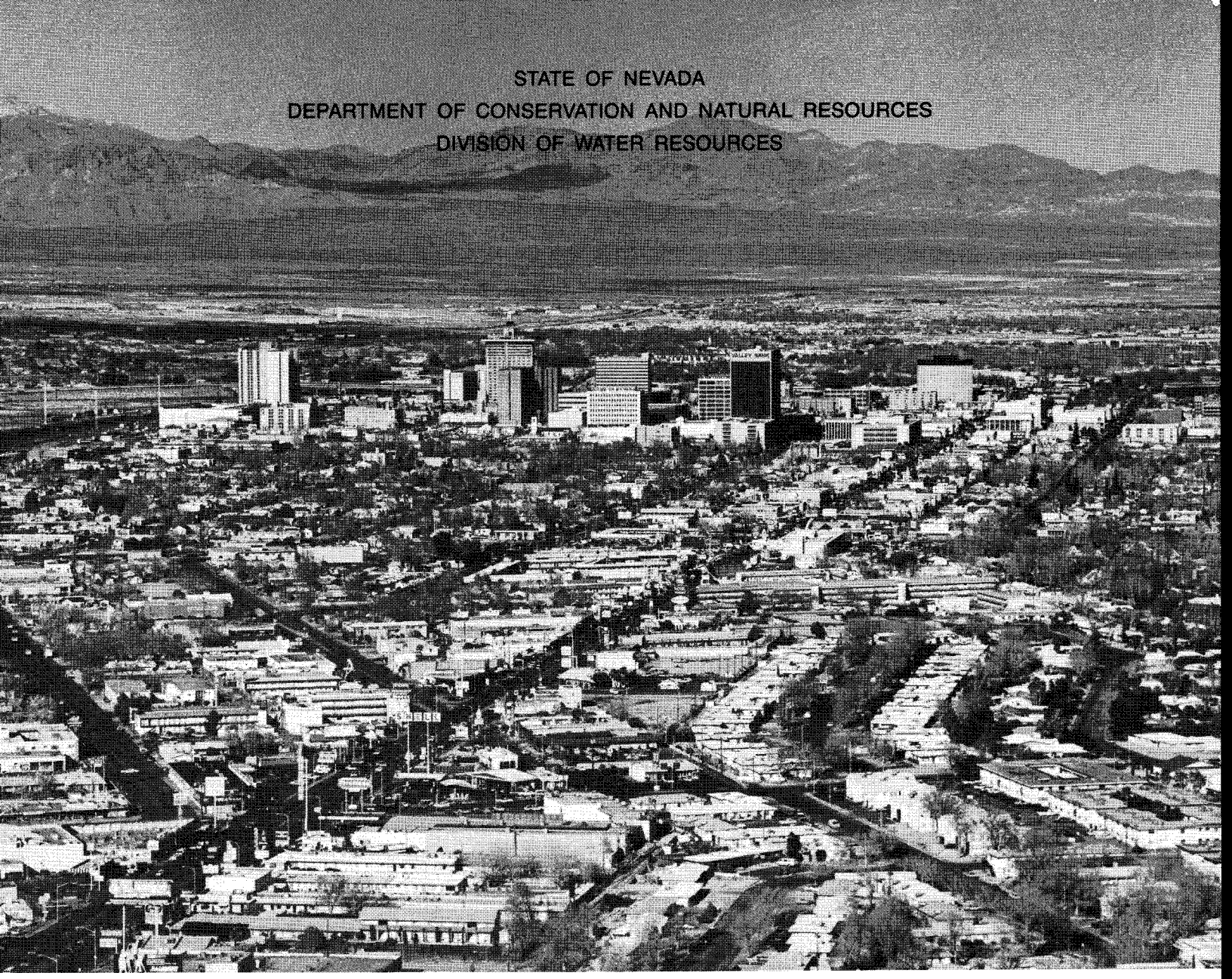
STATE OF NEVADA
DEPARTMENT OF CONSERVATION AND NATURAL RESOURCES
DIVISION OF WATER RESOURCES



WATER-LEVEL CHANGES ASSOCIATED WITH GROUND-WATER DEVELOPMENT IN LAS VEGAS VALLEY, NEVADA, 1978-79

By
DAVID B. WOOD

WATER-RESOURCES INFORMATION REPORT 30

Prepared cooperatively by the
U.S. DEPARTMENT OF THE INTERIOR
GEOLOGICAL SURVEY

Cover: Photograph of downtown Las Vegas, looking north, with Las Vegas Range in distance. January 6, 1977. Las Vegas News Bureau photograph 35405.

