ABSTRACT

Impacts of urban development on ground-water quality have been a concern of water managers for the past decade. The steady population growth in Las Vegas Valley has been responsible for the importation of relatively large volumes of treated Colorado River water to supplement the limited ground-water supply. Water applied to landscapes, over and above consumptive use, has the potential to infiltrate from land surface into the shallow aquifer. The shallow aquifer generally has poor natural water quality and is further degraded by infiltration of irrigation water and urban runoff that mobilize fertilizers, organics, and other undesirable constituents which presents a potential for contamination of the near surface reservoir and principal aquifers.

Ground water provided the total water supply for Las Vegas Valley, through artesian wells and springs, in the early 1900's, and now provides approximately 28 percent of the public water supply. Artesian pressures have declined in excess of three hundred feet in some areas due to pumping more water annually than is naturally replenished. As some of the artesian pressure has been taken off the basin, the potential exists for downward percolation of the poor quality water from the shallow aquifer system to the near surface reservoir and principal aquifers.

A ground-water quality monitoring network of wells was first established, sampled, and analyzed to establish baseline chemistry throughout the valley in 1981-1983 by the U.S Geological Survey, in cooperation with the Las Vegas Valley Water District and Clark County Department of Comprehensive Planning. Most of these wells were resampled and analyzed in 1987 by the Las Vegas Valley Water District.

The results generally indicated that the shallow ground-water aquifer continues to degrade and an indeterminate amount of water from the shallow system appears to be percolating downward to the near surface reservoir and perhaps the principal aquifers. Total dissolved solids concentrations range from about 250 mg/L, the best quality in the principal aquifers, to about 8,000 mg/L in the shallow aquifer system in the eastern part of the valley.

INTRODUCTION

Prior to development, ground water in the principal aquifers was under sufficient pressure to leak upward and feed the near surface reservoir. Ground water in the near surface reservoir then discharged through evapotranspiration from the water table or springs. As the population grew in Las Vegas Valley, increased ground-water pumpage in the north and west reduced artesian pressures in the principal aquifers resulting in declining water levels.

Landscape irrigation in excess of the plants needs mobilize natural salts and other undesirable constituents such as fertilizers and organics and infiltrate into the shallow aquifer. With the decrease in artesian pressure, the potential for contamination of the near surface reservoir and principal aquifers from the shallow aquifer increases considerably.

Purpose and Scope

A ground-water quality monitoring network, first recommended by Van Denburgh and others (1982), was initiated and sampled by Dettinger (1987) in 1981-1983. The purpose of this study is: to resample and analyze this network to determine if ground-water quality changes have occurred in the baseline chemistry as defined by Dettinger (1987); to define the magnitude of the changes; to define, if possible, the reason for the changes; and, to evaluate the adequacy of the network.

The location and general area of investigation in Las Vegas Valley is shown on Figure 1. This study was conducted by the Las Vegas Valley Water District in cooperation with the Nevada Division of Environmental Protection with a grant from the U.S. Environmental Protection Agency.

Previous Ground-Water Quality Investigations

The study described in this report is based primarily on two reports by the U.S. Geological Survey. The first report, Van Denburgh and others (1982), developed general design criteria for a water-quality monitoring program; subsequently applied that criteria to Las Vegas Valley and defined a ground-water quality monitoring network. The second report, Dettinger (1987), describes the network of monitoring wells in Las Vegas Valley and presents analyses of water samples from those wells which establishes a reasonable data base to measure future changes in ground-water quality. In all, Dettinger (1987) sampled a total of 56 wells, of which 40 were chosen for the final monitoring network. Dettinger considered these forty wells to be representative of all aquifer zones in a fairly uniform areal distribution.

Both studies draw heavily on the work of previous water-quality investigators who are listed under Cited and Selected References.

Location System For Wells

The site numbers reference the wells in the Appendix and on the illustrations. These numbers ranging from 1 through 47 correspond to Dettinger's (1987) site number designations. Site number 60 was added to the monitoring network in 1987. Figure 2 shows the location and site number of the forty wells sampled.

