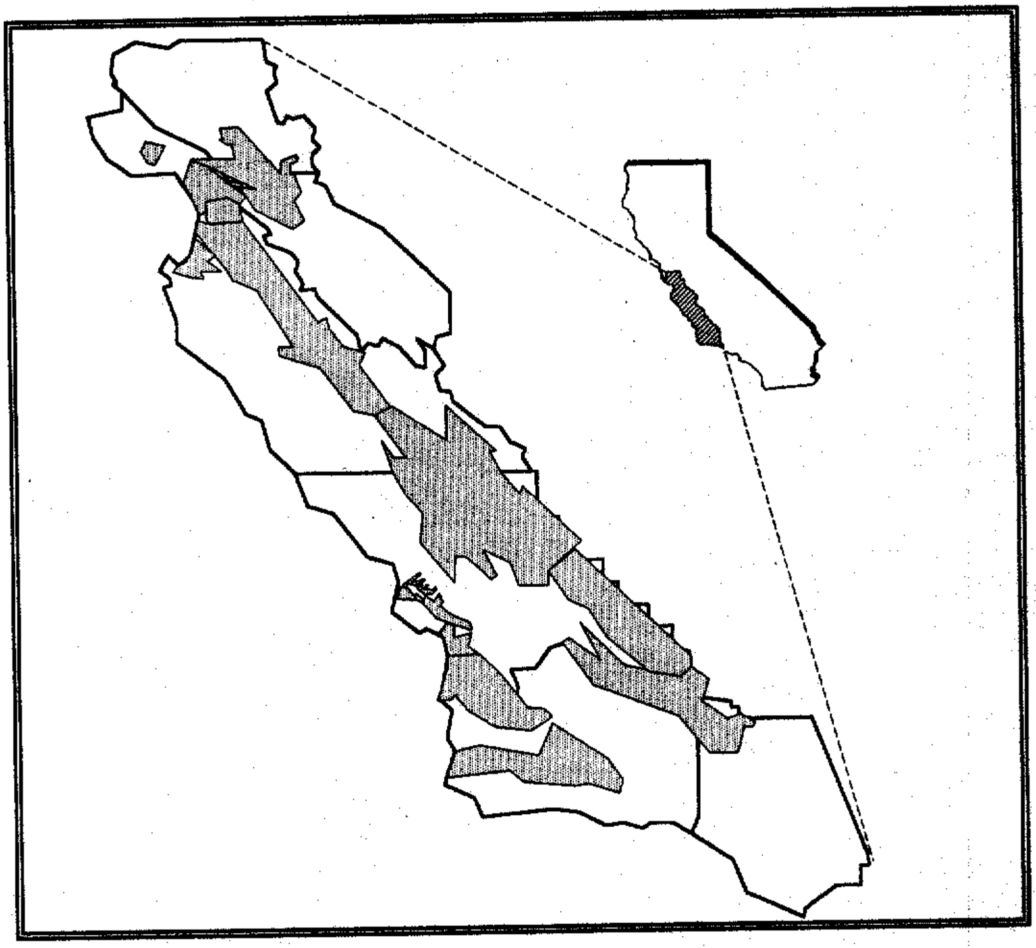
Assessment of Nitrate Contamination in Ground Water Basins of the Central Coast Region
Preliminary Working Draft



December, 1995

California Regional Water Quality Control Board
Central Coast Region

Roger W. Briggs
Executive Officer

STATE OF CALIFORNIA

CALIFORNIA REGIONAL WATER QUALITY CONTROL BOARD
CENTRAL COAST REGION

PREPARED BY:
Martin Howell, Student Assistant
Michelle Stalder, Student Assistant
David Wheeldon, Student Assistant

SPECIAL ASSISTANCE BY:
John Huynh, Student Assistant
Nancy King, Student Assistant

SUPERVISED BY:
Angela Carpenter, Sanitary Engineering Associate

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I. EXECUTIVE SUMMARY

This report has the following purposes: (1) to assess nitrate contamination in ground water basins of the Central Coast Region and (2) to prioritize contaminated basins according to need for management plans. Although this report determines nitrate conditions in the Central Coast Region's basins, it does not determine nitrate sources or remedial measures. Staff will identify nitrate sources and develop management plans for each contaminated ground water basin according to the priority adopted by the Regional Board in the 1995 Triennial Review. This study concludes fifteen ground water basins have significant nitrate contamination.

The first part of this analysis involved the collection of the nearly 30,000 individual nitrate readings representing the 53 ground water basins of the Central Coast Region from the Environmental Protection Agency, United States Geological Survey, Department of Health Services, individual county files, and a number of individual small water systems databases.

For the second part of the analysis, Regional Water Quality Control Board (Regional Board) staff developed isocontour maps using the nitrate data to determine the magnitude and extent of ground water contamination for each basin. Using these 53 preliminary nitrate contour maps, staff determined fifteen ground water basins exceed the California drinking water standard for nitrate.

Next, staff investigated the hydrogeology of each of the contaminated ground water basins to define the presence of separate aquifers within each of these ground water basins. When data made it possible, staff developed nitrate isocontour maps for each aquifer within each of the fifteen ground water basins, as well as nitrate isocontour maps representing different time periods for each aquifer.

Finally, Regional Board staff ranked the fifteen contaminated ground water basins by the severity of contamination. Criteria used to rank ground water basins were: historical nitrate trends, area (size) affected by the contamination, population affected by the contamination, and amount of supporting nitrate data. The fifteen most severely contaminated ground water basins of the Central Coast Region are listed in order below (with the most contaminated basin listed first). Figure I-1 displays the location of the fifteen ground water basins.

Ground Water Basin Name		Hydrologic Basin Number
1.	Salinas Valley	3-4
2.	Gilroy-Hollister Valley	3-3
3.	Santa Maria Valley	3-12
4.	Langley Canyon	3-4.09
5.	Los Osos Valley	3-8
6.	Pajaro Valley	3-2
7.	Paso Robles	3-4.06
8.	Arroyo Grande Valley	3-11
9.	San Luis Obispo Valley	3-9

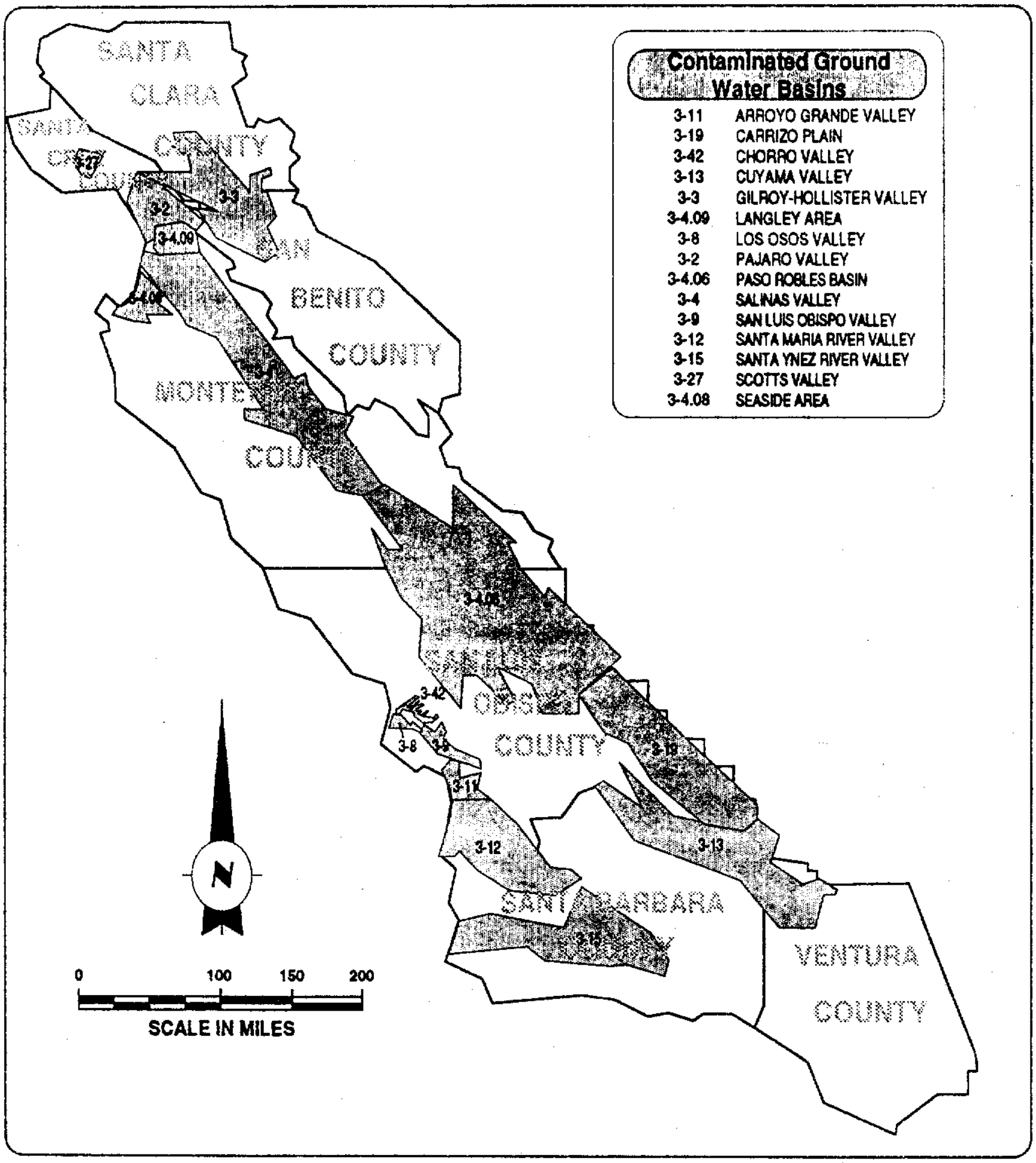


Figure I-1. Nitrate Contaminated Ground Water Basins of the Central Coast

Ground Water Basin Name		Hydrologic Basin Number
10.	Cuyama Valley	3-13
11.	Carrizo Plain	3-19
12.	Santa Ynez Valley	3-15
13.	Chorro Valley	3-42
14.	Seaside	3-4.08
15.	Scotts Valley	3-27

This nitrate assessment effort is one of the most extensive data collection and modeling efforts ever performed by the staff of this Regional Board. The total effort took approximately 6,200 hours (equivalent to three years full time work for one staff person). Work began in 1992 and was completed in 1995.

The collection of the data involved not only gathering the well information from agencies but also determining the location of the wells for the contouring process. In order to locate the wells, staff converted the state well identification numbers into latitude and longitude coordinates or used county parcel maps in conjunction with USGS quadrangle maps to convert well site addresses into latitude and longitude coordinates. The conversion from the state well ID numbers to Latitude/Longitude coordinates can only place the well within a 40 acre parcel. Additionally, locating addresses on a map limits the accuracy of the well locations. Therefore, the locations of the wells depicted on the contour maps are an approximation.

In this first attempt to assess this region's ground water nitrate conditions, the Regional Board staff welcomes public comment. After reviewing the public comments, Regional Board staff will determine whether or not to prepare a final report.

Staff will develop Management Plans for contaminated basins with the aid of any applicable public comments. Staff will develop Management Plans for each ground water basin according to the Triennial Review Priority List, adopted by the Regional Board in 1995. As the first step to developing Management Plans, Regional Board staff will verify and refine this report's data and accurately plot well locations. Additionally, staff will perform a hydrogeologic assessment to characterize geology, physical ground water hydrology, and chemical ground water hydrology.

In summary, this report is a draft report to be used solely as a first attempt to assess nitrate conditions with available existing information. Regional Board staff will verify and refine the nitrate conditions when preparing Management Plans.

The ability of the Regional Board to perform this large endeavor was the result of Water Quality Control Plan update funds made available on a one time basis by the U. S. Environmental Protection Agency and the California State Legislature.

II. INTRODUCTION

The Central Coast Region is experiencing ground water contamination by nitrates. This contamination is a serious problem because incidents of infant methemoglobinemia (the blue baby syndrome) have been attributed to high levels of nitrate in drinking water. Although, reported incidents of infant methemoglobinemia occurred when the nitrate content was as low as 50 mg/l nitrate, as NO3, no cases of this disease have been reported in the United States when the water contained less than 45 mg/l nitrate, as NO3 (California Department of Food and Agriculture, 1989). Because of the relationship between high nitrates in drinking water and infant methemoglobinemia, Title 22 of California Domestic Water Quality Regulations states that water containing concentrations exceeding the State Maximum Contaminant Level (MCL) of 45 mg/l nitrate, as NO3, presents a health risk to humans when continually used for drinking or culinary purposes.

A recent report, "*Nitrate in Drinking Water, Report to the Legislature*", State Water Resources Control Board, Division of Water Quality, October 1988, explained the general nitrate contamination problem for the State of California, however, the report lacked basin specific ground water quality data. A detailed portrait of nitrate contamination obtained through a comprehensive data collection was necessary to assess the magnitude and extent of the nitrate problem in each ground water basin.

The main objective of this assessment is to identify specific ground water basins with nitrate contamination within the Central Coast Region. Extensive data collection determines specific nitrate contaminated ground water basins. The locations of contamination, as well as the extent of this contamination, are approximated for the Central Coast Region.

Figure II-1 shows all the Central Coast Region ground water basins as identified by the California Department of Water Resources. The California Department of Water Resources provided the generalized ground water basin boundaries and ground water basin numbers used in this report. Table II-1 lists the names of the ground water basins, and Table II-2 separates Central Coast Region ground water basins by county.

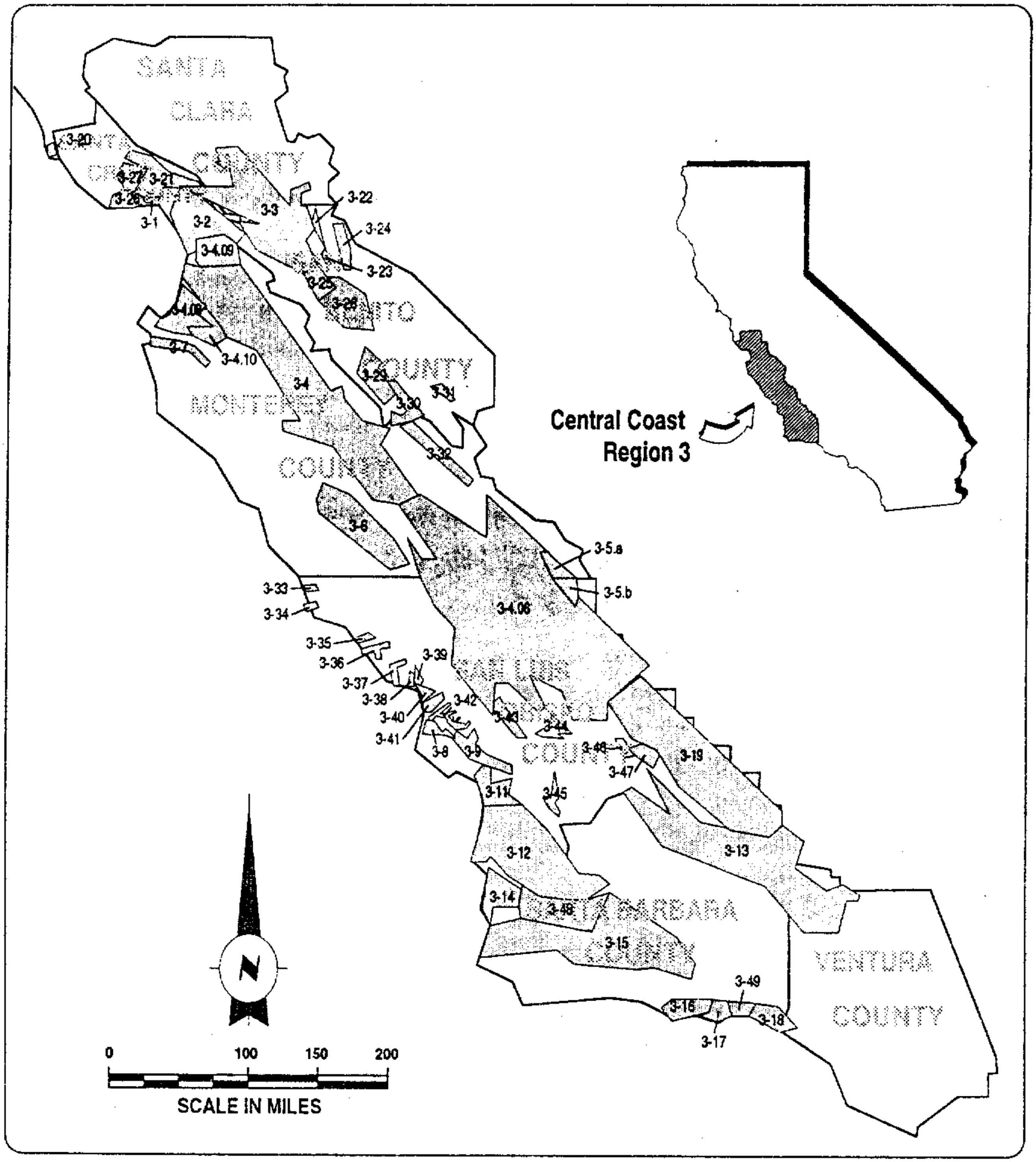


Figure II-1. Central Coast Region Ground Water Basins

Table II-1. Numerical List of Central Coast Region Ground Water Basins

BASIN NUMBER	BASIN NAME	COUNTY
3-1	SOQUEL VALLEY	Santa Cruz
3-2	PAJARO VALLEY	Santa Cruz, Monterey
3-3	GILROY-HOLLISTER VALLEY	Santa Clara, San Benito
3-4	SALINAS VALLEY	Monterey
3-4.06	PASO ROBLES	San Luis Obispo, Monterey
3-4.08	SEASIDE	Monterey
3-4.09	LANGLEY CANYON	Monterey
3-4.10	CORRAL DE TIERRA AREA	Monterey
3-5a	CHOLAME VALLEY PASO ROBLES	Monterey
3-5b	CHOLAME VALLEY SALINAS VALLEY	San Luis Obispo
3-6	LOCKWOOD VALLEY	Monterey
3-7	CARMEL VALLEY	Monterey
3-8	LOS OSOS VALLEY	San Luis Obispo
3-9	SAN LUIS OBISPO VALLEY	San Luis Obispo
3-11	ARROYO GRANDE VALLEY	San Luis Obispo
3-12	SANTA MARIA VALLEY	San Luis Obispo, Santa Barbara
3-13	CUYAMA VALLEY	Santa Barbara, Kern, San Luis Obispo, Ventura
3-14	SAN ANTONIO CREEK VALLEY	Santa Barbara
3-15	SANTA YNEZ VALLEY	Santa Barbara
3-16	GOLETA BASIN	Santa Barbara
3-17	SANTA BARBARA BASIN	Santa Barbara
3-18	CARPENTERIA BASIN	Santa Barbara
3-19	CARRIZO PLAIN	San Luis Obispo
3-20	ANO NUEVO AREA	San Mateo
3-21	SANTA CRUZ PURISIMA FORMATION HIGHLANDS	Santa Cruz
3-22	SANTA ANA VALLEY	San Benito
3-23	UPPER SANTA ANA VALLEY	San Benito
3-24	QUIEN SABE VALLEY	San Benito
3-25	TRES PINOS CREEK VALLEY	San Benito
3-26	WEST SANTA CRUZ TERRACE	Santa Cruz
3-27	SCOTTS VALLEY	Santa Cruz
3-28	SAN BENITO RIVER VALLEY	San Benito
3-29	DRY LAKE VALLEY	San Benito
3-30	BITTER WATER VALLEY	San Benito
3-31	HERNANDEZ VALLEY	San Benito
3-32	PEACH TREE VALLEY	San Benito
3-33	SAN CARPORFORO VALLEY	San Luis Obispo
3-34	RINCONADA VALLEY	San Luis Obispo
3-35	SAN SIMEON VALLEY	San Luis Obispo
3-36	SANTA ROSA VALLEY	San Luis Obispo
3-37	VILLA VALLEY	San Luis Obispo
3-38	CAYUCOS VALLEY	San Luis Obispo
3-39	OLD VALLEY	San Luis Obispo
3-40	TORO VALLEY	San Luis Obispo
3-41	MORRO VALLEY	San Luis Obispo
3-42	CHORRO VALLEY	San Luis Obispo
3-43	ARROYO DE LA CRUZ VALLEY	San Luis Obispo
3-44	POZO VALLEY	San Luis Obispo
3-45	HUASANA VALLEY	San Luis Obispo
3-46	RAFAEL VALLEY	San Luis Obispo
3-47	BIG SPRINGS AREA	San Luis Obispo
3-48	CAREAGA SAND HIGHLANDS	Santa Barbara
3-49	MONTECITO AREA	Santa Barbara

Table II-2. Central Coast Region Ground Water Basins, Listed by County

BASIN NUMBER	BASIN NAME	COUNTY
3-7	CARMEL VALLEY	Monterey
3-5a	CHOLAME VALLEY PASO ROBLES	Monterey
3-4.10	CORRAL DE TIERRA AREA	Monterey
3-4.09	LANGLEY CANYON	Monterey
3-6	LOCKWOOD VALLEY	Monterey
3-2	PAJARO VALLEY	Monterey, Santa Cruz
3-4.06	PASO ROBLES	Monterey, San Luis Obispo
3-4	SALINAS VALLEY	Monterey
3-4.08	SEASIDE	Monterey
3-30	BITTER WATER VALLEY	San Benito
3-29	DRY LAKE VALLEY	San Benito
3-3	GILROY-HOLLISTER VALLEY	San Benito, Santa Clara
3-31	HERNANDEZ VALLEY	San Benito
3-32	PEACH TREE VALLEY	San Benito
3-24	QUIEN SABE VALLEY	San Benito
3-28	SAN BENITO RIVER VALLEY	San Benito
3-22	SANTA ANA VALLEY	San Benito
3-25	TRES PINOS CREEK VALLEY	San Benito
3-23	UPPER SANTA ANA VALLEY	San Benito
3-34	ARROYO DE LA CRUZ VALLEY	San Luis Obispo
3-11	ARROYO GRANDE VALLEY	San Luis Obispo
3-47	BIG SPRINGS AREA	San Luis Obispo
3-19	CARRIZO PLAIN	San Luis Obispo
3-38	CAYUCOS VALLEY	San Luis Obispo
3-5b	CHOLAME VALLEY SALINAS VALLEY	San Luis Obispo
3-42	CHORRO VALLEY	San Luis Obispo
3-13	CUYAMA VALLEY	San Luis Obispo, Santa Barbara, Kern, Ventura
3-45	HUASANA VALLEY	San Luis Obispo
3-8	LOS OSOS VALLEY	San Luis Obispo
3-41	MORRO VALLEY	San Luis Obispo
3-39	OLD VALLEY	San Luis Obispo
3-4.06	PASO ROBLES	San Luis Obispo, Monterey
3-44	POZO VALLEY	San Luis Obispo
3-46	RAFAEL VALLEY	San Luis Obispo
3-43	RINCONADA VALLEY	San Luis Obispo
3-33	SAN CARPORFORO VALLEY	San Luis Obispo
3-9	SAN LUIS OBISPO VALLEY	San Luis Obispo
3-35	SAN SIMEON VALLEY	San Luis Obispo
3-12	SANTA MARIA VALLEY	San Luis Obispo, Santa Barbara
3-36	SANTA ROSA VALLEY	San Luis Obispo
3-40	TORO VALLEY	San Luis Obispo
3-37	VILLA VALLEY	San Luis Obispo
3-48	CAREAGA SAND HIGHLANDS	Santa Barbara
3-18	CARPENTERIA BASIN	Santa Barbara
3-13	CUYAMA VALLEY	Santa Barbara, Kern, San Luis Obispo, Ventura
3-16	GOLETA BASIN	Santa Barbara
3-49	MONTECITO AREA	Santa Barbara
3-14	SAN ANTONIO CREEK VALLEY	Santa Barbara
3-17	SANTA BARBARA BASIN	Santa Barbara
3-12	SANTA MARIA VALLEY	Santa Barbara, San Luis Obispo
3-15	SANTA YNEZ VALLEY	Santa Barbara
3-2	PAJARO VALLEY	Santa Cruz, Monterey
3-21	SANTA CRUZ PURISIMA FORMATION HIGHLANDS	Santa Cruz
3-27	SCOTTS VALLEY	Santa Cruz
3-1	SOQUEL VALLEY	Santa Cruz
3-26	WEST SANTA CRUZ TERRACE	Santa Cruz
3-20	ANO NUEVO AREA	San Mateo

This report depicts nitrate contamination by nitrate isocontour maps that show the area affected and the magnitude of the contamination. Chapters Four through Twenty contain the ground water isocontour maps. Regional Board staff collected the nitrate data mainly from water supply wells and averaged the nitrate readings from each well. Using these average nitrate concentrations, staff created the isocontour maps.

Staff used the computer software programs SURFER and MapViewer to develop the isocontour maps from the available data. The SURFER program interpolated the known nitrate concentrations to estimate nitrate water quality for locations with sparse nitrate data. Although actual nitrate concentrations in these estimated areas need to be determined by thorough ground water sampling, it was not feasible to obtain sufficient samples of ground water from the entire Central Coast Region. The isocontour maps, as such, reflect a generalized model developed by the computer programs of the ground water basins. To determine a more accurate assessment of the ground water quality, more water samples are necessary.

The collection of the data involved not only gathering the well information from agencies but also determining the location of the wells for the contouring process. In order to locate the wells, staff converted the state well identification numbers into latitude and longitude coordinates or used county parcel maps in conjunction with USGS quadrangle maps to convert well site addresses into latitude and longitude coordinates. The conversion from the state well ID numbers to Latitude/Longitude coordinates can only place the well within a 40 acre parcel. Additionally, locating addresses on a map limits the accuracy of the well locations. Therefore, the locations of the wells depicted on the contour maps are an approximation.

Reference

California Department of Food and Agriculture. "Nitrate and Agriculture in California". 1989.

III. DATA COLLECTION

This investigation of nitrate contamination represents the largest data collection effort ever performed by Regional Board staff. Over 27,000 total concentration readings were collected region-wide. Three students worked approximately two and one-half years to collect data, place the data in computer storage, and develop isocontour maps. Regional Board staff also researched aquifer configurations and general basin hydrogeology. It took approximately 6,200 hours (equivalent to three years full-time work for one staff person) to collect water quality data, create a data base for the computer modeling system, and develop the contents of this report.

The oldest data used in this investigation date back to the mid 1950's. Since the data collection effort occurred in 1992, the most recent data collected for this report are from that year. In a few instances, Regional Board staff used 1993 and 1994 data when readily available.

Major Database Systems

The data used for this investigation was obtained from the following sources.

EPA STORET The EPA's STORET water quality database system contributed the largest amount of data to this report with 8231 data points. STORET obtains its data from the State Water Resources Control Board water quality data section.

USGS The USGS National Water Information Service (NWIS) water quality database, another major source of data for this investigation, provided 2713 data points. In order to locate the wells for the contouring process, staff converted the state well identification numbers into latitude and longitude coordinates. It should be noted that the conversion from the state well ID numbers to Latitude/Longitude coordinates can only place the well within a 40 acre parcel.

DHS The California Department of Health Services (DHS) which maintains the Large Water System (LWS) database, as mandated by California Drinking Water Regulations, supplied 3262 data points for the study. A Large Water System is legally defined as a community system that serves 200 or more residents.

DWR The Department of Water Resources (DWR) was not used as a data source because most of the data are available through the STORET system. The DWR maintains water quality data in the Water Data Information System (WDIS) which is available only on microfiche.

Small Water Systems

Small Water Systems are legally defined as community water systems that provide drinking water to between five and 200 customers. Regional Board staff acquired small community water systems' water quality data from the files maintained at each of the county offices within the Central Coast Region except for San Benito County. The Berkeley DHS office furnished the information on the San Benito County Small Water Systems.

While most of the counties in the region maintain information on only Small Water Systems, owners of private wells are not required to report any data to the public agencies. Santa Clara County, however, recently passed regulations requiring owners of new wells to perform nitrate sampling of their well water. This law has generated a useful source of additional water quality data from private wells that is unique to Santa Clara County.

Because of the large size and rural nature of Monterey County, an enormous number of Small Water Systems exist within that county. The 1200 systems from that one county contributed more Small Water System data than the data supplied from all the other counties combined. Monterey County identifies most of these systems by sequential numbering that use the road on which the system is located (e.g., Prunedale Rd. System #1) and the site address. These address locations required Regional Board staff to use county parcel maps in conjunction with USGS quadrangle maps in order to determine the latitude/longitude of each system.

Other Sources

The Monterey County Water Resources Agency (MCWRA) was another major contributor of data for this study. MCWRA has collected data in the Salinas Valley ground water basin and other portions of Monterey County for many years. Recently, the MCWRA has intensively sampled the Salinas Valley ground water basin to obtain additional background data on the extent of nitrate contamination of the valley's ground waters.

Various water agencies throughout the region such as the California American Water Company in the Carmel area and the Pajaro Valley Water District located in Monterey and Santa Cruz Counties also provided water quality and well construction information.

Special investigations conducted in several other portions of the Region provided additional data as well. The San Luis Obispo County study of the Los Osos/Baywood Park area provided data for the Los Osos area. Santa Cruz County and Santa Clara County also provided data from intensive investigations in those counties.

Hydrogeology Research

Regional Board staff obtained information on the hydrogeology of the ground water basins used in this study from various specific studies and reports. Staff used the hydrogeology information in this report to support the nitrate isocontour maps and the basin aquifer delineations. References are listed at the end of the discussions of each ground water basin. A complete list of the hydrogeologic data sources, as well as other references used in this report, can be found in Chapter XXIII.

IV. INITIAL BASIN SELECTION PROCESS

Regional Board staff performed an initial evaluation of all of the ground water basins in the Central Coast Region in order to determine which ground water basins are experiencing a nitrate contamination problem. In the first step, staff developed contour maps of all 53 ground water basins. The ground water basins that showed all nitrate readings below 45 mg/l nitrate, as NO3, on the average, were eliminated from further detailed assessment. (Title 22 of the California Domestic Water Quality Regulations states that 45 mg/l nitrate, as NO3, is the Maximum Contaminant Level.) Staff also eliminated basins that did not have a significant number of wells or data points. Due to minimal usage by municipal water suppliers, several of the ground water basins had very little or no nitrate information .

Contour maps of the eliminated basins are presented in the end of this chapter. Some ground water basins have no map because little or no ground water data is available. The following basins were eliminated during this initial evaluation step. This list includes a brief description of the basin location, along with the main reason for the exclusion.

Basin Number	Basins Eliminated in Initial Evaluation
3-20	**Ano Nuevo Area** (north coast of Santa Cruz County). No nitrate data available.
3-34	**Arroyo De La Cruz Valley** (north coast of San Luis Obispo County, north of San Simeon). Little nitrate data available; data from only five wells. All nitrate averages less than 10 mg/l nitrate, as NO3.
3-47	**Big Springs Area** (San Luis Obispo County, west border of Carrizo Plain ground water basin). No nitrate data available.
3-30	**Bitter Water Valley** (southern San Benito County and eastern Monterey County). No nitrate data available.
3-48	**Careaga Sands Highlands** (central Santa Barbara County, bordering the Santa Ynez Valley and Santa Maria Valley ground water basins). Average high nitrate concentration is 20 mg/l nitrate, as NO3 (Figure IV-1).
3-7	**Carmel Valley** (central coast of Monterey County). Average high nitrate concentration is 25 mg/l nitrate, as NO3 (Figure IV-2).
3-18	**Carpenteria Basin** (southwest Santa Barbara County). Nitrate data for only nine wells. Average high nitrate concentration is 30 mg/l nitrate, as NO3 (Figure IV-3).

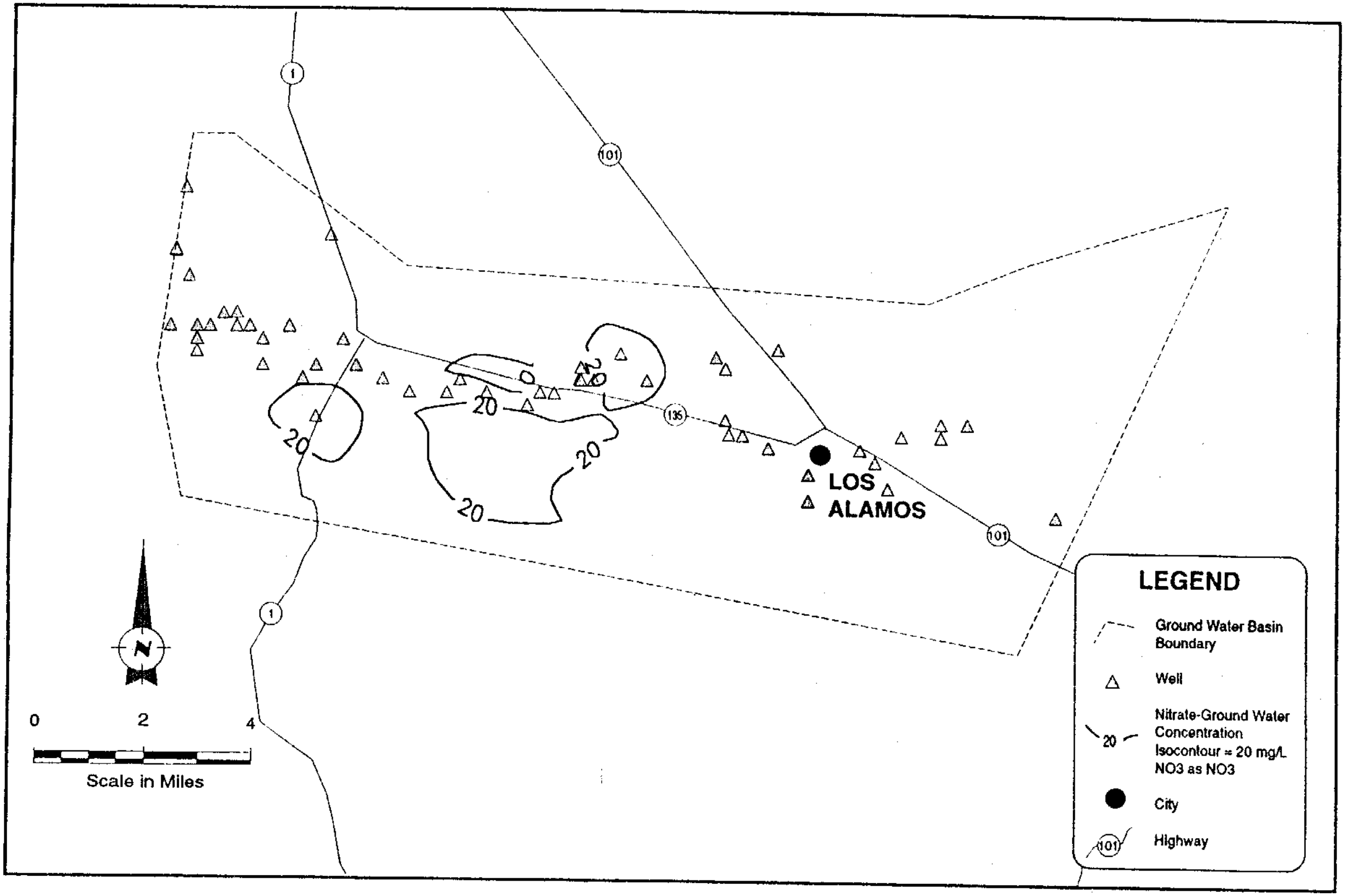


Figure IV-1. Overall Average Nitrate Concentrations in the Careaga Sand Highlands Ground Water Basin

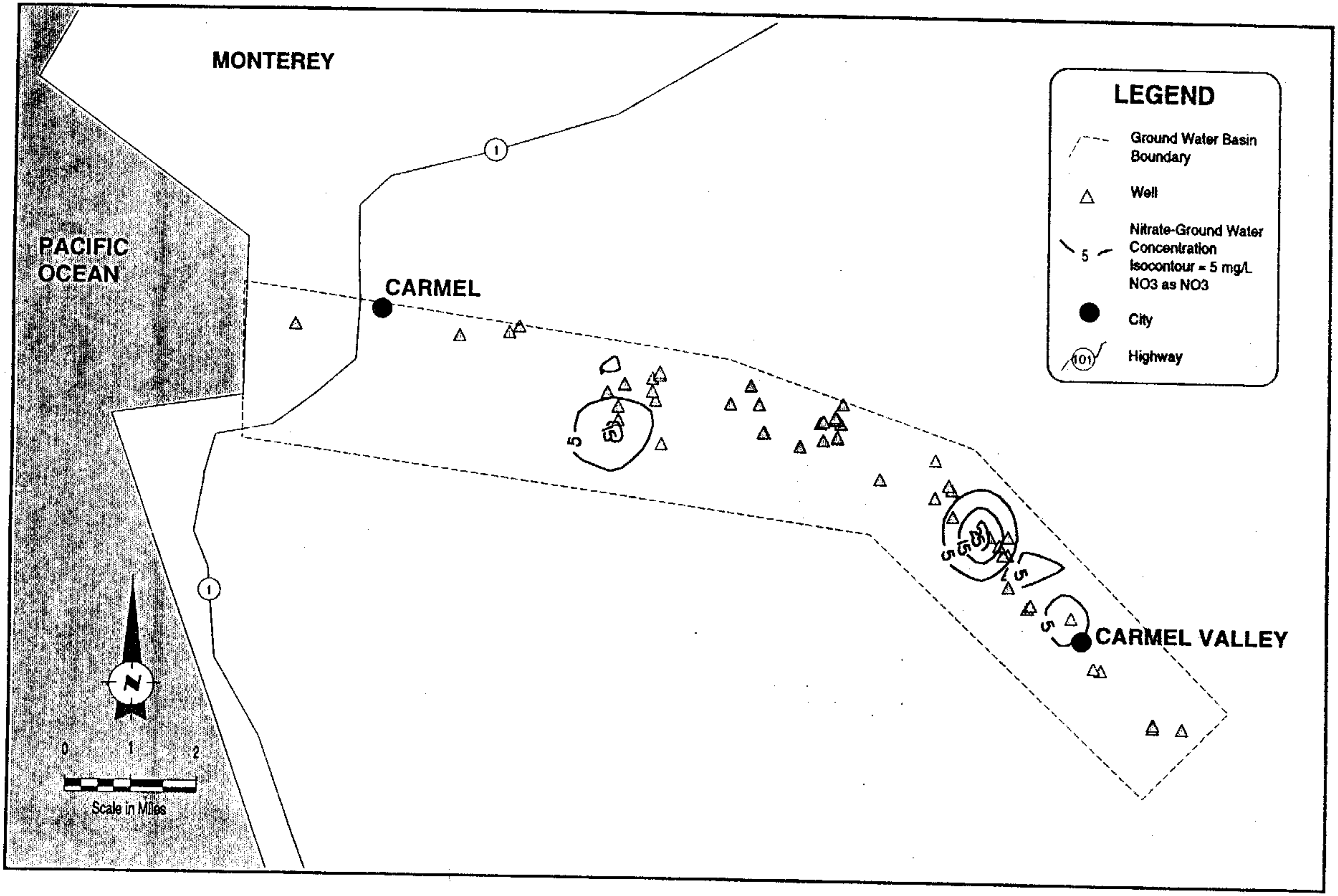


Figure IV-2. Overall Average Nitrate Concentrations in the Carmel Valley Ground Water Basin

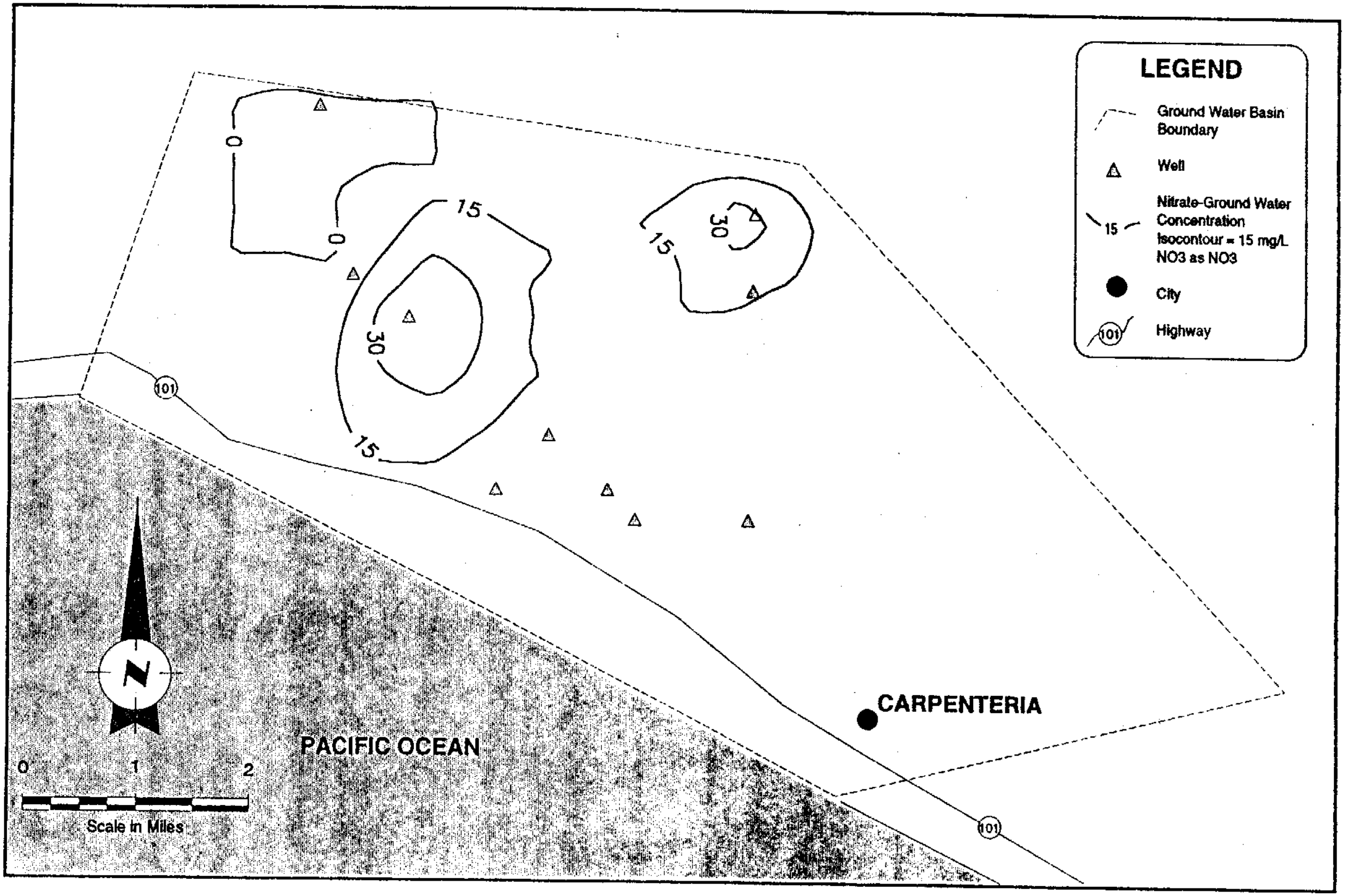


Figure IV-3. Overall Average Nitrate Concentrations in the Carpenteria Ground Water Basin

3-38 **Cayucos Valley** (central coast of San Luis Obispo County). Average high nitrate concentration is 30 mg/l nitrate, as NO3 (Figure IV-4).

3-5 **Cholame Valley** (eastern Monterey and San Luis Obispo Counties). Little nitrate data available; data from only ten wells. All nitrate averages less than 15 mg/l nitrate, as NO3.

3-4.10 **Corral De Tierra Area** (northern Monterey County basin, adjacent to the Salinas Valley ground water basin). Average high nitrate concentration is 30 mg/l nitrate, as NO3 (Figure IV-5).

3-29 **Dry Lake Valley** (southern San Benito County). No nitrate data available.

3-16 **Goleta Basin** (south coast of Santa Barbara County). Most averages are less than 15 mg/l nitrate, as NO3. Average high nitrate concentration is 30 mg/l nitrate, as NO3 (Figure IV-6).

3-31 **Hernandez Valley** (southern San Benito County, Hernandez Reservoir). No nitrate data available.

3-45 **Huasana Valley** (east of Nipomo Area, Central San Luis County). No nitrate data available.

3-6 **Lockwood Valley** (southern Monterey County). Average high nitrate concentration is 20 mg/l nitrate, as NO3 (Figure IV-7).

3-49 **Montecito Area** (south coast of Santa Barbara County). Average high nitrate concentration is 30 mg/l nitrate, as NO3 (Figure IV-8).

3-41 **Morro Valley** (central coast of San Luis Obispo County, north of Morro Bay). Average high nitrate concentration is 40 mg/l nitrate, as NO3 (Figure IV-9).

3-39 **Old Valley** (central coast of San Luis Obispo County). Average high nitrate concentration is 10 mg/l nitrate, as NO3 (Figure IV-10).

3-32 **Peach Tree Valley** (eastern Monterey County). No nitrate data available.

3-44 **Pozo Valley** (central San Luis Obispo County, just south of the Paso Robles ground water basin). Little nitrate data available; data from only two wells.

3-24 **Quien Sabe Valley** (northeast corner of San Benito County). Little nitrate data available; data from only two wells. Nitrate averages less than 10 mg/l nitrate, as NO3.