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Carson City, Nevada
1988

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CONVERSION FACTORS AND ABBREVIATIONS

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

Multiply	*By*	*To obtain*
Acre-feet (acre-ft)	0.001233	Cubic hectometers (hm^3)
Acres	0.4047	Square hectometers (hm^2)
Feet (ft)	0.3048	Meters (m)

INTRODUCTION

Ground-water conditions in Las Vegas Valley are being monitored to provide current information to those involved in the management and evaluation of its water resources. This report summarizes ground-water data collected from early 1978 through early 1979. Information for the period 1971-77 has been listed and summarized in previously published reports (Harrill, 1972, 1973, 1974, 1976a, 1976b, 1977; Katzer, 1977; and Wood, 1979). Information for this report was compiled by the U.S. Geological Survey.

A tabulation of water-level measurements made primarily during the first quarters of 1975-79 is contained in table 3. A multiyear period for each well is listed when available in table 3 to permit evaluation of water-level trends in individual wells. In addition to water levels measured by the U.S. Geological Survey, the tabulation includes measurements by the Las Vegas Valley Water District, the Nevada Division of Water Resources, and the Desert Research Institute of the University of Nevada. Well locations are shown on plate 1.

GENERAL WATER CONDITIONS, 1978-79

Ground-Water Pumpage and Water Imports

Municipal and industrial water for Las Vegas is supplied from ground-water pumpage and water imports from Lake Mead. Ground-water pumpage for calendar year 1978 was about 69,000 acre-feet and water imports were about 91,000 acre-feet. Estimated annual ground-water pumpage since 1955 is given in table 1, and water imports from Lake Mead are summarized in table 2. The magnitude of ground-water pumpage, imports of Lake Mead water, and surface-water outflow from Las Vegas Valley through Las Vegas Wash are shown in figure 1. The areal distribution of pumping in 1978 is shown in figure 2.

Surface-Water Outflow

Surface-water outflow from the valley is computed from the flows measured at two gaging stations--one near Henderson, shown on plate 1, and the other about 5 miles downstream at Northshore Road near Boulder City, which is not shown on the plate. The Henderson gage has been in operation since 1958; however, some inflow from the Henderson area enters the wash downstream from this site. The Boulder City gage was installed in 1970 and measures the approximate total valley outflow, which in calendar year 1978 was 64,200 acre-feet.

TABLE 1.--*Estimated ground-water pumpage, 1955-78*

[From pumpage inventories by the Nevada Division of Water Resources, rounded to the nearest 1,000 acre-feet]

Calendar year	Pumpage (acre-feet per year)	Calendar year	Pumpage (acre-feet per year)
1955	40,000	1967	81,000
1956	43,000	1968	88,000
1957	44,000	1969	87,000
1958	43,000	1970	86,000
1959	46,000	1971	85,000
1960	48,000	1972	70,000
1961	52,000	1973	70,000
1962	[a]54,000	1974	78,000
1963	[a]59,000	1975	73,000
1964	[b]69,000	1976	70,000
1965	73,000	1977	69,000
1966	78,000	1978	69,000

[a] Revised by Harrill (1976a, table 2) from previous estimates.

[b] Revised by Harrill (1977, table 2) from previous estimates.