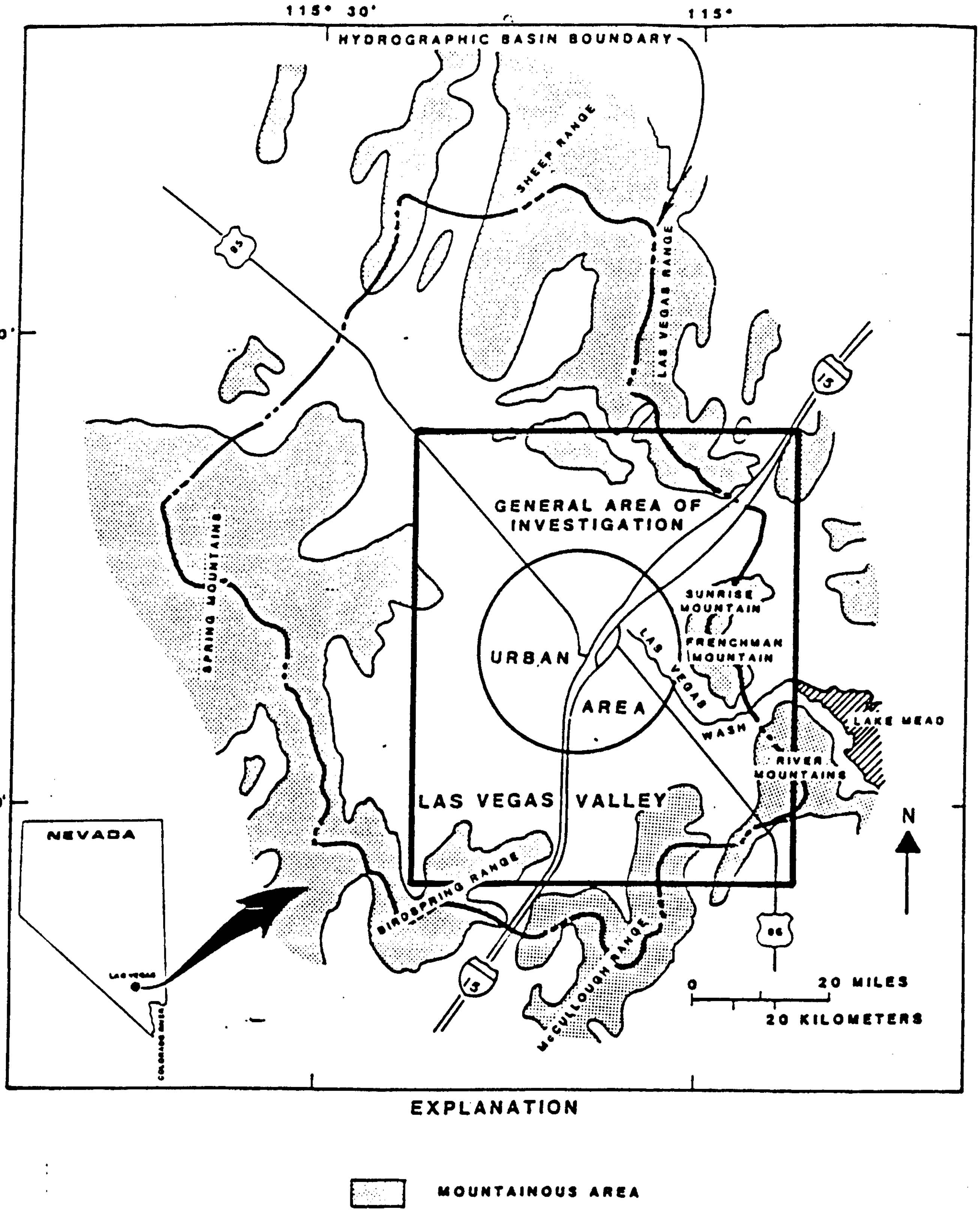

Figure 1.--Location of study area.

The local numbering system for wells in this report indicates location on the basis of the rectangular subdivision of public lands, referenced to the Mount Diablo base line and Meridian as shown in Figure 3. Each number consists of three units: the first unit is the township south of the base line; the second unit, separated from the first by a space, is the range east of the of the Meridian; and the third unit, separated from the second by a space, designates the square-mile section. The section number is followed by letters that indicate the quarter section, quarter-quarter section, and so on; the letters A,B,C, and D designate the northeast, northwest, southwest, and southeast quarters, respectively. The letters are followed by a sequence number (listed only in the Appendix) which indicates the order in which any given well was recorded. An an example of the application of the numbering system is site No. 4, local well number S20 E60 04CAD1 is located within a 10 acre tract identified as SE 1/4 NE 1/4 SW 1/4 Sec. 4, T.20S., R.60E., and it is the first well recorded in that tract.