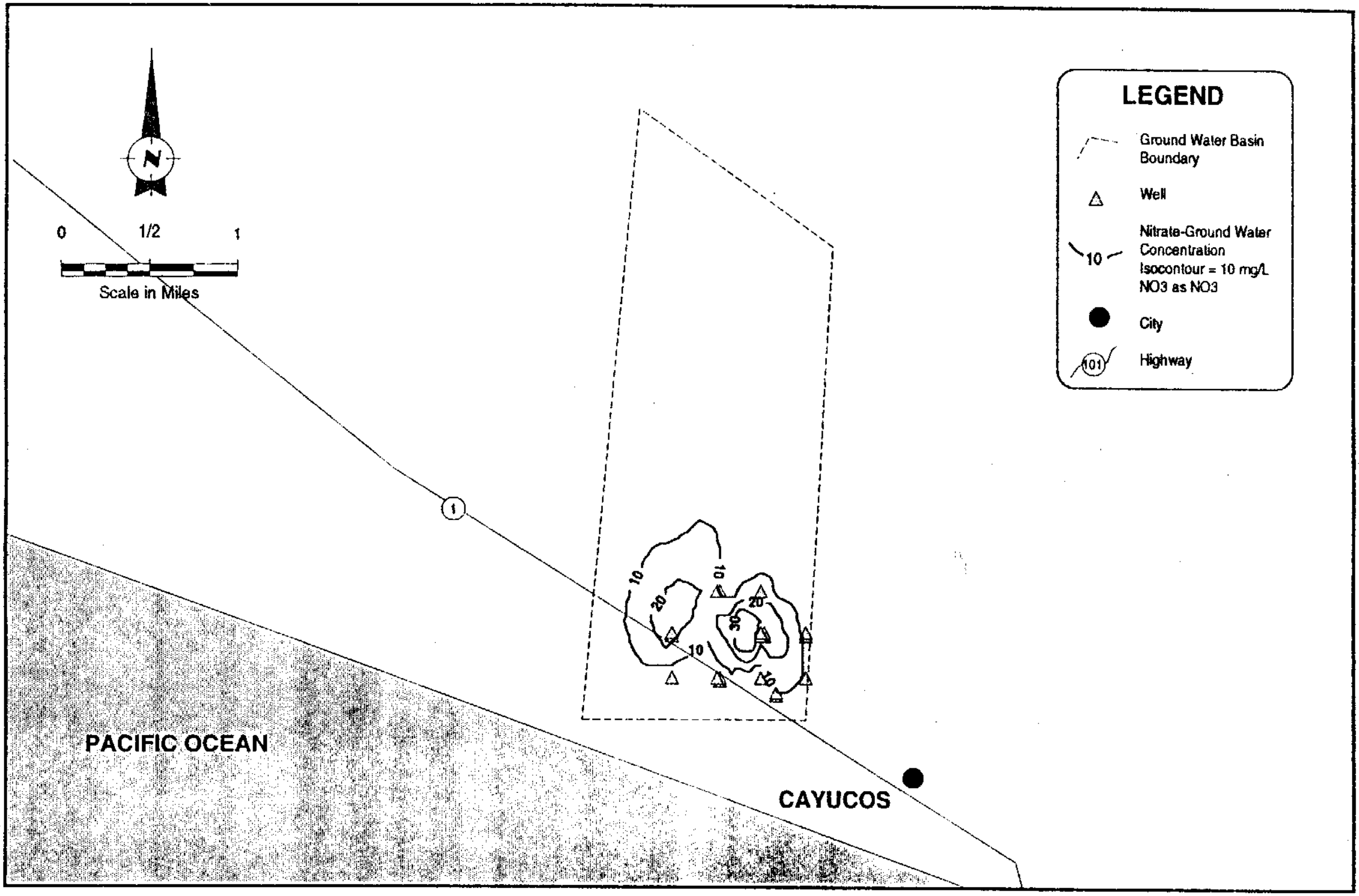


Figure IV-4. Overall Average Nitrate Concentrations in the Cayucos Valley Ground Water Basin

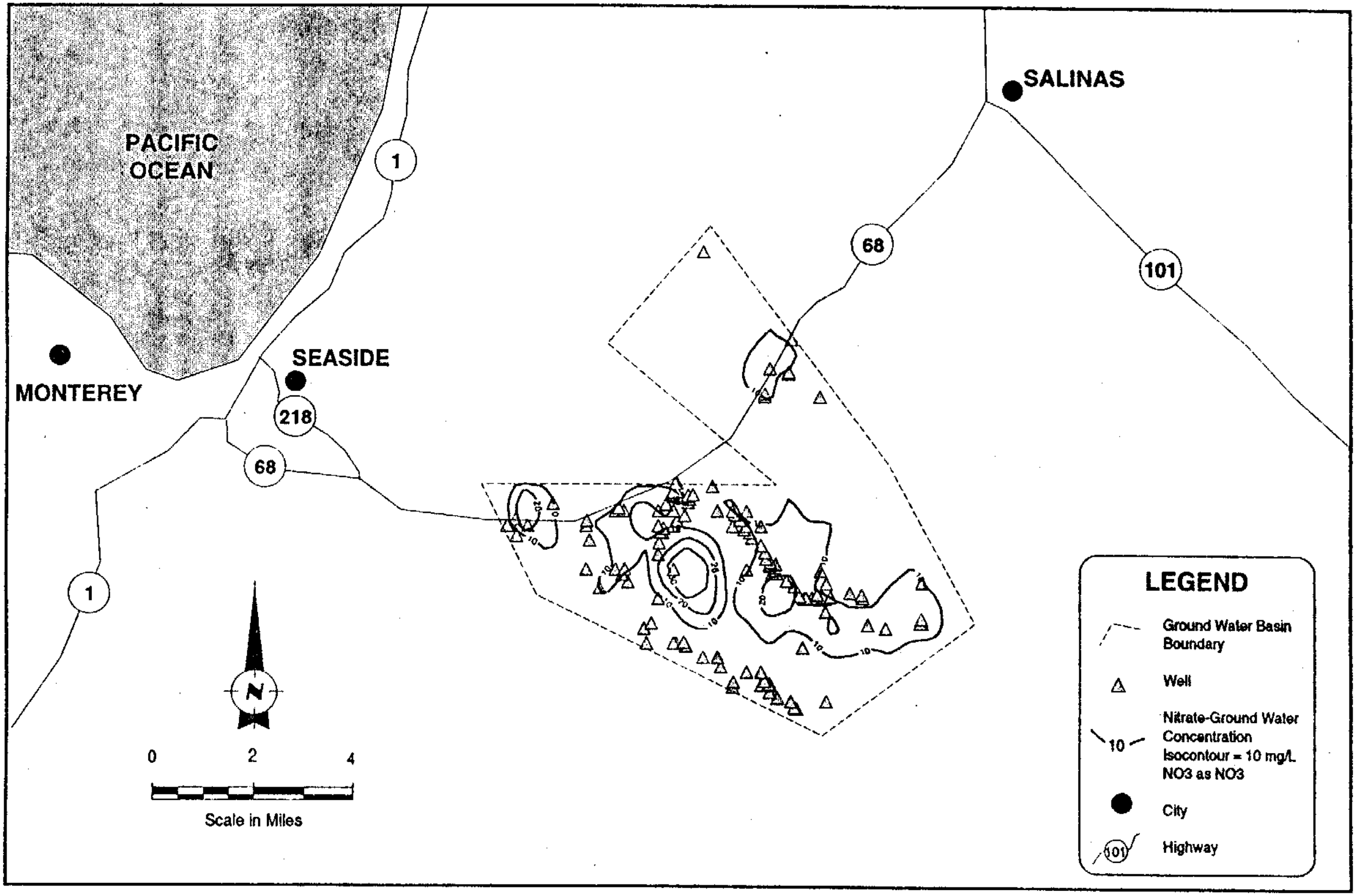


Figure IV-5. Overall Average Nitrate Concentrations in the Corral De Tierra Ground Water Basin

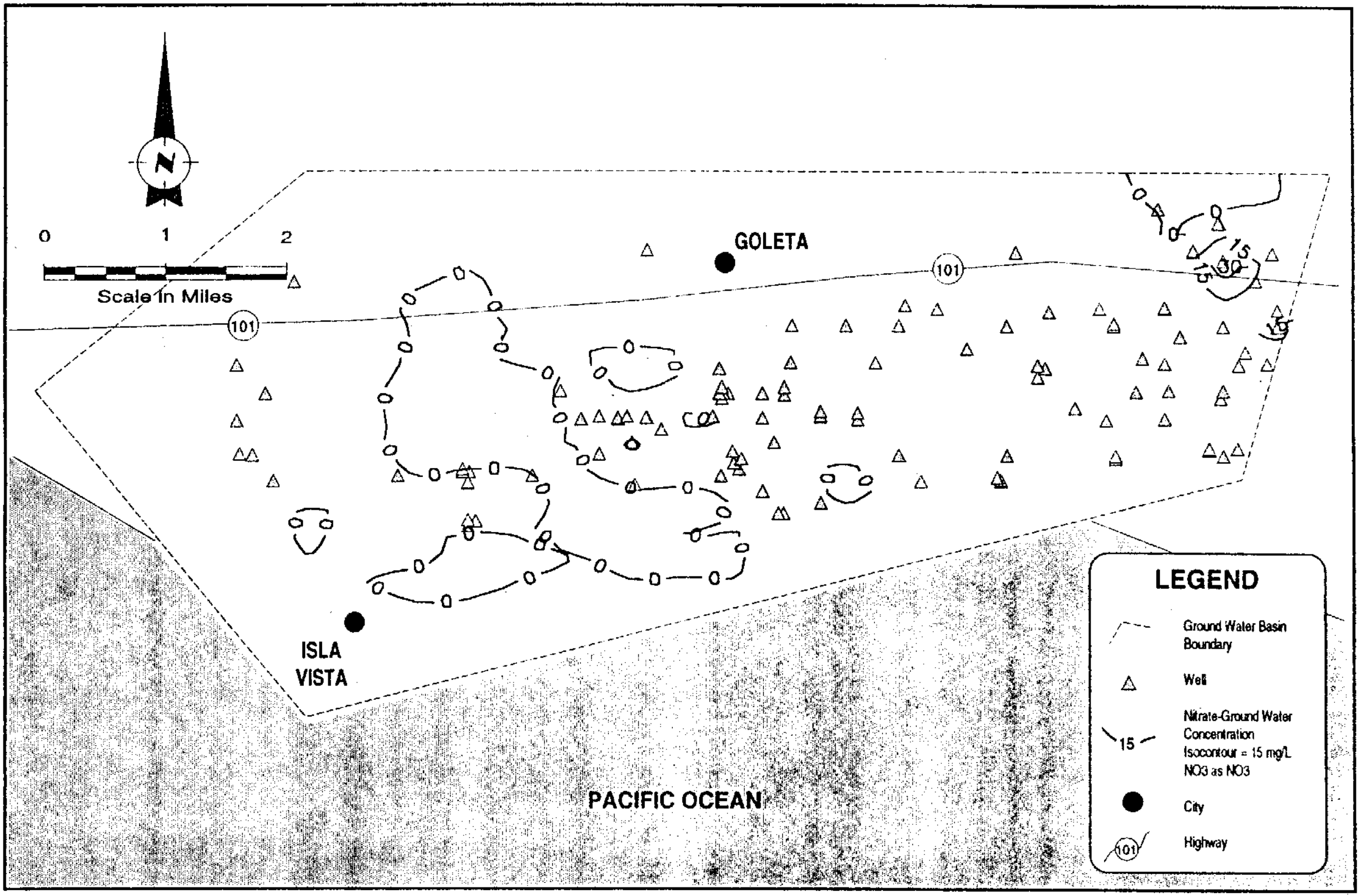


Figure IV-6. Overall Average Nitrate Concentrations in the Goleta Ground Water Basin

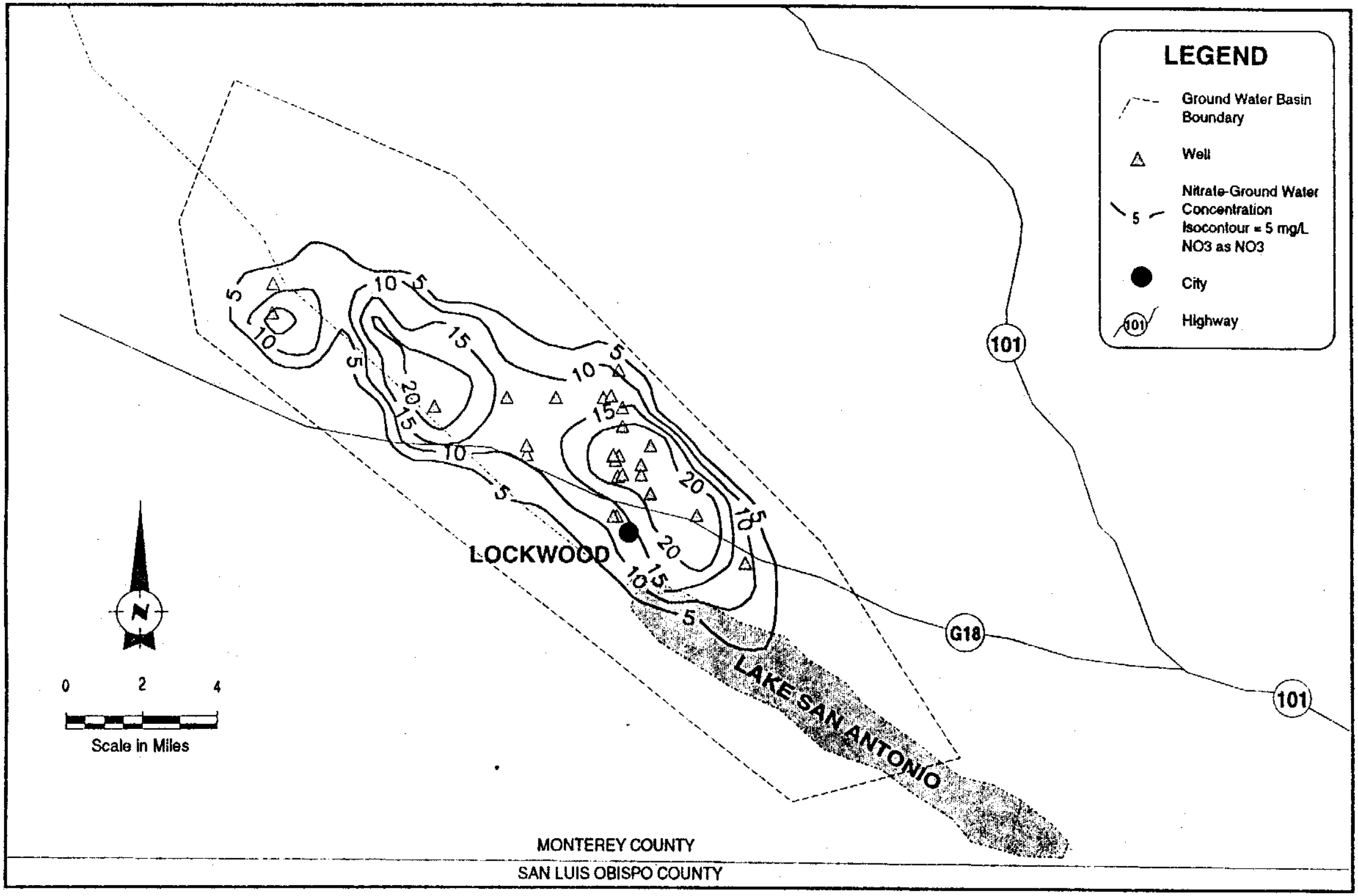


Figure IV-7. Overall Average Nitrate Concentrations in the Lockwood Valley Ground Water Basin

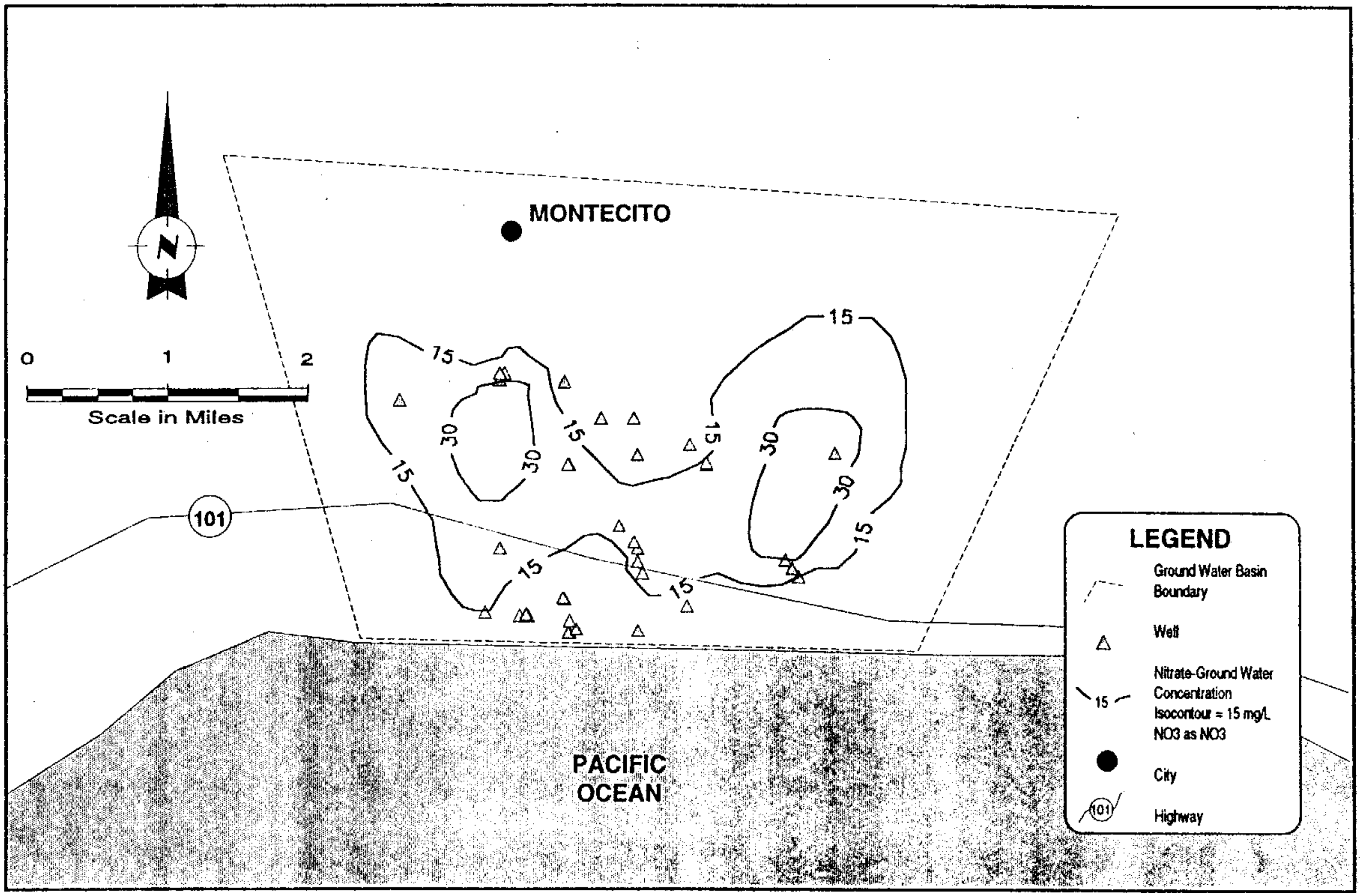


Figure IV-8. Overall Average Nitrate Concentrations in the Montecito Ground Water Basin

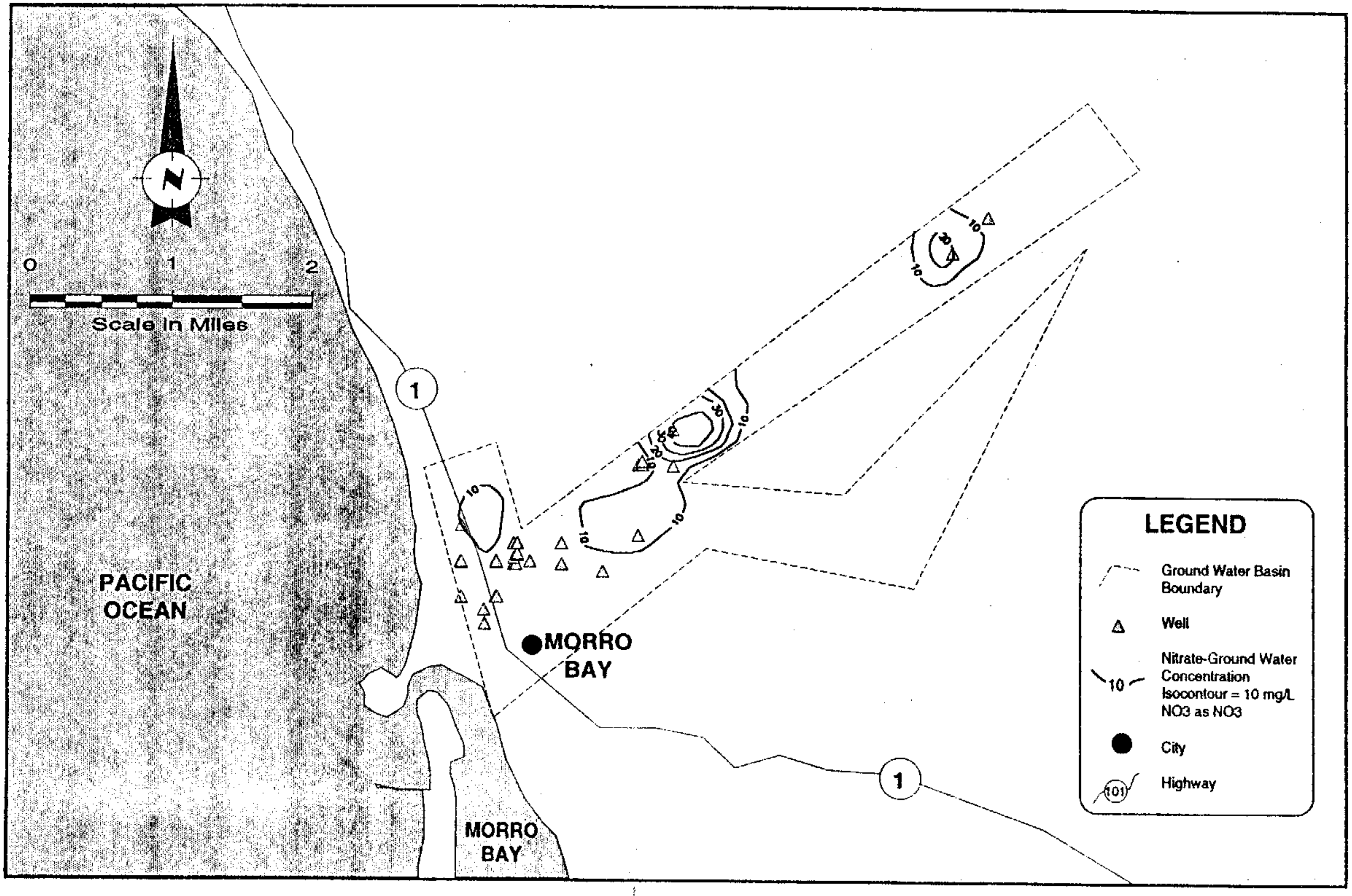


Figure IV-9. Overall Average Nitrate Concentrations in the Morro Valley Ground Water Basin

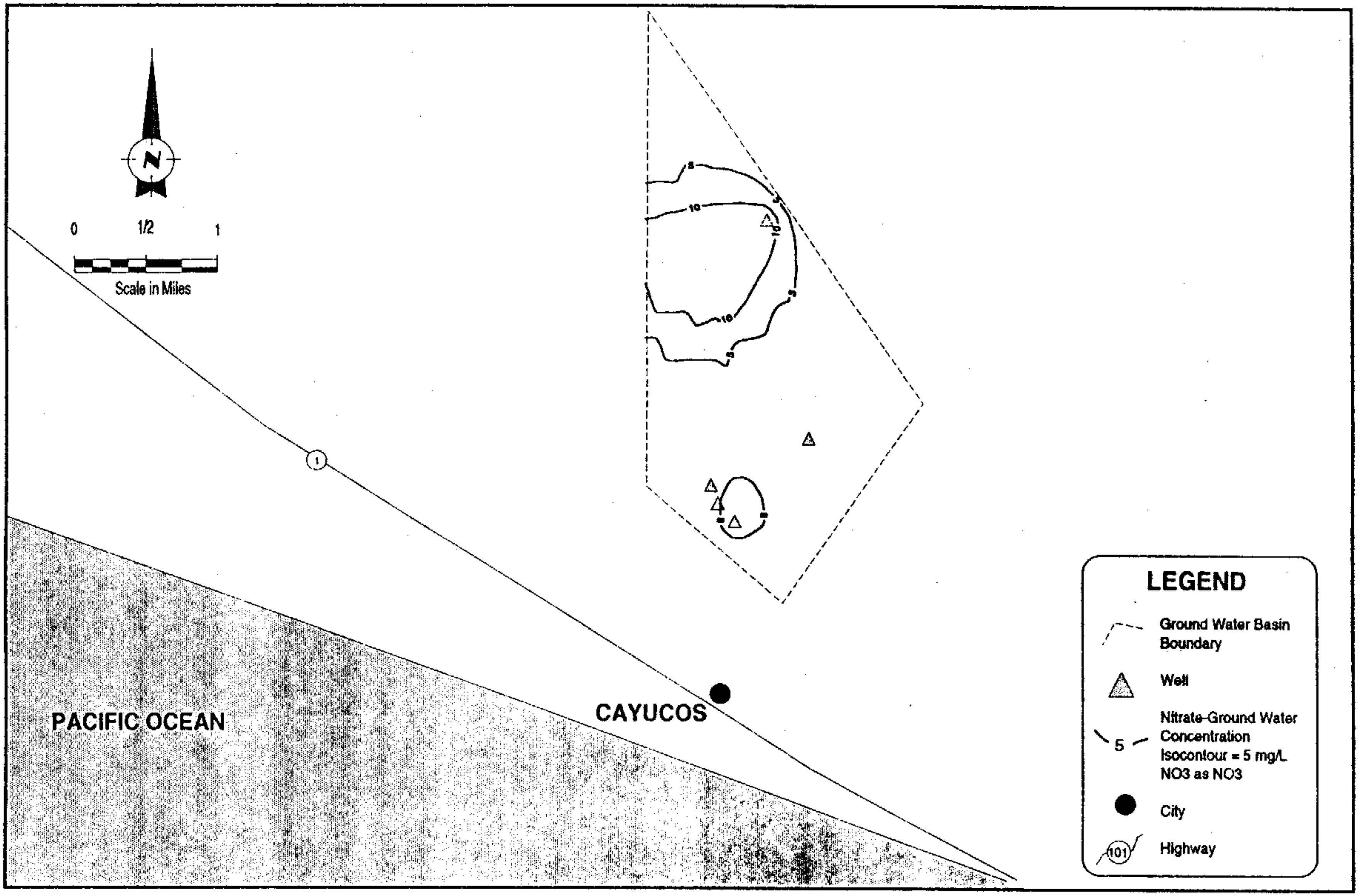


Figure IV-10. Overall Average Nitrate Concentrations in the Old Valley Ground Water Basin

3-46 **Rafael Valley** (southwestern San Luis County, west of Carrizo Plain). No nitrate data available.

3-43 **Rinconada Valley** (south of Santa Margarita, central San Luis Obispo County). Little nitrate data available; data from only four wells.

3-14 **San Antonio Creek Valley** (west coast of Santa Barbara County). Average high nitrate concentration is 30 mg/l nitrate, as NO3 (Figure IV-11).

3-28 **San Benito River Valley** (central San Benito County). Little data available; nitrate data for only three wells.

3-33 **San Carpoforo Valley** (north Coast of San Luis Obispo County, near Monterey County Line). No nitrate data available.

3-35 **San Simeon Valley** (northern central coast of San Luis Obispo County). Average high nitrate concentration is 15 mg/l nitrate, as NO3 (Figure IV-12).

3-22 **Santa Ana Valley** (north San Benito County, North of Hollister). No nitrate data available.

3-17 **Santa Barbara Basin** (south coast of Santa Barbara County). Average high nitrate concentration is 15 mg/l nitrate, as NO3 (Figure IV-13).

3-21 **Santa Cruz Purisima Formation Highlands** (northeast of Watsonville, north of Santa Cruz, central Santa Cruz County). Average high nitrate concentration is 4 mg/l nitrate, as NO3 (Figure IV-14).

3-36 **Santa Rosa Valley** (coastal basin in northern San Luis Obispo County). Average high nitrate concentration is 9 mg/l nitrate, as NO3 (Figure IV-15).

3-1 Soquel Valley (east of the City of Santa Cruz, coastal Santa Cruz County). Average high nitrate concentration is 3 mg/l nitrate, as NO3 (Figure IV-16).

3-40 **Toro Valley** (between Cayucos and Morro Bay, coastal San Luis Obispo County). Average high nitrate concentration is 5 mg/l nitrate, as NO3 (Figure IV-17).

3-25 **Tres Pinos Creek Valley** (southeast of Hollister, San Benito County). Little data available; nitrate data from only 8 wells.

3-23 **Upper Santa Ana Valley** (east of Hollister). No nitrate data available.

3-37 **Villa Valley** (central coast of San Luis Obispo County). Average high nitrate concentration is 30 mg/l nitrate, as NO3 (Figure IV-18).

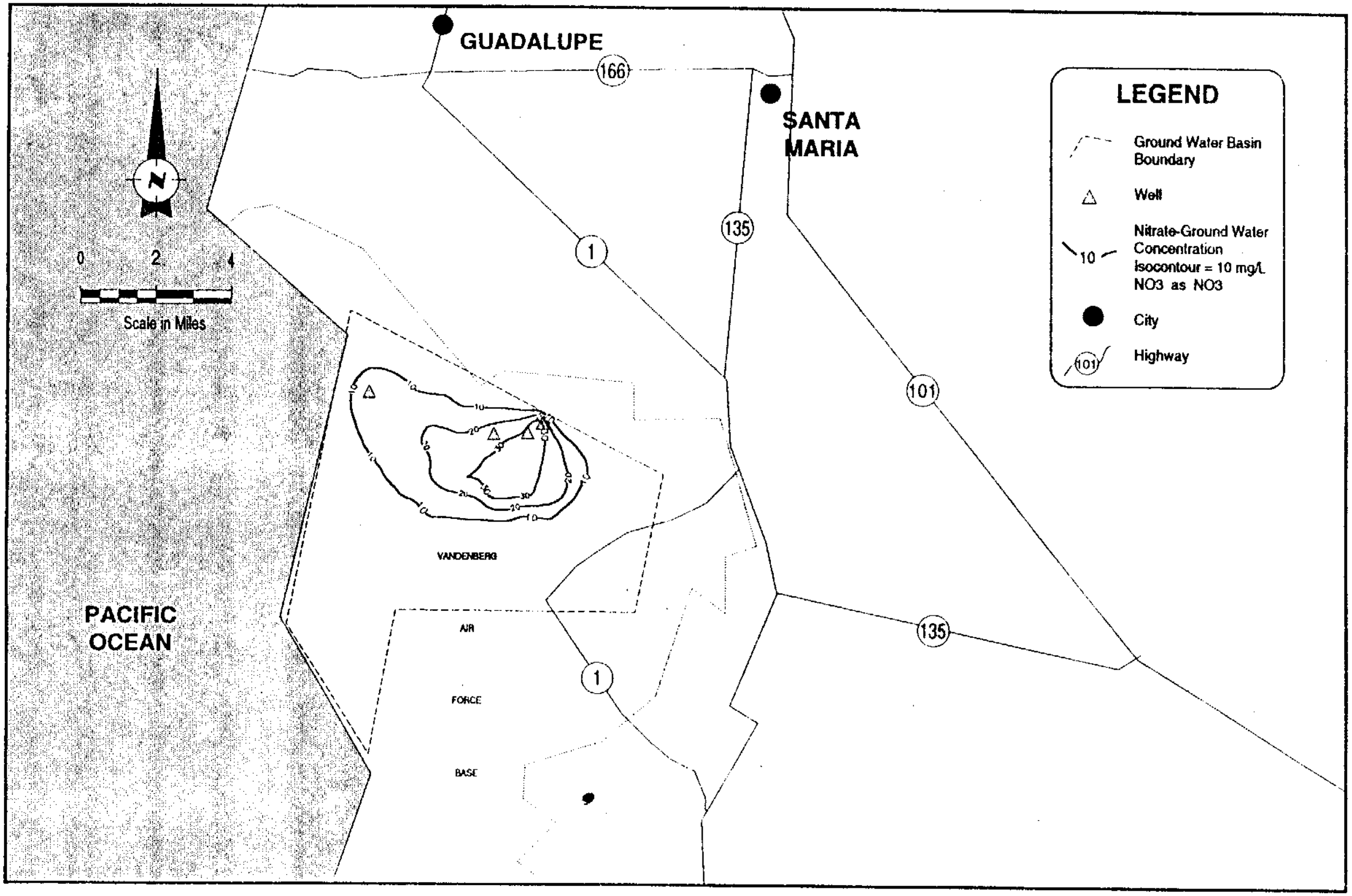


Figure IV-11. Overall Average Nitrate Concentrations in the San Antonio Valley Ground Water Basin

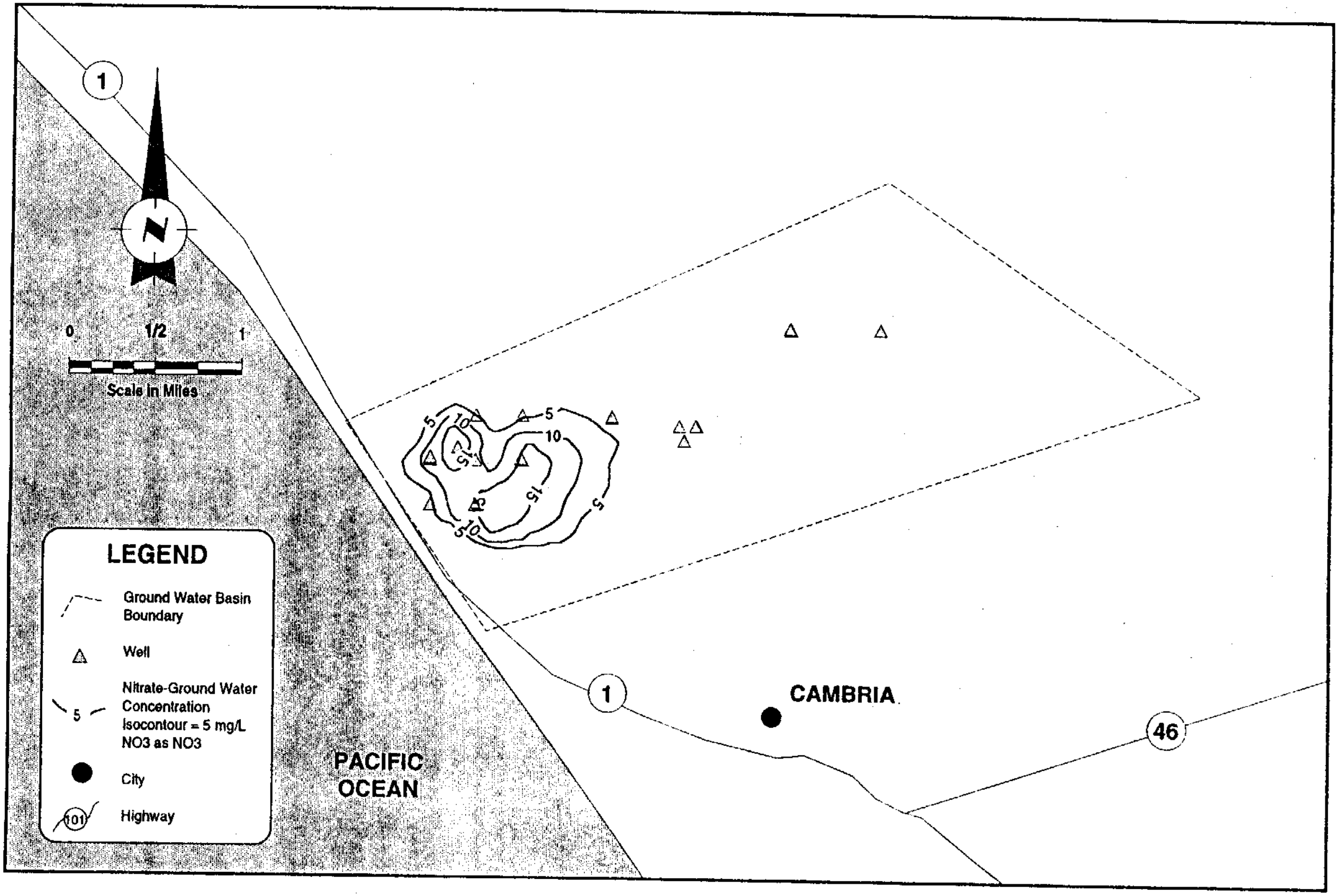


Figure IV-12. Overall Average Nitrate Concentrations in the San Simeon Valley Ground Water Basin

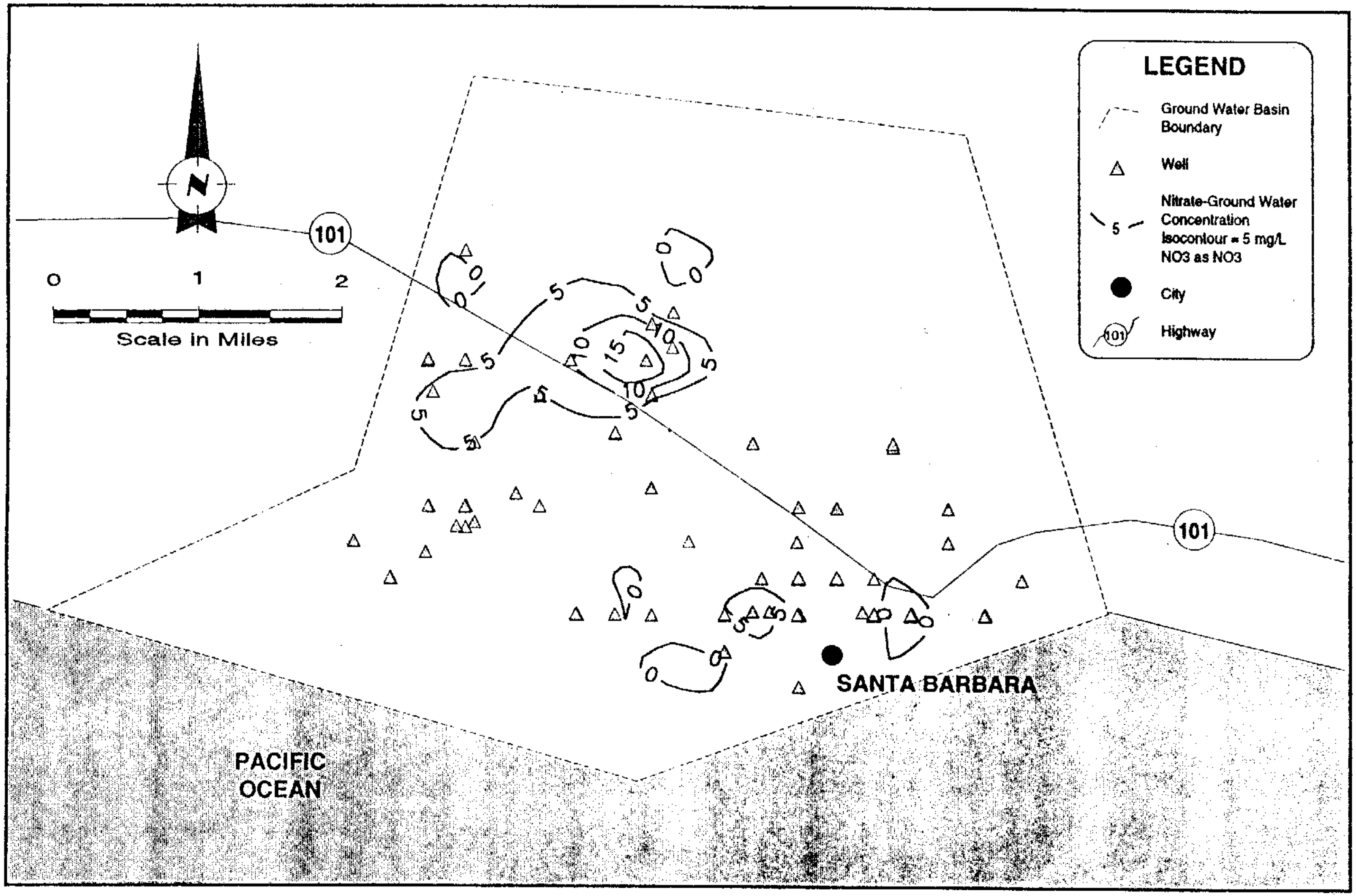


Figure IV-13. Overall Average Nitrate Concentrations in the Santa Barbara Ground Water Basin

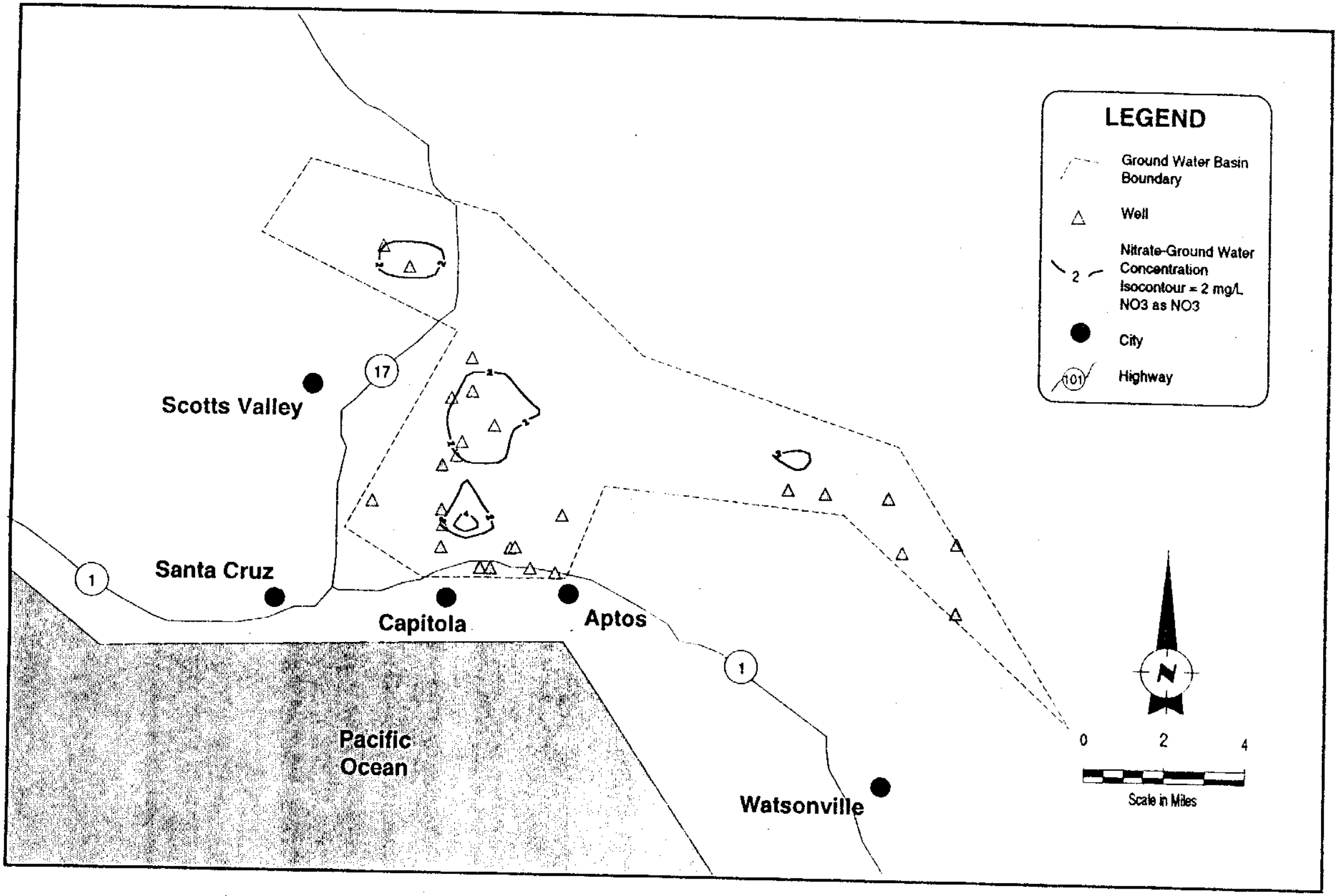


Figure IV-14. Overall Average Nitrate Concentrations in the Santa Cruz Purisima Formation Highlands Ground Water Basin

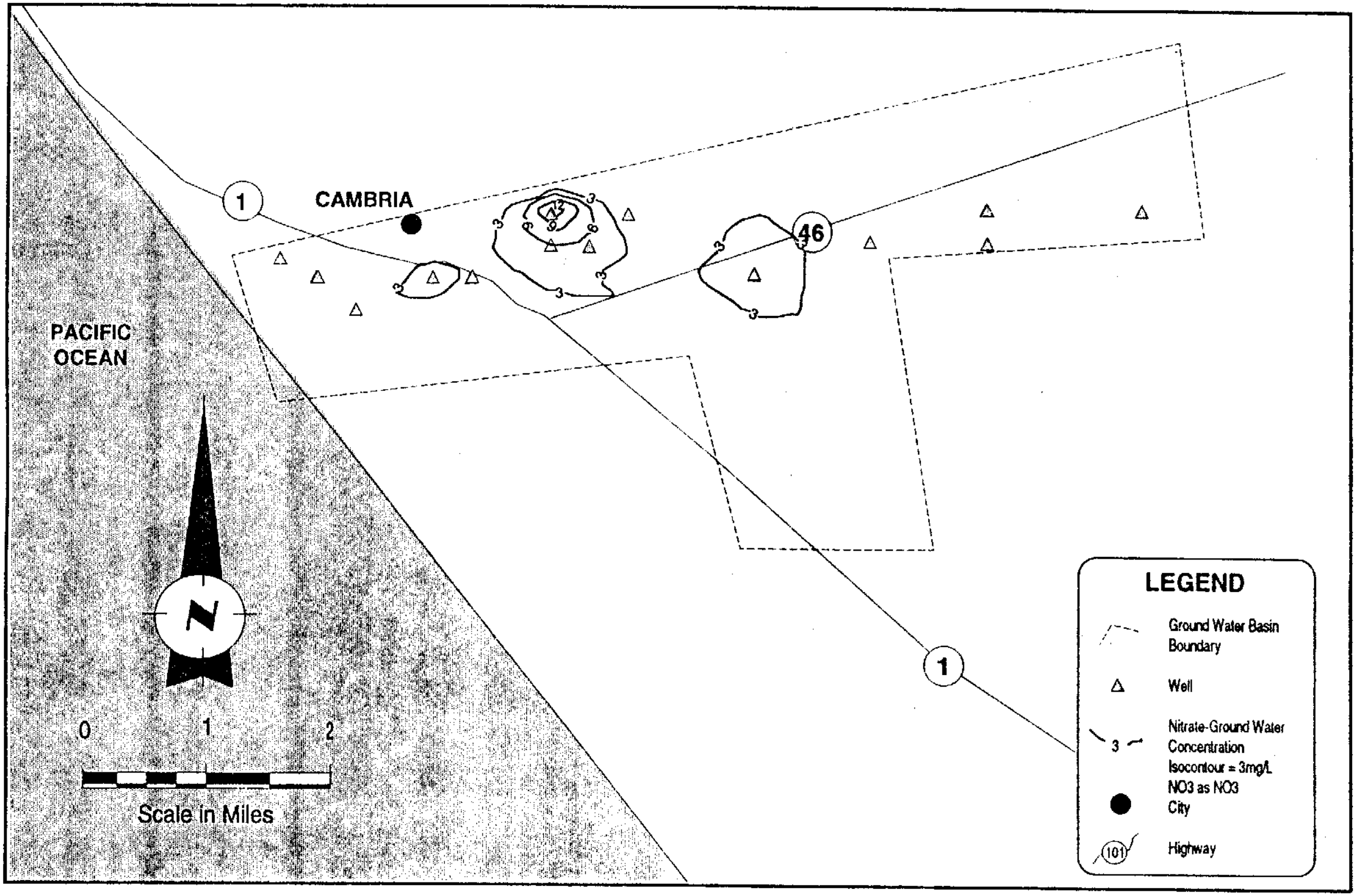


Figure IV-15. Overall Average Nitrate Concentrations in the Santa Rosa Valley Ground Water Basin