TABLE 2.--*Summary of imports from Lake Mead, 1955-78*

[In acre-feet per year, from records of the Nevada Division of Water Resources]

Calendar year	Las Vegas Valley Water District	City of Henderson and Basic Management, Inc.	Southern Nevada Water Project[a]				Total, Las Vegas Valley
			Las Vegas Valley Water District	Nellis Air Force Base	City of North Las Vegas	City of Henderson	
1955	428	16,255	0	0	0	0	16,683
1956	1,589	21,175	0	0	0	0	22,764
1957	1,247	16,778	0	0	0	0	18,025
1958	2,202	15,581	0	0	0	0	17,783
1959	1,079	15,450	0	0	0	0	16,529
1960	2,146	15,898	0	0	0	0	18,044
1961	3,334	15,773	0	0	0	0	19,107
1962	4,887	16,473	0	0	0	0	21,360
1963	6,407	18,084	0	0	0	0	24,491
1964	5,879	16,423	0	0	0	0	22,302
1965	3,596	16,298	0	0	0	0	19,894
1966	5,334	18,079	0	0	0	0	23,413
1967	4,651	18,794	0	0	0	0	23,445
1968	6,920	22,951	0	0	0	0	29,871
1969	9,558	24,021	0	0	0	0	33,579
1970	13,350	20,897	0	0	0	0	34,247
1971	6,120	19,687	14,544	284	454	0	41,089
1972	0	[b]19,683	42,038	1,445	1,324	4	[b]64,494
1973	0	19,345	48,674	1,276	2,341	1,735	73,371
1974	0	19,268	49,290	1,504	3,394	1,939	75,395
1975	0	[b]16,832	54,735	1,885	6,302	1,545	[b]81,299
1976	0	14,081	59,349	2,158	6,466	1,895	83,949
1977	0	12,567	60,244	2,628	6,318	2,160	83,917
1978	0	12,838	67,203	2,513	6,073	2,309	90,935

[a] First water delivered on June 16, 1971.

[b] Revised by Katzer (1977, table 3) from previous figures.

