

GROUND-WATER QUALITY MONITORING NETWORK

Site Selection

Every effort was made to resample the ground-water quality monitoring network established by Dettinger (1987) and sampled in 1981-1983. The wells in the monitoring network were chosen by Dettinger to meet several criteria:

1. To provide the best possible areal coverage and the best selection of the various depth zones and their combinations as shown in Figure 2 and discussed under the Geohydrologic Setting section.

2. To be accessible to allow representative sampling (pump availability, sampling access points prior to storage or treatment, sufficient yields to allow purging in a reasonable time frame).
3. Location in relation to nearby land-uses that have the potential to influence water quality, such as industrial areas and golf courses.
4. Locations where wells intercepting different zones (i.e. shallow vs. deep) were in the same vicinity.
5. To provide a representative network of a practical size for sampling.

Four wells out of the original 40 wells recommended for the monitoring network have been destroyed. Two of these wells were replaced by wells in the same general area. Analytical results for the destroyed wells; site Nos. 21, 22, 32, and 38 in Dettinger's report (1987) are listed in the Appendix with the analytical results of replacement wells, site Nos. 22A and 38A. In Dettinger's work both Lake Mead Base wells No. 3 (site No. 47) and No. 4 (site No. 3) were sampled. These wells are within a quarter of a mile from each other and completed in the same aquifer zones and only Well No. 4 (site Nos. 3) was included in Dettinger's final network. However, only Lake Mead Base well No. 3 (site No. 47) was sampled in 1987. In addition to the 38 wells sampled, one Las Vegas Valley Water District well was added, designated site No. 60. Dettinger (1987) sampled a total of 56 wells but only included 40 in the final monitoring network. A shallow well, designated number 46 in Dettinger's work (not one of the final 40 wells), was sampled as a part of the 1987 sampling effort and included in the Appendix.

As Figure 2 shows, there are no shallow wells in the far west part of the valley. Also wells open to just the deep zone are relatively uncommon outside the major pumping centers. The number of wells sampled from each zone are tabulated below.

Shallow (0-30 ft. below water table and the water table is within 20 feet of land surface)	8
Shallow/Intermediate (0-200 ft. below water table and the water table is greater than 20 ft. below land surface)	8
Intermediate only (30-200 ft. below water table)	6
Intermediate/Deep (30->200 ft. below water table)	6
Deep only (>200 ft. below water table)	7
All zones	5

Water Quality Constituents

The following tabulation shows the laboratories utilized to determine the various categories of water quality constituents for each sample.

<u>Category of Constituents</u>	<u>Laboratory</u>
principal constituents, nutrients, trace metals, total organic carbon	- Desert Research Institute Laboratory, Reno, NV
gross alpha & beta	- Thermo Analytical, Inc., Richmond, CA

Additionally determinations of pH, temperature, and conductivity were made in the field at each sample site.

The Appendix contains the analytical results from the 1981-1983 sampling by Dettinger (1987) as well as the results from the May, June, and November 1987 sampling. The Environmental Protection Agency (EPA) Primary and Secondary Drinking Water Standards are listed in Table 2 for comparative purposes.

Table 2.--Environmental Protection Agency Primary and Secondary
Drinking Water Standards

<u>Constituent</u>	<u>Primary</u>	<u>Value</u>
Arsenic (As)	0.005	mg/L
Barium (Ba)	1.00	mg/L
Cadmium (Cd)	0.01	mg/L
Chromium (Cr)	0.05	mg/L
Fluoride (F)	1.4 - 2.4	mg/L
Lead (Pb)	0.05	mg/L
Mercury (Hg)	0.002	mg/L
Nitrate (NO ₃ as N)	10.0	mg/L
Selenium (Se)	0.01	mg/L
Silver (Ag)	0.05	mg/L
Gross Alpha	15	pCi/L
Gross Beta	50	pCi/L
<u>Secondary</u>		
Chloride (Cl)	400.	mg/L
Copper (Cu)	1.0	mg/L
Iron (Fe)	0.6	mg/L
Magnesium (Mg)	150.	mg/L
Manganese (Mn)	0.10	mg/L
Zinc (Zn)	5.0	mg/L
Sulfate (SO ₄)	500.	mg/L
Total Dissolved Solids (TDS)	1000.	mg/L
pH	6.5 - 8.5	units

Electrical conductivity (EC) and total dissolved solids (TDS) are the most common indicators of overall water quality. The nutrients, nitrate (NO₃) and orthophosphate (OPO₄), may serve as indicators of water quality deterioration due to the influence of septic systems and fertilizers. Total organic carbon (TOC) was included as a indicator of potential contamination from organic sources such as pesticides, solvents, or motor fuels. Samples were analyzed for radiochemical parameters (gross alpha and gross beta) to establish background levels; however, the results are not included in the Appendix since the majority of the samples did not exceed detection limits.

Sampling Procedures

The sampling procedures listed below were followed to ensure the samples collected were representative of the ground water intercepted by each well. Approximately 70 percent of the wells are active and equipped with a pump. The remaining 30 percent were sampled using a portable, compressed air driven, double piston, sampling pump.

Water Level: A static water-level measurement was made when possible. In the majority of cases the pump had been on for a number of hours prior to sampling; therefore, it was not possible to take a meaningful measurement. Estimates were made for wells not recently measured based on either water levels in nearby wells or the most recent measurement of the well sampled was used.

Well Purging: Wells were pumped until pH, temperature, and conductivity stabilized within 10 percent when possible. In some cases pumping wells completed in the shallow aquifer were pumped dry in a matter of a few minutes. In all cases at least two well volumes were purged. For some wells, primarily those completed in the shallow system, this involved purging the well over two or three consecutive days, then allowing the well to recover up to 24 hours before sampling.

Filtration/Preservation: Samples for all constituents listed in the Appendix except radiochemistry and TOC were filtered through field-rinsed 0.45 micron filters immediately upon collection. Samples were preserved as required by EPA in the following manner:

Principal Constituents and Nutrients	- filtered, polyethylene container, refrigerate
Trace Metals	- filtered, glass bottle, preserved with 2 ml conc. HNO ₃ /liter
Gross alpha and beta	- polyethylene container, refrigerated
TOC	- glass container, refrigerated

All containers were sealed with electrical tape.

Field Determinations: Electrical conductivity, pH, and temperature were determined in the field on an unfiltered sample.

Quality Control: One split sample was sent for every 10 samples. One blank of distilled water was sent for analysis to check filtration and preservation procedures.

Sample Storage/Transport: All samples were shipped the day collected to the Desert Research Institute Laboratory in Reno, Nevada. Maximum holding times as recommended by EPA were observed.

Chain of Custody: All samples were accompanied by chain of custody records.