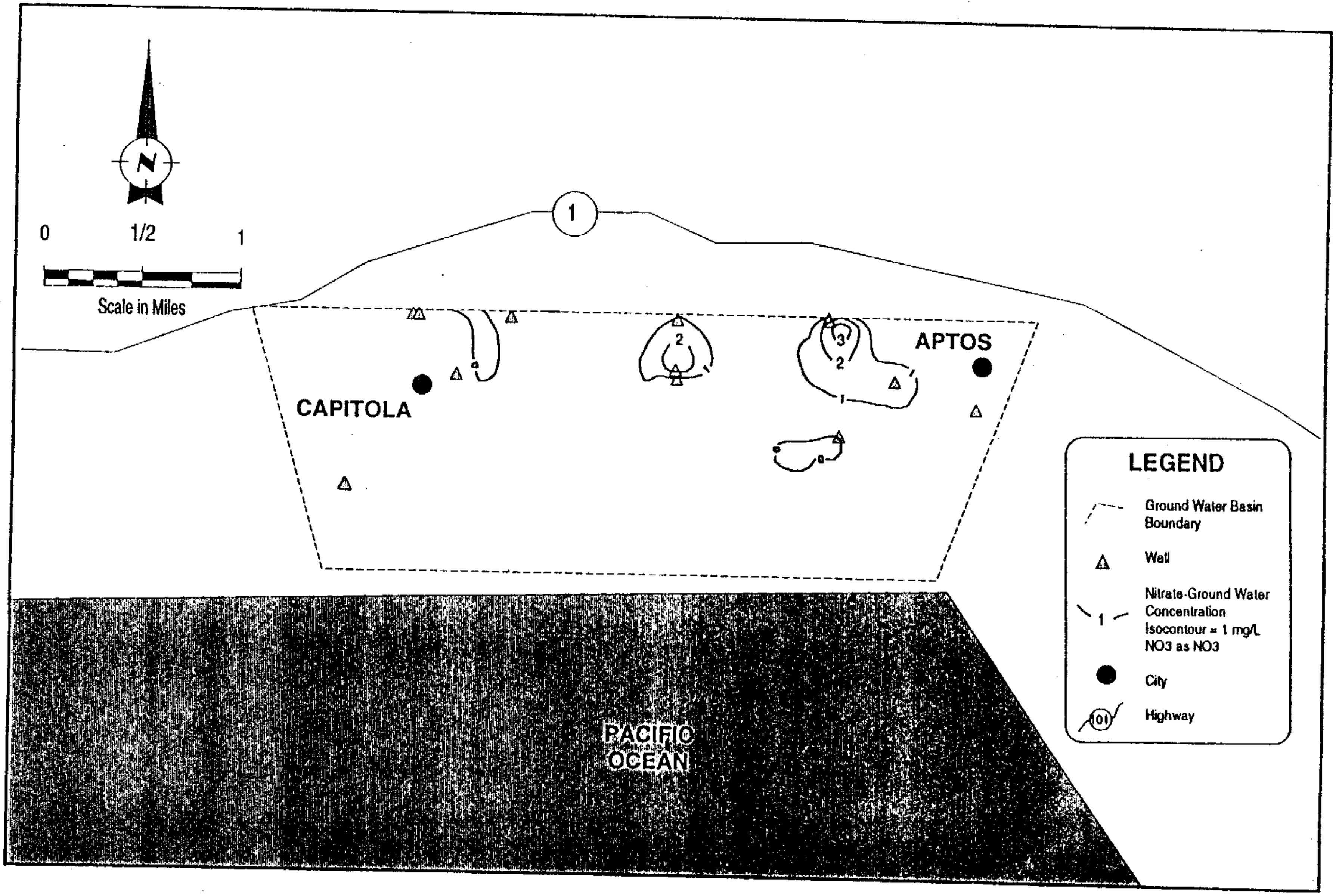


Figure IV-16. Overall Average Nitrate Concentrations in the Soquel Valley Ground Water Basin

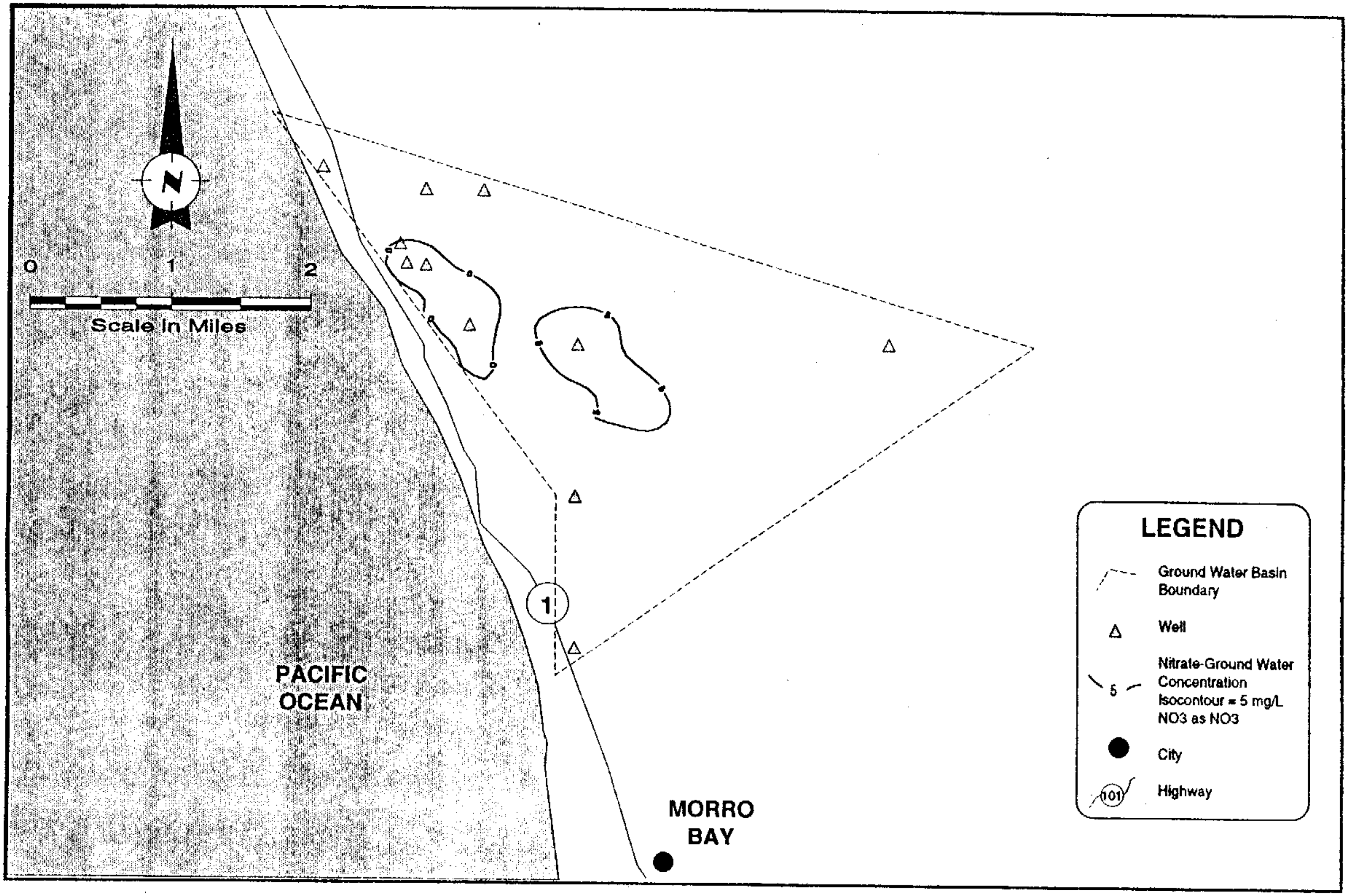


Figure IV-17. Overall Average Nitrate Concentrations in the Toro Valley Ground Water Basin

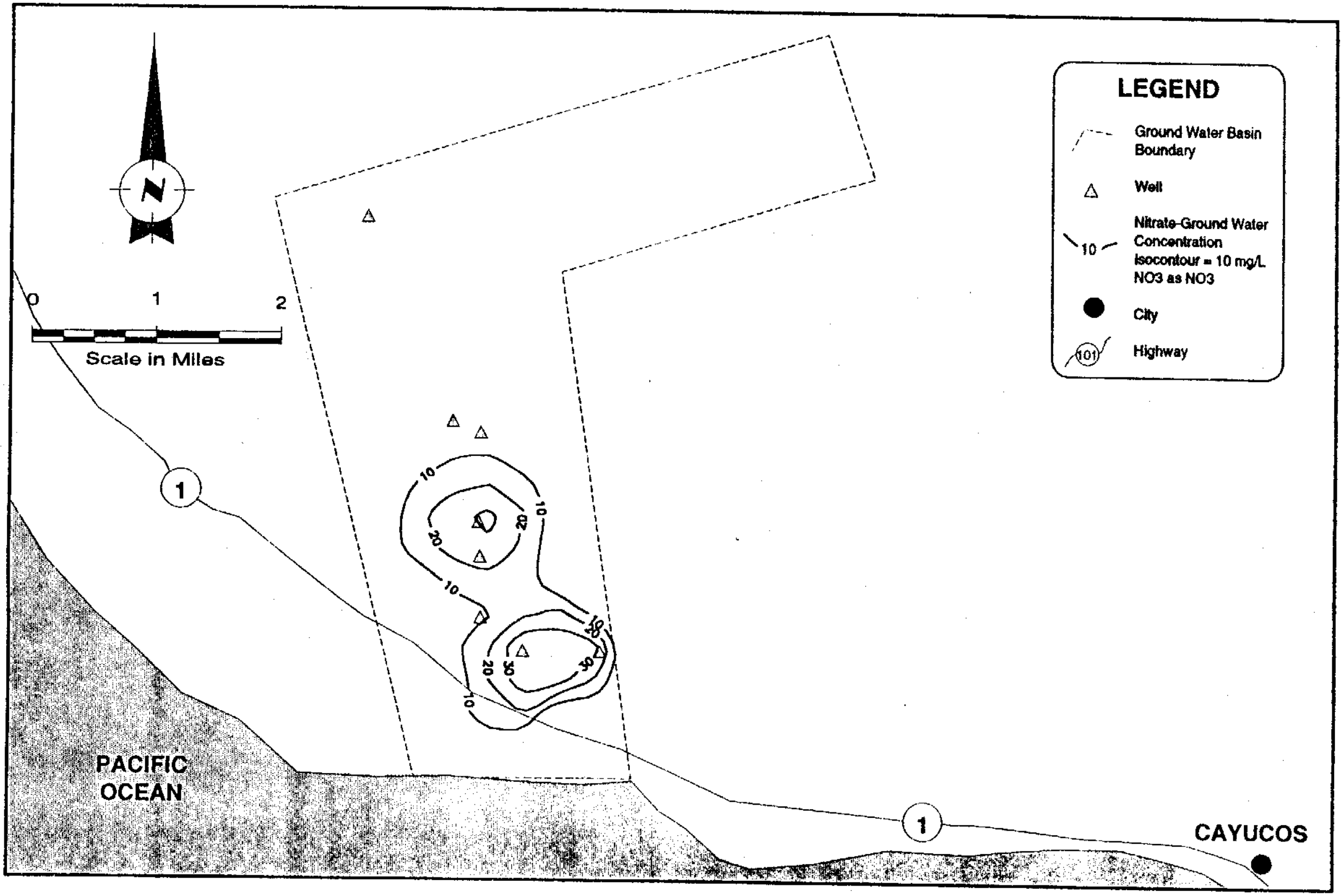


Figure IV-18. Overall Average Nitrate Concentrations in the Villa Valley Ground Water Basin

3-26 **West Santa Cruz Terrace** (central coast of Santa Cruz County). Little nitrate data available. All average nitrate values less than 5 mg/l nitrate, as NO3.

After this initial selection process, fifteen ground water basins remained. These basins have been identified as the known nitrate contaminated ground water basins of the Central Coast Region. Discussion of these basins follows in the next chapters of this report.

V. INDIVIDUAL EVALUATIONS OF PROBLEM GROUND WATER BASINS

Table V-1 lists the fifteen nitrate contaminated ground water basins in alphabetical order. Figure V-1 displays the locations of these fifteen ground water basins. Nitrate contour maps for each of the fifteen contaminated ground water basins are in the following chapters of this report in alphabetical order.

Table V-1. Contaminated Ground Water Basins of the Central Coast

BASIN NUMBER	BASIN NAME
3-11	Arroyo Grande Valley
3-19	Carrizo Plain
3-42	Chorro Valley
3-13	Cuyama Valley
3-3	Gilroy-Hollister Valley
3-4.09	Langley Canyon
3-8	Los Osos Valley
3-2	Pajaro Valley
3-4.06	Paso Robles
3-4	Salinas Valley
3-9	San Luis Obispo Valley
3-12	Santa Maria Valley
3-15	Santa Ynez Valley
3-27	Scotts Valley
3-4.08	Seaside Area

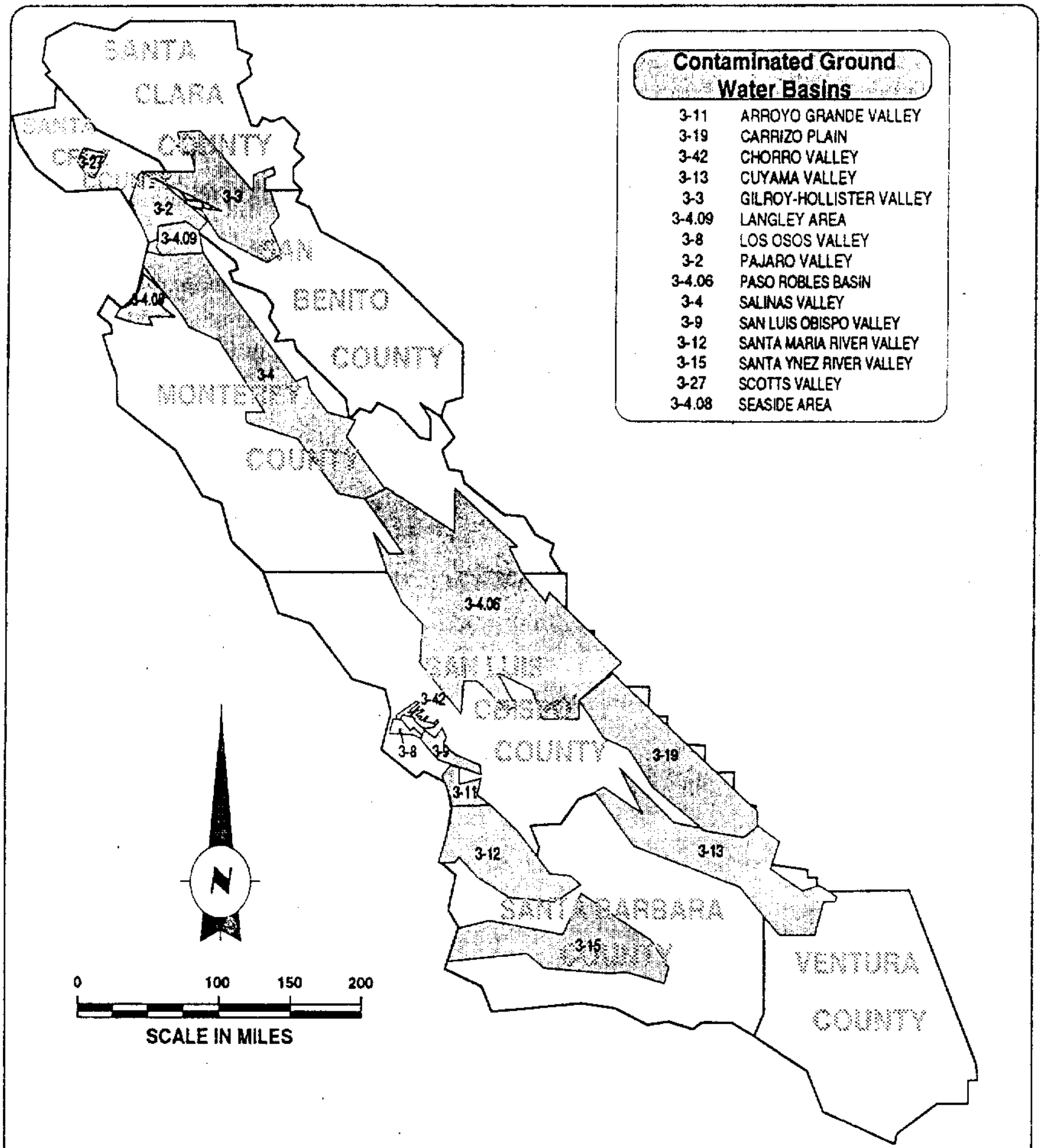


Figure V-1. Nitrate Contaminated Ground Water Basins of the Central Coast

VI. ARROYO GRANDE VALLEY GROUND WATER BASIN

Introduction

The Arroyo Grande ground water basin lies in southwestern San Luis Obispo County, with the Pacific Ocean along the western side of the basin and the northwestern trending Santa Lucia Mountains along the eastern side of the basin. This ground water basin services the Arroyo Grande, Grover Beach, Pismo Beach, and Oceano communities, where the Arroyo Grande Creek flood plain supports extensive farming activities.

Nitrate Concentrations in the Arroyo Grande Valley Ground Water Basin

Although the hydrogeology of the Arroyo Grande Valley ground water basin consists of a complex system of semi-confining clay and silty clay layers (DWR, 1979), the perforation data for the wells in this area are inadequate to divide up the nitrate data to different aquifer layers. Therefore, for the purposes of this assessment, the Arroyo Grande Valley ground water basin is treated as a single aquifer. However, Regional Board staff obtained sufficient nitrate data to divide the maps for this basin into the following time periods: 1950 to 1964, 1965 to 1979, and 1980 to 1993 (Figures VI-1, VI-2, and VI-3, respectively).

Sporadic sampling in the later half of the 1980 to 1993 time period may cause an inaccurate portrayal of current nitrate concentrations seen in Figure VI-3. In fact, many wells exhibiting nitrate contamination in earlier years were not sampled during these later years. Additionally, the limited number of wells with data for this time period and the resulting increased amount of interpolation required in the contouring process further reduce the reliability of the nitrate contour lines. High nitrate concentrations may still exist in the 1980 to 1993 time period, but without sufficient data full confidence can not be given to the nitrate contour lines seen in Figure VI-3.

The Regional Board recommends further monitoring of the Arroyo Grande Valley ground water basin to identify the extent and magnitude of current nitrate concentrations. Specifically, the wells (or wells within their vicinity), shown in Table VI-1, require additional sampling.

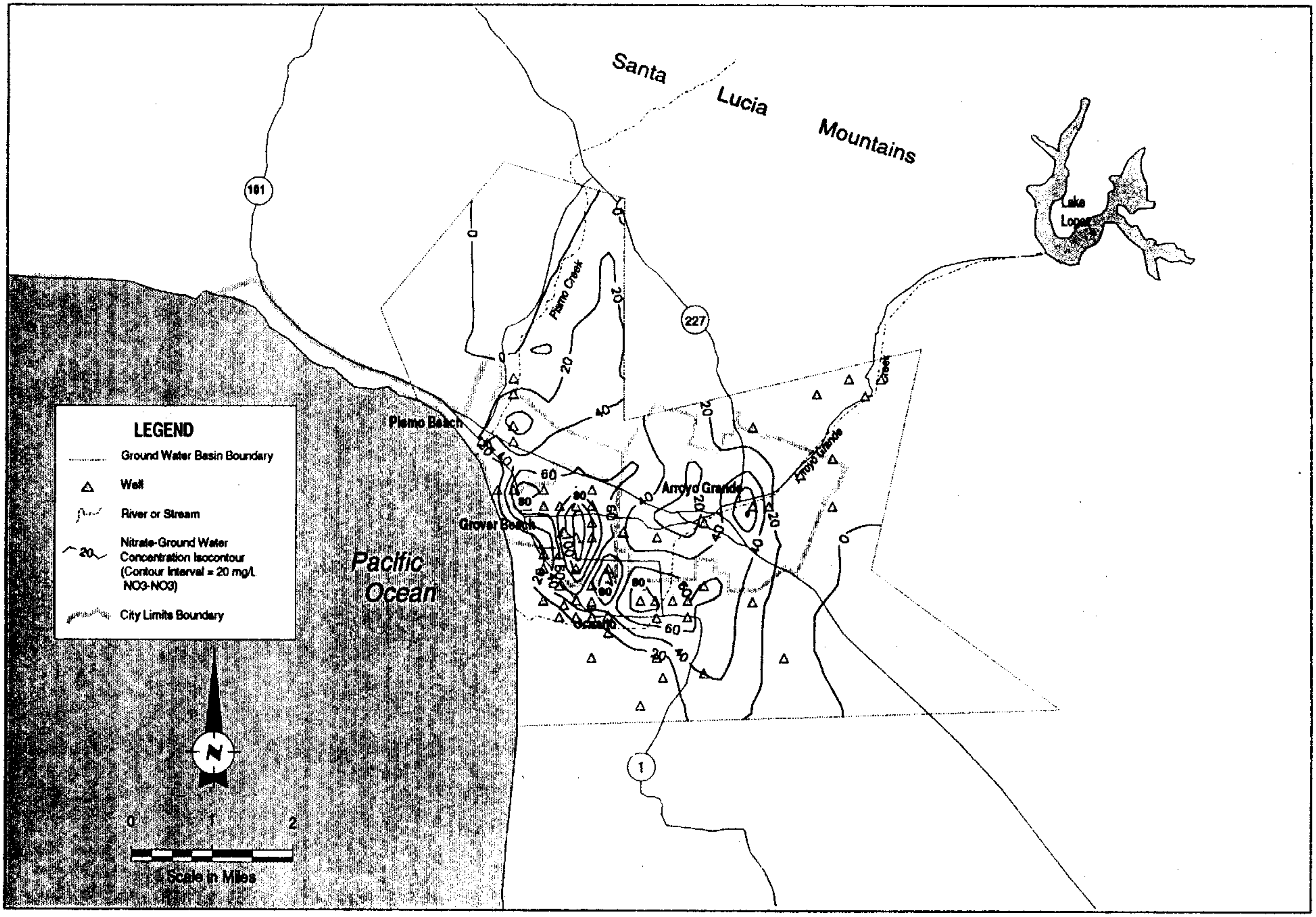


Figure VI-1. Average Nitrate Concentrations in the Arroyo Grande Valley Ground Water Basin from 1950 to 1964

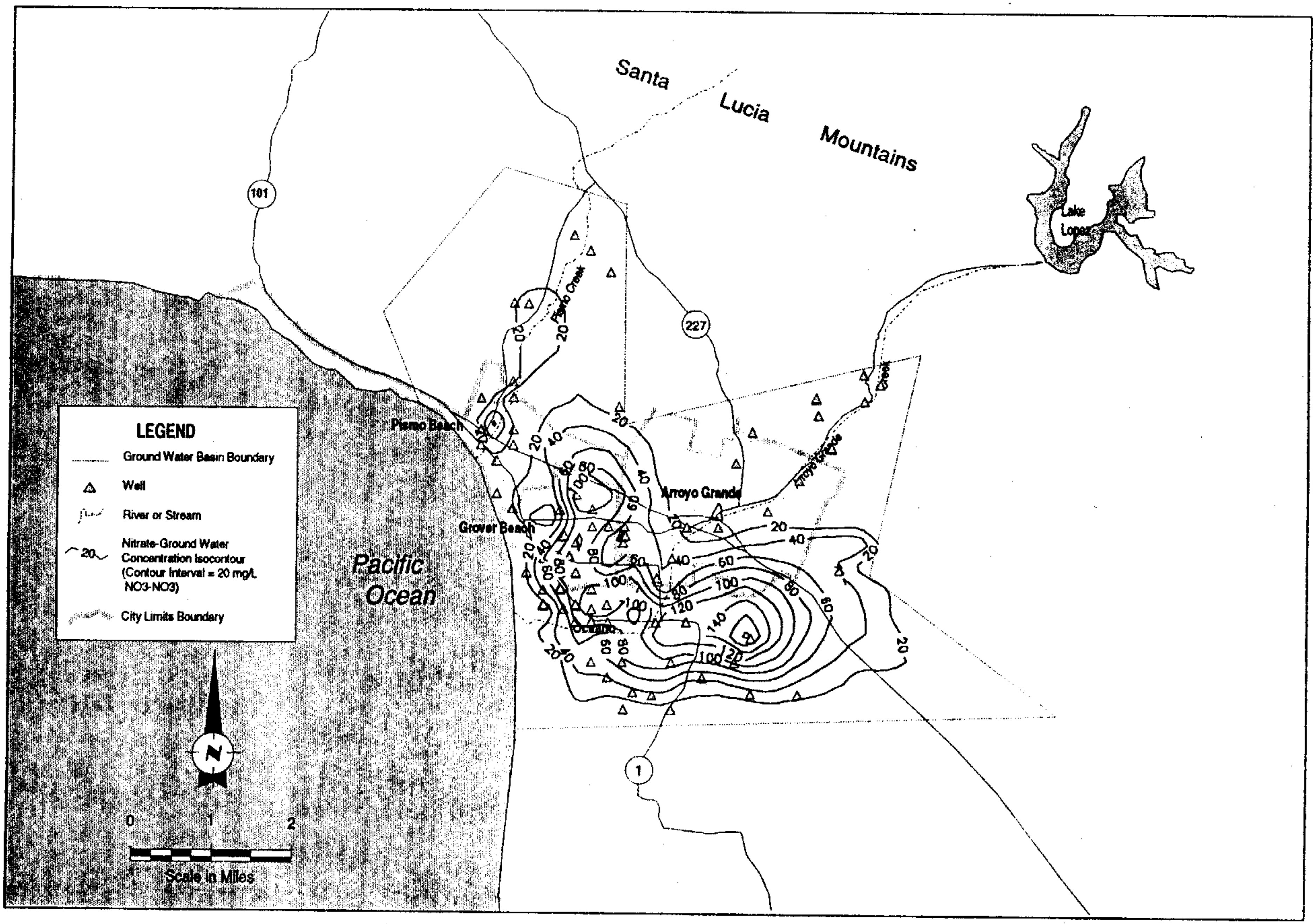


Figure VI-2. Average Nitrate Concentrations in the Arroyo Grande Valley Ground Water Basin from 1965 to 1979

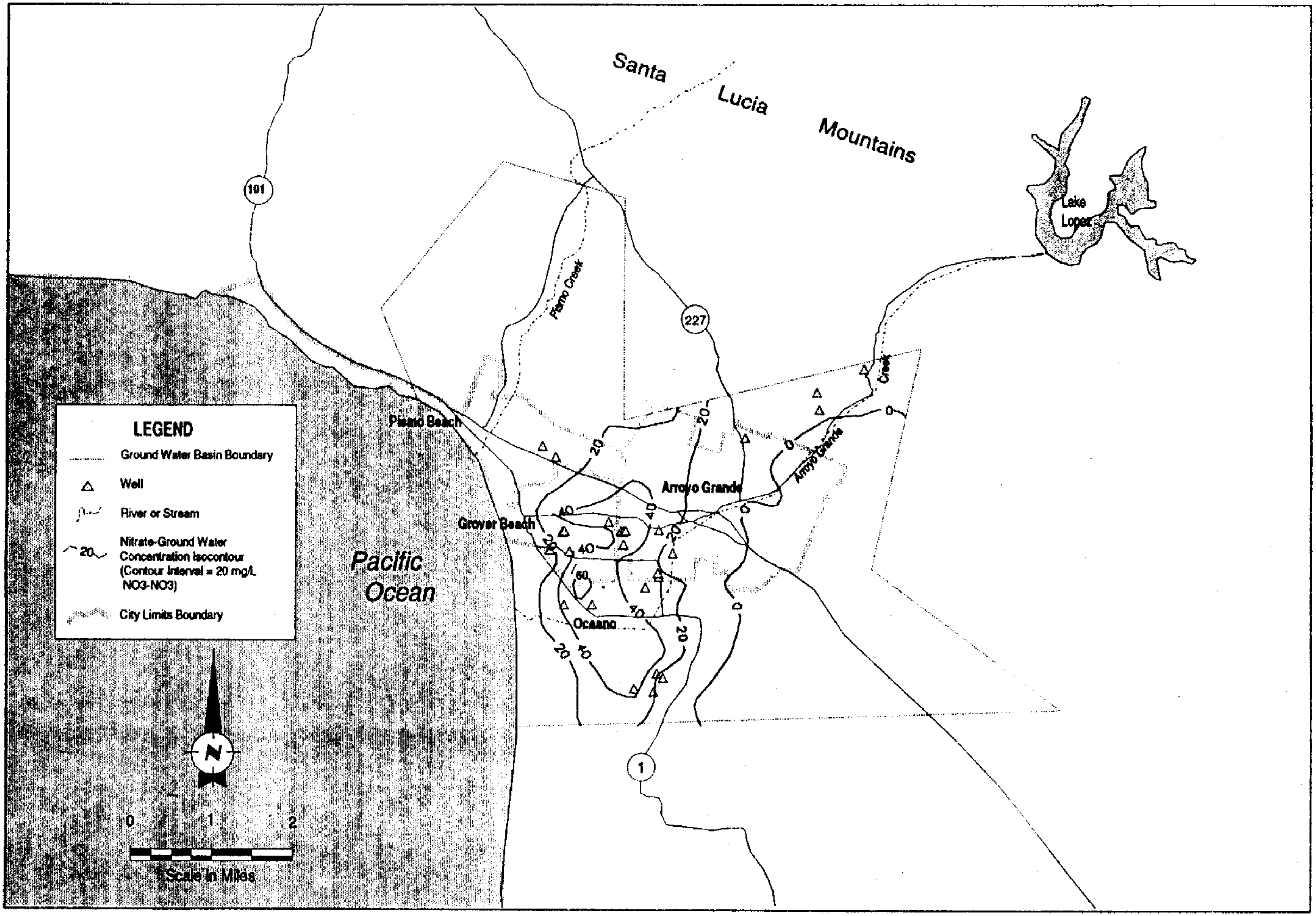


Figure VI-3. Average Nitrate Concentrations in the Arroyo Grande Valley Ground Water Basin from 1980 to 1993

Table VI-1. Wells Recommended for Further Testing in the Arroyo Grande Valley Ground Water Basin.

32S/13E-19J02	32S/13E-30P01	32S/13E-32M04
32S/13E-19L01	32S/13E-30Q02	32S/13E-33A03
32S/13E-19N01	Q04	32S/13E-33E03
32S/13E-19P01	32S/13E-30R01	32S/13E-33F01
32S/13E-19Q01	J03	32S/13E-33G01
32S/13E-19R01	32S/13E-31B01	32S/13E-33K01
32S/13E-20M01	B03	K03
32S/13E-20N05	B05	32S/13E-33M02
32S/13E-22Q01	B09	32S/13E-34Q01
32S/13E-29B01	32S/13E-31H01	32S/12E-13J01
32S/13E-29E01	H03	J02
E02	H04	J03
E05	32S/13E-31J02	32S/12E-13R01
E07	J03	32S/12E-24J01
32S/13E-29D01	32S/13E-32A01	12N/35W-29L01
D04	32S/13E-32C02	12N/35W-30K03
32S/13E-29G13	32S/13E-32D01	12N/35W-30M02
32S/13E-29P01	D04	
32S/13E-30H01	D09	Grande Mobile Manor wells
H02	32S/13E-32E02	(Specifically well 2)
32S/13E-30K04	32S/13E-32F15	
K05	32S/13E-32H01	
K17	32S/13E-32L02	
32S/13E-30L02		

References

California Department of Water Resources Southern District (DWR). "Ground Water in the Arroyo Grande Area." District Report, 1979.

VII. CARRIZO PLAIN GROUND WATER BASIN

Introduction

The Carrizo Plain ground water basin is located in southeastern San Luis Obispo County, where the Temblor mountain range, in the east, and the Caliente Range, on the west, form the boundaries of the plain. The community of California Valley also lies in this region.

Nitrate Concentrations in the Carrizo Plain Ground Water Basin

The hydrogeology of the Carrizo Plain forms a very complicated picture with several different geologic formations throughout the basin. While there is evidence that confined ground water exists in some areas (Kemnitzer, 1967), the exact locations of confined ground water in the Carrizo Plain basin are not known. Furthermore, a lack of well perforation information made it impossible for Regional Board staff to compare nitrate concentrations at different vertical ground water depths. Therefore, for mapping purposes, this ground water basin is considered a single connected hydrologic unit.

Because of sparse ground water sampling information, the mapping program was used to create a single map representing the average nitrate concentrations in the Carrizo Plain ground water basin from 1953 to 1990 (Figure VII-1). Therefore, the change in nitrate concentrations over time can not be analyzed.

This one map, however, exhibits the widespread high nitrate concentrations in the Carrizo Plain ground water basin. Areas in the north and south ends of the basin show average nitrate concentrations at almost triple the Maximum Contaminant Level of 45 mg/l nitrate, as NO3. In addition, another nitrate plume exists near Soda Lake. At this location, average concentrations approach 120 mg/l nitrate, as NO3.

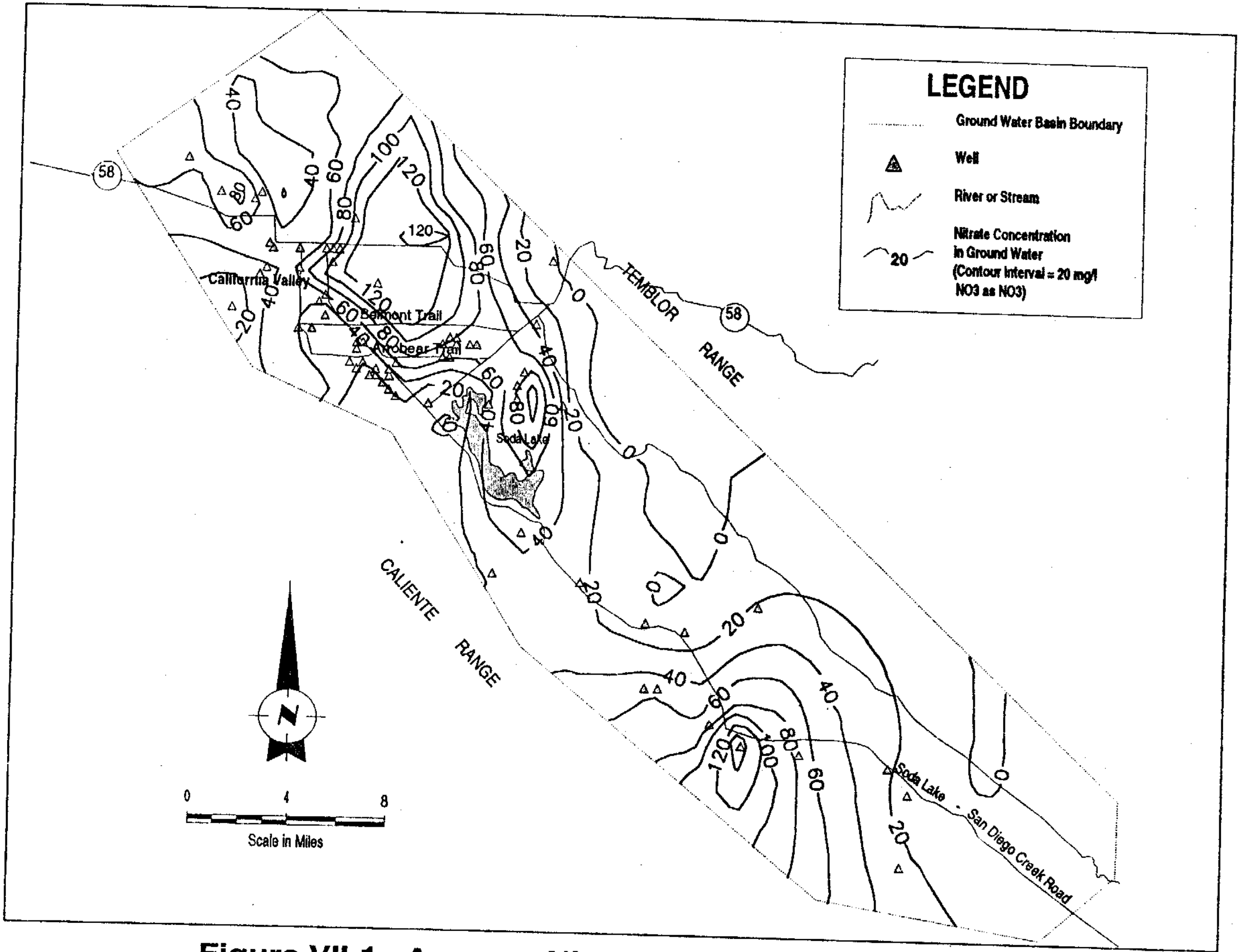


Figure VII-1. Average Nitrate Concentrations in the Carrizo Plain Ground Water Basin

While the average nitrate concentrations in the basin are very high, little current information exists. To determine the extent and magnitude of the nitrate concentrations in the basin, the Regional Board recommends further sampling of many of the wells in the Carrizo Plain ground water basin. The following wells (or wells within their vicinity) should be sampled for evidence of nitrate contamination.

Table VII-1. Wells Recommended for Further Testing in the Carrizo Plain Ground Water Basin.

12N/27W-36E01	30S/20E-30K01	29S/18E-28L01
12N/26W-32M02	30S/18E-01D01	29S/18E-28G01
32S/21E-32J01	30S/18E-01C01	29S/18E-29G01
32S/20E-25H01	30S/18E-01B01	29S/18E-29E01
32S/20E-25F01	30S/18E-01L01	29S/17E-13R01
30S/20E-31L01	30S/19E-08E01	29S/17E-13R02
30S/20E-31C01		

References

Kemnitzer, W.J. "Ground water in the Carrizo Plain, San Luis Obispo County, California. Report of Investigations." 1967.

VIII. CHORRO VALLEY GROUND WATER BASIN

Introduction

The Chorro Valley ground water basin lies in the central and western portion of San Luis Obispo County. Extending eight to ten miles inland from Chorro Creek's mouth at the Pacific Ocean, this coastal basin is bound on the southwest by a series of volcanic peaks and on the northeast by the Santa Lucia Mountains. The City of Morro Bay, which lies northwest of the basin, receives a portion of drinking water from the Chorro Valley ground water basin.

The Paso Robles Formation and Recent Alluvium comprise the two most important water storage units (Brown and Caldwell, 1981). Although the Paso Robles Formation includes confined aquifers, Regional Board staff could not obtain information regarding specific areas of confinement.

Nitrate Concentrations in the Chorro Valley

The contour maps, Figures VIII-1 through VIII-3, which compare the three time periods of 1951 to 1963, 1964 to 1979, and 1980 to 1992, do not indicate a nitrate problem in the Chorro Valley. Although wells with nitrate readings exceeding the Maximum Contaminant Level do exist, because the isocontour maps are drawn based on well averages, these high readings are not evident in Figures VIII-1 through VIII-3. The maps display the highest nitrate concentrations near the confluence of San Bernardo and Chorro Creek.

Due to the limited amount of water quality data in the eastern half of the basin, the Regional Board encourages further sampling of the wells in this area. Table VIII-1 lists specific wells recommended for further sampling in this area.

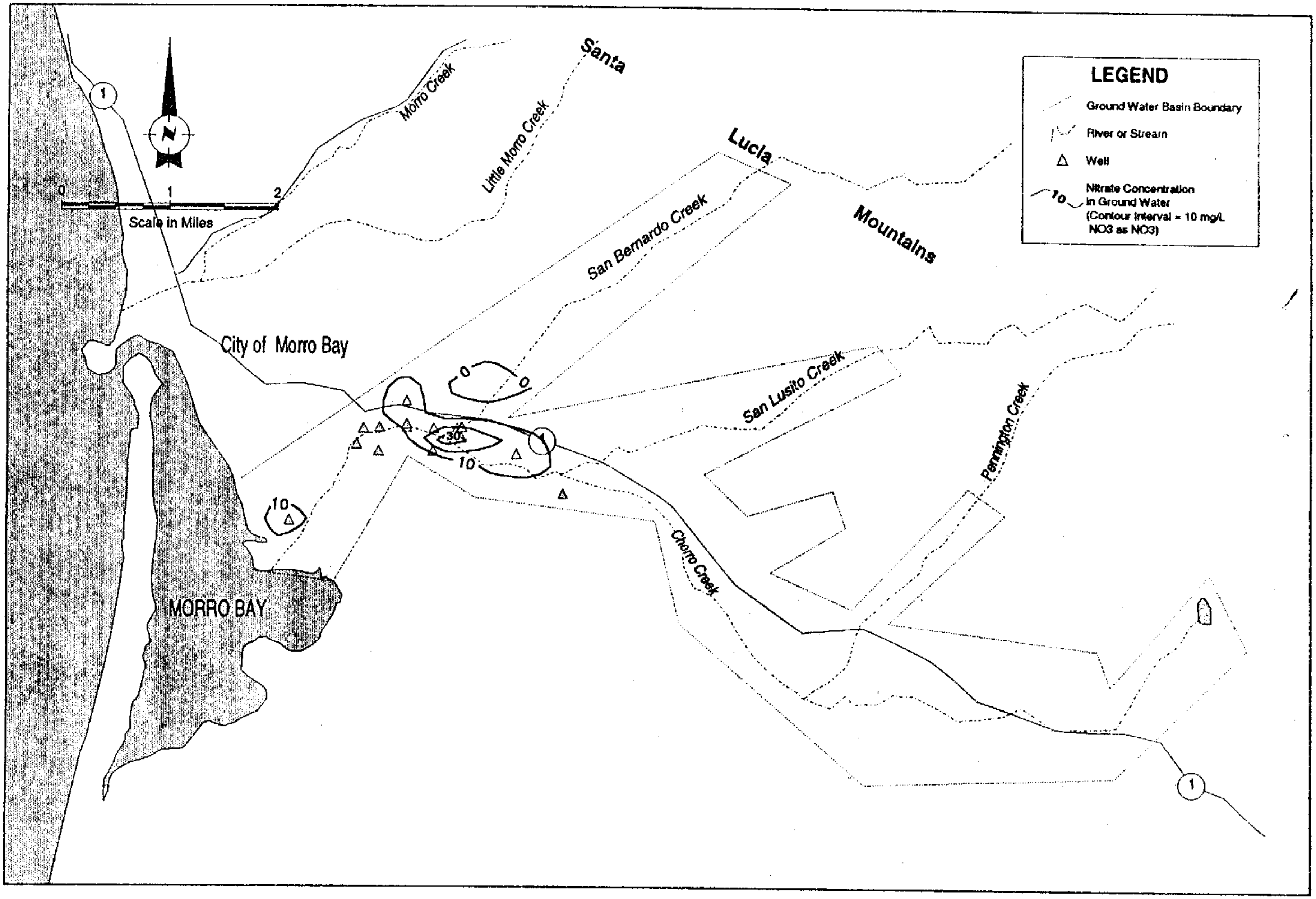


Figure VIII-1. Average Nitrate Concentrations in the Chorro Valley Ground Water Basin from 1951 to 1963

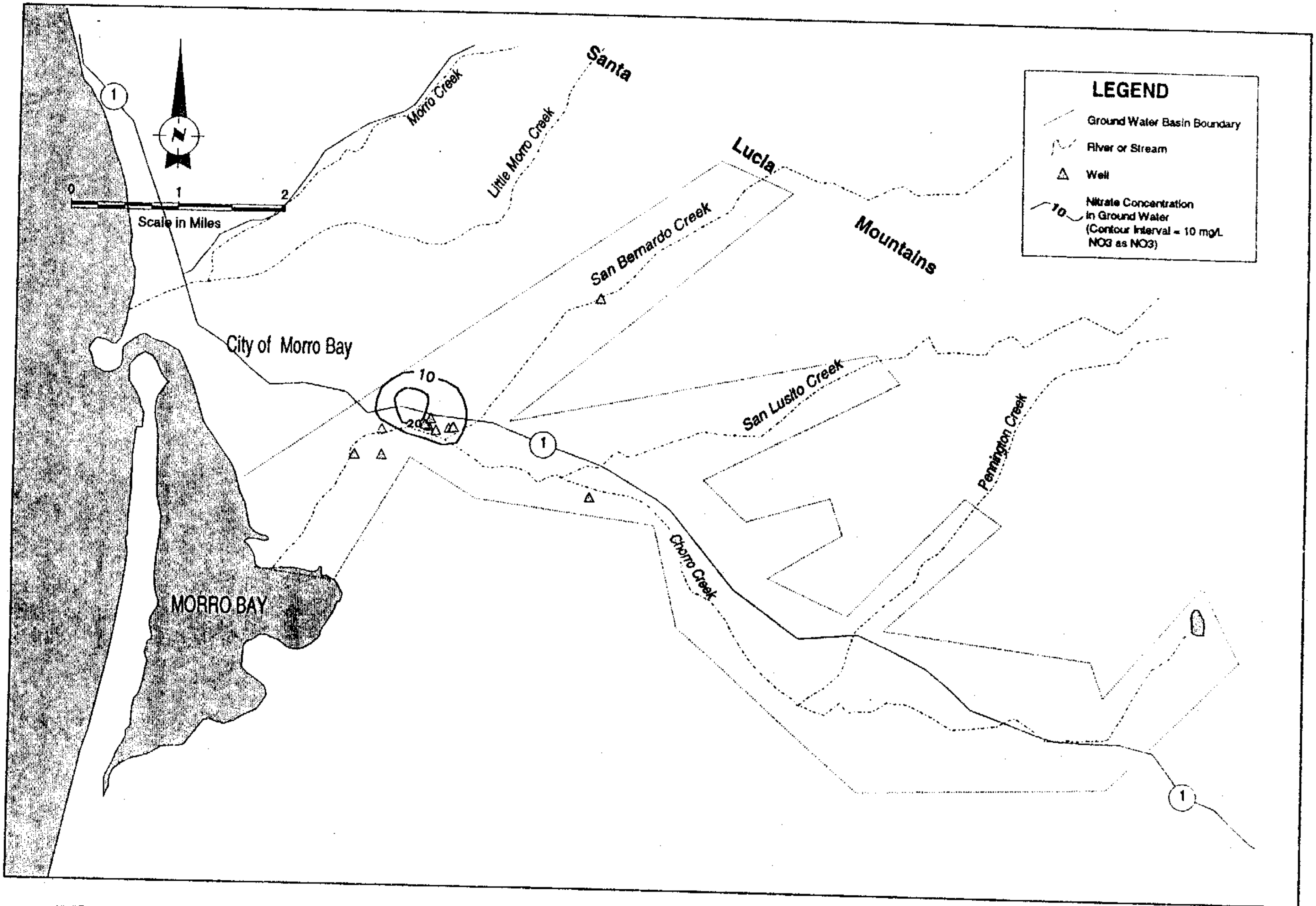


Figure VIII-2. Average Nitrate Concentrations in the Chorro Valley Ground Water Basin from 1964 to 1979

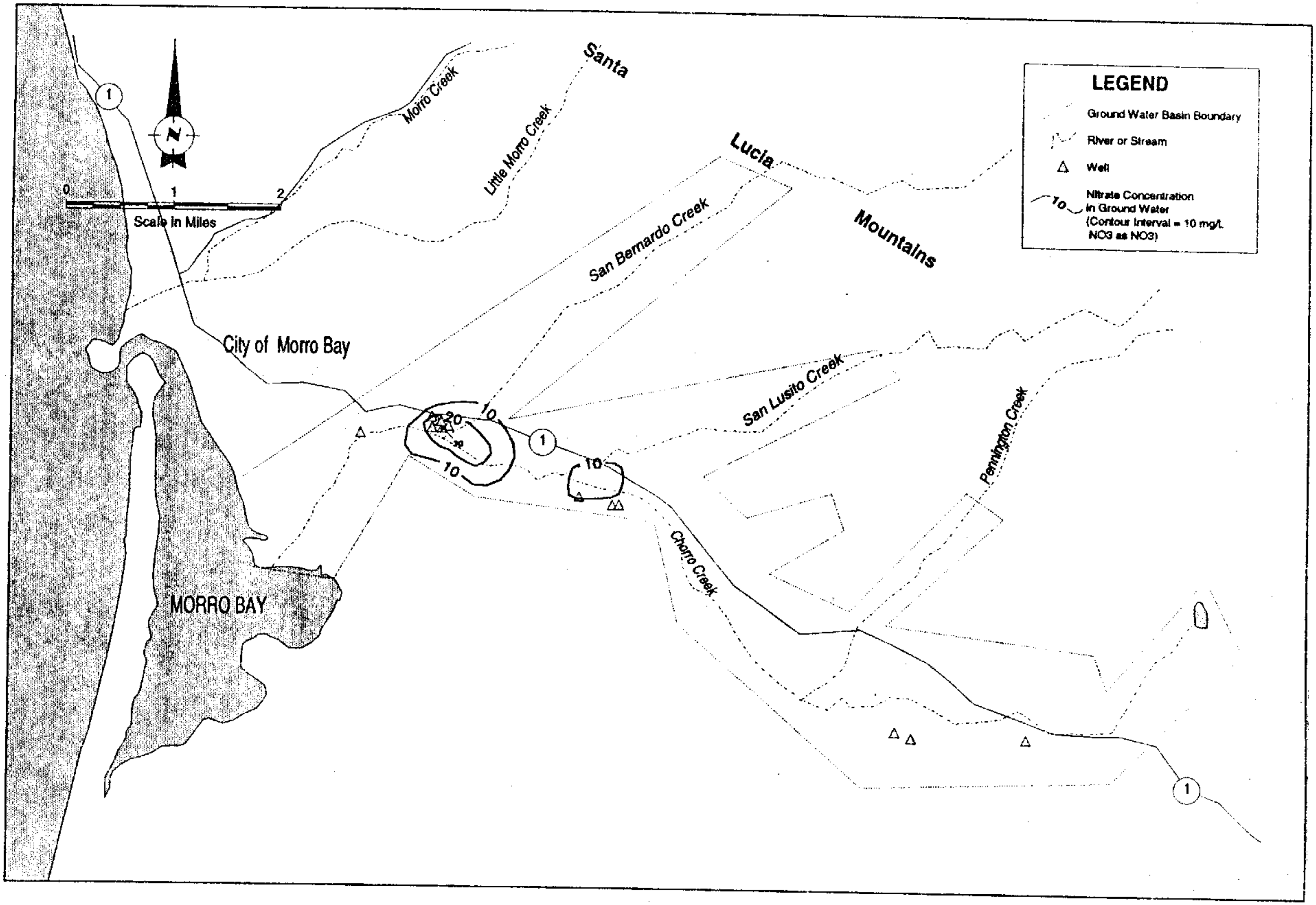


Figure VIII-3. Average Nitrate Concentrations in the Chorro Valley Ground Water Basin from 1980 to 1992

Table VIII-1. Wells Recommended for Further Testing in the Chorro Valley Ground Water Basin.