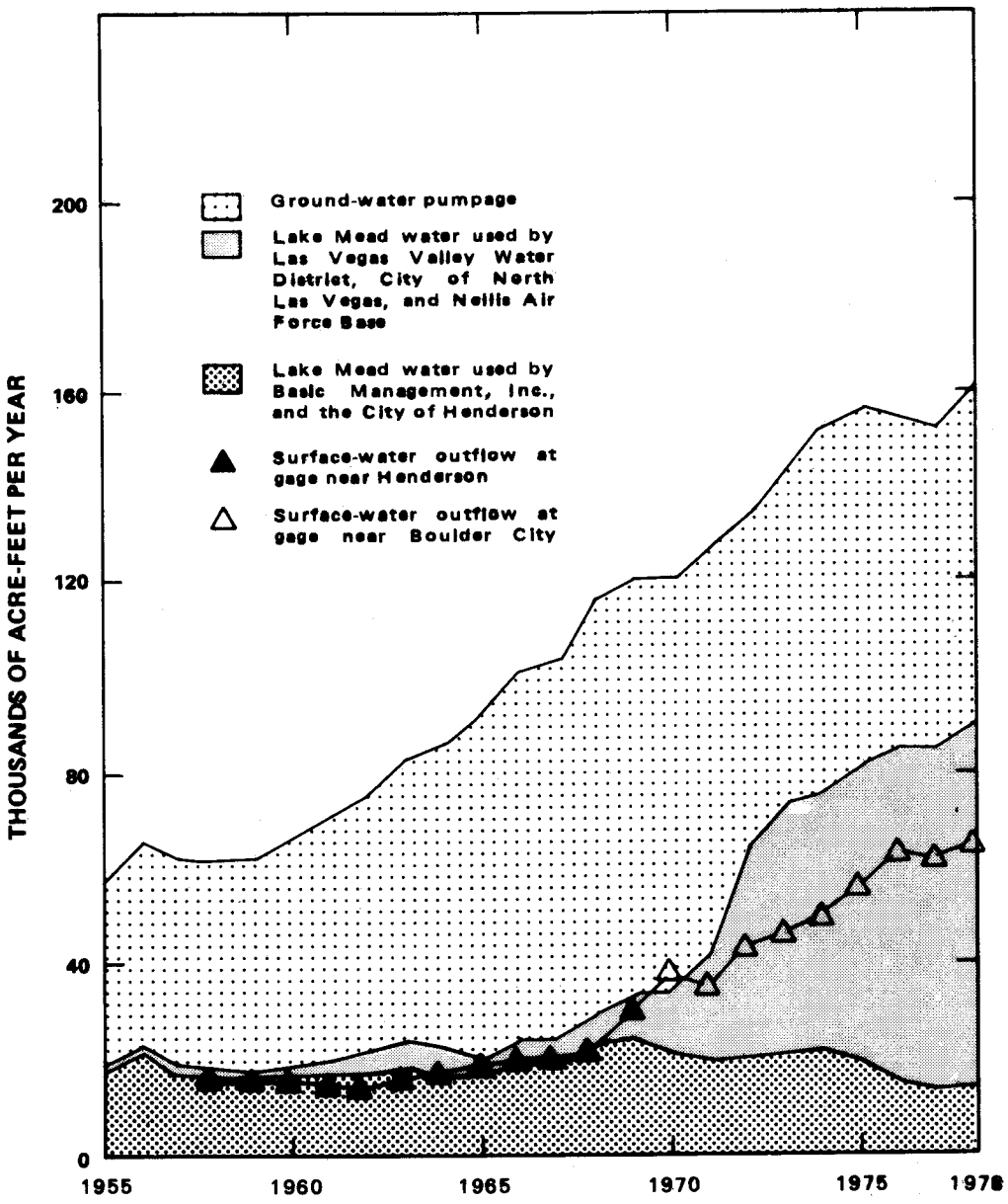

FIGURE 1. – Ground-water pumpage and imports of Lake Mead water, 1955–78, and surface-water outflow measured at the Las Vegas Wash gaging stations near Henderson (1958–69) and near Boulder City (1970–78).

