximum of 85 percent. Senate Bill 159 places these figures in statute.

Like the rest of the provisions relating to the conditions under which these well owners may be required to hook up to the municipal water systems, the financial factors are "sunsetted" on July 1, 2005. The whole program will be reevaluated at that time.

LEGISLATIVE HEARINGS

MINUTES AND EXHIBITS

MINUTES OF THE
SENATE COMMITTEE ON NATURAL RESOURCES

Seventy-First Session
February 26, 2001

The Senate Committee on Natural Resources was called to order by Chairman Dean A. Rhoads, at 1:30 p.m., on Monday, February 26, 2001, in Room 2144 of the Legislative Building, Carson City, Nevada. Exhibit A is the Agenda. Exhibit B is the Attendance Roster. All exhibits are available and on file at the Research Library of the Legislative Counsel Bureau.

COMMITTEE MEMBERS PRESENT:

Senator Dean A. Rhoads, Chairman
Senator Lawrence E. Jacobsen, Vice Chairman
Senator Mike McGinness
Senator Mark A. James
Senator Raymond C. Shaffer
Senator Bob Coffin
Senator Maggie Carlton

STAFF MEMBERS PRESENT:

Fred W. Welden, Committee Policy Analyst
Billie Brinkman, Secretary
Heather Miller, Committee Secretary

OTHERS PRESENT:

Linda J. Eissmann, Senior Research Analyst, Research Division, Legislative Counsel Bureau
R. Michael Turnipseed, P.E., Director, Department of Conservation and Natural Resources
Hugh Ricci, P.E., State Engineer, Division of Water Resources, State Department of Conservation and Natural Resources
Robert Crowell, Lobbyist
Robert Tretiak, Ph.D., Lobbyist, Vice President, Nevada Well Owners Association
Julie A. Wilcox, Lobbyist, Director of Public Services, Las Vegas Valley Water District, and Southern Nevada Water Authority
Michael D. Goff, R.G., Hydrologist, Department of Resources, Southern Nevada Water Authority
Steve K. Walker, Lobbyist, Washoe County

Chairman Rhoads opened the committee meeting with the introduction of Senate Bill (S.B.) 159 and S.B. 161, concerning water wells.

SENATE BILL 159: Makes various changes concerning protectible interests in domestic water wells. (BDR 48-309)

SENATE BILL 161: Requires applicant for permit to operate certain water systems to provide documentation that applicant possesses sufficient water rights to operate system. (BDR 40-308)

Linda J. Eissmann, Senior Research Analyst, Research Division, Legislative Counsel Bureau (LCB), gave testimony on both S.B. 159 and S.B. 161 from a prepared statement (Exhibit C). Ms. Eissmann referred to LCB Bulletin 01-18, "Domestic and Municipal Water Wells" (Exhibit D. Original is on file at the Research Library.), in her statement. This bulletin provided a description of the purpose of each bill. Senate Bill 159 is a result of a measure enacted in a previous session of the Nevada Legislature, S.B. 19 of the Sixty-seventh Session, she said.

SENATE BILL 19 OF THE SIXTY-SEVENTH SESSION: Make various changes to provisions governing water. (BDR 48-528)

Ms. Eissmann stressed the issue considered by the technical advisory committee was "protectible interests," and whether this provision should be extended to all domestic well owners, not only those in counties with a population less than 400,000. Well owners in Clark County are currently excluded from the "protectible interest" provision of Nevada Revised Statutes (NRS) 533.024, she explained. Ms. Eissmann stated that NRS 533.024 stipulates "protectible interests" means protection of the domestic well's water supply from unreasonable adverse impacts.

Ms. Eissmann then testified on S.B. 161 and again read from her prepared statement (Exhibit C). She said S.B. 161 requires the applicant for expansion of a public water system to submit documentation from the state engineer to the Health Division, confirming the applicant holds sufficient water rights to operate the expanded water system.