30S/11E-13A01
30S/12E-17D01
30S/12E-18D01
Any additional wells in the ground water basin east of San Bernardo Creek

References

Brown and Caldwell. "Preliminary Water Management Plan." Prepared for the City of Morro Bay. 1981.

IX. CUYAMA VALLEY GROUND WATER BASIN

Introduction

The Cuyama Valley ground water basin, located mainly in the northeast corner of Santa Barbara County, extends to San Luis Obispo, Kern, and Ventura Counties. This basin lies mostly within the Cuyama Valley, which encloses the three small communities of New Cuyama, Cuyama, and Ventucopa and is transected latitudinally by Highway 166 and Highway 33. The Cuyama River also flows through this valley and follows the route of the two highways.

Although the primary land use in the valley is agriculture with a large production of alfalfa and grain crops, two oil fields are located in the Cuyama Valley. The most productive ground water wells in the valley are located east of Cuyama. There, the geology consists mainly of a thick layer of the recent alluvium. Additionally, significant amounts of irrigation wells lie in the east along the Cuyama River. The Cuyama Valley ground water basin is overdrafted.

Nitrate Concentrations in the Cuyama Valley Ground Water Basin

Although the Cuyama Valley is mostly on unconfined ground water basin, some local areas of confinement exist within the basin. For the purposes of this assessment, however, this ground water basin is considered a single, hydraulically continuous water body.

Figures IX-1, IX-2, and IX-3 represent the nitrate levels in the Cuyama Valley ground water basin from the years 1960 to 1969, 1970 to 1979, 1980 to 1994, respectively. Unfortunately, the most recent map, Figure IX-3, does not contain as many wells as the other maps. Due to this deficit, estimations of possible historical trends are difficult to establish. All maps present a nitrate contamination problem, with plumes above the 45 mg/l nitrate, as NO3, drinking water standard, just southeast of Cuyama during all three time periods.

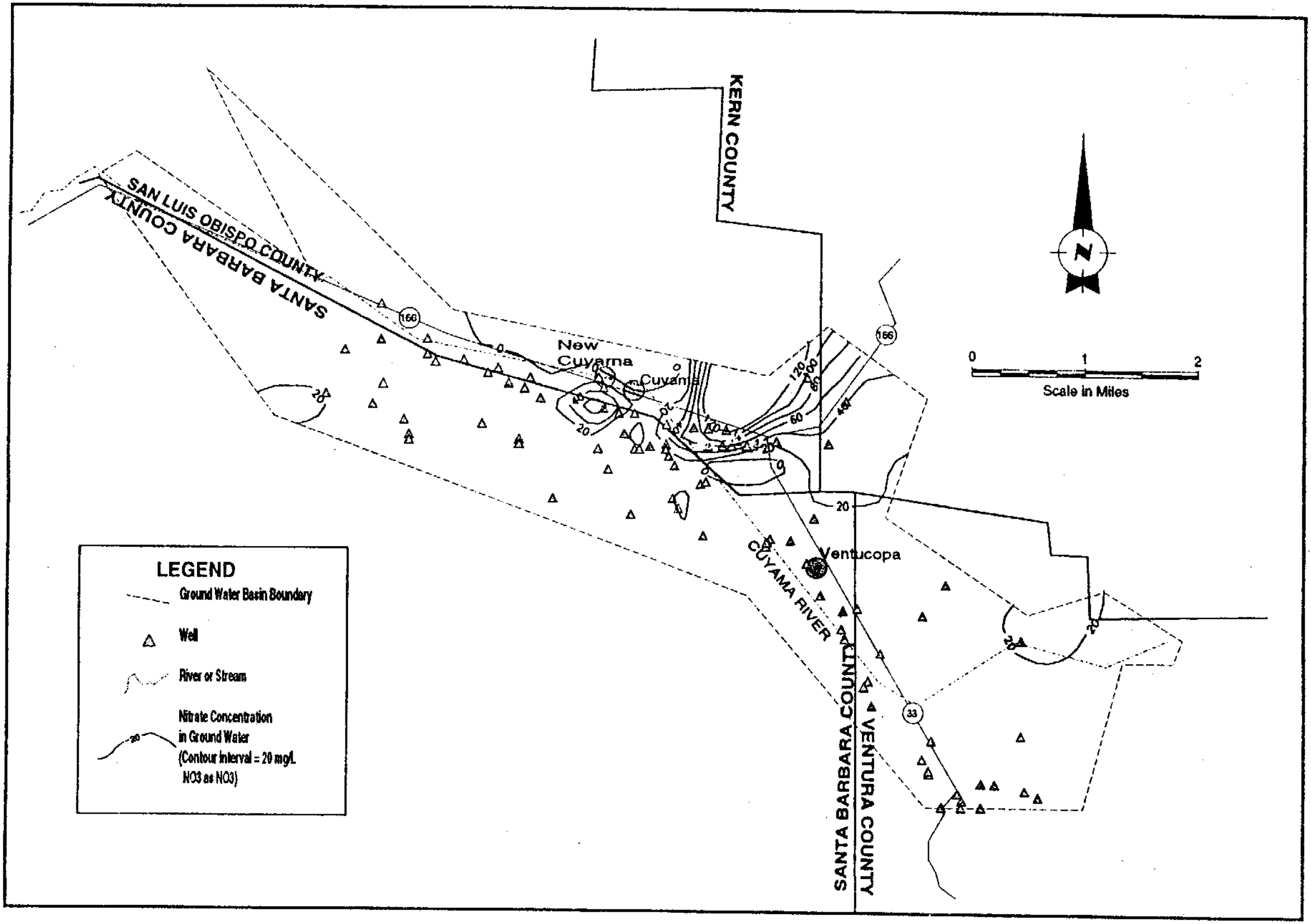


Figure IX-1. Average Nitrate Concentrations in the Cuyama Valley Ground Water Basin from 1960 to 1969

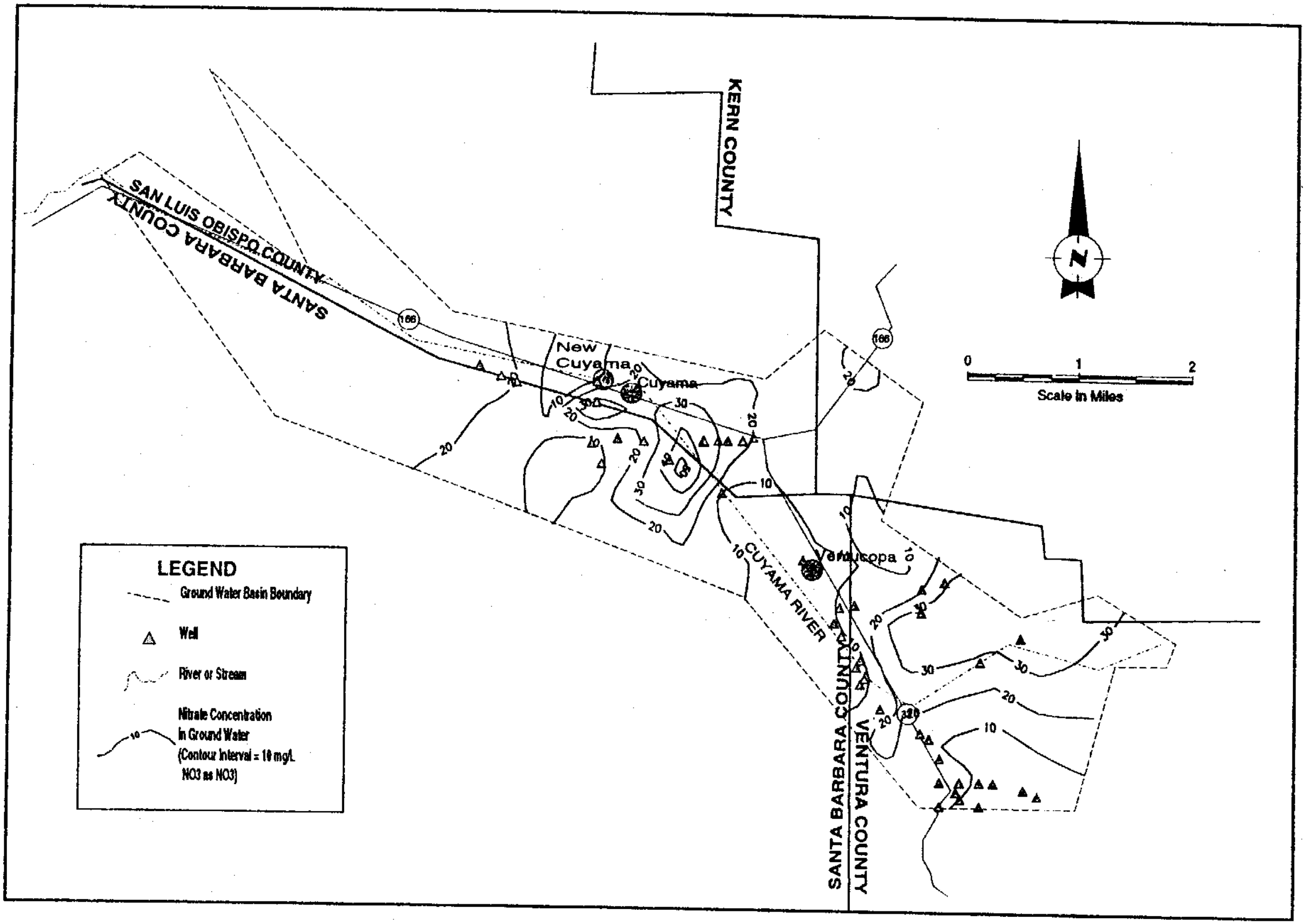


Figure IX-2. Average Nitrate Concentrations in the Cuyama Valley Ground Water Basin from 1970 to 1979

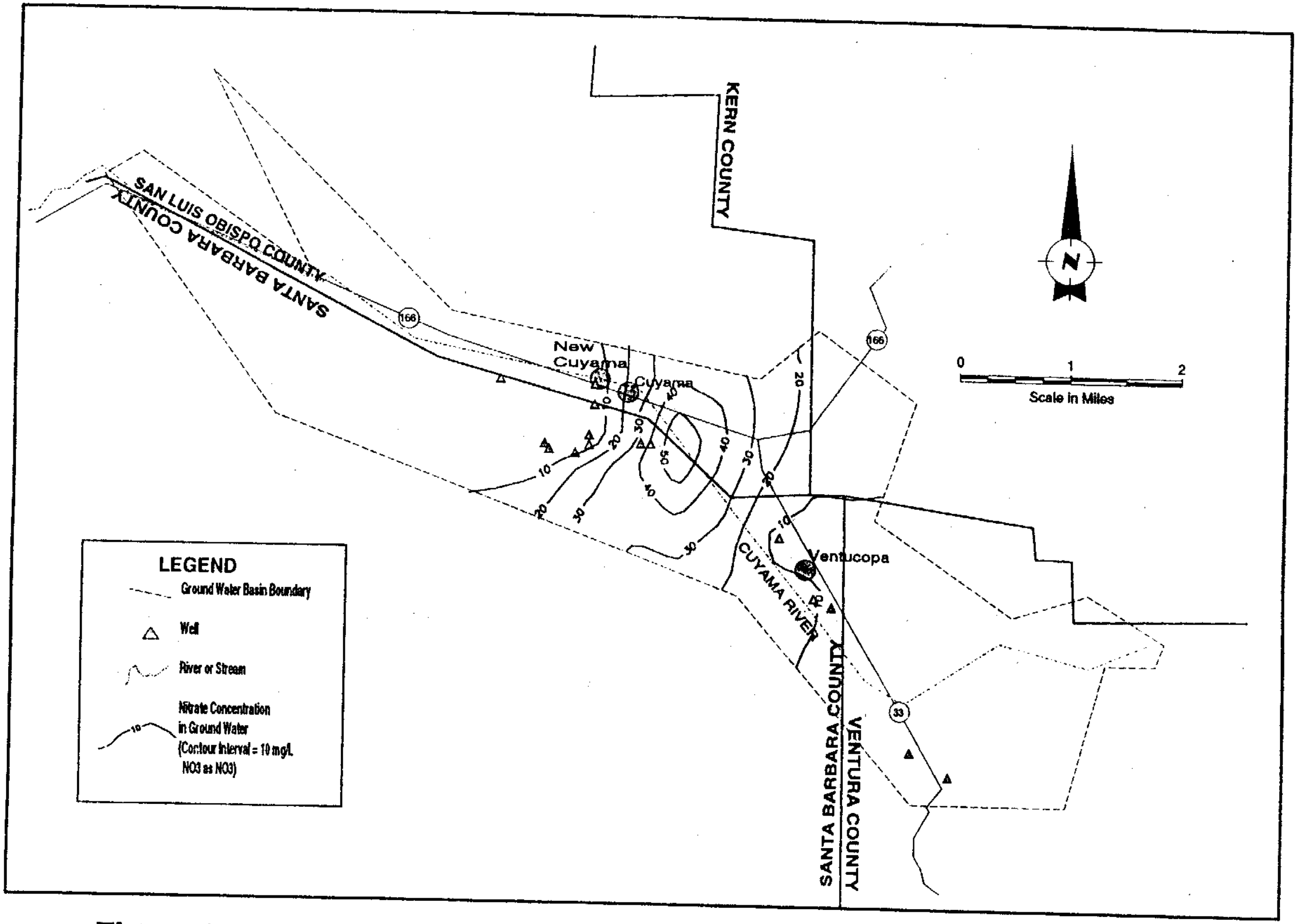


Figure IX-3. Average Nitrate Concentrations in the Cuyama Valley Ground Water Basin from 1980 to 1994

Figure IX-1 exhibits the average nitrate concentrations from the oldest time period, 1960 to 1969. and displays the most severe nitrate contamination of the three time periods. This time period, which had more well data than subsequent time periods, shows that wells located southeast of Cuyama measured average nitrate concentrations of 120 mg/l nitrate, as NO3. However, the northwest and southeast portions of the basin do not show a nitrate contamination problem.

Figure IX-2, depicting the years 1970 to 1979, shows an overall reduction in average nitrate levels. This reduction is most dramatically seen in the area to the southeast of Cuyama, where the peak average nitrate concentrations dropped to around 50 mg/l nitrate, as NO3. However, a number of wells measuring high nitrate levels in the previous time period (1960 to 1969, Figure IX-1) were not sampled in the 1970 to 1979 time period and could produce this dramatic decrease in nitrate levels. Although lower than in the previous time period, these values still remain above the 45 mg/l nitrate, as NO3, State Maximum Contaminant Level. Note, in the southeastern corner of the basin, the presence of high nitrate levels which exceeds 30 mg/l nitrate, as NO3, is unique to this time period.

The nitrate concentration map for the years 1980 to 1994 (Figure IX-3) displays a concentrated nitrate plume reaching 50 mg/l nitrate, as NO3, in the center of the ground water basin, just east of Cuyama. Slightly increased in size, this plume's shape and magnitude is consistent with that seen in the 1970 to 1979 map. Whereas, past maps (Figures IX-1 and IX-2) evidenced the presence of nitrates in the ground water in the southeastern corner of the Cuyama basin, the contamination is not evident in Figure IX-3. However, little recent water data exists for this area, and since this area demonstrated increasing nitrate concentrations in previous time periods, a nitrate problem could presently exist. A similar situation occurs to the east of Cuyama and New Cuyama. Although, in former periods, this area showed contamination as high as 120 mg/l nitrate, as NO3, supported by numerous wells, the contamination is not apparent in the most recent map. In both of these cases, the disappearance of the plumes coincides with a lack of nitrate samples taken in the later time periods.

Table IX-1 cites the wells that require additional sampling. Regional Board staff advise additional sampling of these wells to provide a more detailed picture of the current nitrate contamination problem in the Cuyama Valley ground water basin.

Table IX-1. Wells Recommended for Further Testing in the Cuyama Valley Ground Water Basin.

8N/23W-11D01	10N/24W-09Q01	10N/25W-22H01
8N/23W-11E01	10N/24W-20L01	10N/25W-23E01
8N/23W-34L01	10N/25W-16J01	10N/25W-24E01
8N/24W-16A01	10N/25W-17J01	10N/26W-04G01
9N/23W-29E01	10N/25W-17J02	10N/26W-04R01
9N/23W-30P01	10N/25W-17M01	10N/26W-04R02
10N/24W-06C01	10N/25W-21G01	10N/26W-04R03
10N/24W-09L01	10N/25W-22E01	

X. GILROY-HOLLISTER VALLEY GROUND WATER BASIN

Introduction

A large inland basin, the Gilroy-Hollister Valley ground water basin, extends south from southern Santa Clara County into San Benito County and is transected by the Pajaro River separating the Santa Clara Valley to the north from the San Juan and Hollister Valleys to the south. Four sub-basins, Llagas, Gilroy-Bolsa, San Juan, and Hollister Sub-Basins, together form the Gilroy-Hollister Valley ground water basin (Figure X-1). To the north, the Llagas and Gilroy-Bolsa Sub-Basins lie in the Santa Clara Valley, and to the south, the San Juan Sub-Basin lies in the San Juan Valley and the Hollister Sub-Basin lies in the Hollister Valley. The Gilroy-Hollister Valley ground water basin services the communities of Morgan Hill, Gilroy, Hollister, and San Juan Bautista.

Nitrate Concentrations in the Gilroy-Hollister Valley Ground Water Basin

Average nitrate concentrations throughout the entire Gilroy-Hollister Valley ground water basin were compared among the following time periods: 1950 to 1965, 1966 to 1976, 1977 to 1987, and 1988 to 1992 (Figures X-2, X-3, X-4, and X-5). For contouring purposes, staff used all of the nitrate data, whether from unconfined or confined ground water, to create these maps.

The Llagas Sub-Basin contains of a major confining aquitard located approximately 100 feet below ground surface. This aquitard separates the upper unconfined ground water from the lower confined ground water. Although many wells exist in the area of confinement, a deficit of well perforation data make a comparison of the nitrate concentrations above and below the major aquitard impossible. Regional Board staff encountered few data from the shallow aquifer, located above the major aquitard, to create a map for it alone; however, staff found sufficient data to map the confined waters below the major aquitard for just the most recent time period, 1980 to 1992 (Figure X-6). Because of a lack of data over time, staff could not evaluate historical trends of the nitrate concentrations in the confined waters.

The maps display the widespread nitrate contamination in the Gilroy-Hollister Valley ground water basin. In addition, they show nitrate ground water quality has degraded since the 1950's.

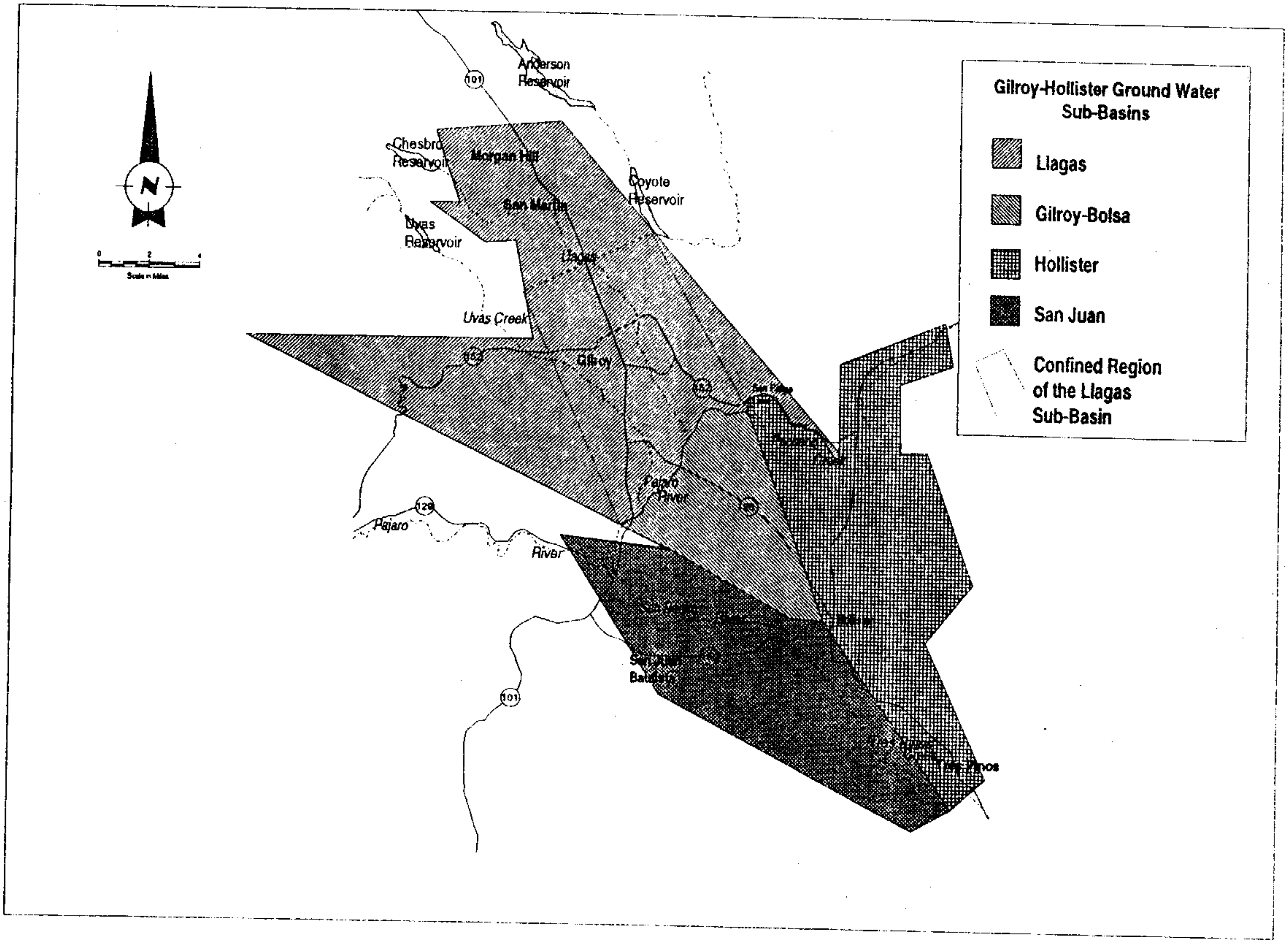


Figure X-1. Sub-Basins of the Gilroy-Hollister Valley Ground Water Basin*

* Sub-basin borders are based on generalized boundaries from Kilburn, 1972

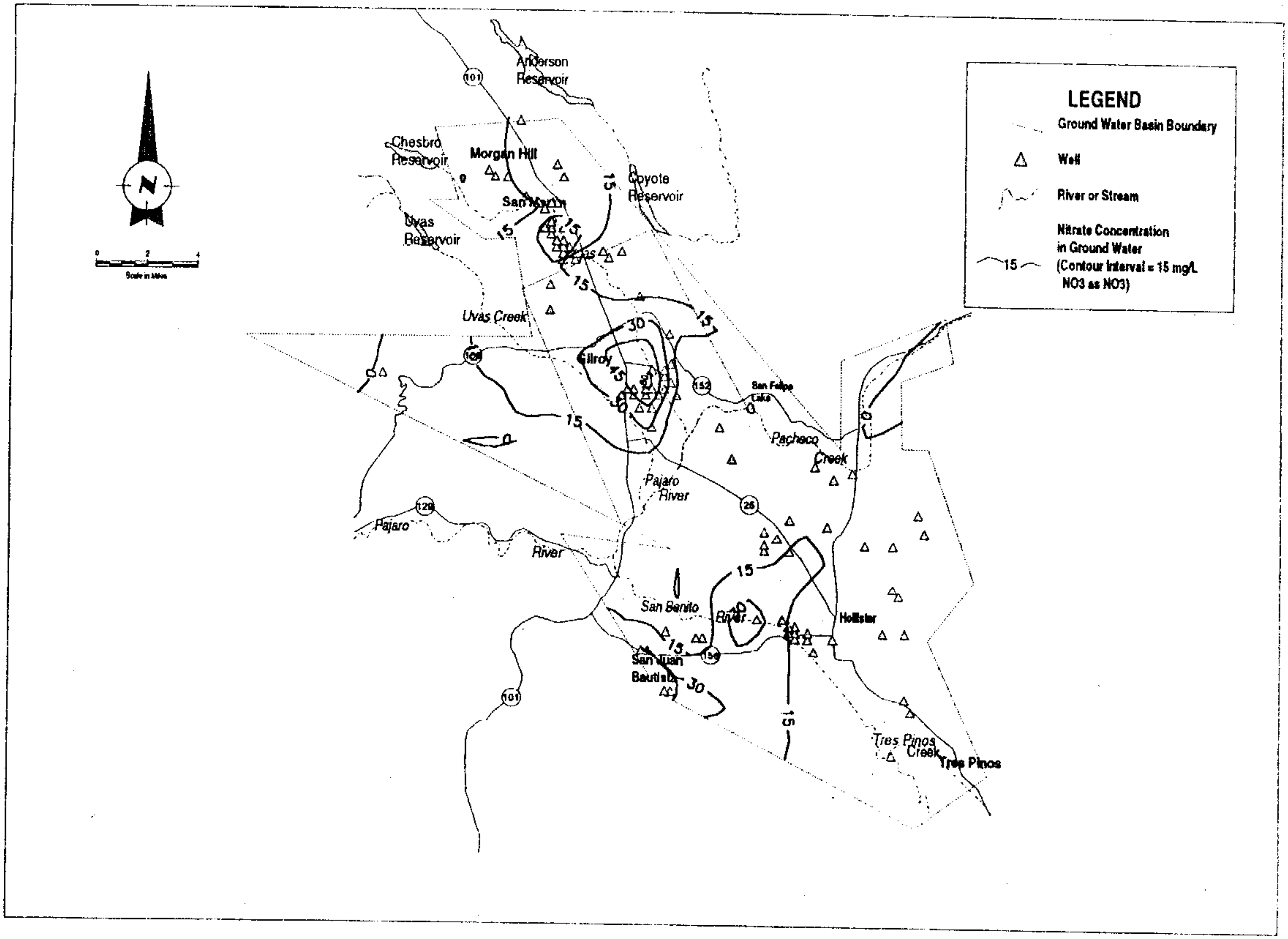


Figure X-2. Average Nitrate Concentrations in the Gilroy-Hollister Valley Ground Water Basin from 1950 to 1965

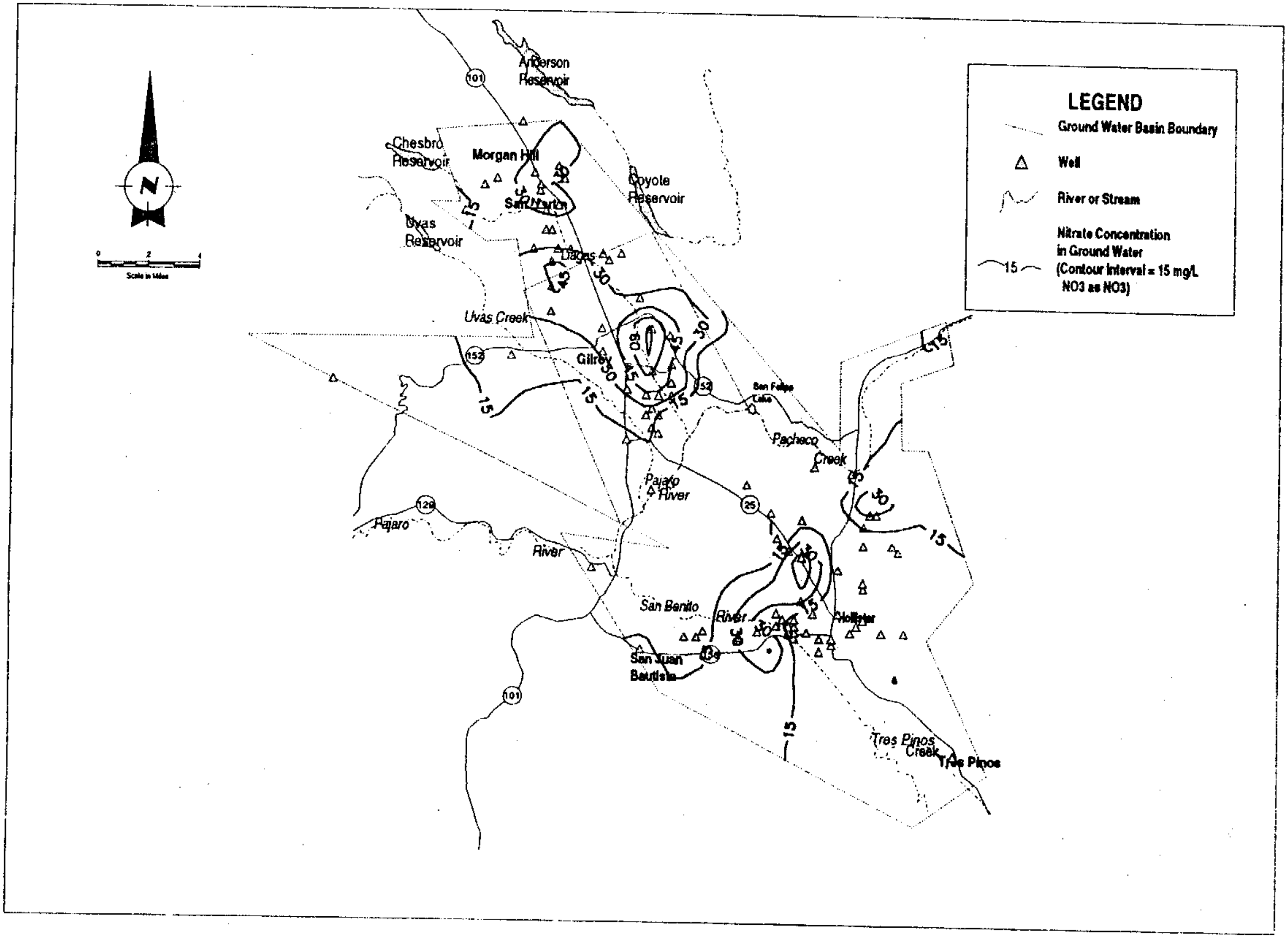


Figure X-3. Average Nitrate Concentrations in the Gilroy-Hollister Valley Ground Water Basin from 1966 to 1976

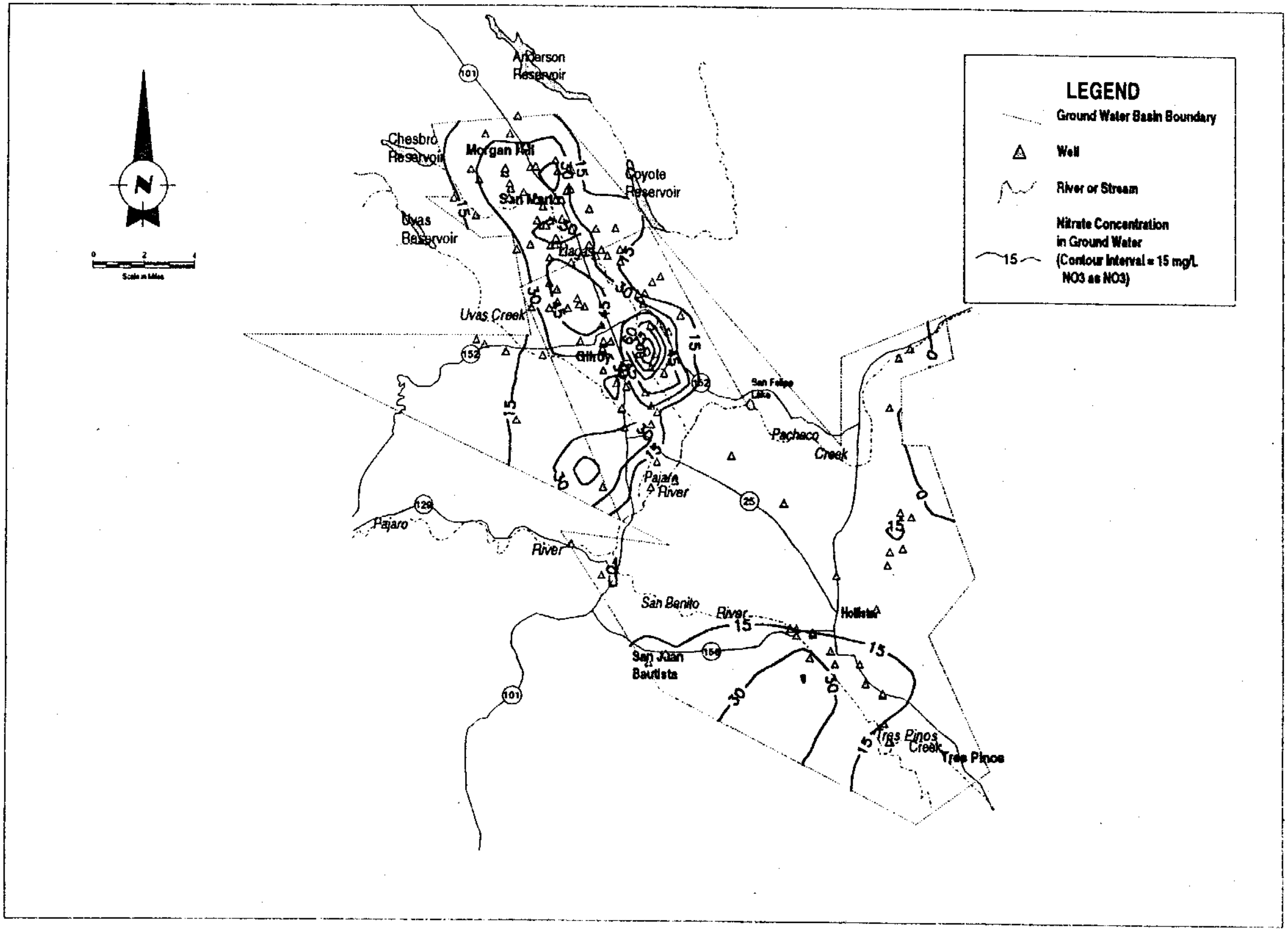


Figure X-4. Average Nitrate Concentrations in the Gilroy-Hollister Valley Ground Water Basin from 1977 to 1987

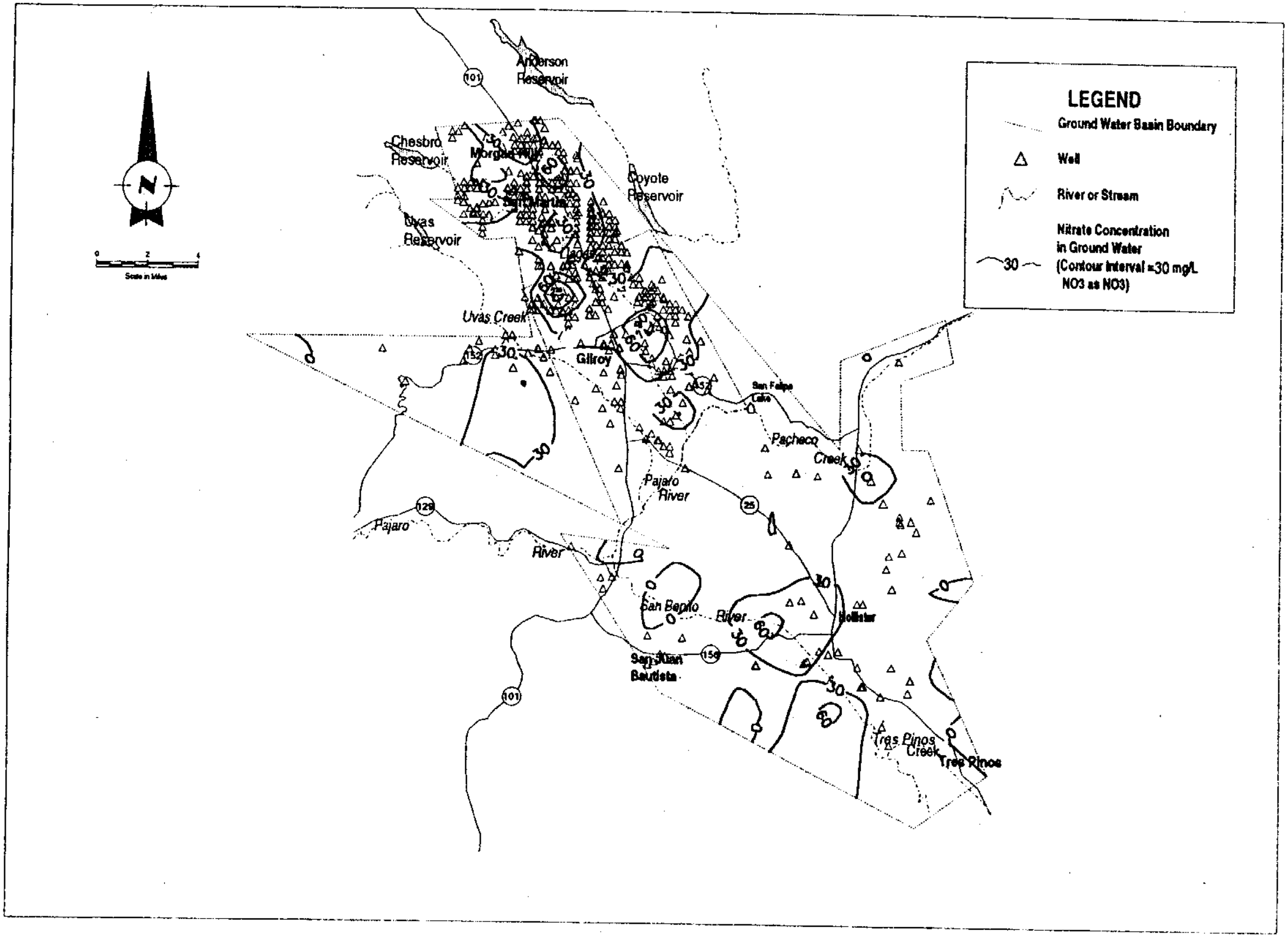


Figure X-5. Average Nitrate Concentrations in the Gilroy-Hollister Valley Ground Water Basin from 1988 to 1992

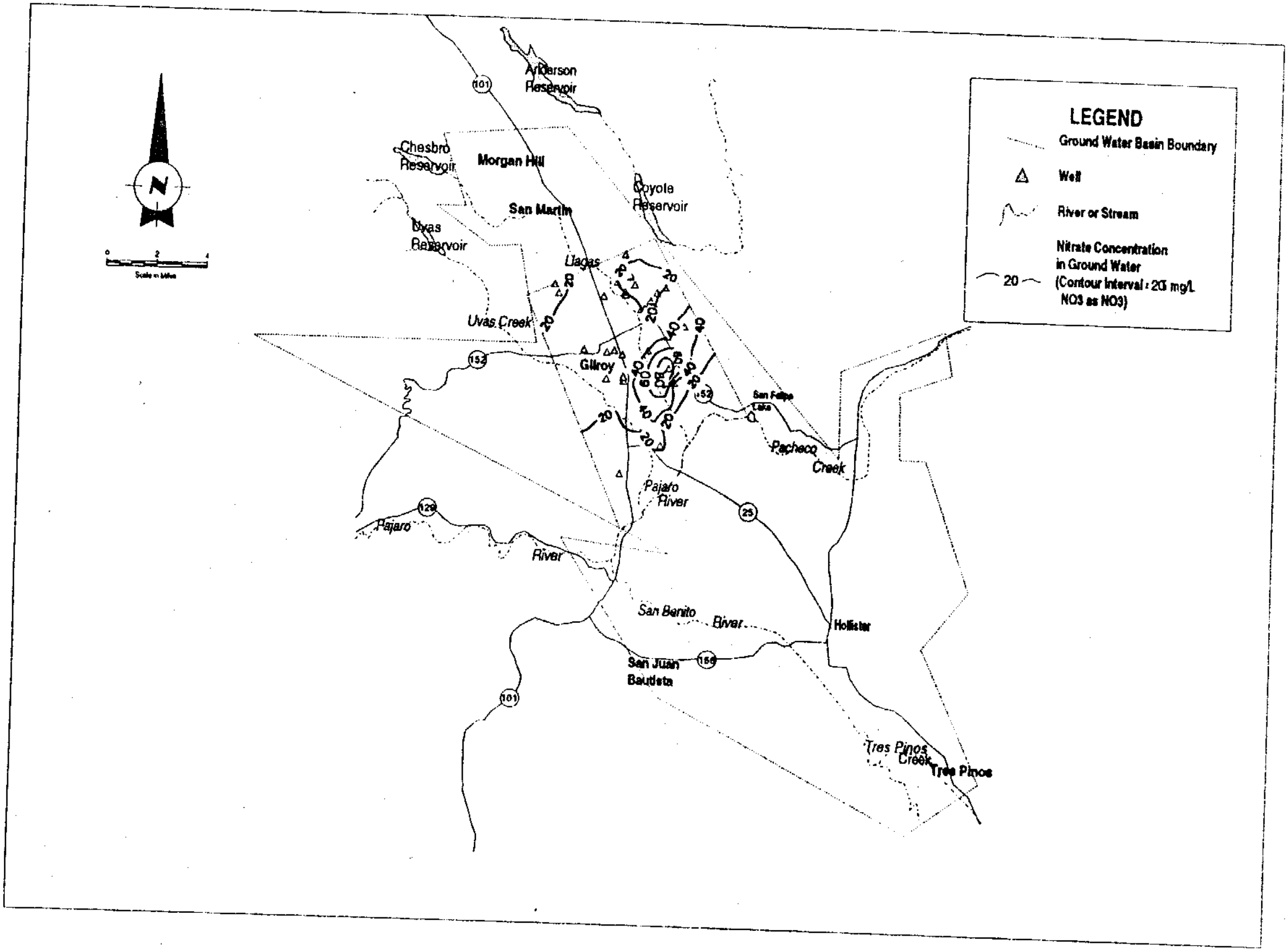


Figure X-6. Average Nitrate Concentrations in the Confined Aquifers of the Llagas Sub-Basin from 1980 to 1992

Llagas and Gilroy-Bolsa Sub-Basins

Two notable nitrate plumes demonstrate that concentrations exceeding the Maximum Contaminant Level of 45 mg/l nitrate, as NO3, are widespread in the Llagas and Gilroy-Bolsa Sub-Basins. One plume, adjacent to Gilroy, existed since the 1950's. From the peak concentration of 60 mg/l nitrate, as NO3, in the 1950's and early 1960's (Figure X-2), the Gilroy plume's average nitrate concentration rose to a high of 90 mg/l nitrate, as NO3, between 1988 and 1992 (Figure X-5). The nitrate levels of a second nitrate plume, located approximately half way between Gilroy and San Martin, increased from a high of 45 mg/l nitrate, as NO3, in the late 1960's and early 1970's (Figure X-3) to a peak concentration of 120 mg/l nitrate, as NO3, between 1988 and 1992 (Figure X-5).

In the northern portion of the Llagas Sub-Basin, nitrate concentrations near Morgan Hill have risen since the 1950 to 1965 time period. Nitrate concentrations at 15 mg/l nitrate, as NO3, during the earlier time period, (Figure X-2), approached 60 mg/l nitrate, as NO3, in 1988 to 1992 (Figure X-5).

Figure X-6 represents average nitrate concentrations in the lower confined aquifers of the Llagas/Gilroy-Bolsa Sub-Basin. This contour map indicates the presence of high nitrate concentrations in the lower aquifer zones, with an area near Gilroy at a peak concentration of 80 mg/l nitrate, as NO3.