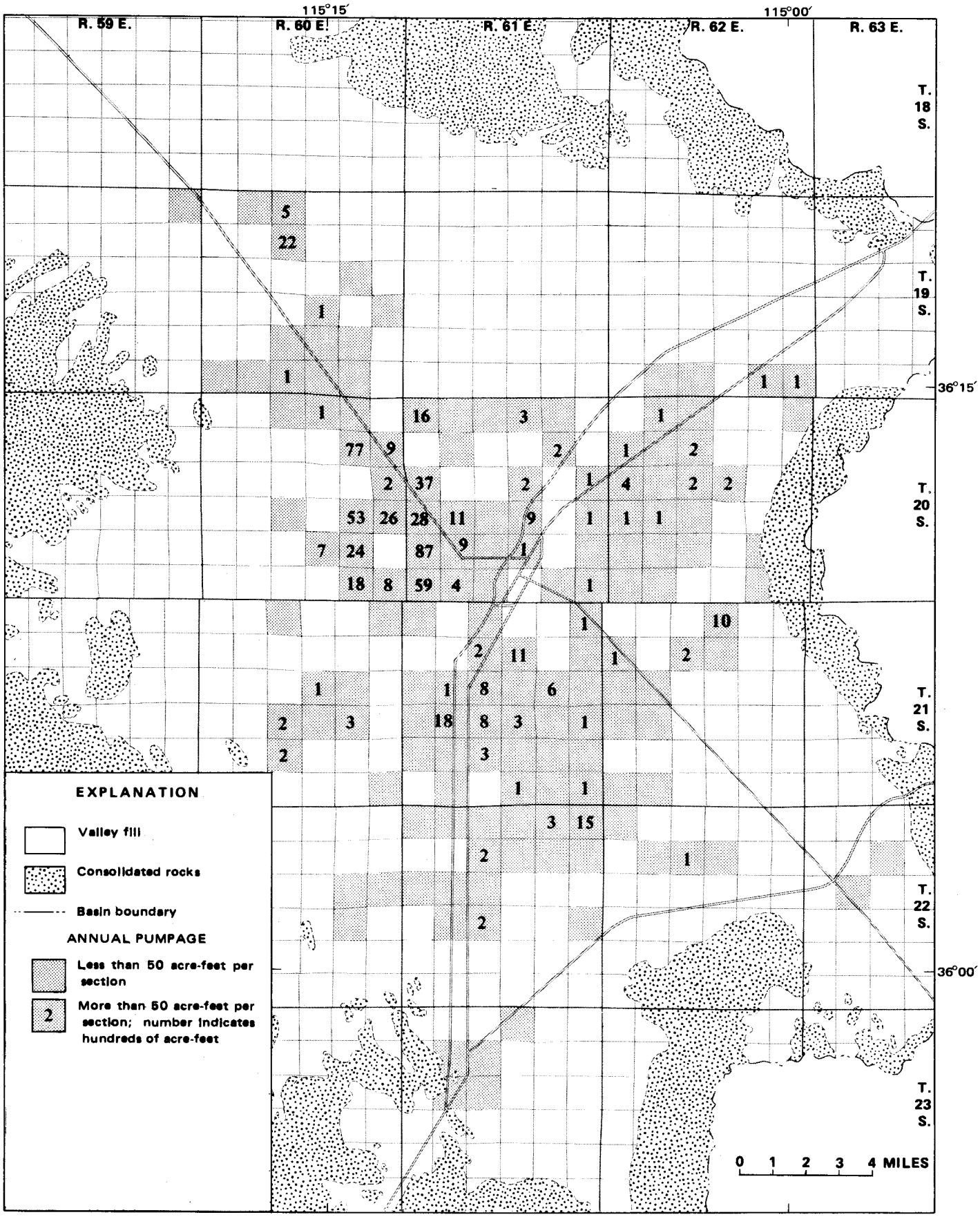

FIGURE 2.–Distribution of pumpage in 1978.

Water-Level Changes

To facilitate analysis of water-level data, two maps were prepared. One shows water-level changes in heavily pumped artesian zones of the valley-fill reservoir (figure 3) and includes information on wells that penetrate part or all of the shallow, middle, and deep zones of aquifers as defined by Maxey and Jameson (1948, pages 81, 82). Most wells penetrate more than one aquifer zone, and their water levels are composites of heads in the aquifers tapped. Depths of these wells range generally between 200 and 1,100 feet, and most penetrate more than 100 feet of saturated valley fill. In this report, the three zones of aquifers are grouped together and referred to as the "principal aquifers." Water-level declines in the principal aquifers in excess of 5 feet, as shown in figure 3, are due principally to continued heavy pumping and ground-water overdraft, but they may be due, in part, to a variation in the seasonal distribution of pumping.

The other map shows water-level changes in a shallower zone of saturated valley fill (figure 4). Water in this zone occurs under both water-table and artesian conditions. This unit has been called the near-surface zone of aquifers, or the "near-surface reservoir" by Malmberg (1965, page 24). The latter term is used in this report. The reservoir is not well defined in areal extent or depth and, except where it comprises the incompletely confining deposits above the shallow artesian aquifers, is difficult to delineate because it is not a distinct lithologic or hydrologic unit (Malmberg, 1965, page 24). In this report, wells that penetrate 100 feet or less of saturated valley fill are considered to indicate conditions in the near-surface reservoir. Maps of the near-surface reservoir may not adequately describe water-table conditions beneath areas where lawn-irrigation water infiltrates the soil and percolates down to a shallow water table or where a large head difference between zones is caused by pumping.

Hydrographs of seven selected observation wells are included to show the water-level changes during the period 1960-79 (figures 5-8). Selected wells represent a geographic coverage of the report area, and the water levels probably reflect composites of heads in the aquifers tapped.

In general, water levels in the principal aquifers continued to decline on the west side of the valley and rose on the east side. Levels in the near-surface reservoir continued to rise in the center of the valley but declined in the peripheral areas.