Hollister and San Juan Sub-Basins

Whereas nitrate concentrations south of the Pajaro River are neither as high nor as widespread as those observed in the northern portion of the basin, the increasing nitrate concentrations provide evidence of contamination since the 1950's.

Near Hollister, for example, nitrate concentrations increased from a high of 30 mg/l nitrate, as NO3, in the 1950's and early 1960's (Figure X-2) to a high of 60 mg/l nitrate, as NO3, in the 1980's and 1990's (Figure X-5). Due to the relative scarcity of wells in this area, Regional Board staff advise verifying the current size of this plume through further water quality sampling.

One other noteworthy plume lies southeast of San Felipe Lake. Although present in the mid-1960's, Figure X-4 does not display the plume from 1977 to 1987. Because of an absence of well samples during this time period in this area, the plume's presence and its magnitude of nitrate contamination can not be verified from 1977 to 1987. Nevertheless, sampling in the late 1980's and early 1990's show the nitrate concentrations of as 60 mg/l, as NO3, in the same area (Figure X-5). To provide a more defined picture of nitrate contamination, staff recommend further sampling of the wells (or wells within their vicinity) listed in Table X-1.

Table X-1. Wells Recommended for Further Testing in the Gilroy-Hollister Valley Ground Water Basin.

12S/05E-09N02	12S/05E-31A01
12S/05E-16B01	12S/05E-31E03
12S/05E-21N01	12S/05E-31E04
12S/05E-21Q01	Slic Whittaker Small Water System well(s)
12S/05E-22C01	
12S/05E-27E05	

References

California Central Coastal Regional Water Quality Control Board. "Water Quality Control Policy for Pajaro River Basin and Underlying Ground Waters." 1968.

United States Geological Survey (USGS). "Ground-Water Hydrology of the Hollister and San Juan Valleys, San Benito County, California, 1913-1968." 1972.

XI. LANGLEY CANYON GROUND WATER BASIN

Introduction

The Langley Canyon ground water basin, in northern Monterey County east of Elkhorn Slough, underlies Prunedale and the hilly region between Prunedale and the Pajaro River. Mostly rural, this basin supports increasing suburban development around Prunedale.

Nitrate Concentrations in the Langley Canyon Ground Water Basin

The Langley Canyon ground water basin is considered a single unconfined aquifer. Figures XI-1 through XI-3 show the nitrate levels in the Langley Canyon ground water basin from 1961 to 1972, 1973 to 1982, 1983 to 1992, respectively. These maps represent data from the entire ground water basin for different time segments.

Figure XI-1 represents the oldest time period. This contour map shows a 50 mg/l nitrate, as NO3, plume exists in this time period near the southern border of the basin. This plume exceeds the State Maximum Contaminant Level of 45 mg/l nitrate, as NO3. Another area of high nitrate exists in the center of the basin with a nitrate plume of 40 mg/l nitrate, as NO3.

A significantly increased number of wells create the nitrate contours for 1973 to 1982 (Figure XI-2). Although the majority of the wells lie below 20 mg/l nitrate, as NO3, two plumes merit attention. One plume near the northern border of the basin boundary displays the highest peak in the basin with a maximum nitrate concentration of 50 mg/l nitrate, as NO3. This 50 mg/l nitrate, as NO3, plume is present because three wells registered nitrate readings above 45 mg/l nitrate, as NO3. The other plume, near the southern boundary of the basin, peaks at approximately 40 mg/l nitrate, as NO3. With several wells near the southern boundary to support the contours, this plume was also present in the previous time period, 1961 to 1972 (Figure XI-1).

Figure XI-3 represents the data from the years 1983 to 1992. In addition to the increase in nitrate concentrations of some previous plumes, this time period shows the formation of new plumes. The central northern and central southern borders are still a problem with several new clusters of high concentration at 45 mg/l nitrate, as NO3. The data documents nearly 400 readings out of approximately 2800 (Appendix G-2) that exceed the 45 mg/l nitrate, as NO3, State Maximum Contaminant Level. From the 1960's to the present, there is a progressive increase in nitrate contamination.

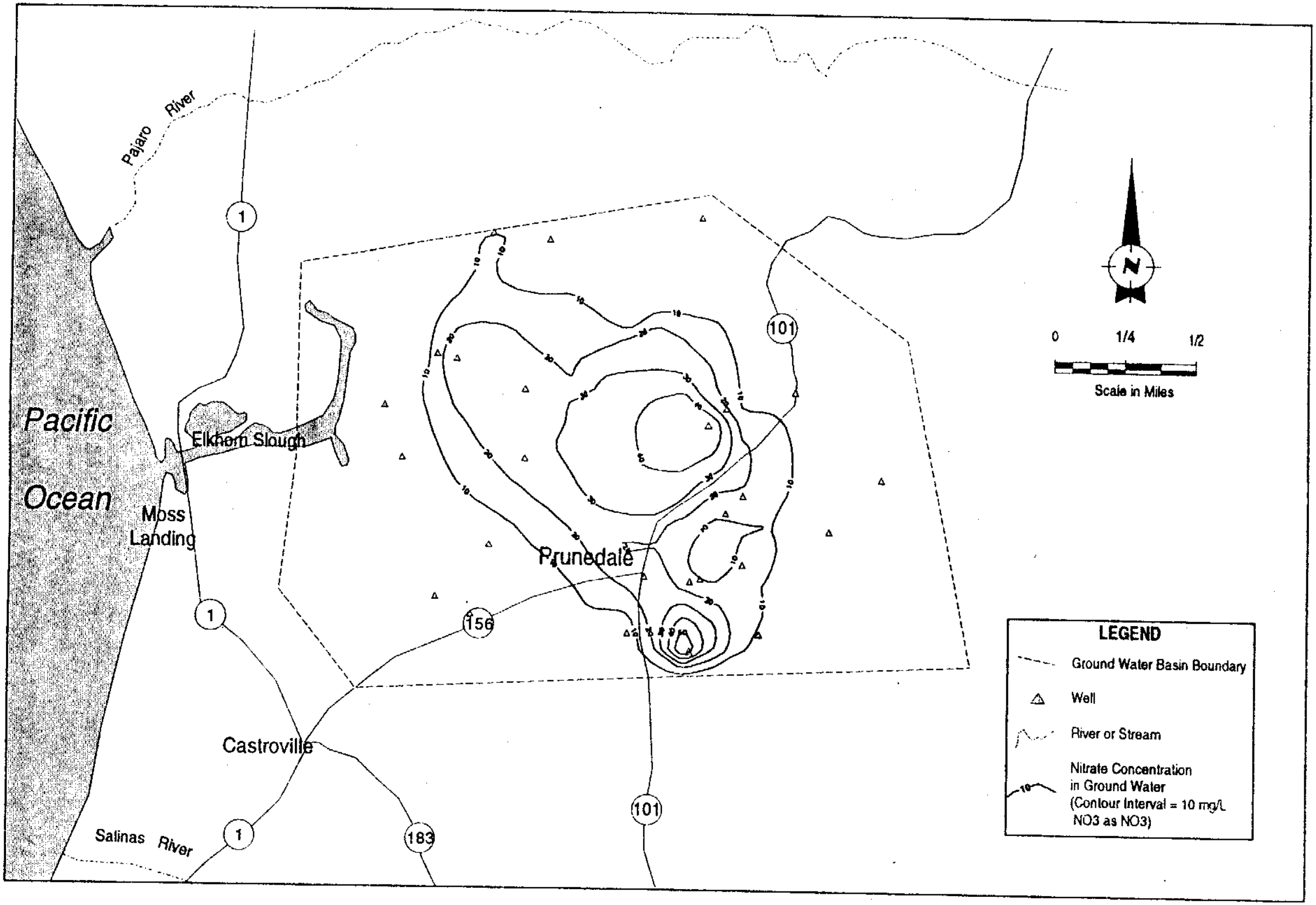


Figure XI-1. Average Nitrate Concentrations in the Langley Canyon Ground Water Basin from 1961 to 1972

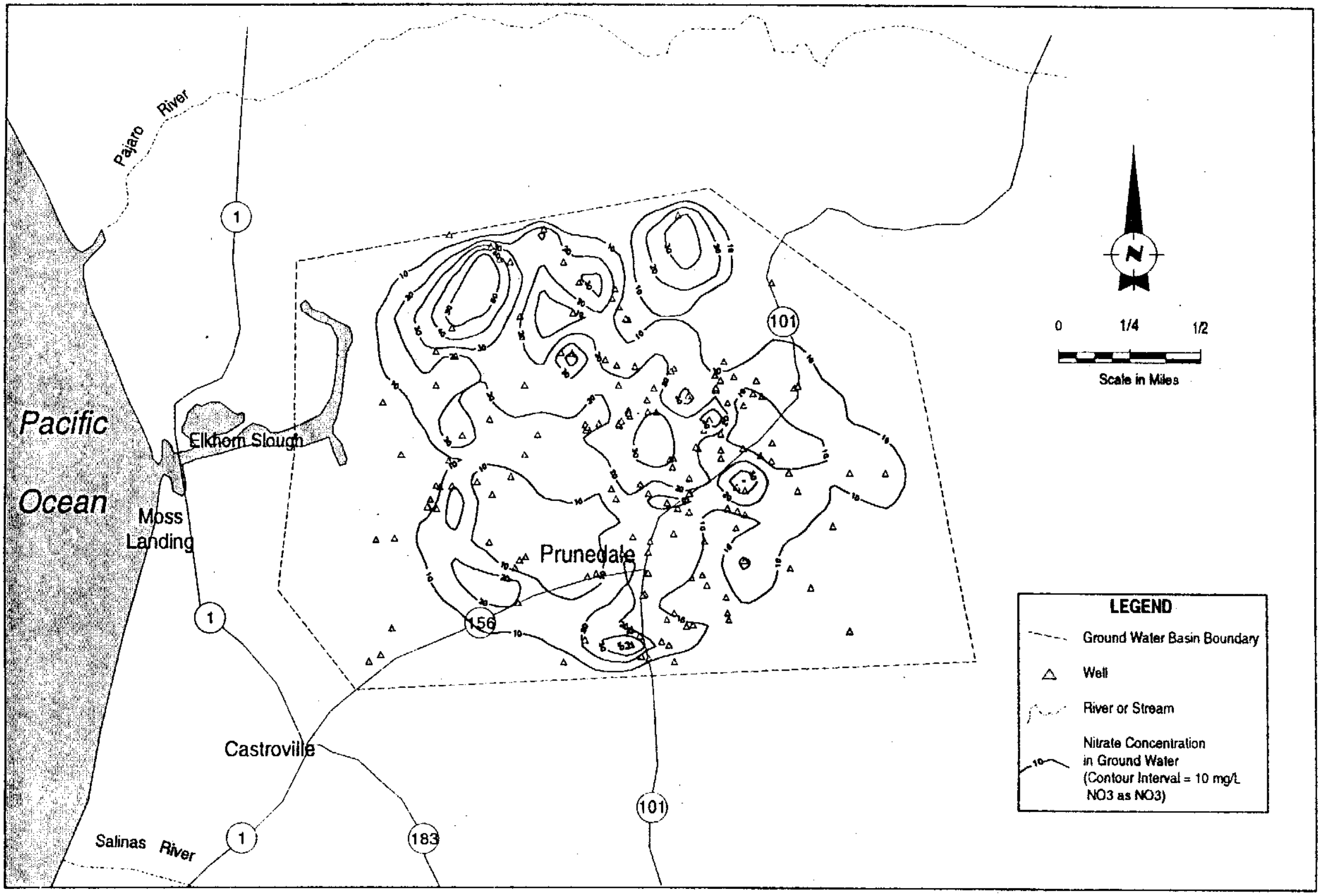


Figure XI-2. Average Nitrate Concentrations in the Langley Canyon Ground Water Basin from 1973 to 1982

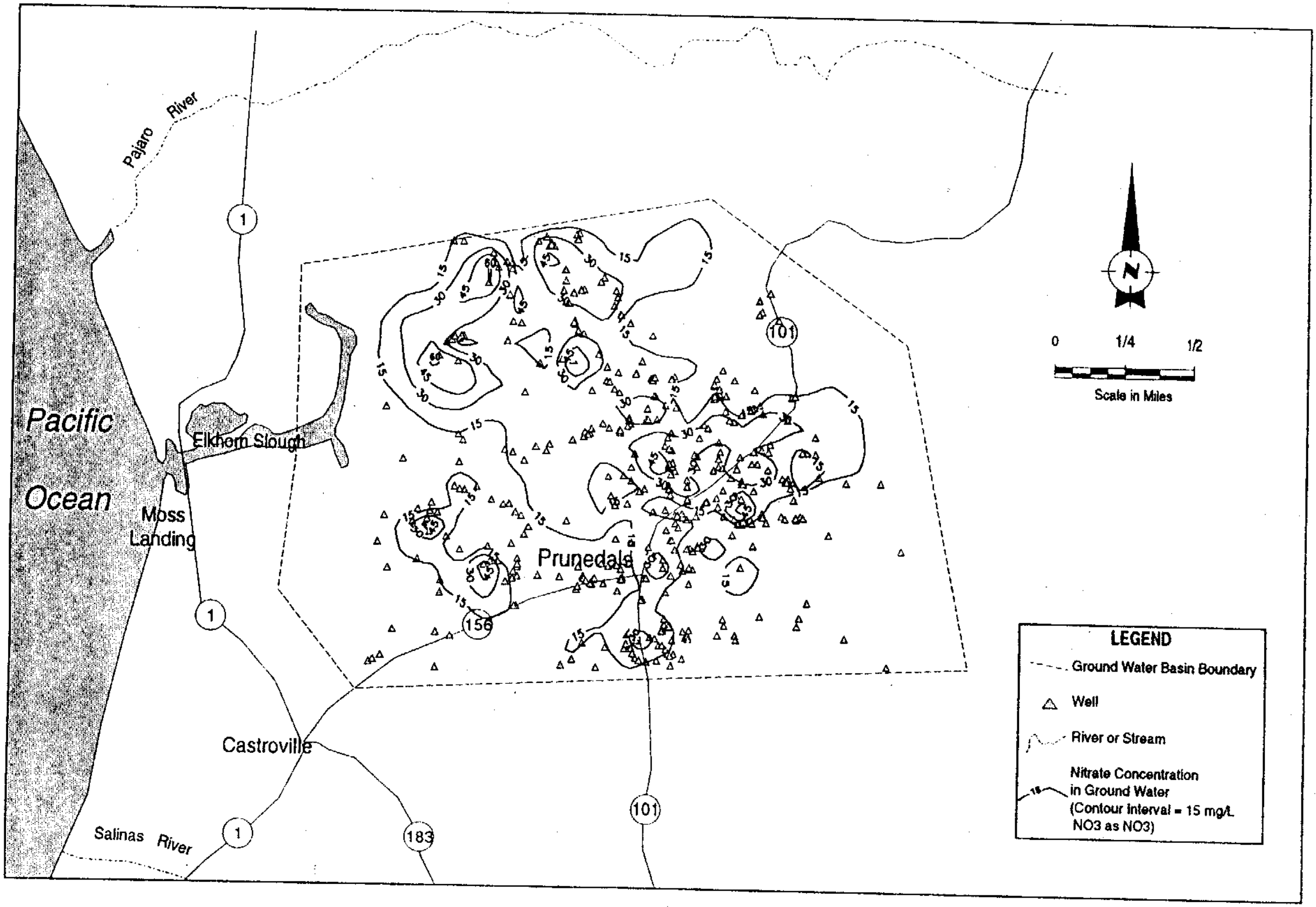


Figure XI-3. Average Nitrate Concentrations in the Langley Canyon Ground Water Basin from 1983 to 1992

XII. LOS OSOS VALLEY GROUND WATER BASIN

Introduction

The Los Osos Valley ground water basin is located within the Los Osos Valley hydrologic basin (Figure XII-1). This wedge-shaped, coastal basin is bordered by two parallel ranges of low-lying hills: the Irish Hills on the south and the Park Ridge Hills on the north. This basin services the communities of Los Osos and Baywood Park.

Historically, the Los Osos and Baywood Park areas have been used for grazing and farming activities. In the late 1950's, the area west of Los Osos Creek began major development. Between 1970 and 1980, intense development occurred and the population of this area increased by over 200 percent (Brown & Caldwell, 1983).

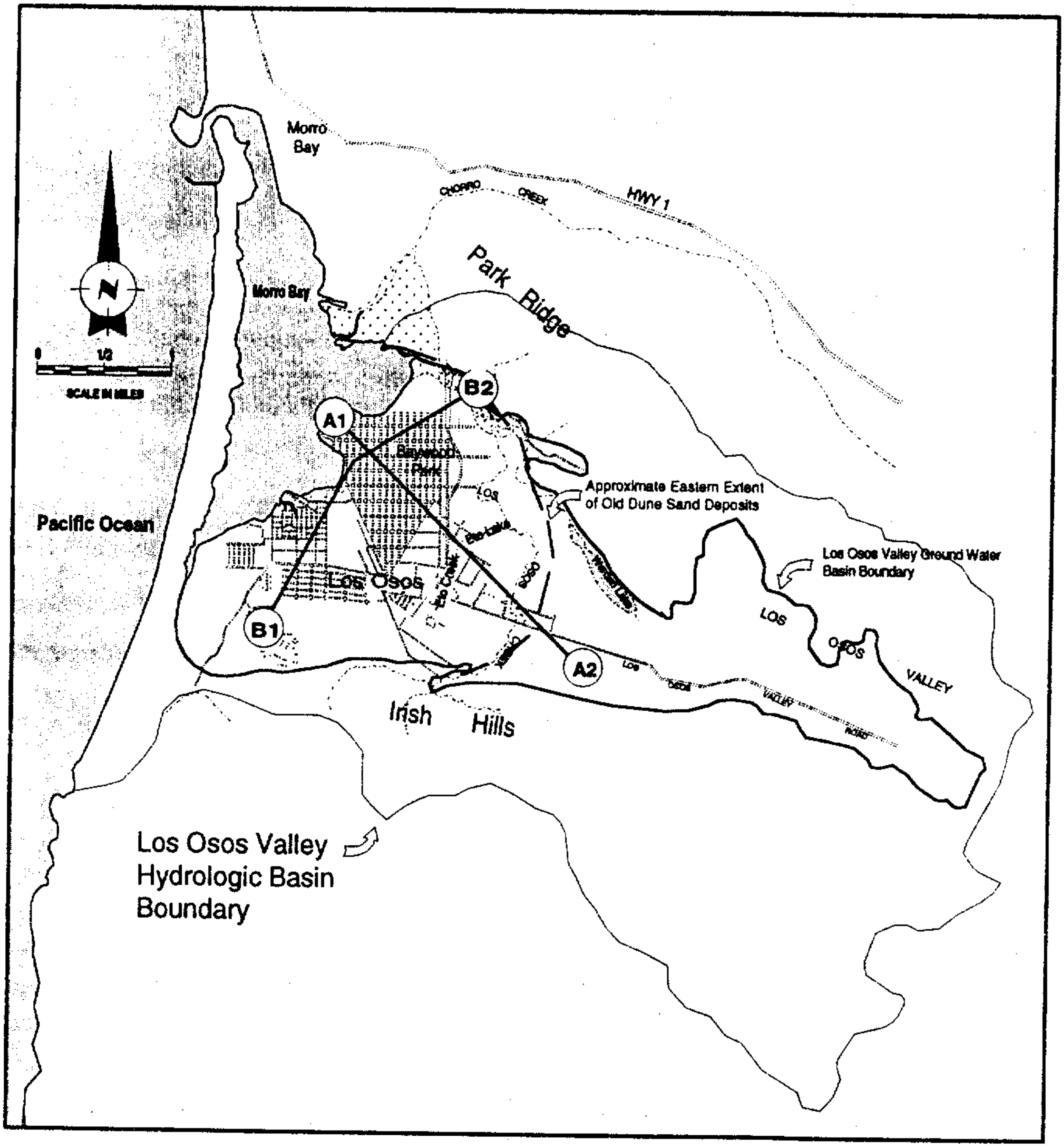
Nitrate Concentrations in the Los Osos Valley Ground Water Basin

Together the basin's two main aquifer zones (Old Dune Sand Deposits and Paso Robles Formation) form a wedge approximately 900 feet deep at the western basin boundary with the depth decreasing to less than 100 feet at the eastern ground water basin boundary. Figure XII-1 indicates the locations of two cross-sections, A1-A2 and B1-B2. These cross-sections, shown in Figures XII-2a and XII-2b, depict the approximate geology of the two main water bearing zones (Brown & Caldwell, 1983; USGS, 1988).

In the upper aquifer, the Old Dune Sand Deposits form a cap overlying the western portion of the ground water basin. These sediments average approximately 100 feet in thickness and extend eastward from Morro Bay toward Los Osos Creek. (The Old Dune Sand Deposits are represented in Figures XII-2a and XII-2b by the "Qso" symbol.)

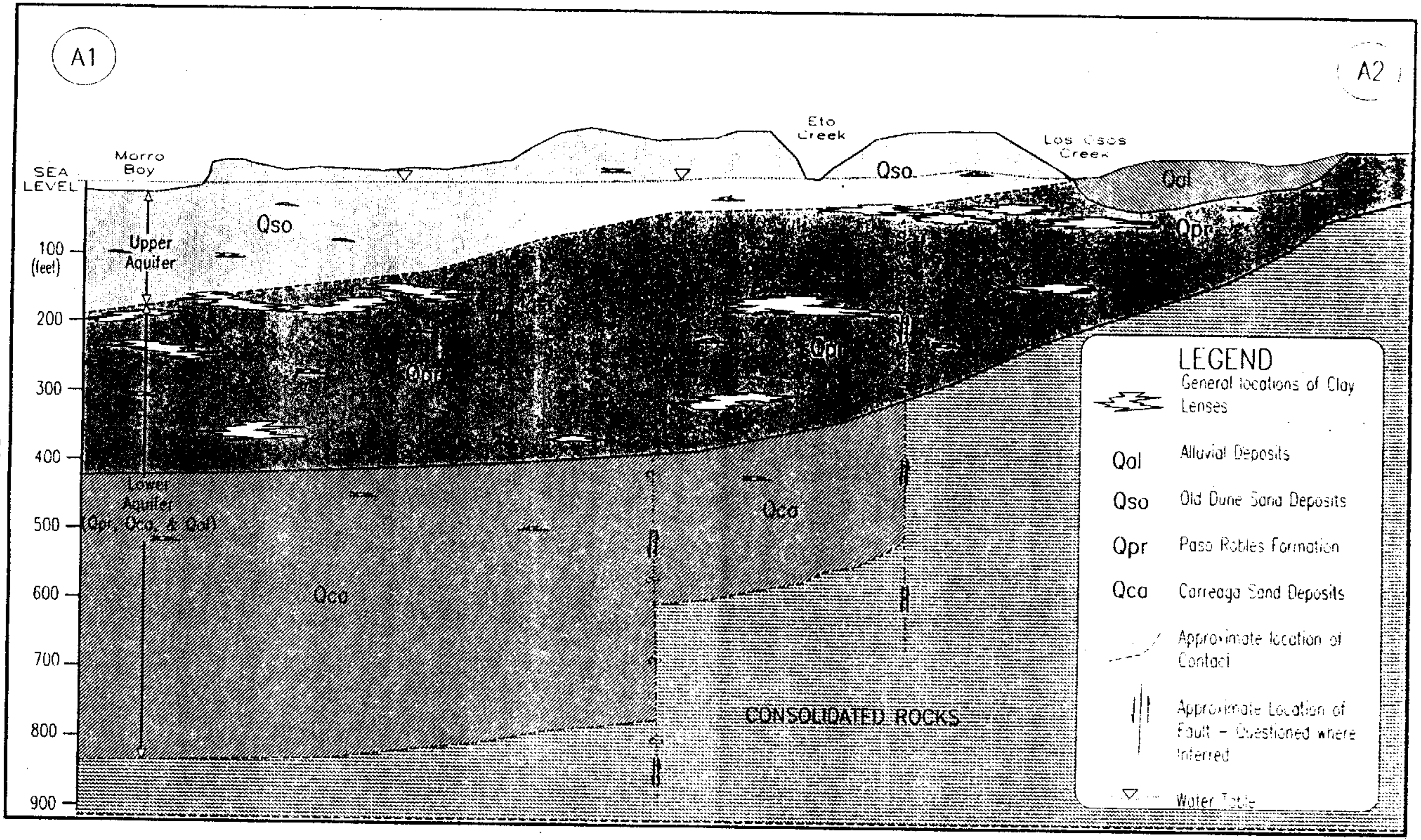
The lower aquifer extends from Morro Bay to east of Los Osos Creek where it outcrops as shown on Figure XII-2a. For the purposes of this report, the Alluvial Deposits, along with the Paso Robles Formation and the Careaga Sand Formation, are considered the lower aquifer. (In Figures XII-2a and XII-2b, the Alluvial Deposits are represented by the "Qal" symbol, the Paso Robles Formation is represented by the "Qpr" symbol, and the Careaga Sand Formation is represented by the "Qca" symbol.) The thickness of this aquifer at the western boundary is approximately 700 feet, reducing to a thickness of approximately 100 feet at the eastern basin boundary. Recent Alluvial Deposits lie east of Los Osos Creek.

Nitrate contour maps represented in Figures XII-3 to XII-8 are analyzed in this section. The analysis is broken up into a discussion of the two main aquifer zones. Each aquifer is portrayed in three different time periods.



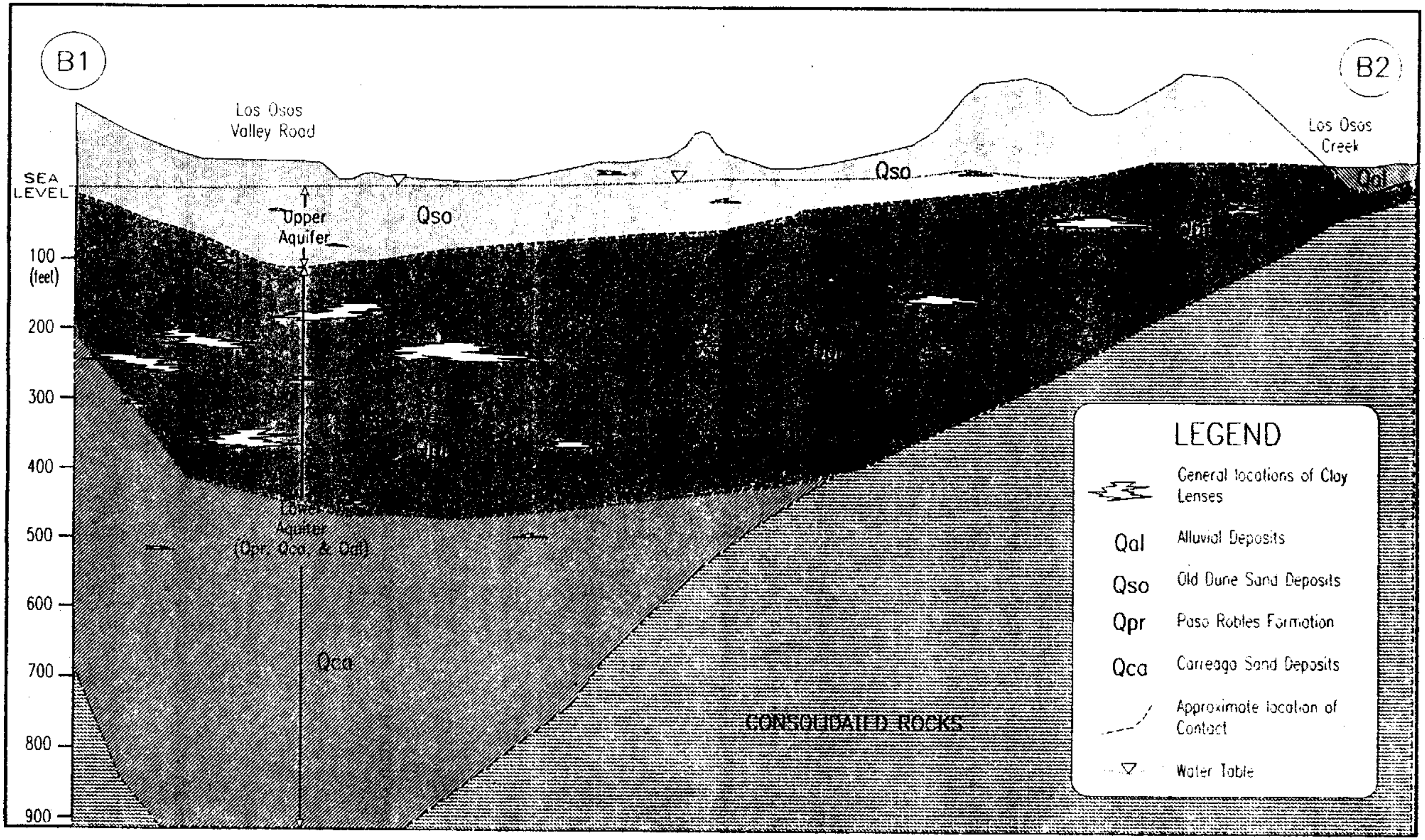
(REF: Brown & Caldwell, 1983)

Figure XII-1. General Site Map of the Los Osos Valley Ground Water Basin with Locations of Geologic Cross-Sections



(REF: Brown & Caldwell, 1983; USGS, 1988)

Figure XII-2a. Generalized Description of Geologic Section A1 - A2



(REF: Brown & Caldwell, 1983; USGS, 1988)

Figure XII-2b. Generalized Description of Geologic Section B1 - B2

Several wells were not included in the contour maps. These wells were not included because: (1) no perforation data was available to identify the aquifer represented, (2) the well was outside the ground water boundary, or (3) only one data value represented the concentration. Wells with limited perforation data were not mapped because it was not possible to determine which aquifer was perforated. Likewise, some wells had only one nitrate reading for a particular mapped time interval. If the well concentration was high, the mapping program would portray this reading as the center of a plume with a high value. Therefore, single high readings were not placed into the mapping program. An explanation of the reason for not including particular wells is provided in Appendix H-4.

Old Dune Sand Aquifer (Upper Aquifer)

Figures XII-3, XII-4, and XII-5 represent the nitrate concentration contours for the Old Dune Sand Aquifer for three time periods between 1954 to 1994. Looking at the three maps in succession, the nitrate concentrations seem to increase with time. The oldest time period, Figure XII-3, representing data from 1954 to 1973, shows little nitrate contamination. Two plumes with an average high concentration of 20 mg/l nitrate, as NO3, exist.

From 1974 to 1984, data indicate an increase in nitrate concentrations (Figure XII-4). A nitrate plume in the western region of the basin had a maximum average concentration of 60 mg/l nitrate, as NO3. Another plume near the center of Baywood Park shows a maximum average concentration of 45 mg/l nitrate, as NO3.

The most recent map, Figure XII-5, shows three regions within this aquifer with high concentrations. One is located near well number 21 with a maximum average concentration of 75 mg/l nitrate, as NO3. Another is located near well number 38 with a maximum average nitrate concentration of 60 mg/l nitrate, as NO3. The third area has a maximum average concentration of 45 mg/l nitrate, as NO3, centered around well number 79.

Both well numbers 21 and 79 have adequate data to establish a water quality trend. However, well number 38 has only two sampling events for this time frame; both occurred in 1987. Sampling is necessary to validate recent water quality trends.

Two other wells which require additional monitoring are well numbers 20 and 76. Well number 20 has eight monitoring data between 1974 and 1978; no further sampling occurred after 1978. Well number 76 has only two sampling events for the 1985 to 1994 time period; both occurred in 1987.

Paso Robles Aquifer (Lower Aquifer)

Figures XII-6, XII-7, and XII-8 represent the nitrate contours for the Paso Robles Formation, the Careaga Formation, and the Alluvial Deposit east of Los Osos Creek (referred to as the Paso Robles Aquifer in this report). The nitrate contamination problem for the Paso Robles Aquifer is not as severe as the problem encountered in the Old Dune Sand Aquifer.

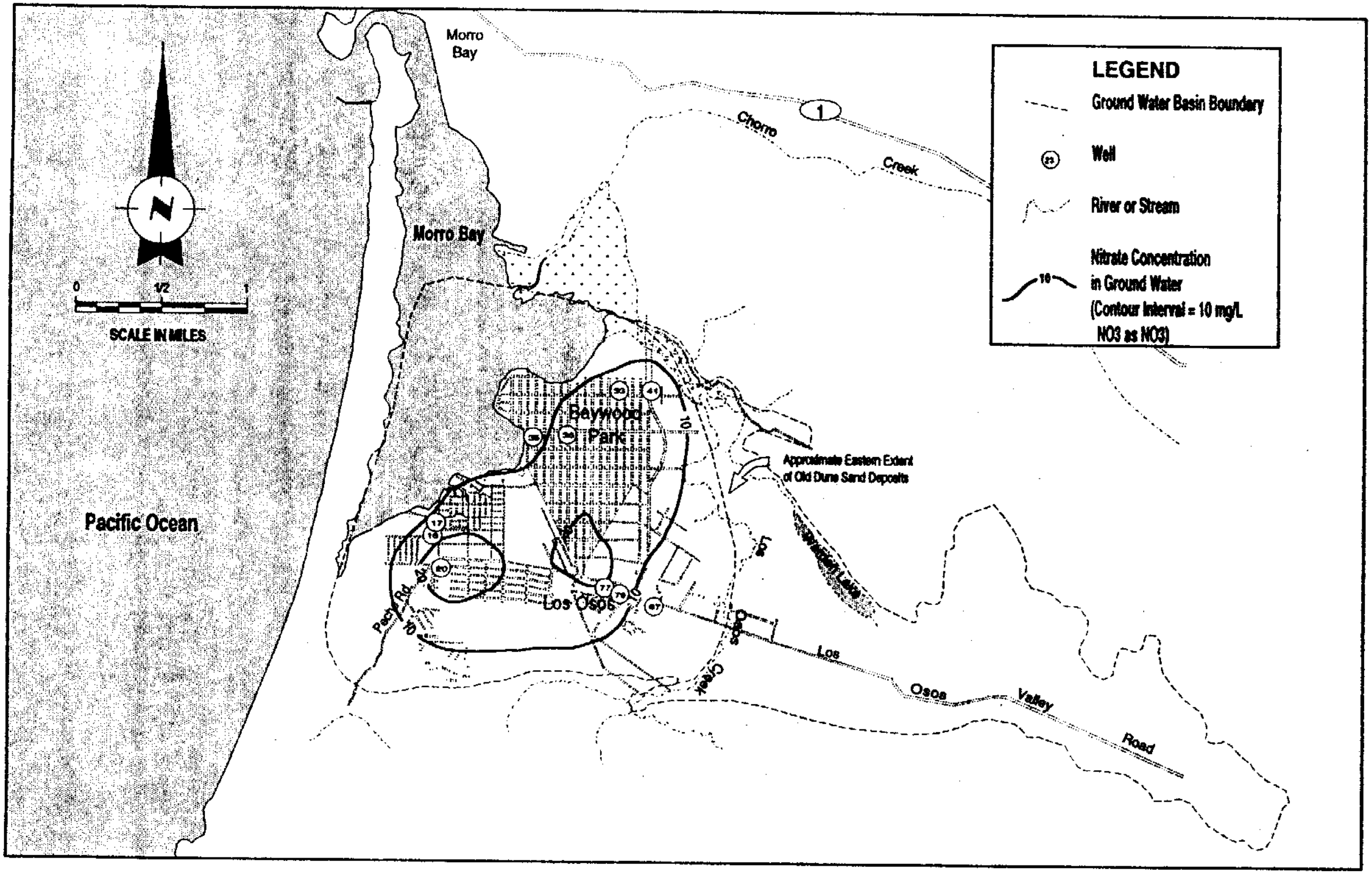


Figure XII-3. Average Nitrate Levels in the Old Dune Sand Aquifer of the Los Osos Valley Ground Water Basin from 1954 to 1973

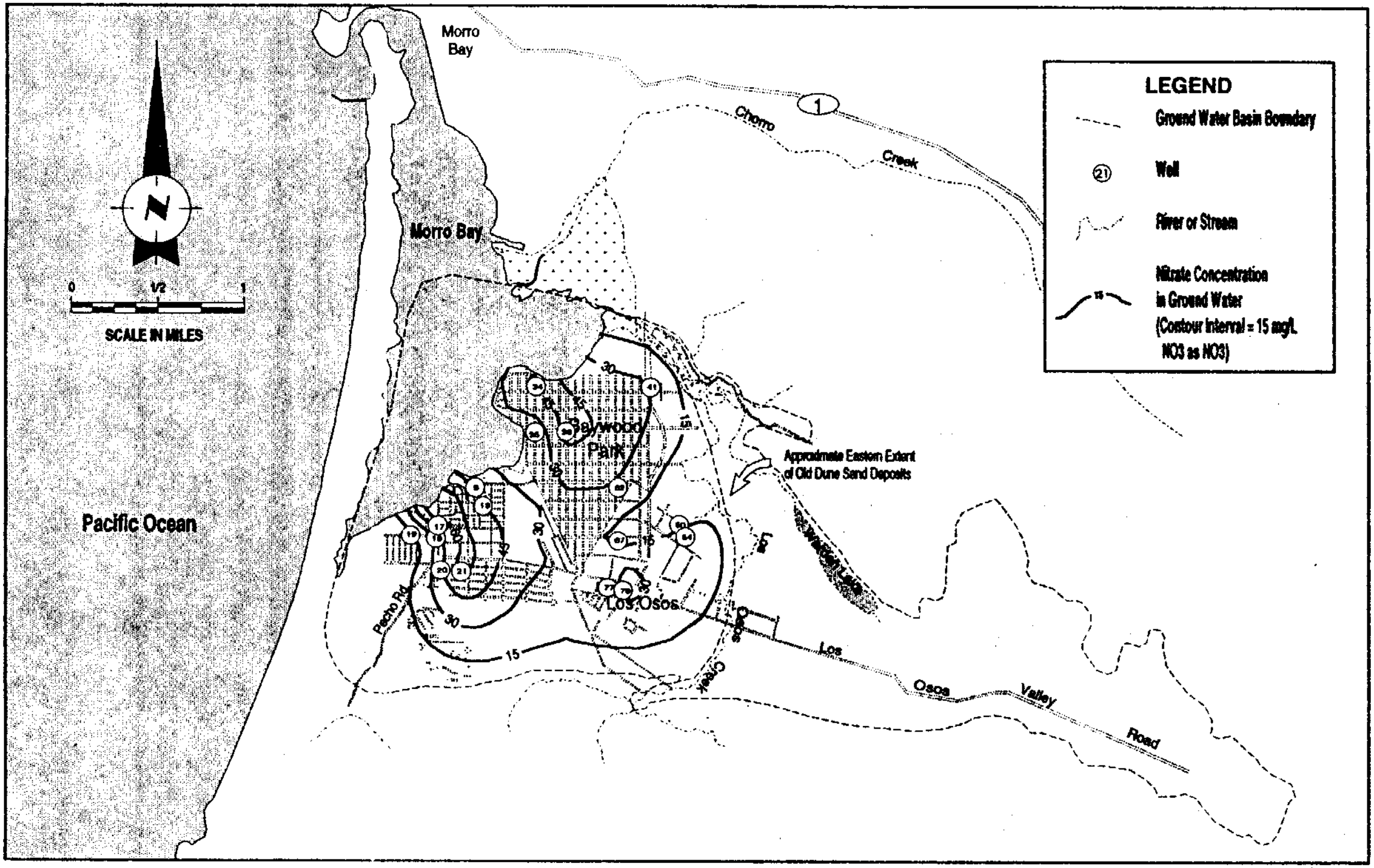


Figure XII-4. Average Nitrate Levels in the Old Dune Sand Aquifer of the Los Osos Valley Ground Water Basin from 1974 to 1984

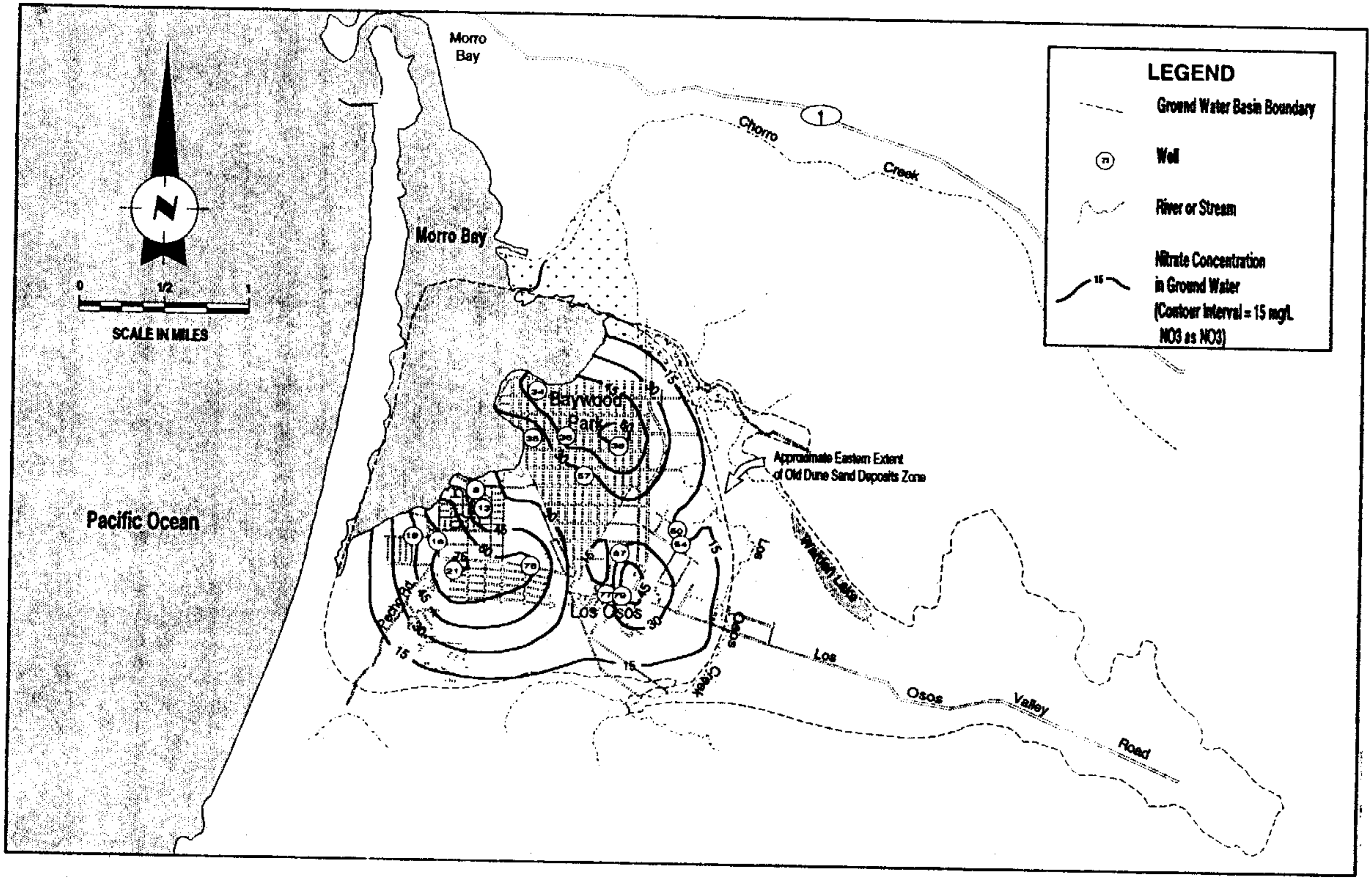


Figure XII-5. Average Nitrate Levels in the Old Dune Sand Aquifer of the Los Osos Valley Ground Water Basin from 1985 to 1994

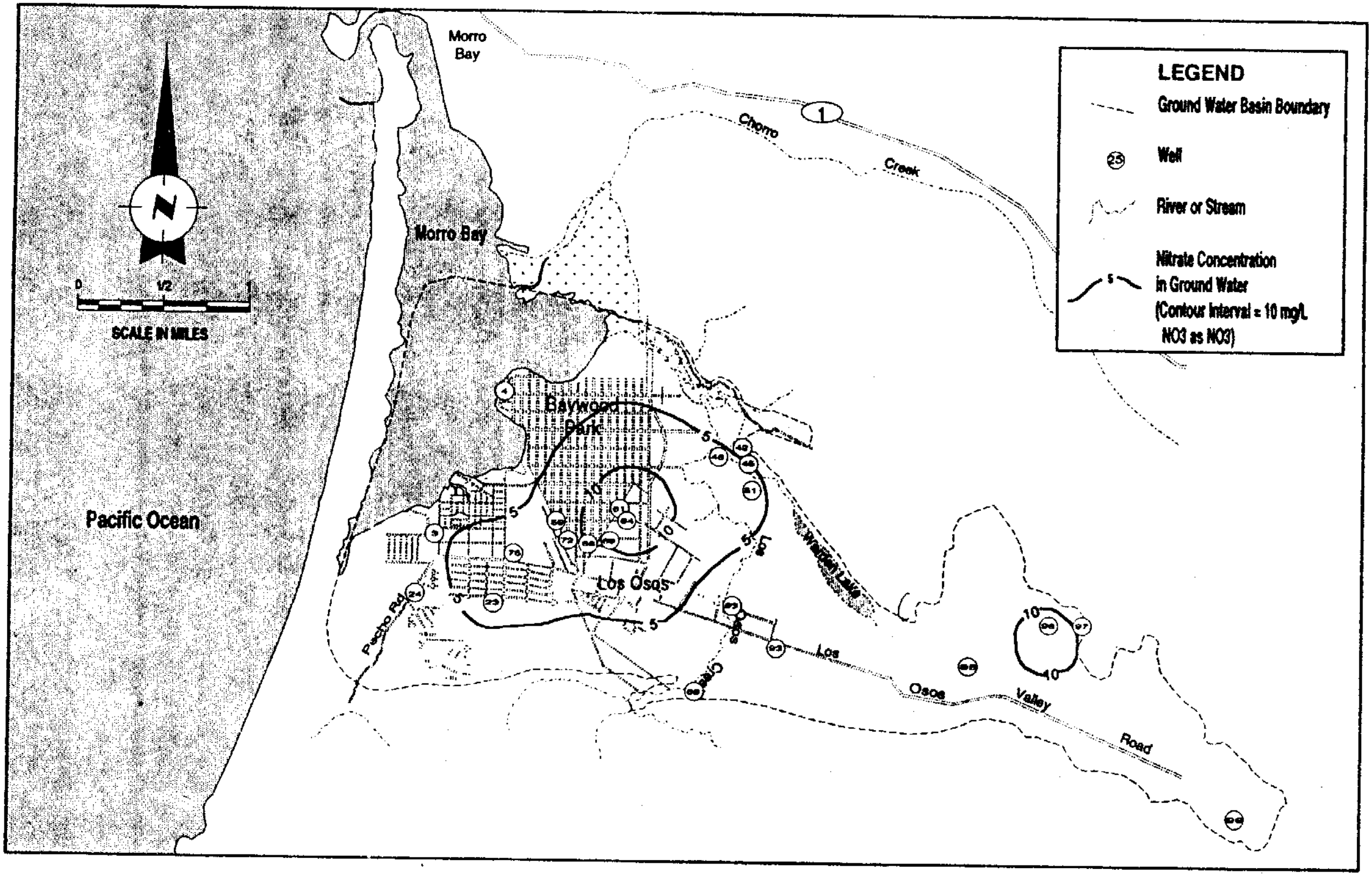


Figure XII-6. Average Nitrate Levels in the Paso Robles and Alluvium Aquifers of the Los Osos Valley Ground Water Basin from 1954 to 1973

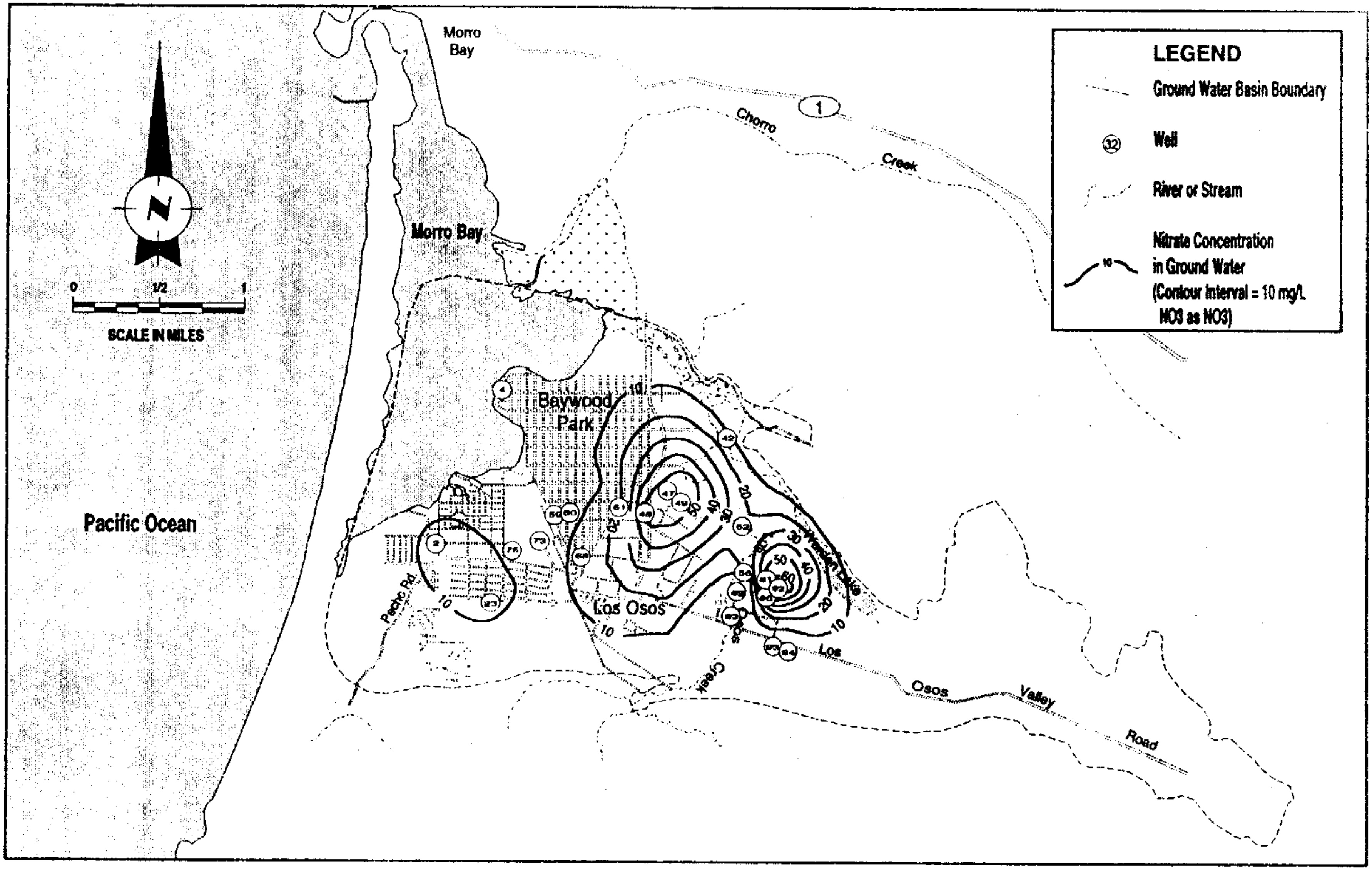


Figure XII-7. Average Nitrate Levels in the Paso Robles and Alluvium Aquifers of the Los Osos Valley Ground Water Basin from 1974 to 1984

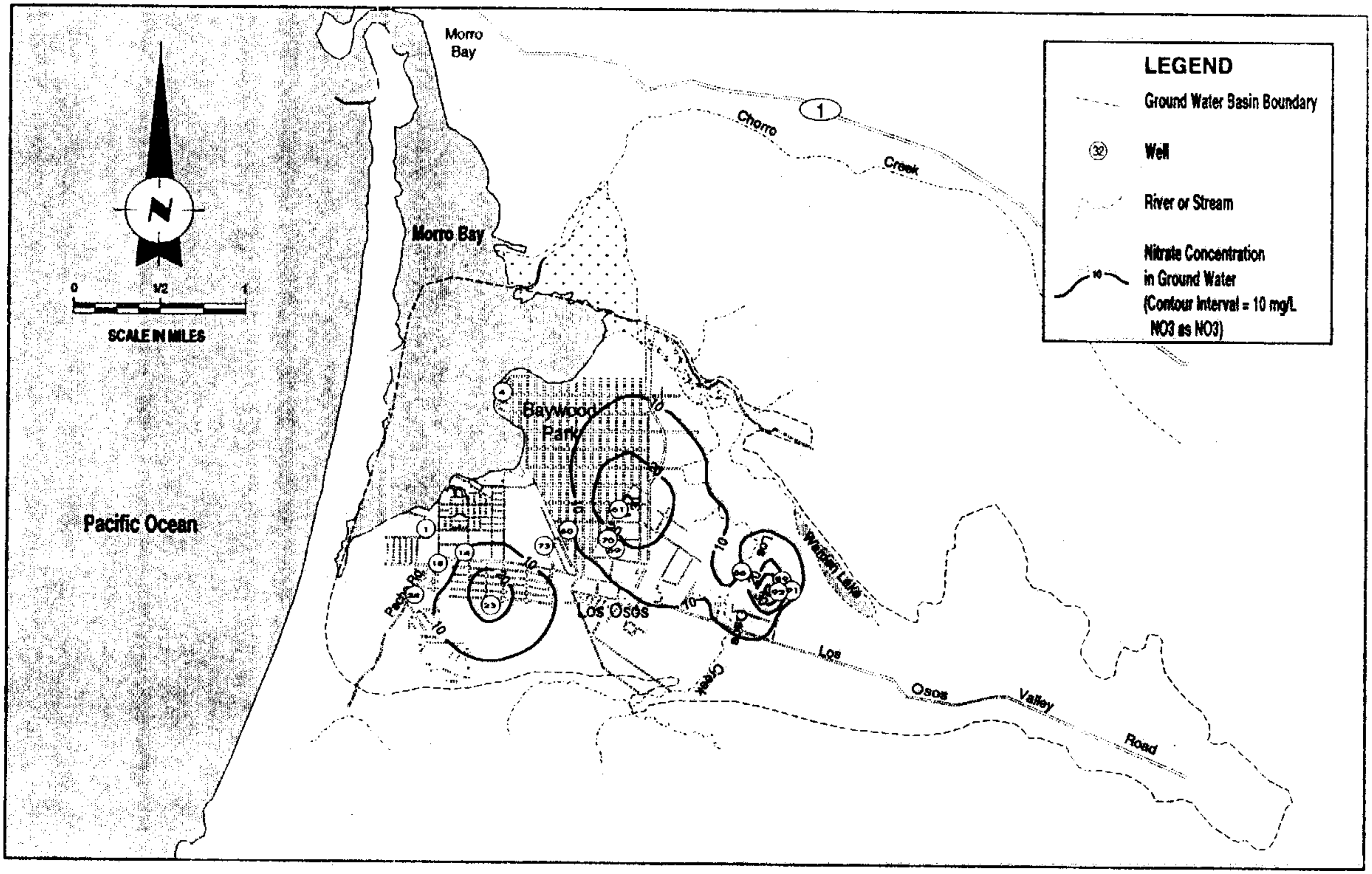


Figure XII-8. Average Nitrate Levels in the Paso Robles and Alluvium Aquifers of the Los Osos Valley Ground Water Basin from 1985 to 1994

Figure XII-6 represents the 1954 to 1973 time frame. Wells sampled directly below the community of Los Osos/Baywood Park generally average 10 mg/l nitrate, as NO3, or less. Another plume east of this community also shows nitrate concentrations of the same magnitude.

Figures XII-7 and XII-8 provide contours for the Paso Robles Formation between 1974 to 1984 and 1985 to 1994, respectively. One significant finding for the Paso Robles aquifer is nitrate concentrations have been steadily increasing in the vicinity of Los Osos Valley Road and Pecho Road. Average nitrate concentrations from 1954 to 1973 were less than 10 mg/l nitrate, as NO3 (see Figure XII-6). In the late 1970's and early 1980's, the average nitrate concentration rose to 10 mg/l nitrate, as NO3 (see Figure XII-7). In the late 1980's and early 1990's, a 20 mg/l nitrate, as NO3 plume developed.

A comparison of the 1974 to 1984 and 1985 to 1994 time frames appears to indicate a decrease in nitrate concentrations in the central and eastern portions of the community. However, as discussed below, the data is so discontinuous between the two time periods, that no conclusions can be reached until additional sampling is completed. The necessary sampling is described directly below. For example, well number 92 needs further sampling. From 1973 to 1984, only three sampling events occurred; all were in 1984. From 1985 to 1994, only two sampling events occurred; both were in 1987. Sampling is necessary to validate recent water quality trends.

Furthermore, well numbers 80 and 81, located near well number 92, had eight and nine sampling events, respectively; all occurred between 1974 to 1978. No sampling events occurred after 1978.

Another well, near well number 92, which requires additional monitoring is well number 89. This well had only three sampling events; all occurred in 1989. The most recent concentration was approaching the state drinking water standard of 45 mg/l nitrate, as NO3. Sampling is necessary to verify compliance with state standards.

In the central portion of the community, a 50 mg/l nitrate, as NO3, contour (centered around well numbers 47, 48 and 49) has many monitoring data for the 1974 to 1979 period. However, sampling of these wells was not performed after 1979. One cannot determine the recent trend of this contour without more sampling.

One other well which requires further testing is well number 61. Although well number 61 has abundant data between 1958 to 1987, no recent sampling events have occurred since 1987. Monitoring data up until 1978 indicated low levels of nitrate contamination. However, these levels have increased during the mid 1980's to a level above the state drinking water standard of 45 mg/l nitrate, as NO3.

Table XII-1. Wells Recommended for Further Testing in the Los Osos Valley Ground Water Basin.

State Well Number	Report Well Number	State Well Number	Report Well Number
30S/10E-13P01	20	30S/11E-18N01	76
30S/11E-08J01	38	30S/11E-20A01	80
30S/11E-17E01	47	30S/11E-20A02	81
30S/11E-17E04	48	30S/11E-20D02	89
30S/11E-17F02	49	30S/11E-21D13	92
30S/11E-18H01	61		

References

Brown and Caldwell. "Phase I Water Quality Management Study." Volume 1 - Project Report. April 1983.

United States Geological Survey (USGS). "Hydrogeology and Water Resources of the Los Osos Valley Ground-Water Basin, San Luis Obispo County, California. 1988.

XIII. PAJARO VALLEY GROUND WATER BASIN

Introduction

On the California coast, the Pajaro Valley ground water basin extends from southern Santa Cruz County into northern Monterey County. Surrounded to the north and east by the Santa Cruz Mountains, this ground water basin supports the City of Watsonville, a large urban center, as well as the communities of Aromas and Corralitos.

Nitrate Concentrations in the Pajaro Valley Ground Water Basin

The ground water basin contains two confining layers. Unfortunately, Regional Board staff encountered insufficient well perforation information to map the nitrate concentrations in the unconfined ground water. Nevertheless, staff collected enough nitrate readings to create contour maps of the confined aquifers for three time periods: 1954 to 1970, 1971 to 1984, and 1985 to 1992 (Figures XIII-1, XIII-2, XIII-3).

Staff also prepared contour maps to represent both the confined and unconfined aquifers. Staff constructed isocontours for the years 1950 to 1959, 1960 to 1975, 1976 to 1985, and 1986 to 1992 (Figures XIII-4, XIII-5, XIII-6, and XIII-7, respectively).

Confined Aquifers

The confined aquifers were mapped for three time periods as mentioned above. In all three time periods, the area with the highest nitrate concentrations lies near Moss Landing in the southwestern part of the basin. In the 1950's, average nitrate concentrations averaged 20 mg/l nitrate, as NO3, or less. Since then, concentrations have risen markedly. In the most recent time period, 1985 to 1992, the highest averaged values reach 150 mg/l nitrate, as NO3 (Figure XIII-3).

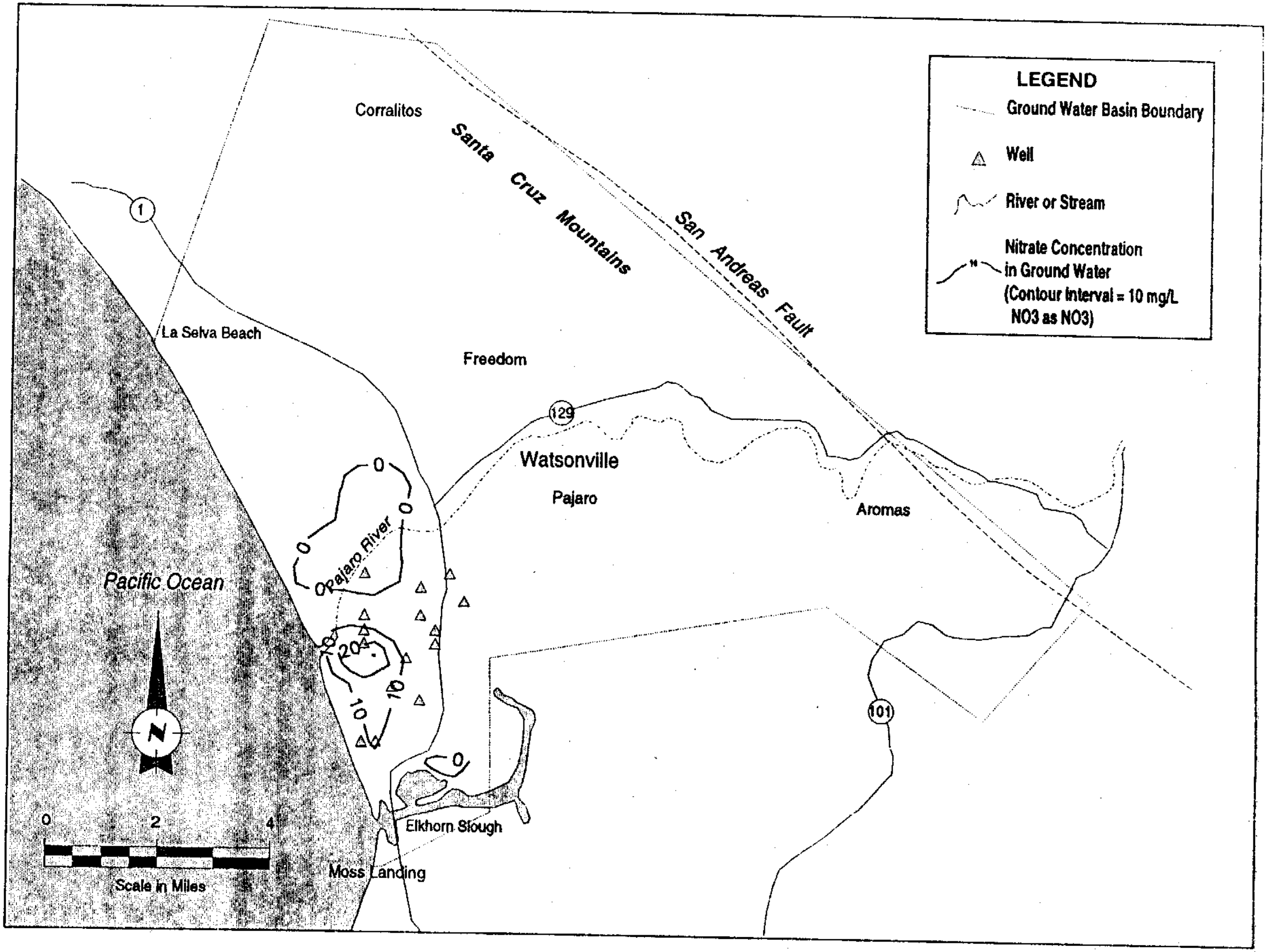


Figure XIII-1. Average Nitrate Concentrations in the Confined Aquifers of the Pajaro Valley Ground Water Basin from 1954 to 1970

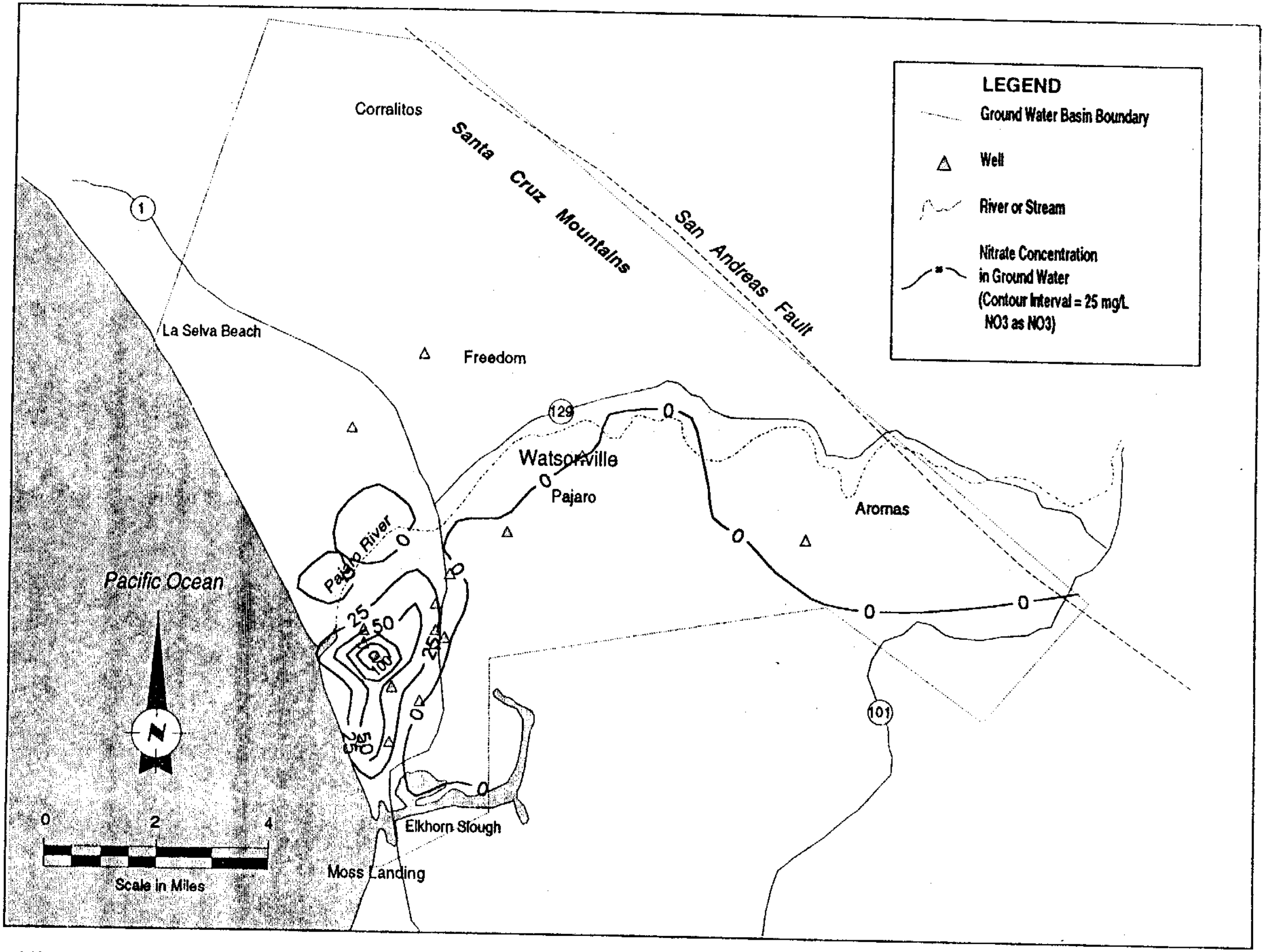


Figure XIII-2. Average Nitrate Concentrations in the Confined Aquifers of the Pajaro Valley Ground Water Basin from 1971 to 1984

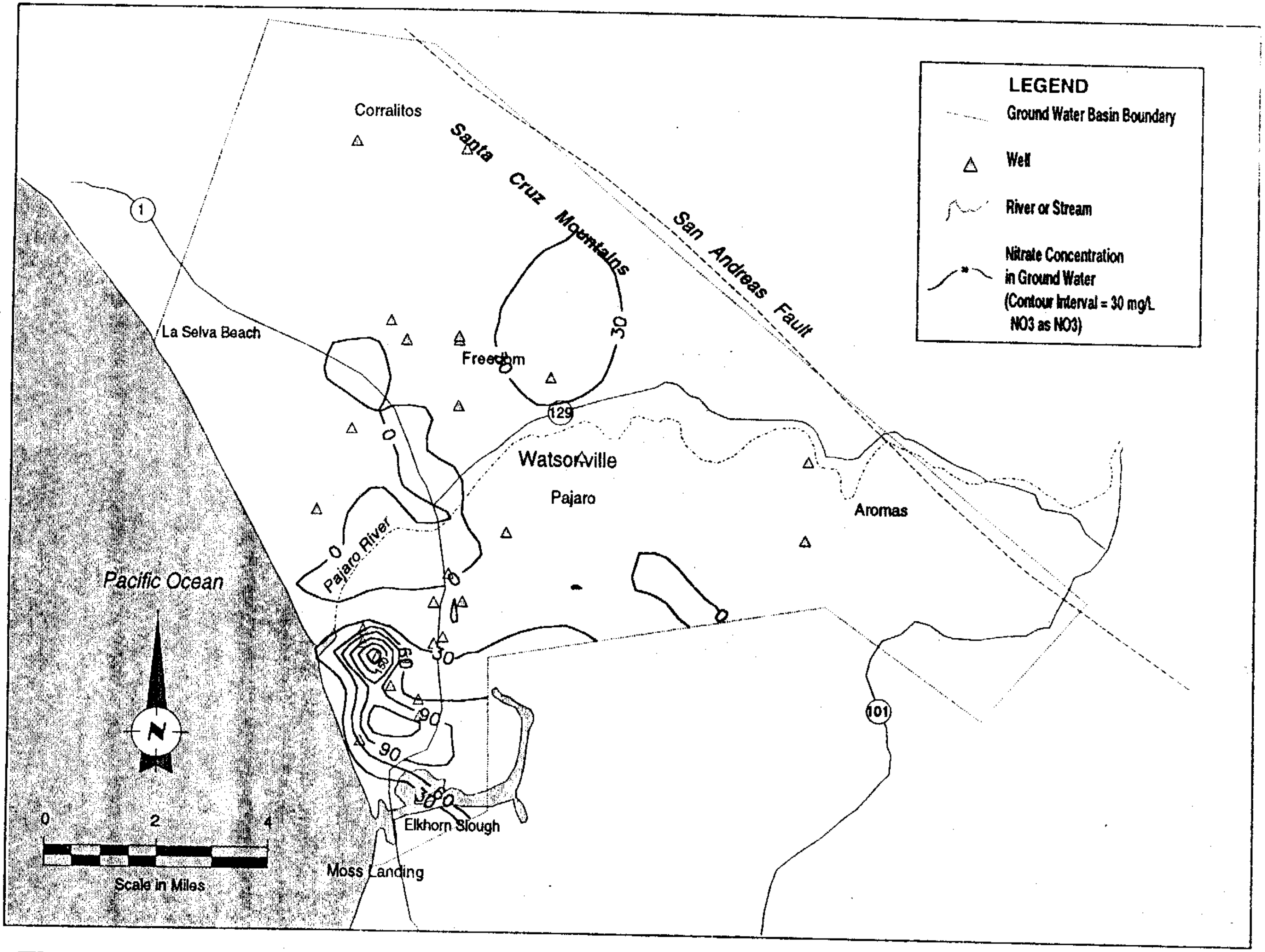


Figure XIII-3. Average Nitrate Concentrations in the Confined Aquifers of the Pajaro Valley Ground Water Basin from 1985 to 1992

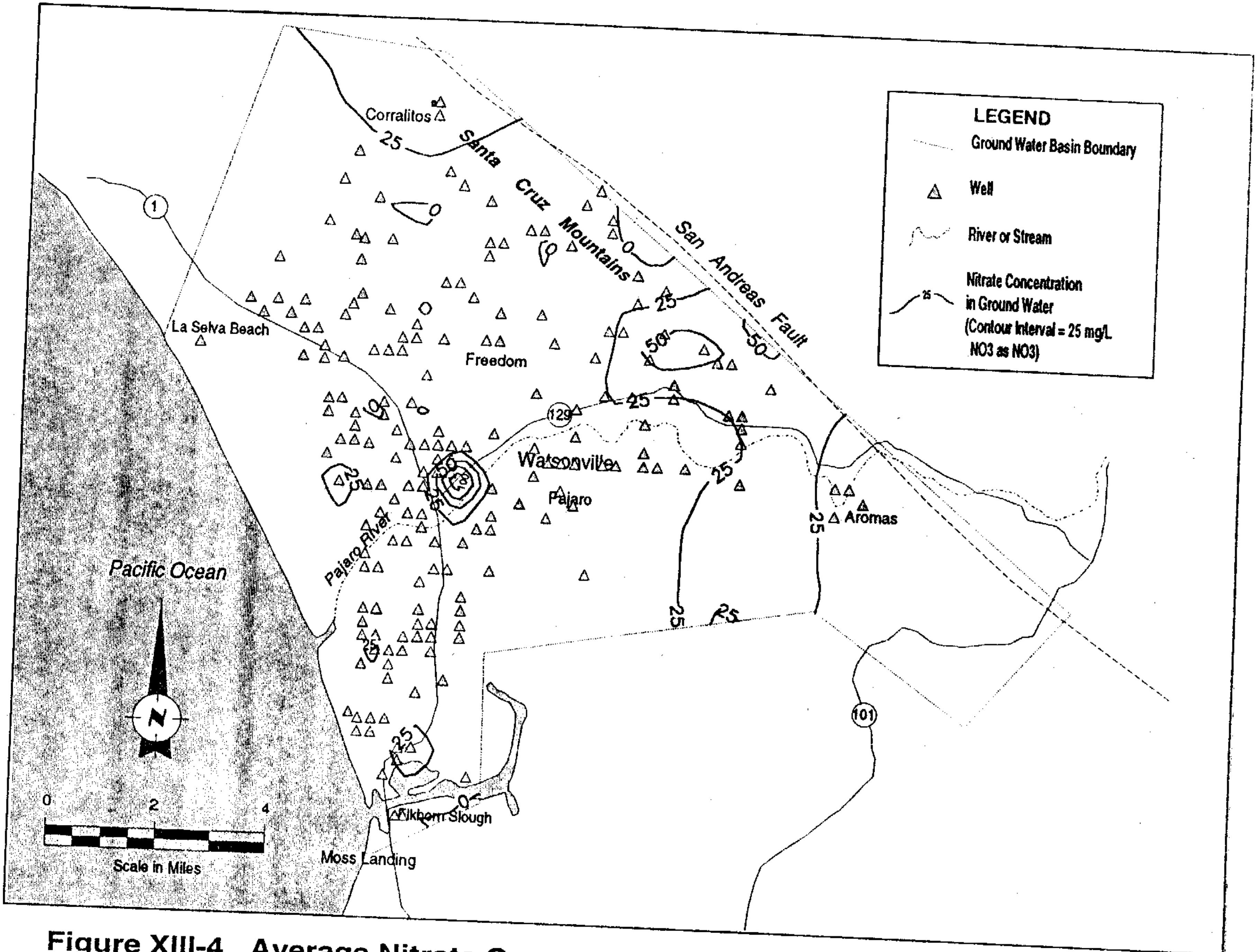


Figure XIII-4. Average Nitrate Concentrations in the Unconfined and Confined Aquifers of the Pajaro Valley Ground Water Basin from 1950 to 1959

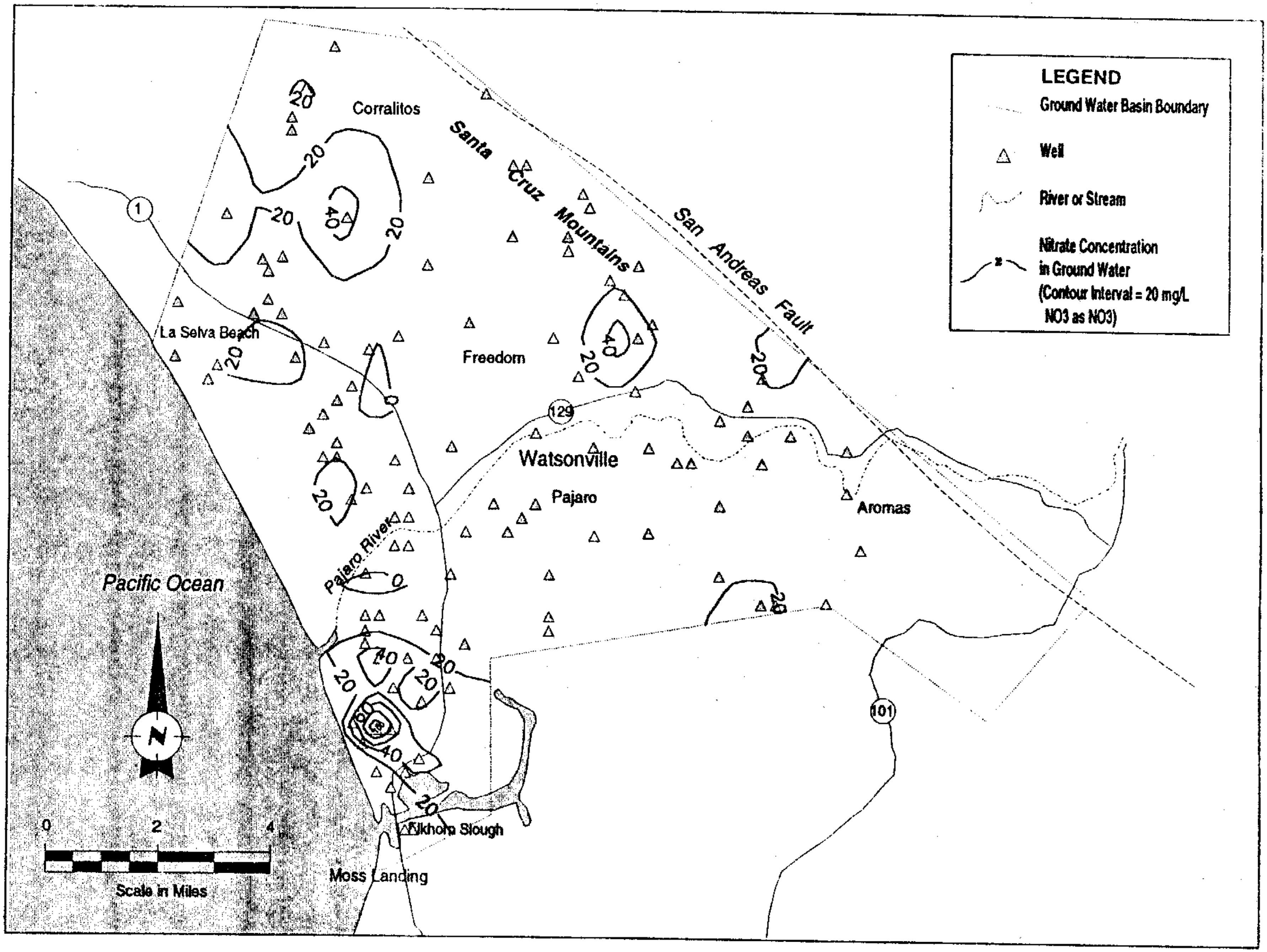


Figure XIII-5. Average Nitrate Concentrations in the Unconfined and Confined Aquifers of the Pajaro Valley Ground Water Basin from 1960 to 1975

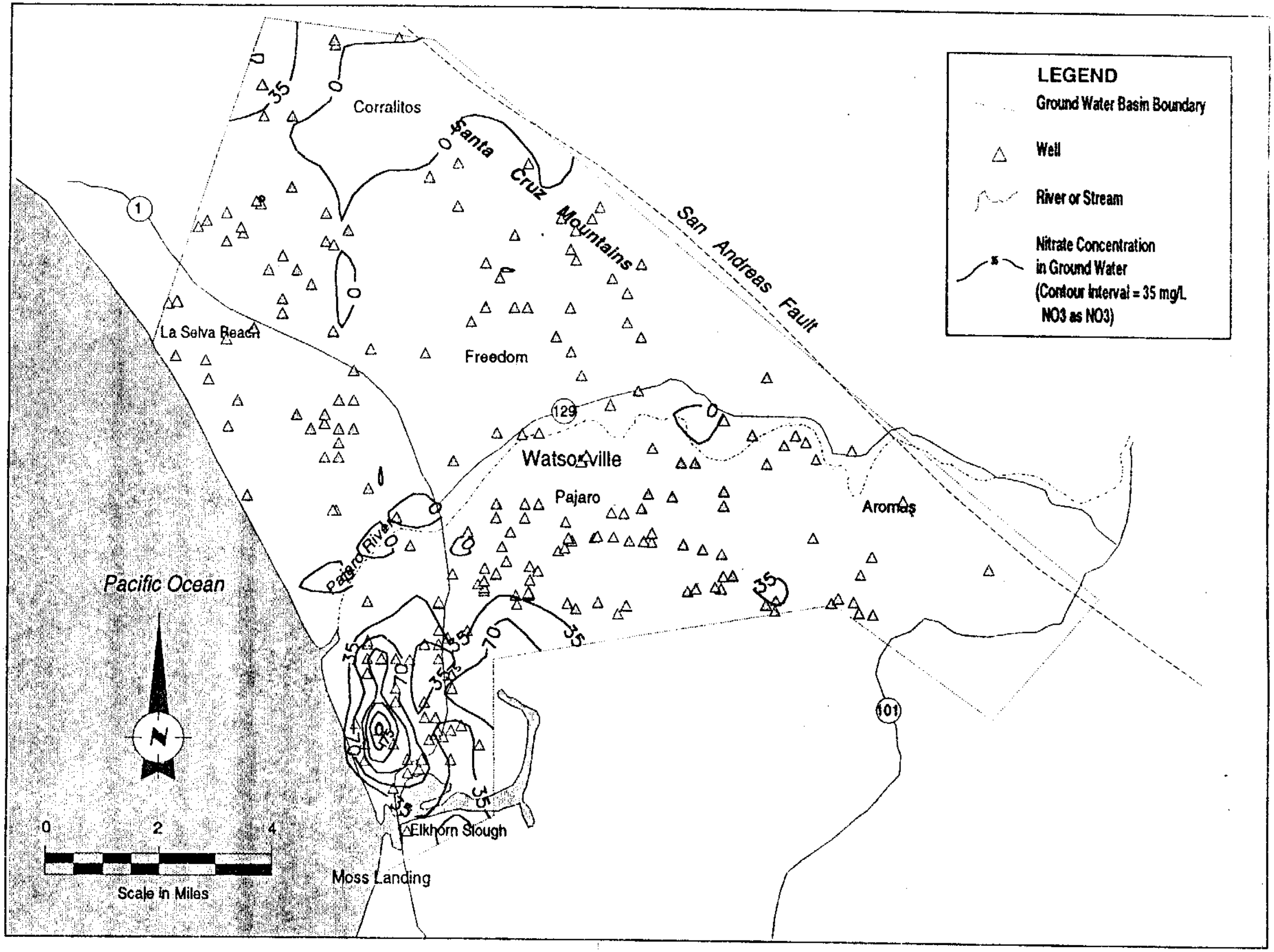


Figure XIII-6. Average Nitrate Concentrations in the Unconfined and Confined Aquifers of the Pajaro Valley Ground Water Basin from 1976 to 1985

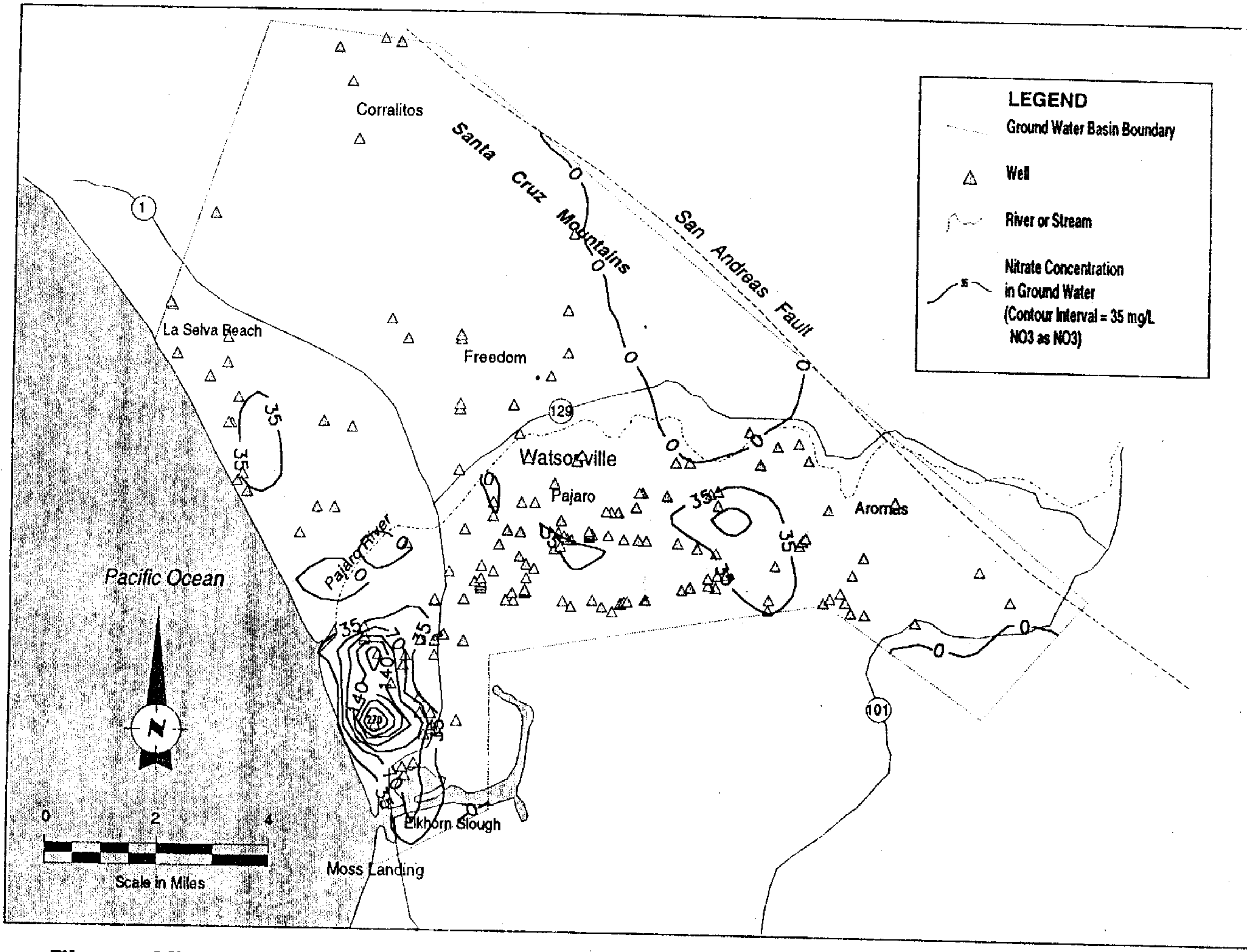


Figure XIII-7. Average Nitrate Concentrations in the Unconfined and Confined Aquifers of the Pajaro Valley Ground Water Basin from 1986 to 1992

Unconfined and Confined Ground Water Basin

The maps of the overall basin, Figures XIII-4, XIII-5, XIII-6, and XIII-7, show nitrate contours of the confined and unconfined aquifer. Figure XIII-7, the most recent picture of the ground water basin, displays the average nitrate levels in the Moss Landing area as reaching 270 mg/l nitrate, as NO3, six times the state Maximum Contaminant Level. These maps exhibit a trend of increasing nitrate concentrations, providing evidence that parts of this ground water basin are severely contaminated.

In the past, some areas of nitrate hot spots existed; however, maps from later time periods do not indicate their presence. West of Watsonville, for example, a nitrate plume was present in the 1950's with average nitrate concentrations as high as 100 mg/l nitrate, as NO3 (Figure XIII-4). The more recent maps, Figures XIII-5 through XIII-7, provide no evidence supporting the presence of this plume. A similar pattern occurred in the area northeast of Watsonville. At this location, staff collected data indicating nitrate concentrations up to 50 mg/l nitrate, as NO3, in 1950 to 1959 and up to 40 mg/l nitrate, as NO3, in 1960 to 1975. Some recent concentrations, however, averaged approximately zero mg/l nitrate, as NO3. While worth noting, these recent concentrations can not establish current nitrate trends in these areas because of insufficient recent sampling data. Regional Board staff advise more sampling of historical hot spots to verify present trends. Table XIII-1 lists wells recommended for further testing.

Table XIII-1. Wells Recommended for Further Testing in the Pajaro Valley Ground Water Basin.

12S/02E-08Q01	11S/02E-08L01	11S/02E-36G02
12S/02E-08P01	11S/01E-24H03	11S/02E-36P03
12S/02E-08K02	11S/02E-36M01	11S/03E-31M01
12S/02E-08LO1	11S/02E-26R02	11S/03E-31Q02
12S/01E/14J01	11S/01E-12D01	11S/03E-31P01
12S/01E/36A01	11S/01E-23 (#221)	11S/02E-01B01
11S/02E-08F01	11S/01E-23 (#220)	12S/03E-06A01
11S/02E-08F02		

References

Montgomerey Watson. "Pajaro Valley Water Management Agency Basin Management Plan, Main Report-Volume I." November, 1993.

XIV. PASO ROBLES GROUND WATER BASIN

Introduction

The Paso Robles ground water basin, a large inland ground water basin in the upper Salinas Valley watershed, extends from southern Monterey County into northern San Luis Obispo County. Communities located in the Paso Robles Basin include San Ardo, San Miguel, Paso Robles, and Atascadero. As population growth in the communities of San Ardo, San Miguel, Paso Robles, and Atascadero increases, agricultural land is continually converted to residential property.

Nitrate Concentrations in the Paso Robles Ground Water Basin

The hydrogeology of the Paso Robles ground water basin displays a poorly defined aquifer system (Chipping (Int.), 1993). However, the Paso Robles Formation, which basically underlies the entire basin (Chipping et al., 1993), is considered the most extensive water producing formation (DWR, 1971).

Because this basin is not known to have a distinct aquifer system, it is mapped as one continuous unit. Figure XIV-1 shows nitrate concentrations from 1954 to 1966. Staff, noting negligible change in nitrate concentrations from 1967 up to 1992, created one map for this period, Figure XIV-2.

Figures XIV-1 and XIV-2 reveal areas in both time periods where nitrate concentrations approached and equaled the Maximum Contaminant Level of 45 mg/l nitrate, as NO3. Also both figures locate a nitrate plume near the junction of Highways 46 and 101 where peak average concentrations increased from 45 mg/l nitrate, as NO3, in 1954 to 1966 to 60 mg/l nitrate, as NO3, in 1967 to 1992. Additionally, the areas west of Cholame and north of Paso Robles show degradation in water quality.

References

Chipping, David, PhD, et al. "A Study of the Paso Robles Ground Water Basin to Establish Best Management Practices and Establish Salt Objectives." California Water Quality Control Board, Contract 0-174-253-0, 1993.

Chipping, D, PhD, California Polytechnic State University, San Luis Obispo. Interview. San Luis Obispo, CA. 28 July 1993.

California Department of Water Resources (DWR). "Preliminary Evaluation of the Water Supply of the Arroyo Grande and Paso Robles Areas." 1971.