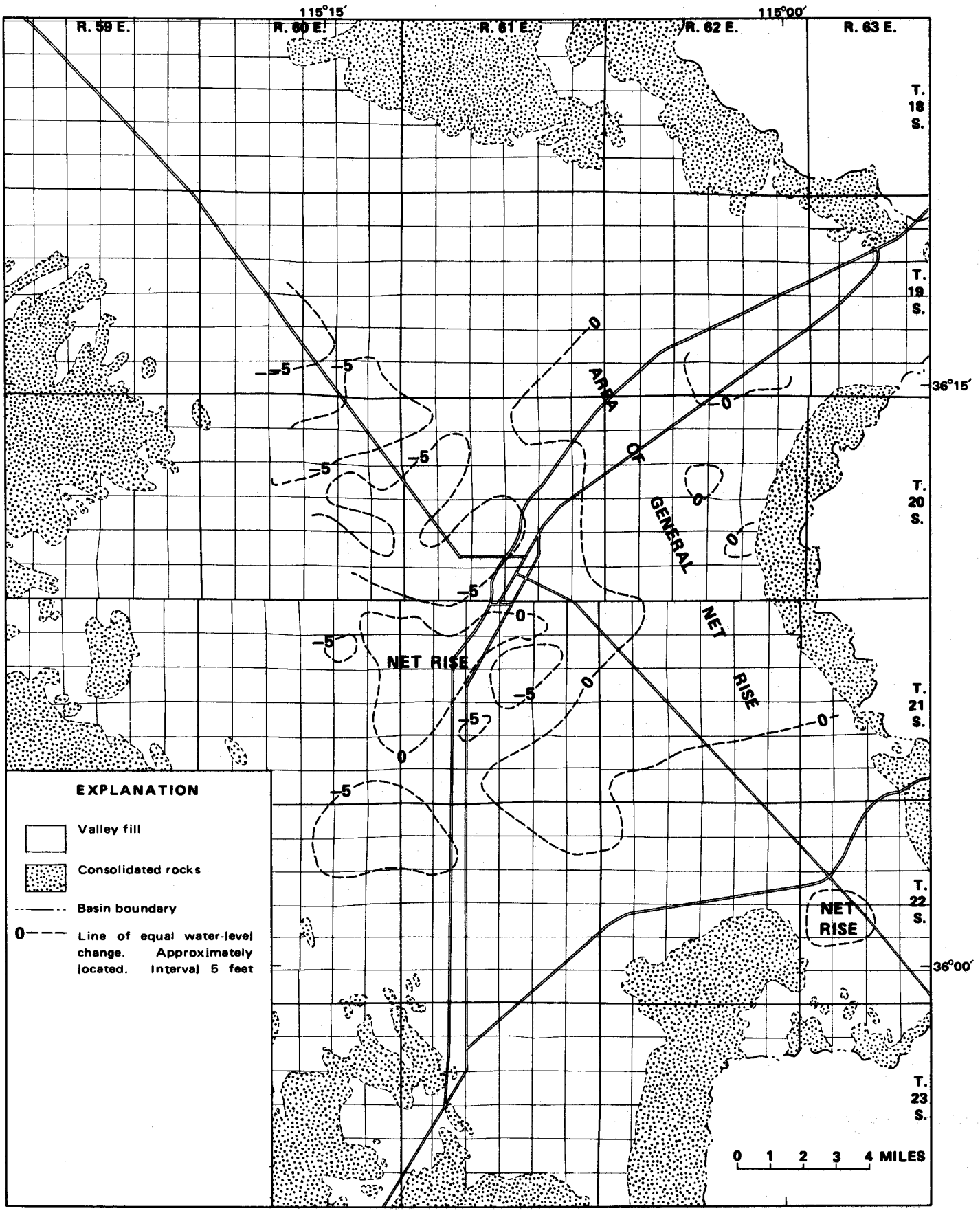

FIGURE 3.--Approximate net change in water levels in wells that penetrate the principal aquifers, early 1978-early 1979.