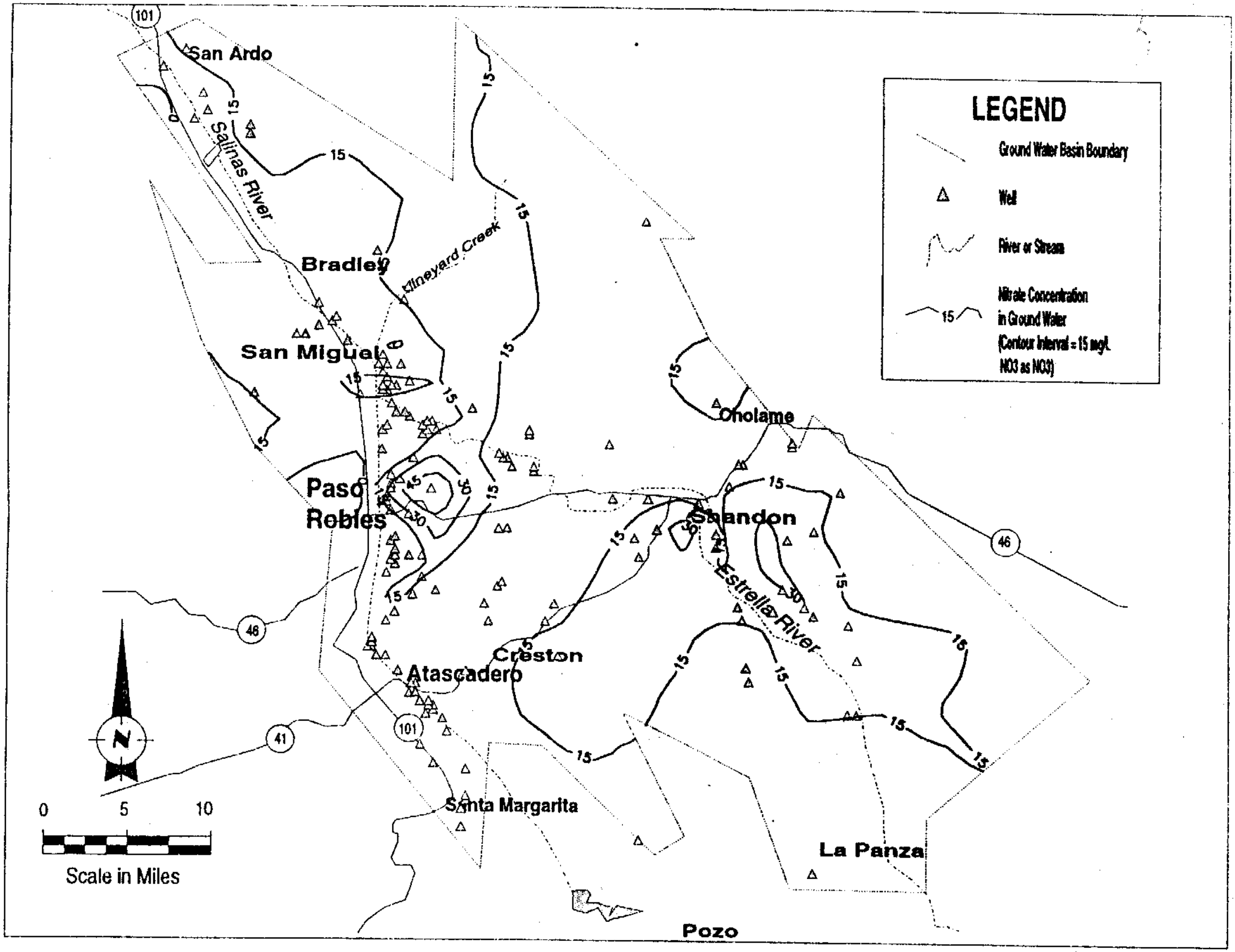


Figure XIV-1. Average Nitrate Concentrations in the Paso Robles Ground Water Basin from 1954 to 1966

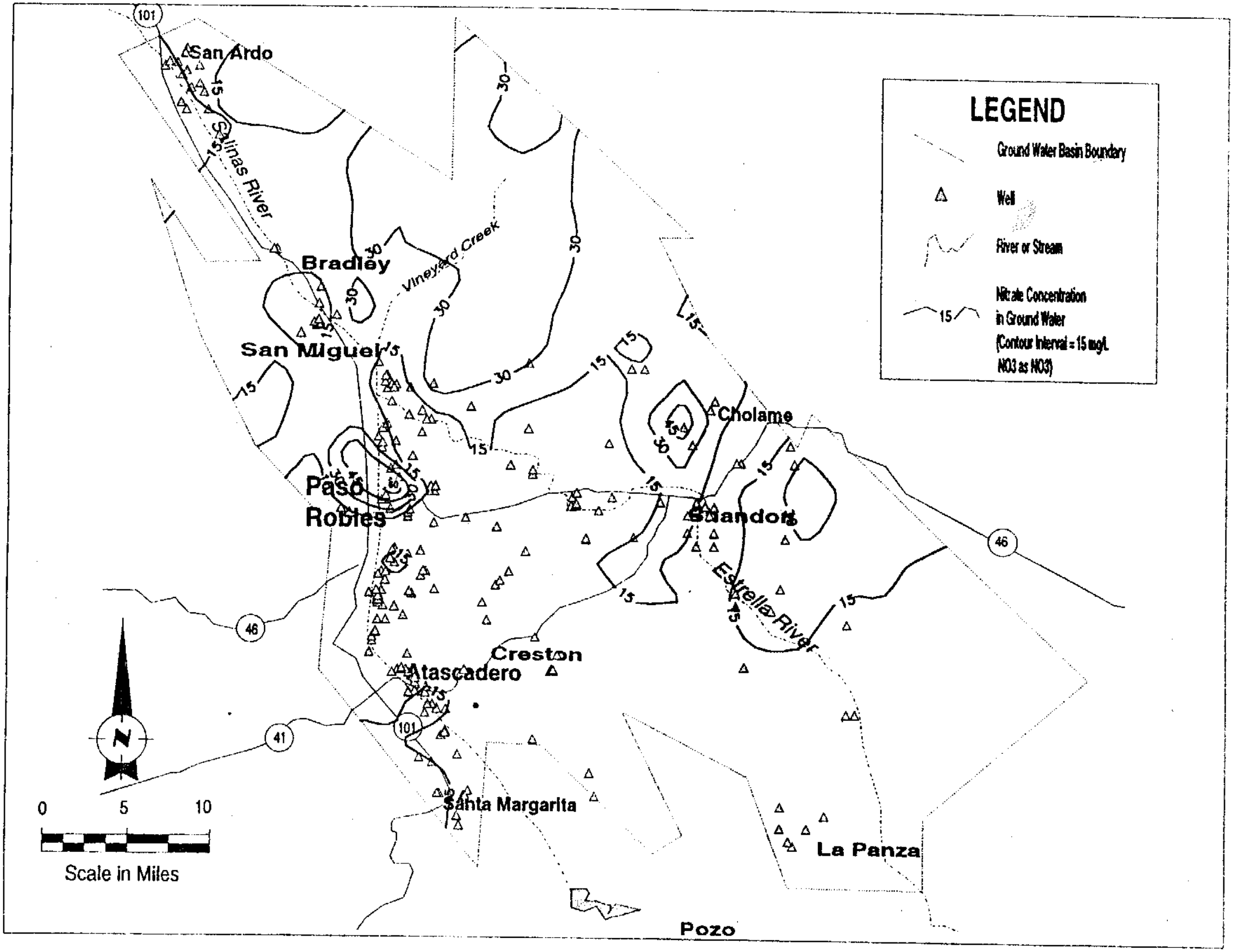


Figure XIV-2. Average Nitrate Concentrations in the Paso Robles Ground Water Basin from 1967 to 1992

XV. SALINAS VALLEY GROUND WATER BASIN

Introduction

Long and narrow, the Salinas Valley ground water basin extends from the City of San Ardo in the south to Monterey Bay in the north. Supporting a very large agricultural industry, the ground water in the Salinas Valley also serves as a drinking water supply for a population of approximately 150,000 people living in the King City, Greenfield, Soledad, Gonzales, and Salinas communities.

Nitrate Concentrations in the Salinas Valley Ground Water Basin

Although hydrologically linked to one another (Boyle Engineering Corp., 1986), the Salinas Valley ground water basin is commonly divided into four sub-areas: Upper Valley, Forebay, East Side, and Pressure (Figure XV-1). The Pressure Area lies between Gonzales and the Pacific Ocean and is composed primarily of confined and semi-confined aquifers. The three primary water bearing strata are designated as the 180-ft. aquifer, the 400-ft. aquifer, and the 900-ft. aquifer. The water bearing formations in the Upper Valley, Forebay, and East Side are generally unconfined and semi-confined (MCWRA, 1992).

Figures XV-2 and XV-3 display the nitrate contamination for the entire basin. These maps compare basin nitrate concentrations among two major time periods: 1966 to 1980 and 1981 to 1992. Prior to 1966, however, staff encountered too little data to represent nitrate concentrations in the overall basin.

Figures XV-4 through XV-9 show the nitrate contamination only of the Pressure Area. For the purposes of this investigation, staff labeled the three aquifers in the Pressure Area with the approximate aquifer depth designations of 180-ft., 400-ft., and 900-ft. aquifer. The depths of the 180-ft. and 400-ft. aquifers range from approximately 140 to 340 feet and 340 to 640 feet, respectively. Fortunately, staff collected enough historical data to compare average nitrate concentrations in the 180-ft. and the 400-ft. among three time periods: 1950 to 1966, 1967 to 1982, and 1983 to 1992 (Figures XV-4, XV-5, XV-6 and XV-7, XV-8, XV-9). The data from the 900-ft. aquifer was insufficient to map the nitrate concentrations .

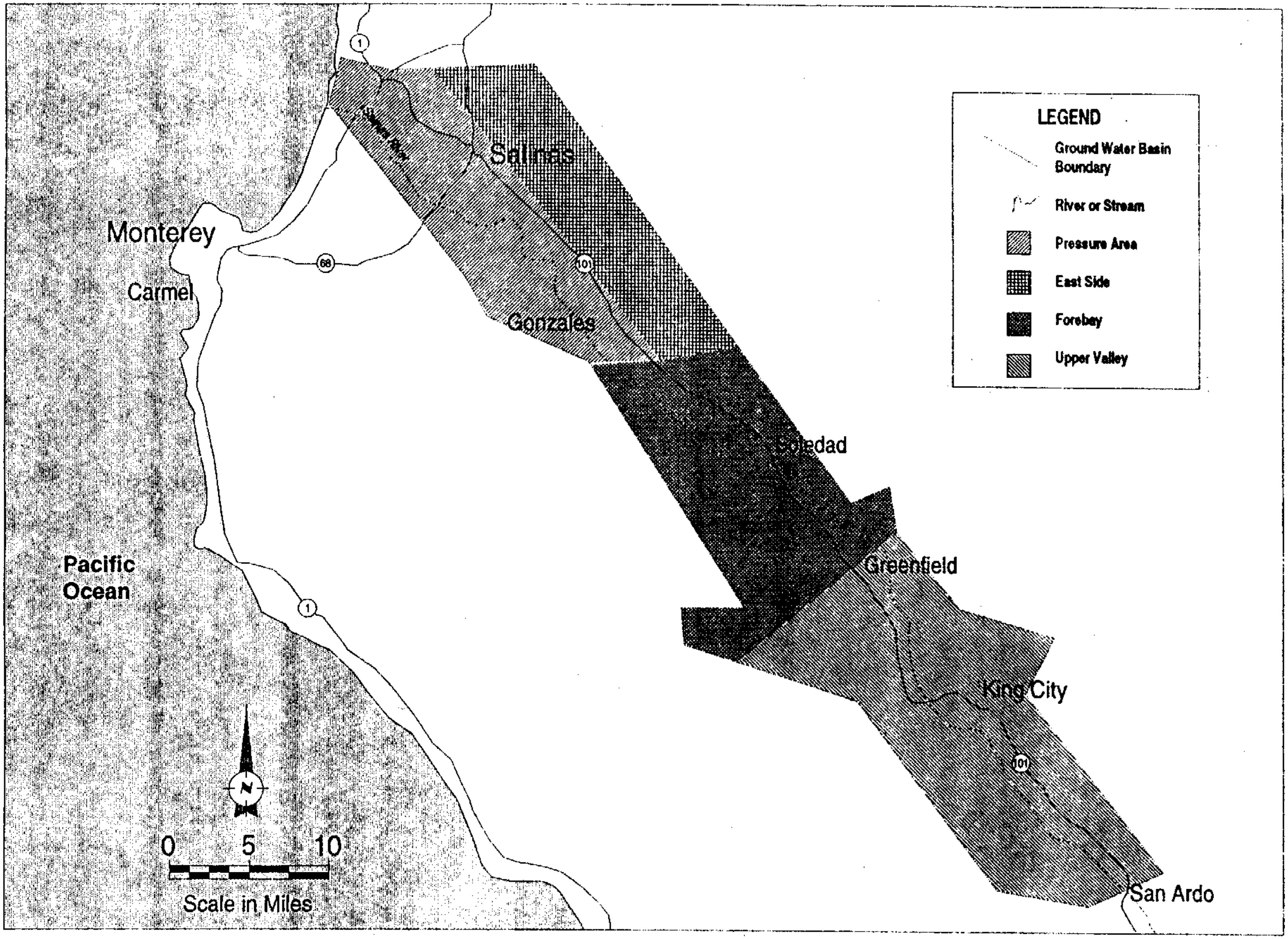


Figure XV-1. Hydrogeologic Sub-Areas of the Salinas Valley Ground Water Basin

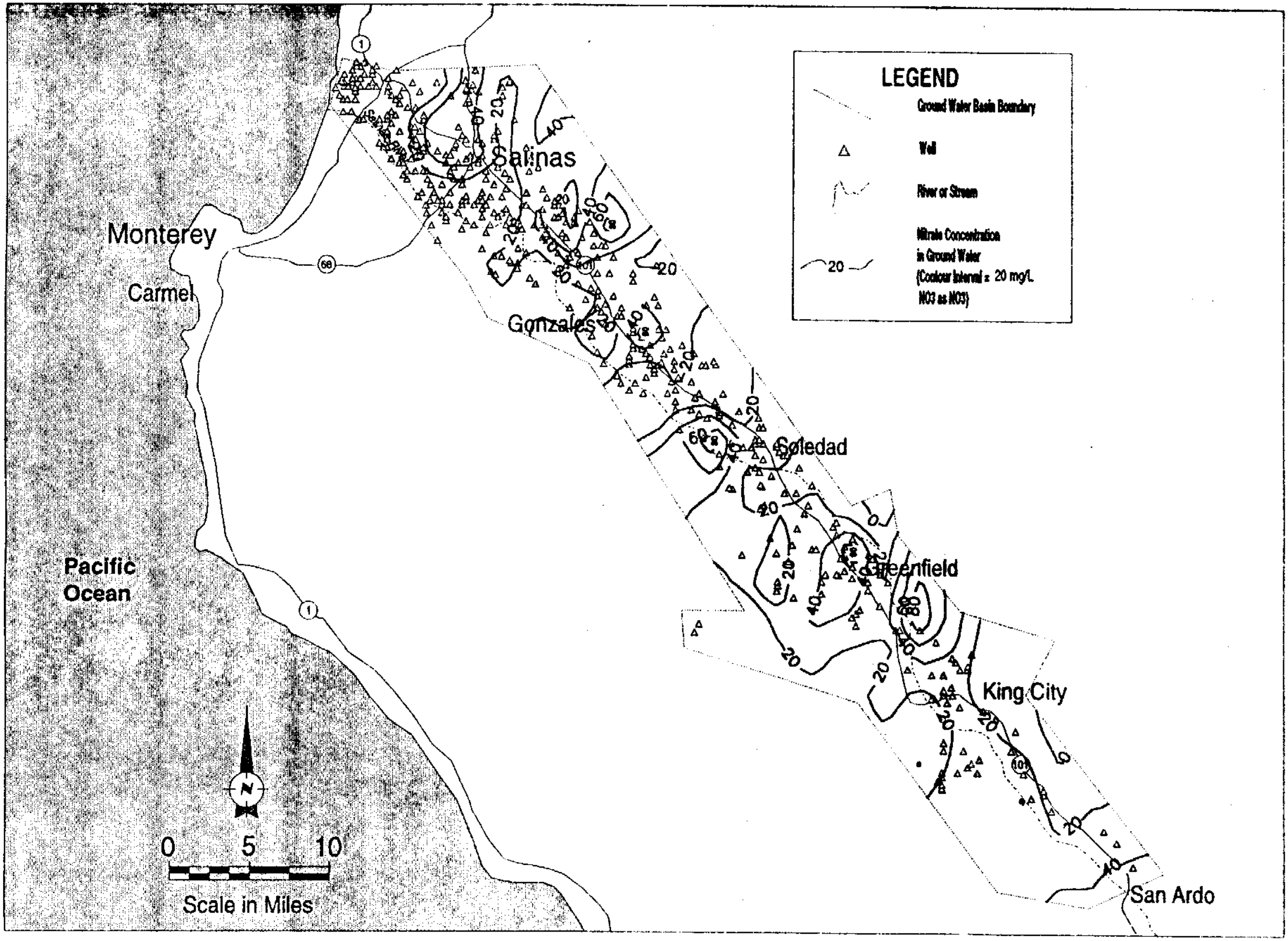


Figure XV-2. Average Nitrate Concentrations in the Salinas Valley Ground Water Basin from 1966 to 1980

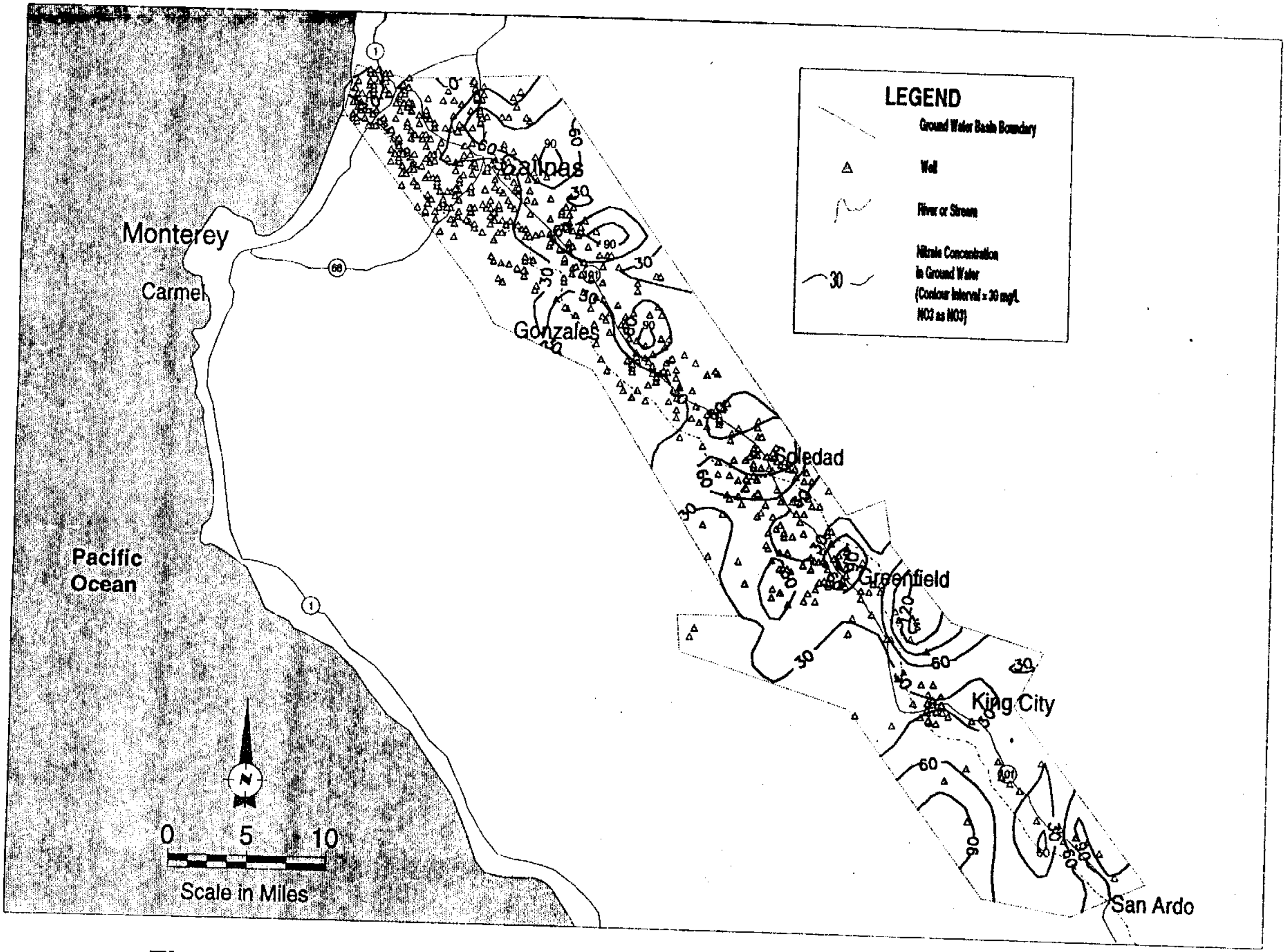


Figure XV-3. Average Nitrate Concentrations in the Salinas Valley Ground Water Basin from 1981 to 1992.

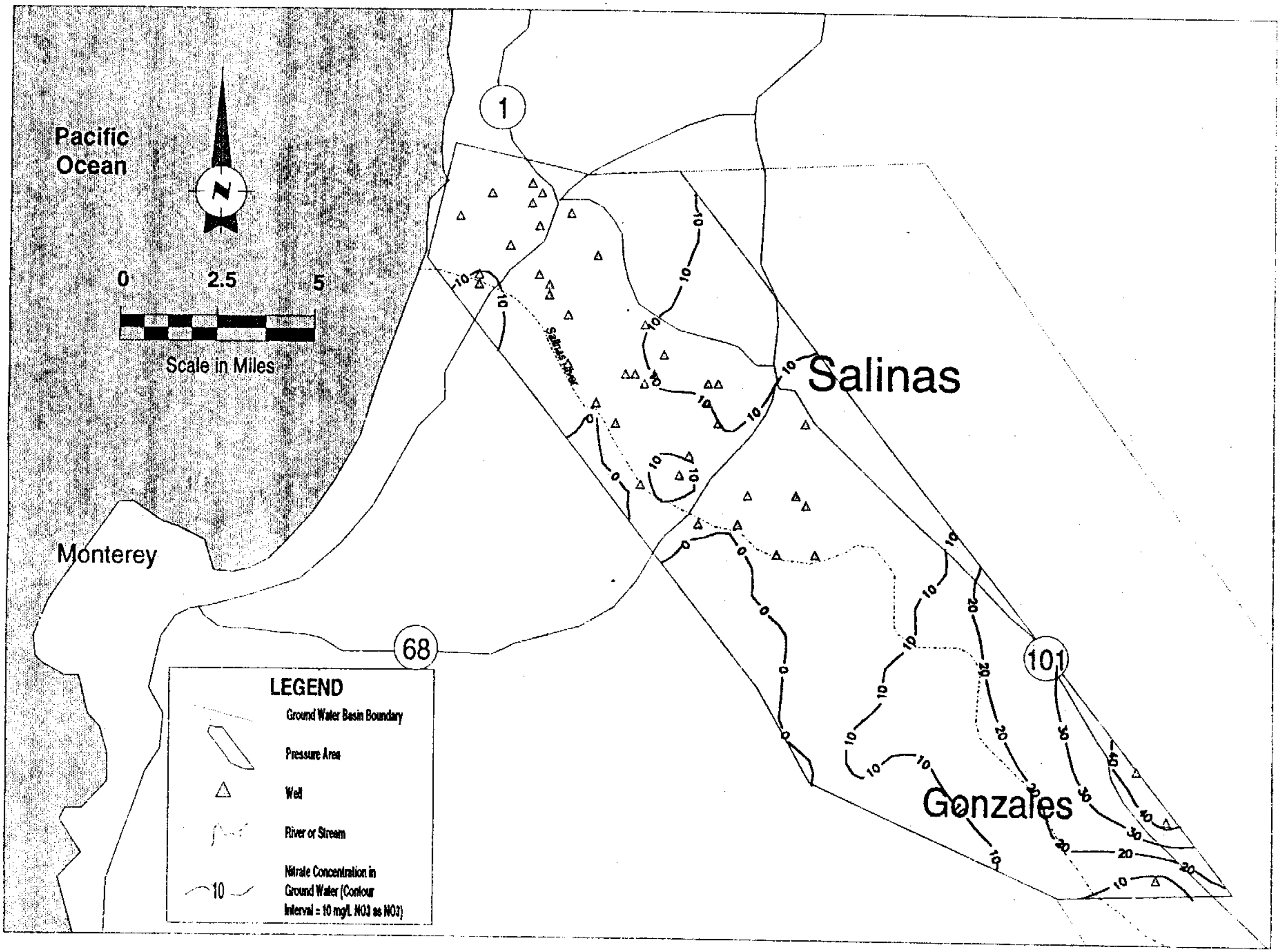


Figure XV-4. Average Nitrate Concentrations in the 180-ft Aquifer of the Salinas Valley Ground Water Basin from 1950 to 1966

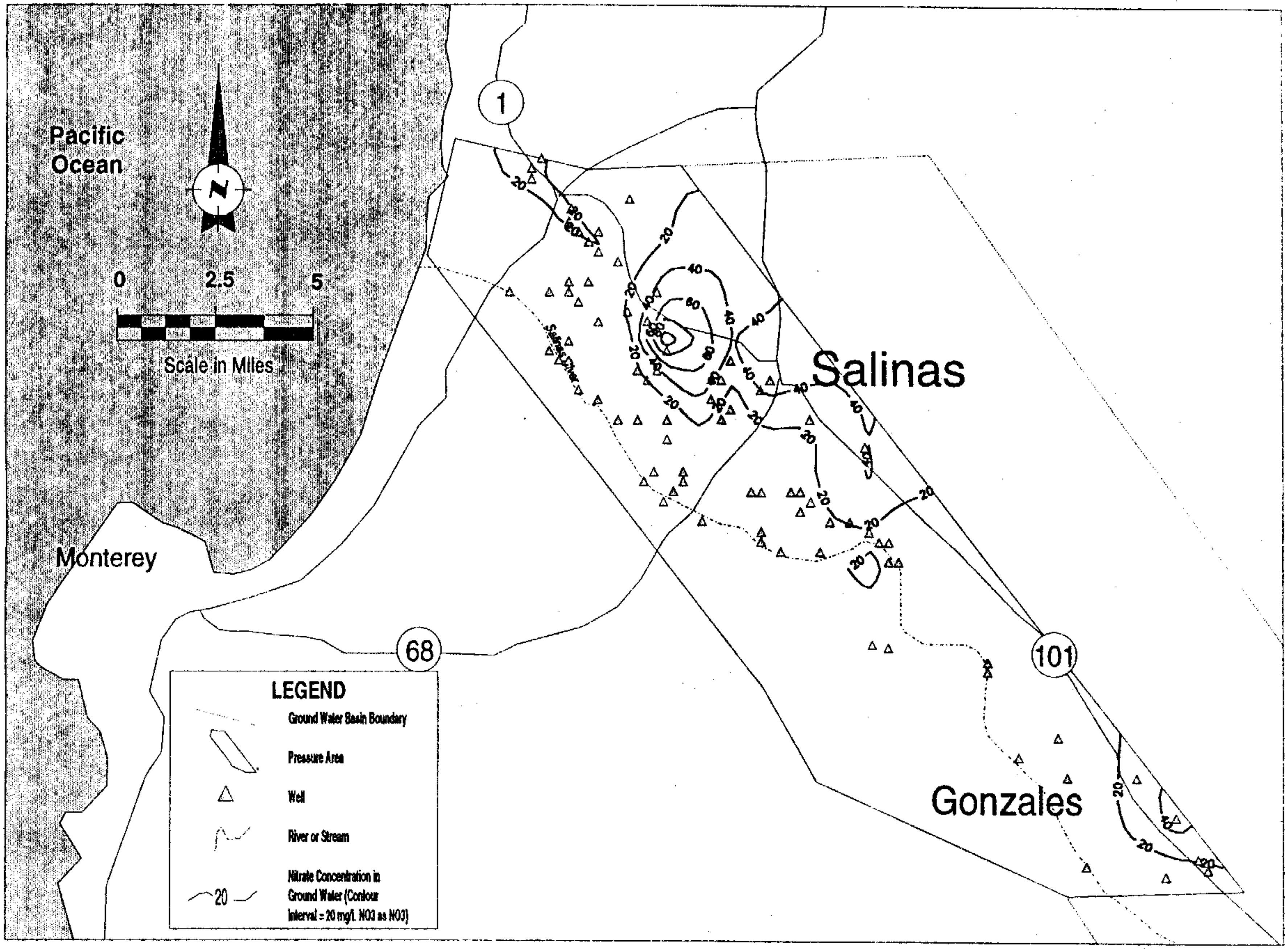


Figure XV-5. Average Nitrate Concentrations in the 180-ft Aquifer of the Salinas Valley Ground Water Basin from 1967 to 1982

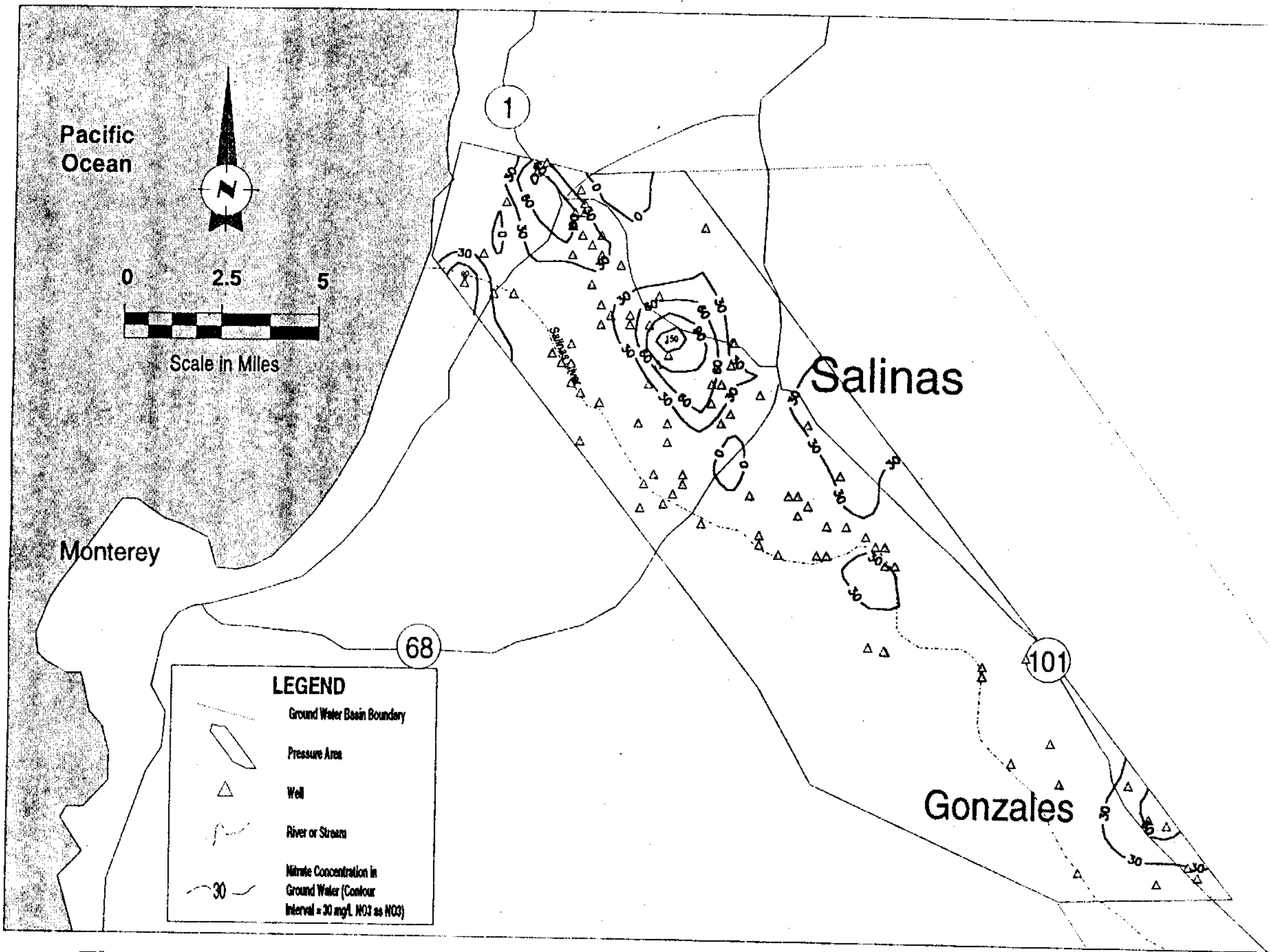


Figure XV-6. Average Nitrate Concentrations in the 180-ft Aquifer of the Salinas Valley Ground Water Basin from 1983 to 1992

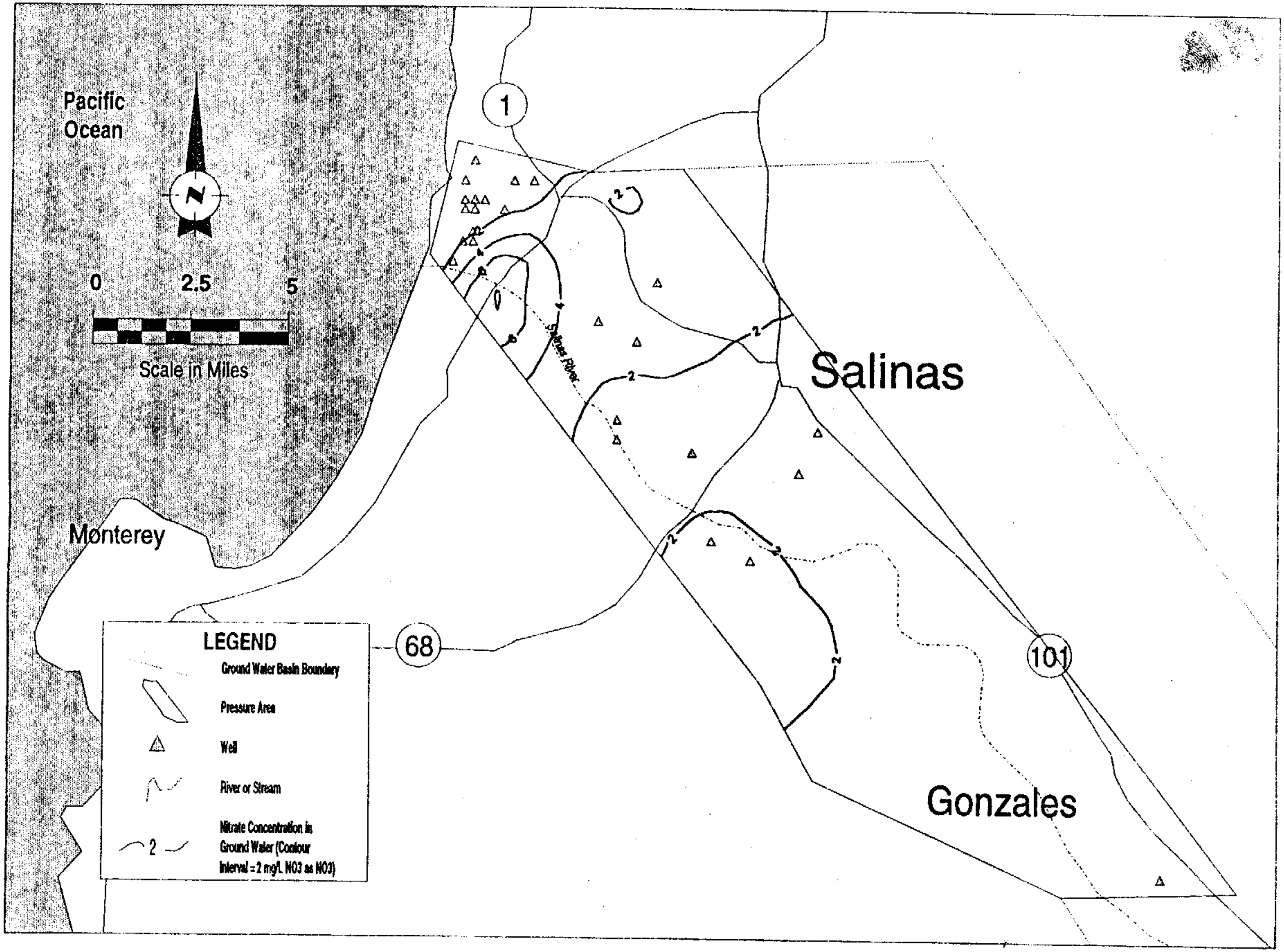


Figure XV-7. Average Nitrate Concentrations in the 400-ft Aquifer of the Salinas Valley Ground Water Basin from 1950 to 1966

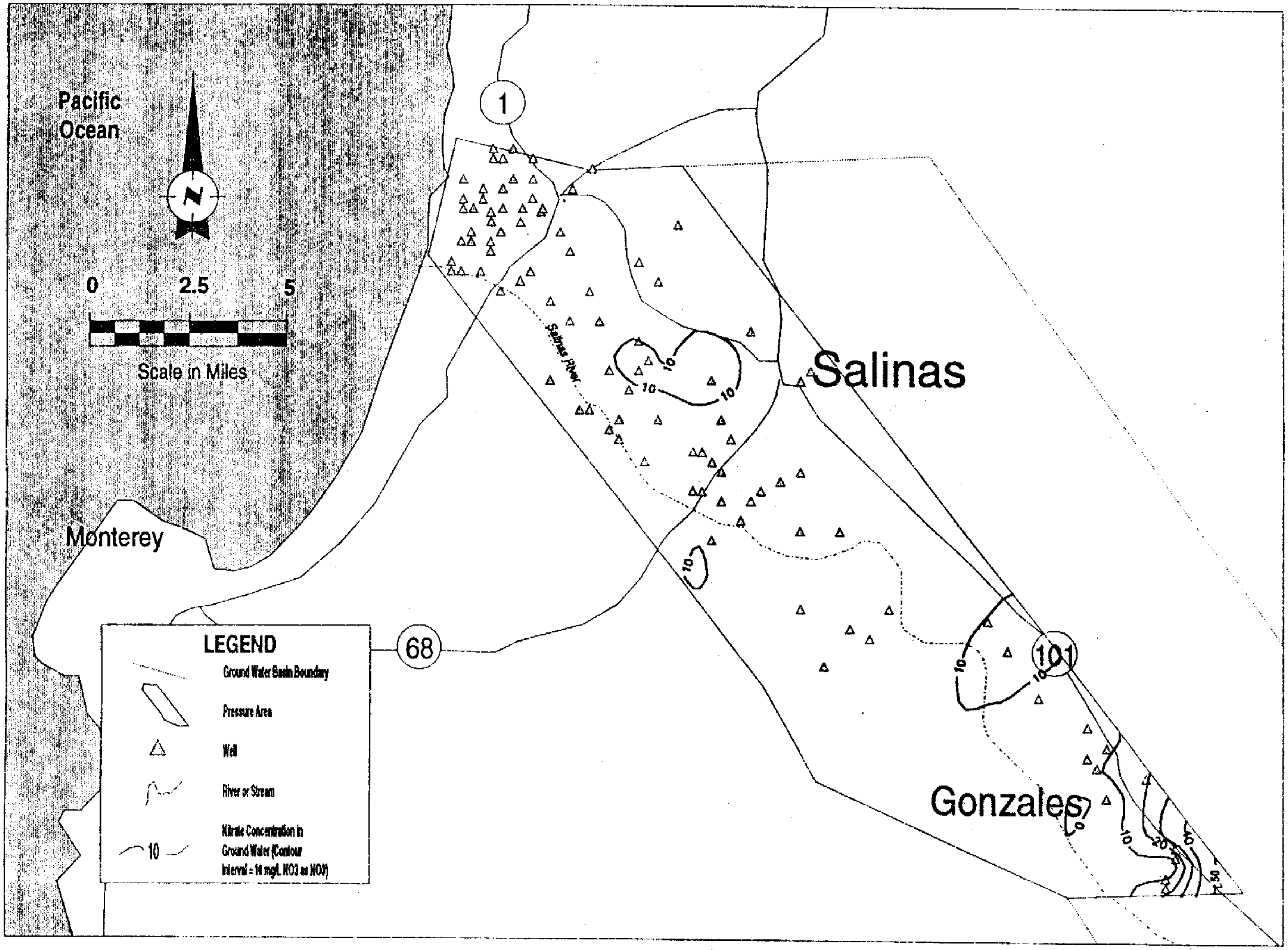


Figure XV-8. Average Nitrate Concentrations in the 400-ft Aquifer of the Salinas Valley Ground Water Basin from 1967 to 1982

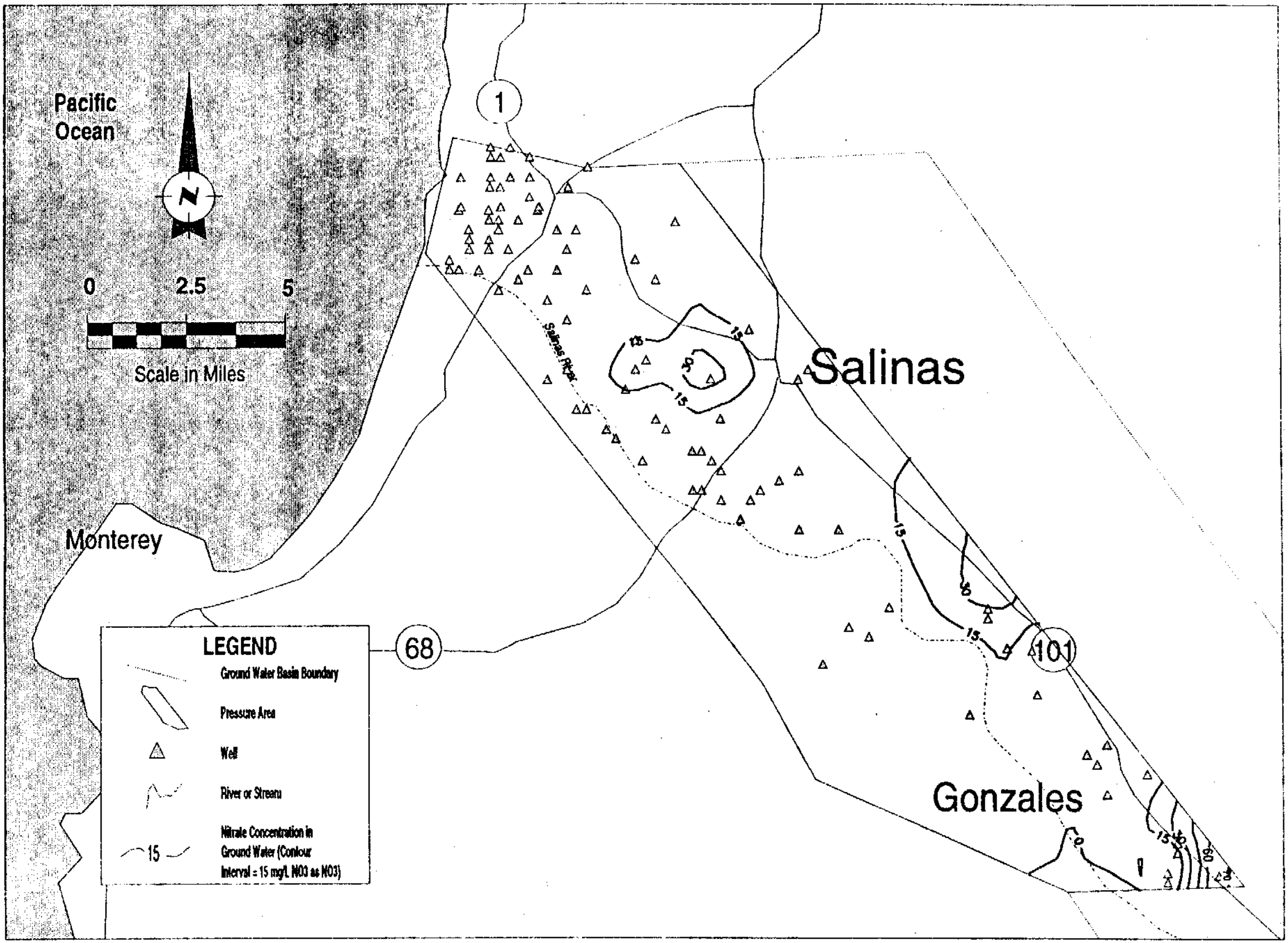


Figure XV-9. Average Nitrate Concentrations in the 400-ft Aquifer of the Salinas Valley Ground Water Basin from 1983 to 1992

Overall Basin

Since 1966, many areas throughout the Salinas Valley ground water basin exceeded the Maximum Contaminant Level of 45 mg/l nitrate, as NO3. The earlier Figure XV-2 indicates the existence of approximately five nitrate plumes in which peak average nitrate concentrations exceeded the 45 mg/l nitrate, as NO3, standard. The most recent contour map from 1981 to 1992 shows nine such plumes (Figure XV-3).

The change in the peak concentrations of these plumes reflect the increase in nitrate contamination of this basin. For example, the plume southeast of Greenfield, which ranged as high as 80 mg/l nitrate, as NO3, in the late 1960's or 1970's (Figure XV-2), rose to a high of 150 mg/l nitrate, as NO3, in the 1980's and 1990's, (Figure XV-3).

Nitrate concentrations have also been high south of Salinas. At this location, concentrations ranged as high as 80 mg/l nitrate, as NO3, prior to 1980 (Figure XV-2). The latest contour map shows averages as high as 90 mg/l nitrate, as NO3 (Figure XV-3). Additionally, these figures display the degradation of water quality near Greenfield, near Soledad, and near San Ardo in the southern most end of the basin .

Pressure Area

Figures XV-4 through XV-9 represent the nitrate concentrations of two of the aquifers in the Pressure Area. These maps show that average nitrate concentrations have increased over time in both the 180-ft. aquifer (Figures XV-4, XV-5, and XV-6) and 400-ft. aquifer (Figures XV-7, XV-8, and XV-9) zones.

In the 180-ft. aquifer, several areas currently exceed the Maximum Contaminant Level of 45 mg/l nitrate, as NO3. One area of concern lies west of Salinas. At this location, the high nitrate concentrations of 80 mg/l nitrate, as NO3, in the 1968 through 1982 time period (Figure XV-5), increased to a high of 150 mg/l nitrate, as NO3, in the 1983 to 1992 time period (Figure XV-6).

Although the maps show the nitrate concentrations in the 400-ft. aquifer as generally lower than in the 180-ft. aquifer, they display an increase in nitrate concentrations in the southeast corner of the 400-ft. pressure area. Figures XV-7, XV-8, and XV-9 show an increase in nitrate concentrations from below 2 mg/l in the 1950's to as high as 70 mg/l in the late 1980's and early 1990's. The maps also display the presence of higher nitrate concentrations at the southern end of the Pressure Area where the confinement ends.

References

Boyle Engineering Corporation. "Salinas Valley Ground Water Model." Monterey Flood Control and Water Conservation District. 1986.

Monterey County Flood Control and Water Conservation District. "Nitrates in Ground Water, Salinas Valley, California." 1988.

Monterey County Water Resources Agency (MCWRA). "Ground Water Extraction Management Study." 1992.

XVI. SAN LUIS OBISPO VALLEY GROUND WATER BASIN

Introduction

The San Luis Obispo Valley ground water basin lies in the center of San Luis Obispo County. Located approximately five miles inland from the Pacific Ocean in the San Luis Obispo Valley, this ground water basin is bordered by the Santa Lucia Range to the north and the San Luis Hills to the south. The ground water is used for agriculture and municipal/domestic water supply.

Nitrate Concentrations in the San Luis Obispo Valley Ground Water Basin

The two sub-basins, Edna Valley Sub-Basin, located in the Pismo Creek Drainage, and San Luis Valley Sub-Basin, located in the San Luis Creek Drainage, form the San Luis Obispo Valley ground water basin. Nearly all of the water wells in these two sub-basins draw from a sequence of unconsolidated alluvium and older alluvial deposits (Boyle, 1991). While considered continuous hydrologic units, the ground water sub-basin contain some clay lenses which cause localized confinement (Boyle, 1991).

Figure XVI-1 depict both sub-basins of the San Luis Obispo Valley. Initial data analysis showed no significant change in the historical contours of the basin; therefore, Regional Board staff mapped data from 1980 to 1992 only (Figure XVI-1). The absence of adequate well perforation data eliminated any analysis by depth for the basin.

Figure XVI-1 shows high average nitrate concentrations in the area east of the Los Osos Valley Road and U.S. Highway 101 intersection. At this location, average nitrate concentrations equal the Maximum Contaminant Level of 45 mg/l nitrate, as NO3.

References

Boyle Engineering. "Ground Water Basin Evaluation VT-S35-200-01." Prepared for the City of San Luis Obispo. 1991.

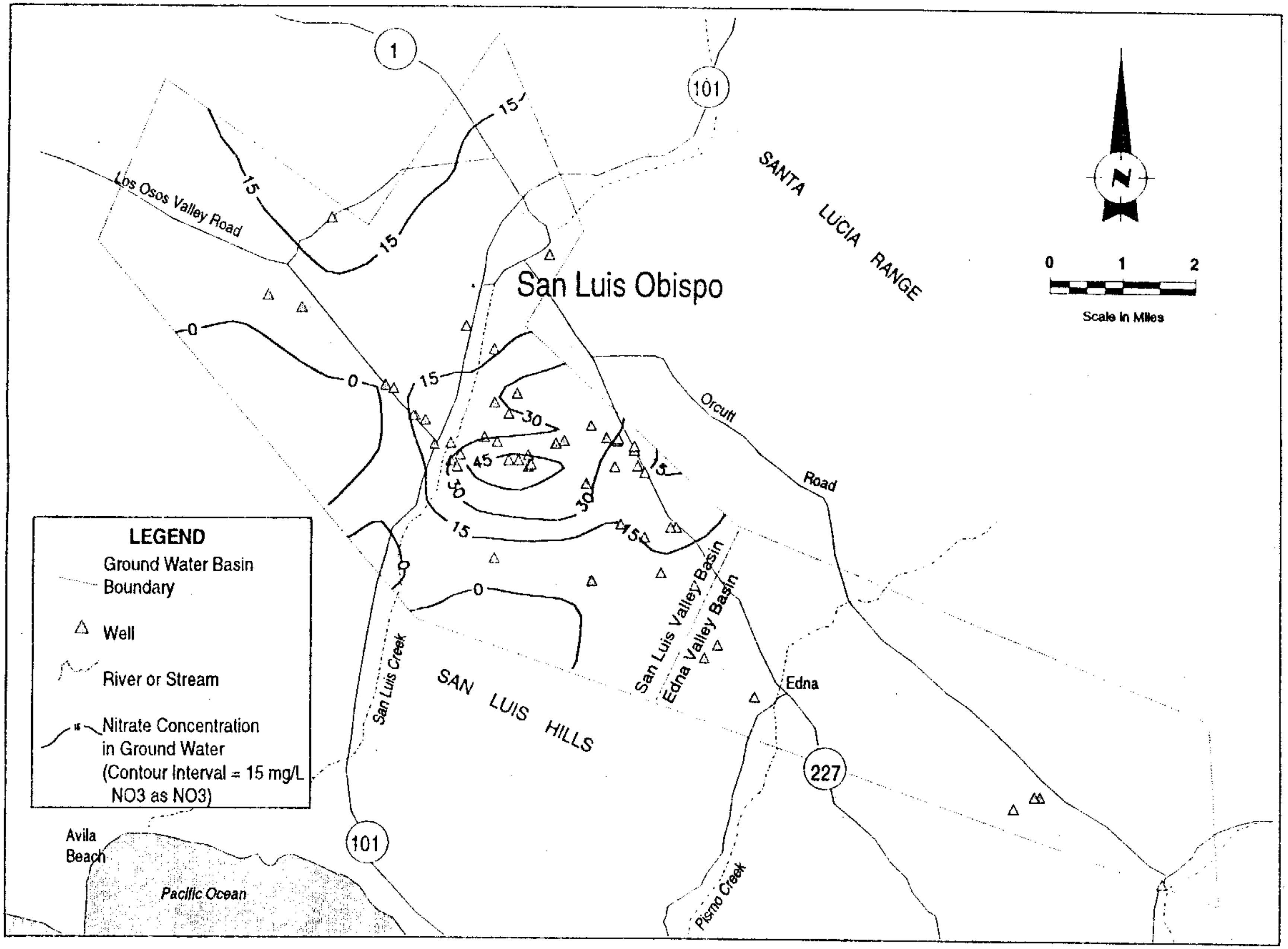


Figure XVI-1. Average Nitrate Concentrations in the San Luis Obispo Valley and Edna Valley Ground Water Basins from 1980 to 1992

XVII. SANTA MARIA VALLEY GROUND WATER BASIN

Introduction

The Santa Maria Valley ground water basin extends south from the Nipomo Mesa in San Luis Obispo County to the Orcutt Uplands in Santa Barbara County (Figure XVII-1). The communities of Santa Maria, Nipomo, Guadalupe, and Orcutt are located in this basin. Ground water is used for municipal/domestic water supply and agriculture.

Nitrate Concentrations in the Santa Maria Valley Ground Water Basin

Functioning as one continuous hydraulic unit, the Santa Maria Valley ground water basin underlies an area of approximately 170 square miles which extends westerly from the upper end of the Sisquoc Plain to 20 miles off the Pacific Coast (USGS, 1977). The aquifer system averages 1,000 feet in saturated thickness and possesses a maximum thickness of 2,300 feet (Toups Corp, 1976).

Figures XVII-2, XVII-3 and XVII-4 indicate the existence of nitrate plumes in the vicinity of Santa Maria and Guadalupe. Plumes exist in all three time periods; however, the magnitude is highest in the most recent decade.

A comparison of Figures XVII-3 and XVII-4 shows several anomalies throughout the basin. High concentration areas which appear in the time period from 1962 to 1980 are absent in the 1981 to 1995 time period. For example, in Figure XVII-3, a 60 mg/l nitrate, as NO3, contour shown just north of the Santa Maria River in the vicinity of Nipomo is not present in Figure XVII-4. Two wells were high in nitrate during the 1962 to 1980 time period (well numbers 299 and 301 in Appendix M). Well number 299 was sampled in the 1962 to 1980 time period, but was not sampled in the 1981 to 1995 time period. For well number 301, only one data point was available in either time periods. However, in the 1962 to 1980 time frame, a nitrate concentration of 105 mg/l was reported, whereas a nitrate concentration of 4.20 mg/l was reported in the most recent time frame. These wells are recommended for further sampling.

Figure XVII-3 shows the area bounded by the Santa Maria River, Highway 166, Highway 1, and Highway135, containing two maximum nitrate concentrations of 45 mg/l and 90 mg/l. Both of these contours are not present in Figure XVII-4 because of insufficient data. Further sampling of wells in this area is recommended.

Figure XVII-3 indicates the presence of two nitrate plumes in the vicinity of Nipomo east of Highway 101. One plume has a high concentration of 45 mg/l nitrate, as NO3. Another plume has a high concentration of 30 mg/l nirate, as NO3. These plumes are not present in the later time period shown in Figure XVII-4. This is due to the fact that wells with high concentrations were not sampled during 1981 though 1995. Further sampling of these wells is needed to verify current trends.

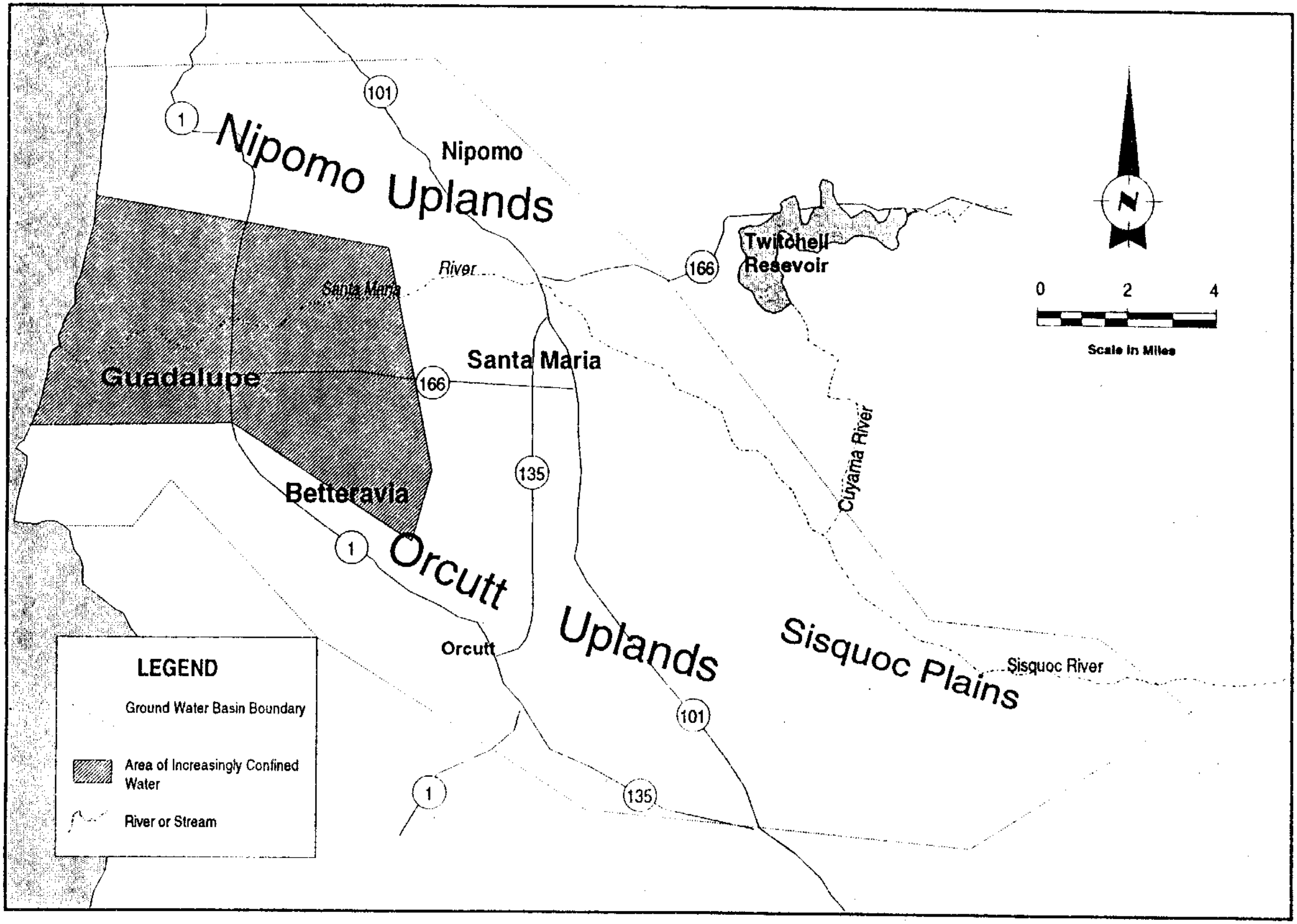


Figure XVII-1. Location of the Hydrogeologic Areas of the Santa Maria Valley Ground Water Basin

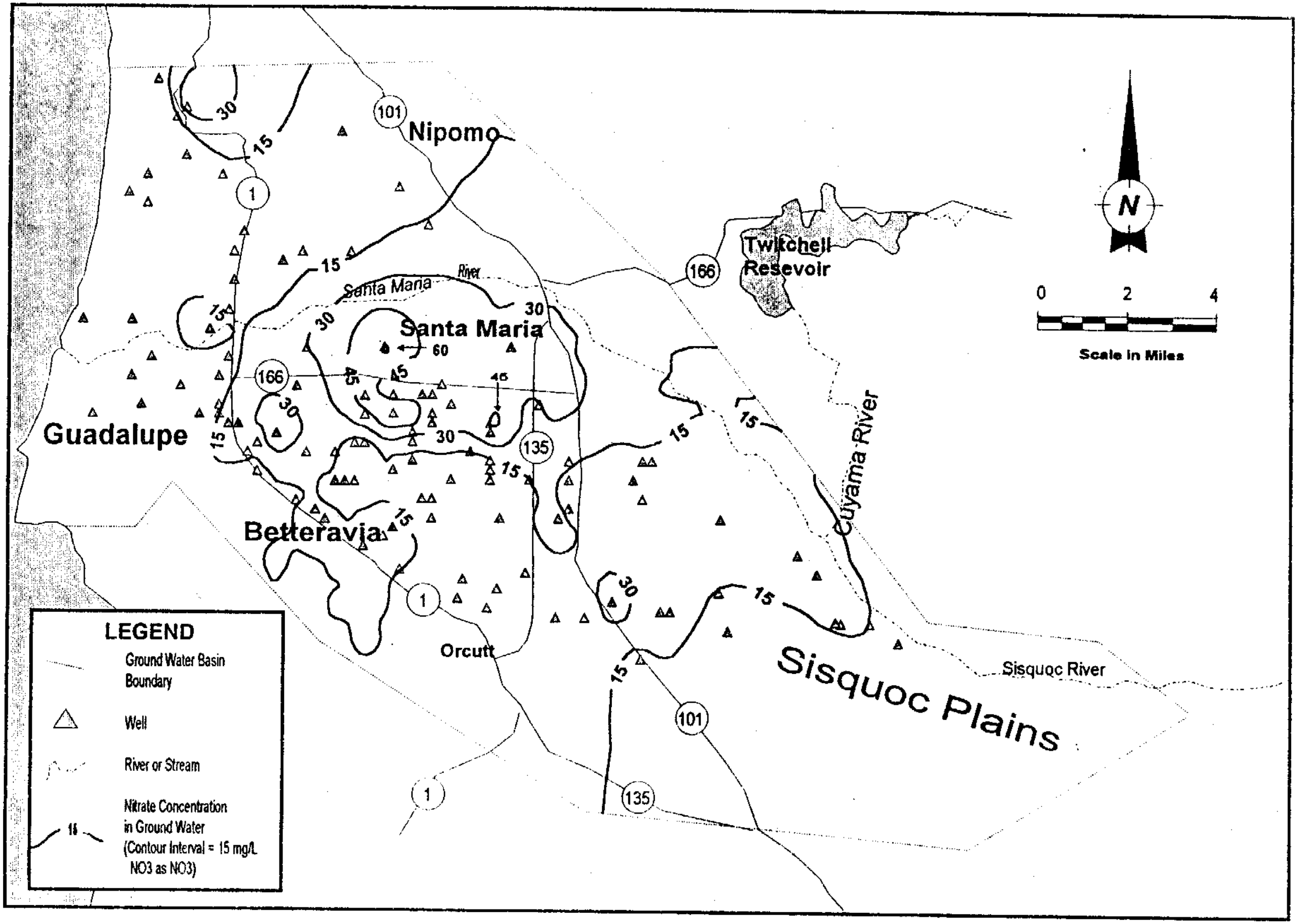


Figure XVII-2. Average Nitrate Concentrations in the Santa Maria Valley Ground Water Basin from 1951 to 1961

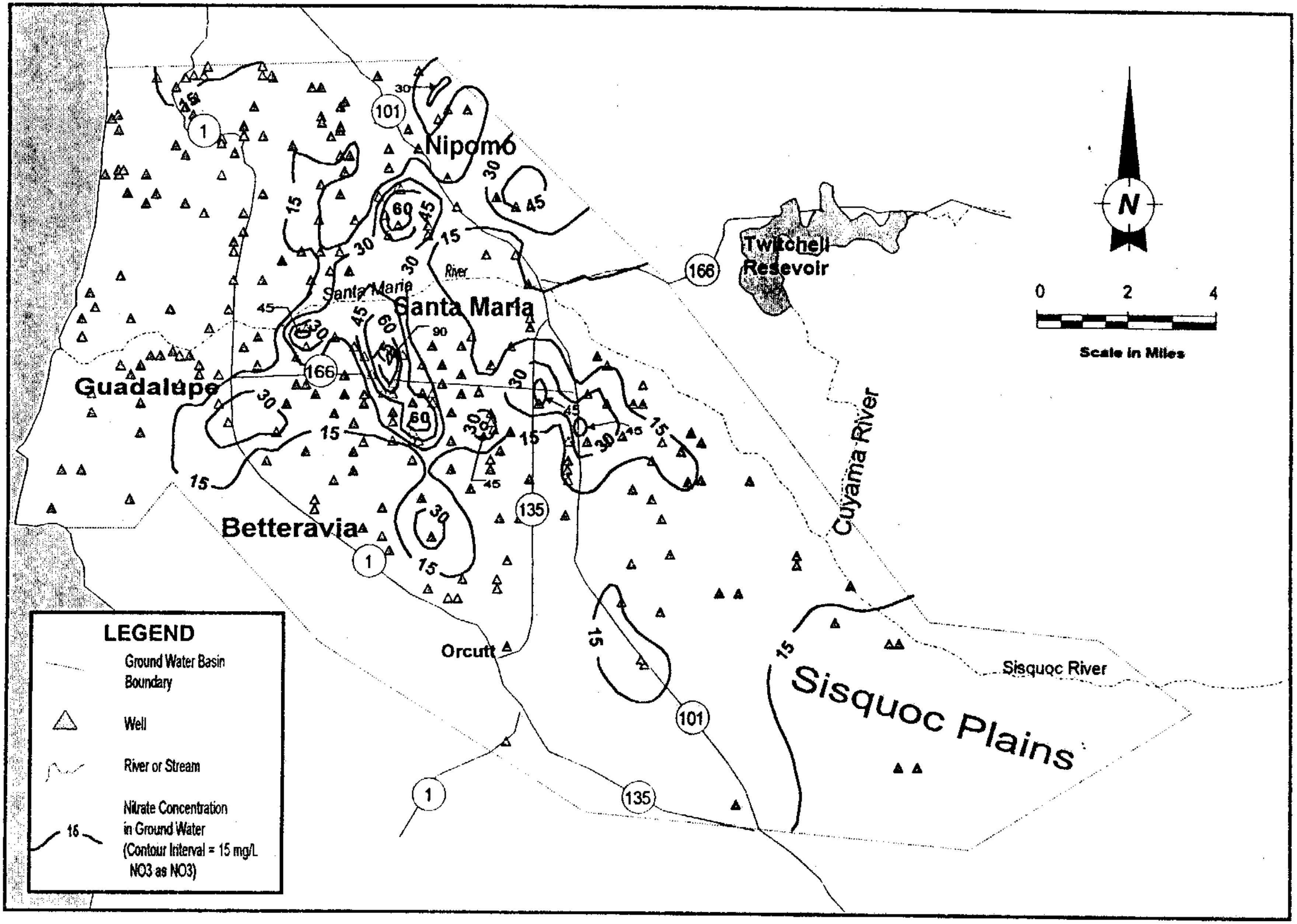


Figure XVII-3. Average Nitrate Concentrations in the Santa Maria Valley Ground Water Basin from 1962 to 1980

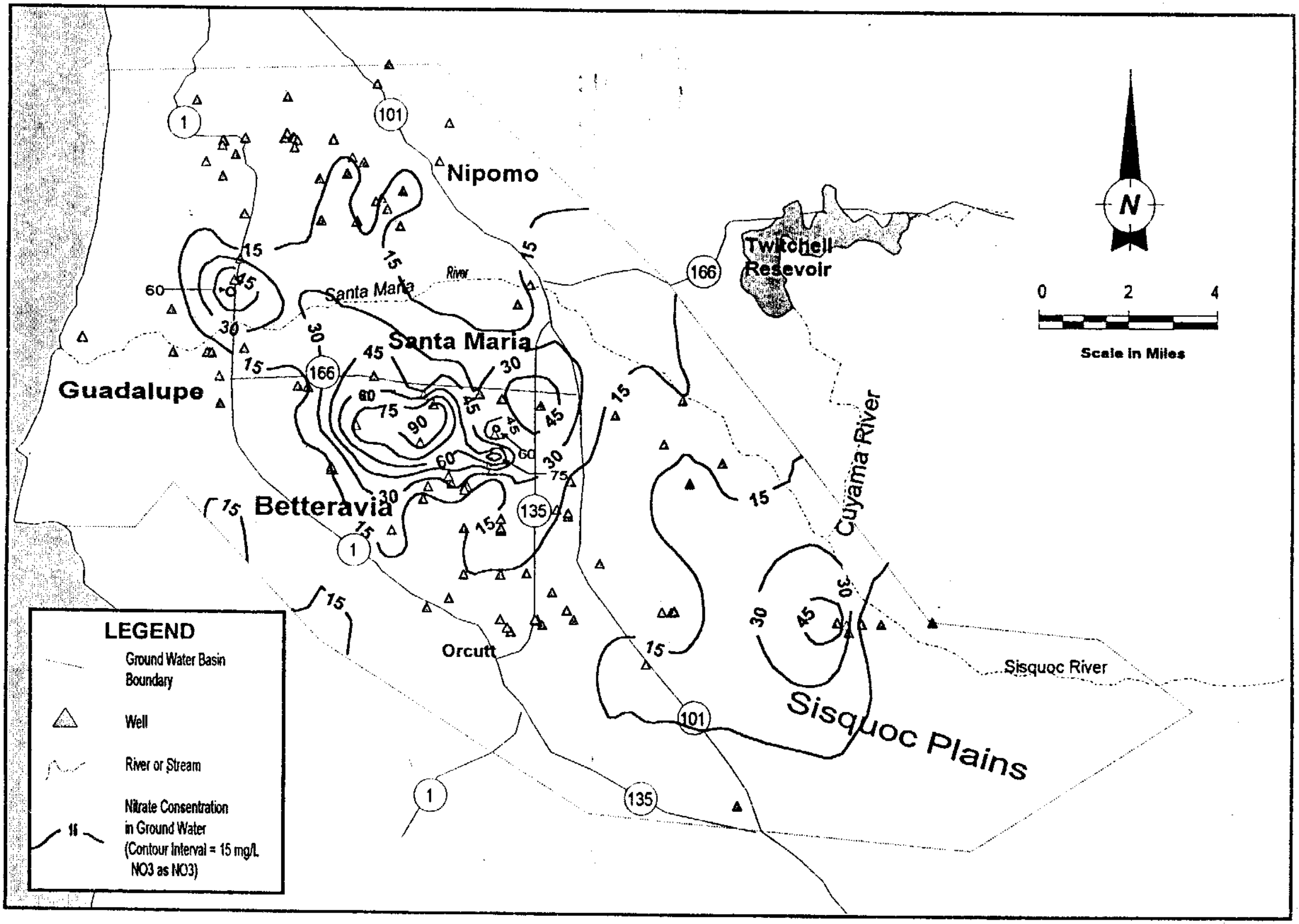


Figure XVII-4. Average Nitrate Concentrations in the Santa Maria Valley Ground Water Basin from 1981 to 1995

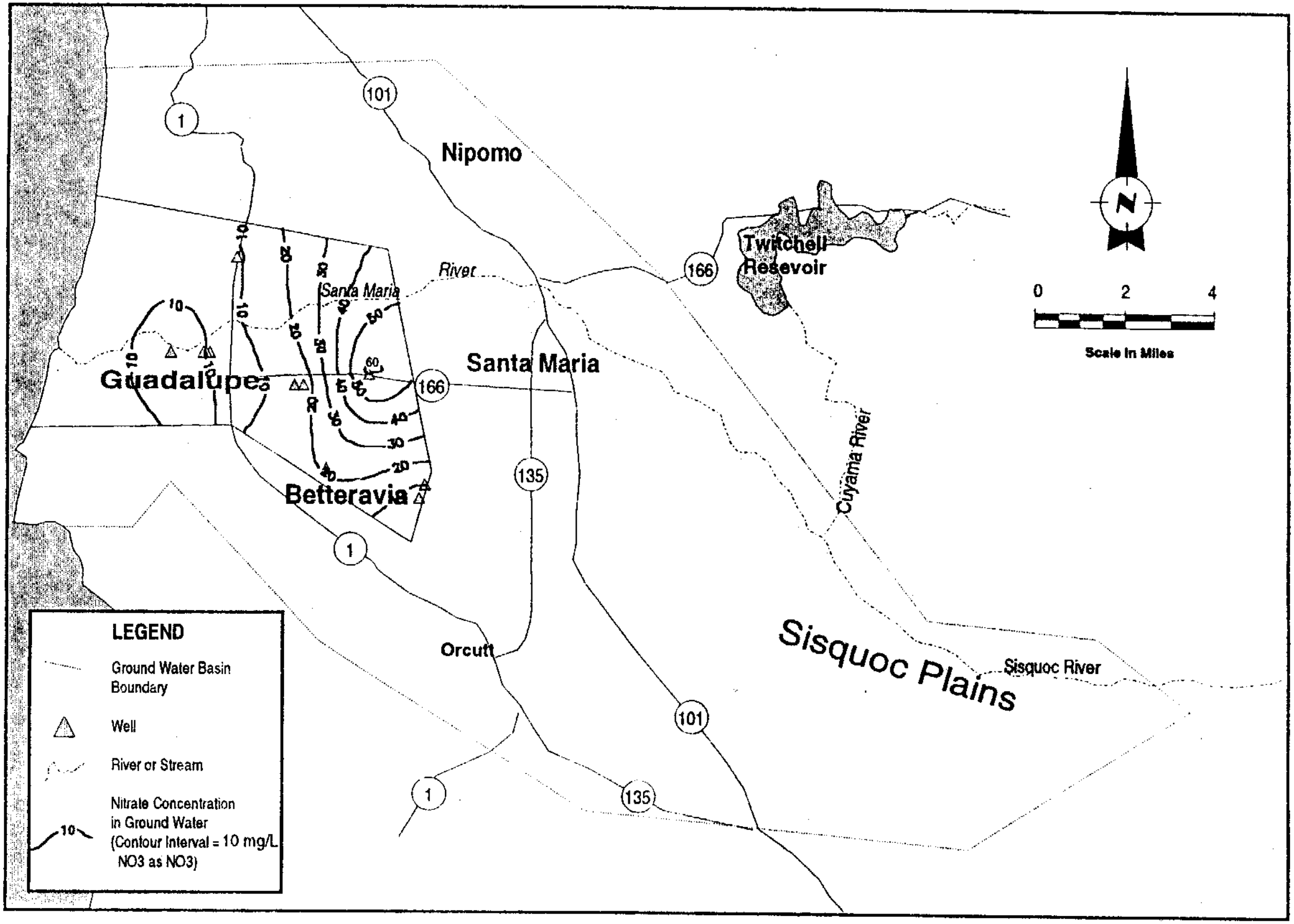


Figure XVII-5. Average Nitrate Concentrations in the Area of Confinement in the Santa Maria Valley Ground Water Basin from 1981 to 1993

A 30 mg/l nitrate, as NO3, contour is centered near Guadalupe (Figures XVII-3). Wells revealing high concentrations (wells 236 and 238) were sampled in the 1962 to 1980 time period, but not in the 1981 to 1995 time period. These wells are recommended for further sampling. (See Appendix M-2 for well data.)

A similar situation occurs near Orcutt and east of Betteravia (Figures XVII-3 and XVII-4). One well, well 173 (see Appendix M-2), has a high concetration in the 1960s but was not sampled since that time. Again, this well is recommended for additional sampling.

Unfortunately, there was also insufficient data available to map the shallow aquifer above the semi-confined aquifer located at the western portion of the basin. Only one isocontour map of the semi-confined aquifer is represented for one time period, encompassing the years 1981 to 1995. Only one time period is mapped due to a deficit of historical nitrate concentrations in this zone (Figure XVII-5).

Figure XVII-5, shows high nitrate concentrations in the east, with a maximum average concentration of approximately 60 mg/l nitrate, as NO3. This peak results mainly from the data of one well with many high nitrate readings. All of this well's eight readings surpass the 30 mg/l nitrate, as NO3 value, with the highest value reaching 115 mg/l nitrate, as NO3. The remainder of the wells in this area produce nitrate contours of 20 mg/l nitrate, as NO3, and less.

Table XVII-1 lists the wells recomended for additional sampling in the Santa Maria Valley ground water basin. Wells indicated by asterisks are located in the Nipomo area.

Table XVII-1. Wells Recommended for Further Testing in the Santa Maria Valley Ground Water Basin.

State Well No.	Report Well No.	State Well No.	Report Well No.	State Well No.	Report Well No.
Not Available	5	10N/34W-27H03	155	11N/34W-27G01	297*
Not Available	11	10N/34W-32P02	173	11N/34W-28E01	298*
10N/34W-06N01	106	10N/35W-01N01	184	11N/34W-29P02	299*
10N/34W-07B01	107	10N/35W-11C01	209	11N/34W-30D02	300*
10N/34W-07P01	108	10N/35W-12B01	212	11N/34W-30Q01	301*
10N/34W-08E01	109	10N/35W-12H01	213	11N/34W-31C01	302*
10N/34W-14E01	119	10N/35W-12J01	214	11N/34W-32C01	303*
10N/34W-16J02	123	10N/35W-21C01	236	11N/34W-33J01	304*
10N/34W-16R01	124	10N/35W-22G03	238	11N/34W-34A04	305*
10N/34W-17C01	125	10N/35W-24B01	242	11N/35W-13D01	346*
10N/34W-17D01	126	10N/35W-24B02	243	11N/35W-13F01	347*
10N/34W-17F01	127	11N/34W-08R01	281	11N/35W-14L01	348*
10N/34W-18D01	133	11N/34W-17B01	285*	11N/35W-24D01	360*
10N/34W-18H01	134	11N/34W-17N03	287*	11N/35W-24L01	362*
10N/34W-18P01	136	11N/34W-19E01	291*	11N/35W-26K02	366*
10N/34W-19A01	137	11N/34W-19F01	292*	11N/35W-26M01	367*
10N/34W-20E01	142	11N/34W-19L03	293*	11N/35W-33F01	373*
10N/34W-20H03	143	11N/34W-19Q01	294*	11N/35W-35A02	375*
10N/34W-21R01	146	11N/34W-20J01	295*	11N/35W-36C01	377*
10N/34W-24F01	151	11N/34W-27D01	296*	Not Available	401*

*Wells located in the vicinity of Nipomo.

References

United States Geological Survey (USGS). "Evaluation of Ground-Water Quality in the Santa Maria Valley, CA." July 1977.

Toups Corporation. "Santa Maria Valley Water Resources Study." City of Santa Maria Department of Public Works, 1976.

XVIII. SANTA YNEZ VALLEY GROUND WATER BASIN

Introduction

Located on the California Coast in Santa Barbara County, the Santa Ynez Valley ground water basin lies between the Cities of Santa Maria and Santa Barbara. Extending eastward just past Lake Cachuma from the coastline west of Lompoc, this basin's borders encompass the western communities of Lompoc, Vandenberg Village, and part of Vandenberg Air Force Base, and the eastern communities of Los Olivos, Solvang, Santa Ynez and Buellton. In the eastern corner, the Santa Ynez Valley ground water basin also contains Lake Cachuma and the surrounding recreation area.

Nitrate Concentrations in the Santa Ynez Valley Ground Water Basin

The three main sub-basins of the Santa Ynez Valley ground water basin are the Lompoc, Buellton and Santa Ynez Uplands Sub-Basins (Figure XVIII-1). With little or no ground water underflow between them, the subareas are considered hydraulically separate for the purposes of this ground water quality analysis. Significant confinement occurs in the Lompoc Sub-Basin and is delineated into two distinct aquifers. With few areas of confinement, the Buellton and Santa Ynez Uplands basins are considered single aquifers (U.S. Geological Survey, 1985).

The Lompoc Sub-Basin underlies the City of Lompoc and a portion of Vandenberg Air Force Base. For the purposes of this report, the two aquifers of the Lompoc Sub-Basin are called the upper aquifer and the lower aquifer. The upper aquifer extends downward from the surface approximately 150 ft. to a consolidated layer. The shallow, middle, and the main zones of the upper aquifer experience a slight degree of confinement due to differences in permeability. Nevertheless, there is flow between all three and the three zones are treated as one unconfined aquifer. The lower aquifer, extending below the 150 ft. upper aquifer, is a confined aquifer (U.S. Geological Survey, 1985).

Figures XVIII-2, XVIII-3 and XVIII-4 show the nitrate contamination in the Buellton and Santa Ynez Uplands Sub-Basins, and Figures XVIII-5 through XVIII-8 show the nitrate contamination in the upper and lower Lompoc Sub-Basin aquifers. Figures XVIII-5, XVIII-6, and XVIII-7 exhibit the nitrate concentrations in upper aquifer, and Figure XVIII-8 exhibits the lower aquifer of the Lompoc Sub-Basin.

Figures XVIII-2, XVIII-3 and XVIII-4 display the peaks of the nitrate plumes below the 45 mg/l nitrate, as $NO3$, Maximum Contaminant Level for the Buellton and the Santa Ynez Sub-Basins.

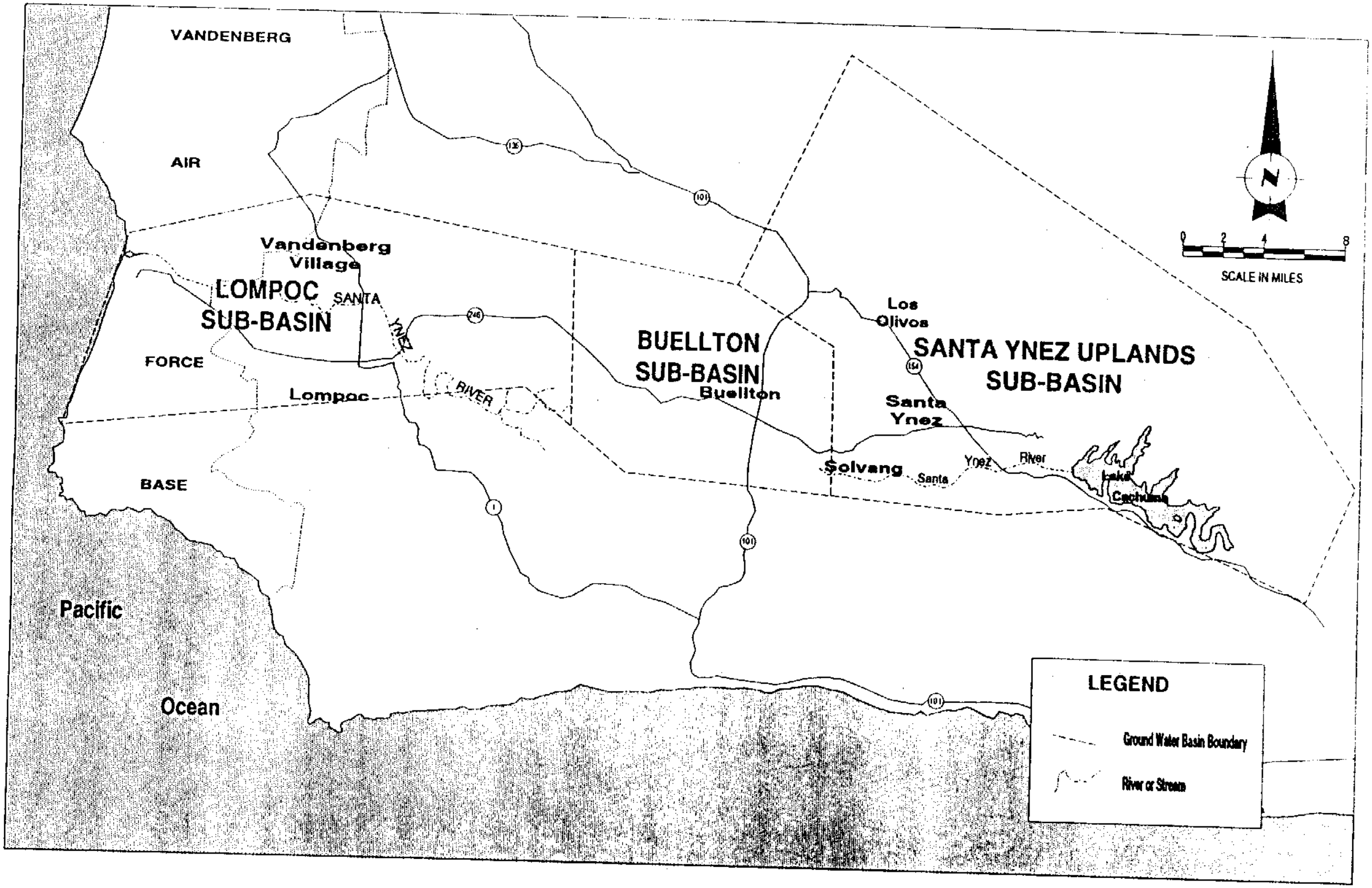


Figure XVIII-1. Sub-Basins of the Santa Ynez Valley Ground Water Basin

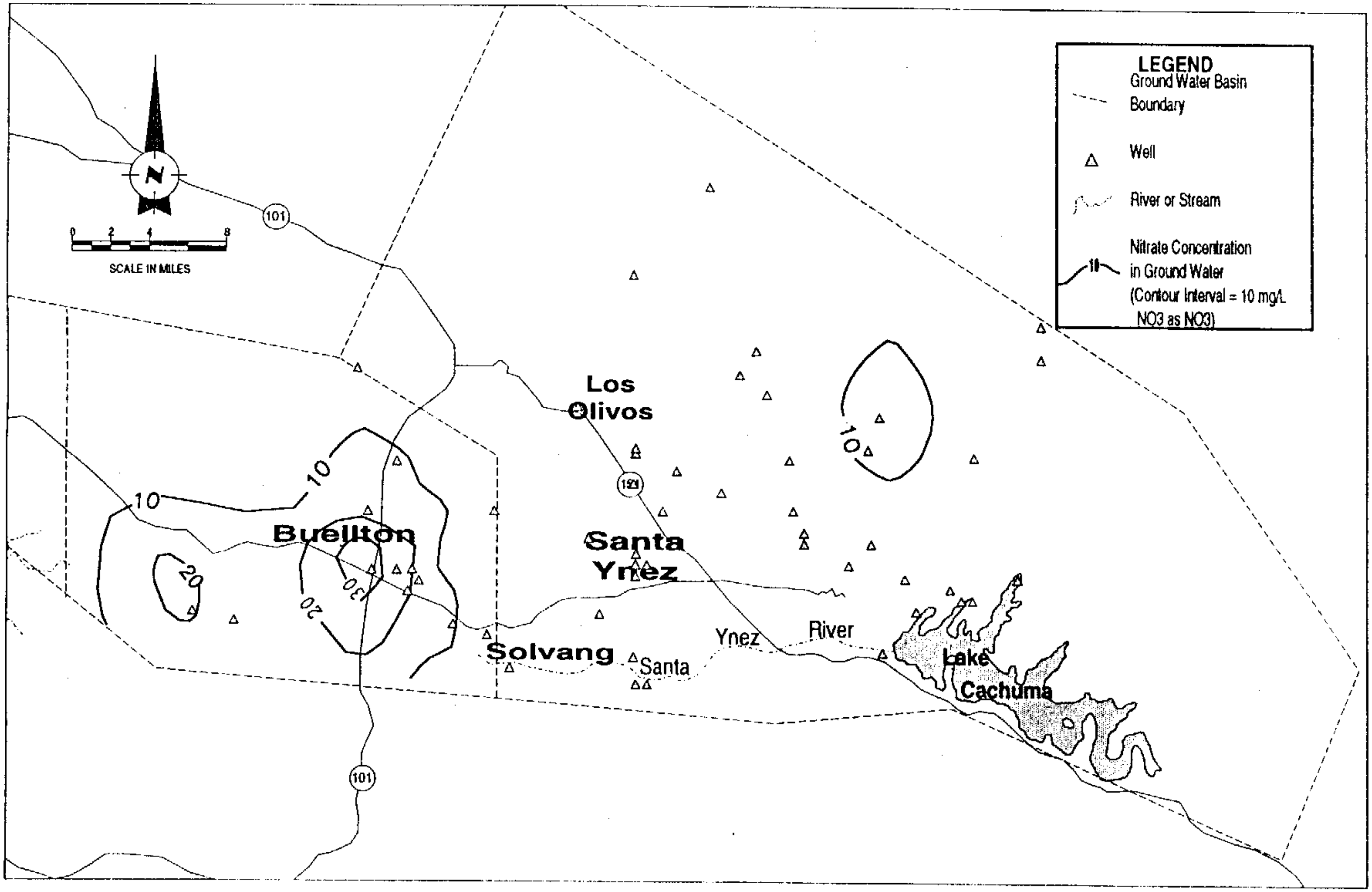


Figure XVIII-2. Average Nitrate Concentrations in the Buellton and Santa Ynez Uplands Sub-Basins from 1953 to 1969

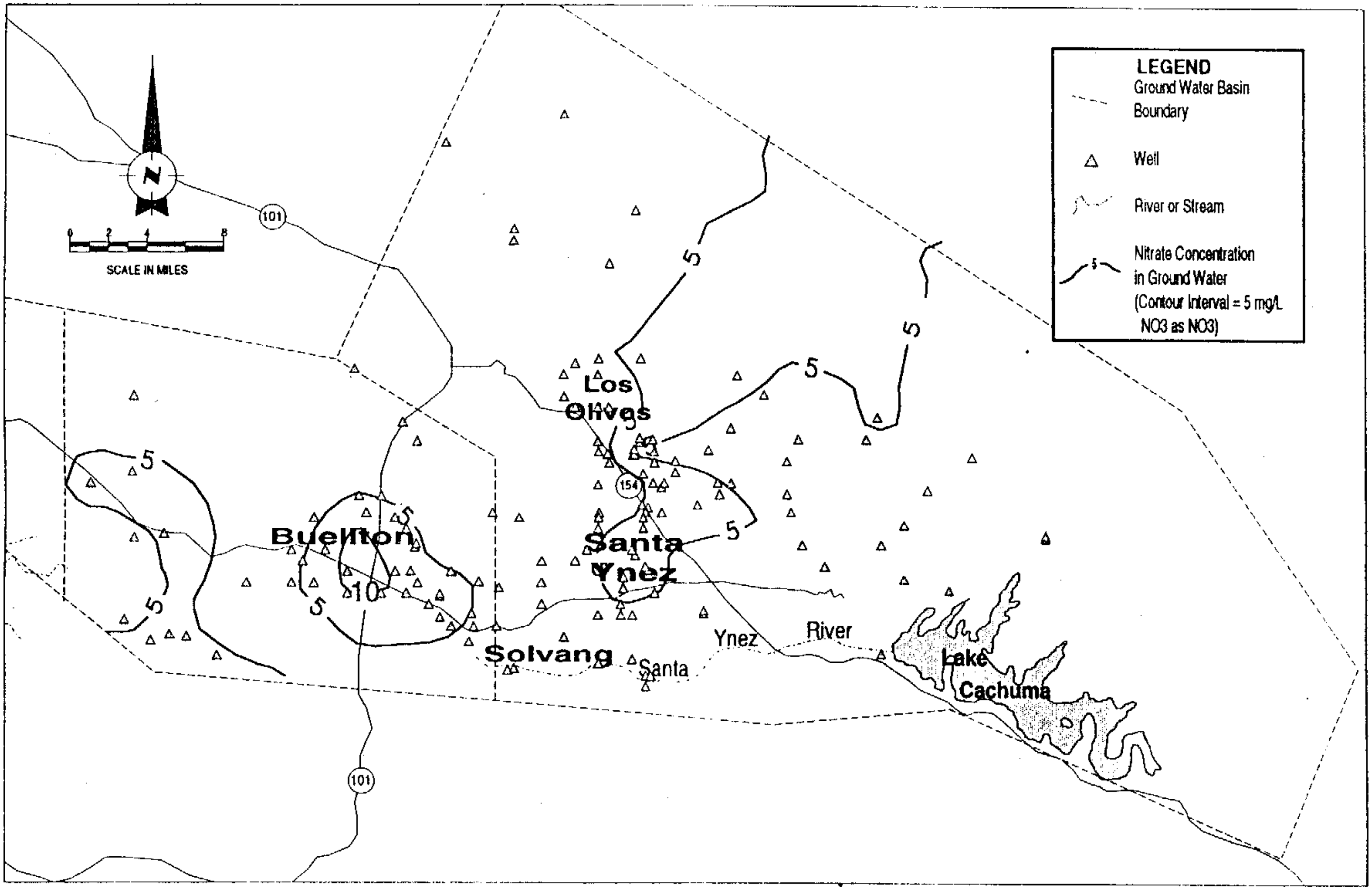


Figure XVIII-3. Average Nitrate Concentrations in the Buellton and Santa Ynez Uplands Sub-Basins from 1970 to 1984

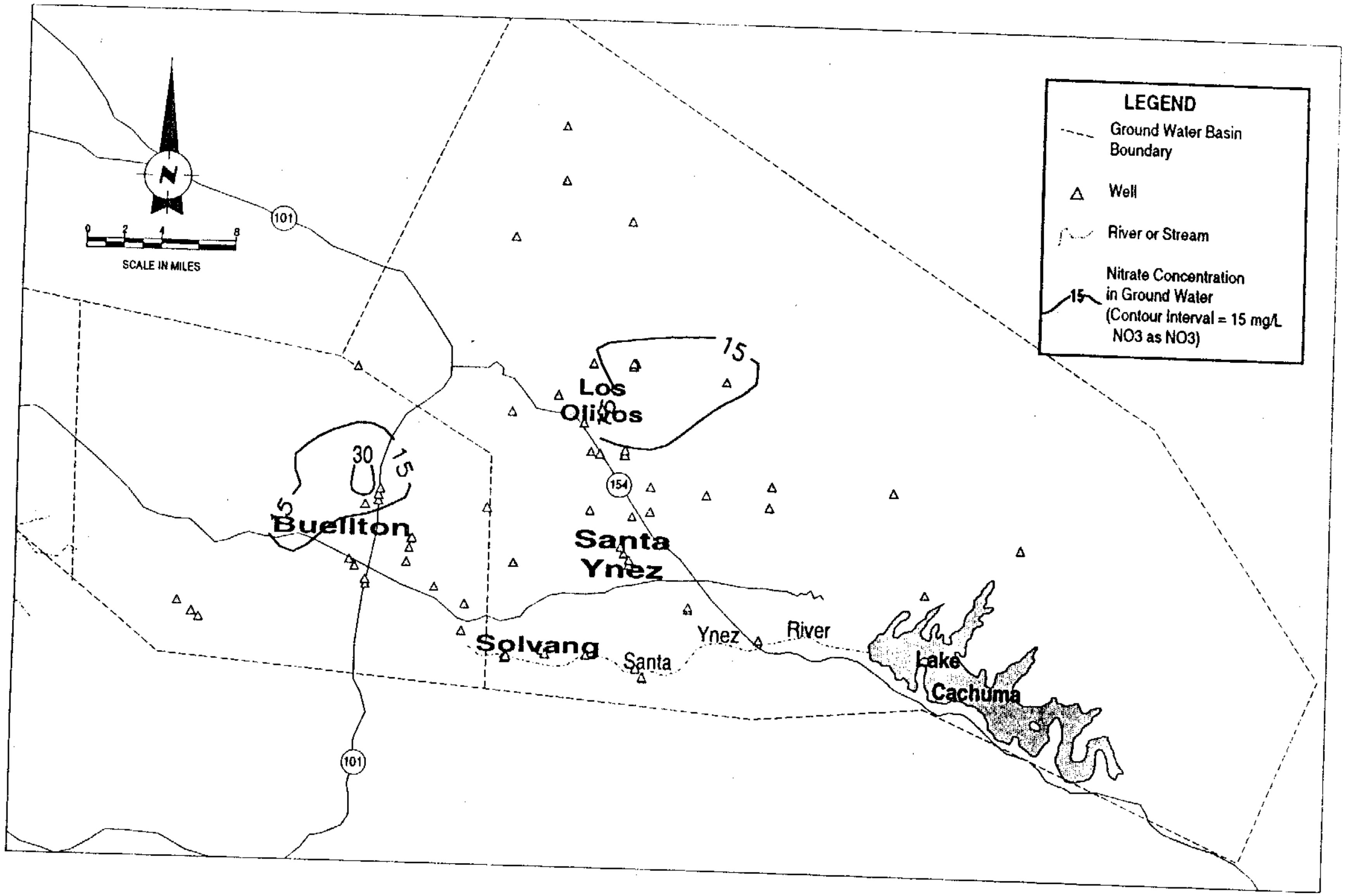


Figure XVIII-4. Average Nitrate Concentrations in the Buellton and Santa Ynez Uplands Sub-Basins from 1985 to 1992

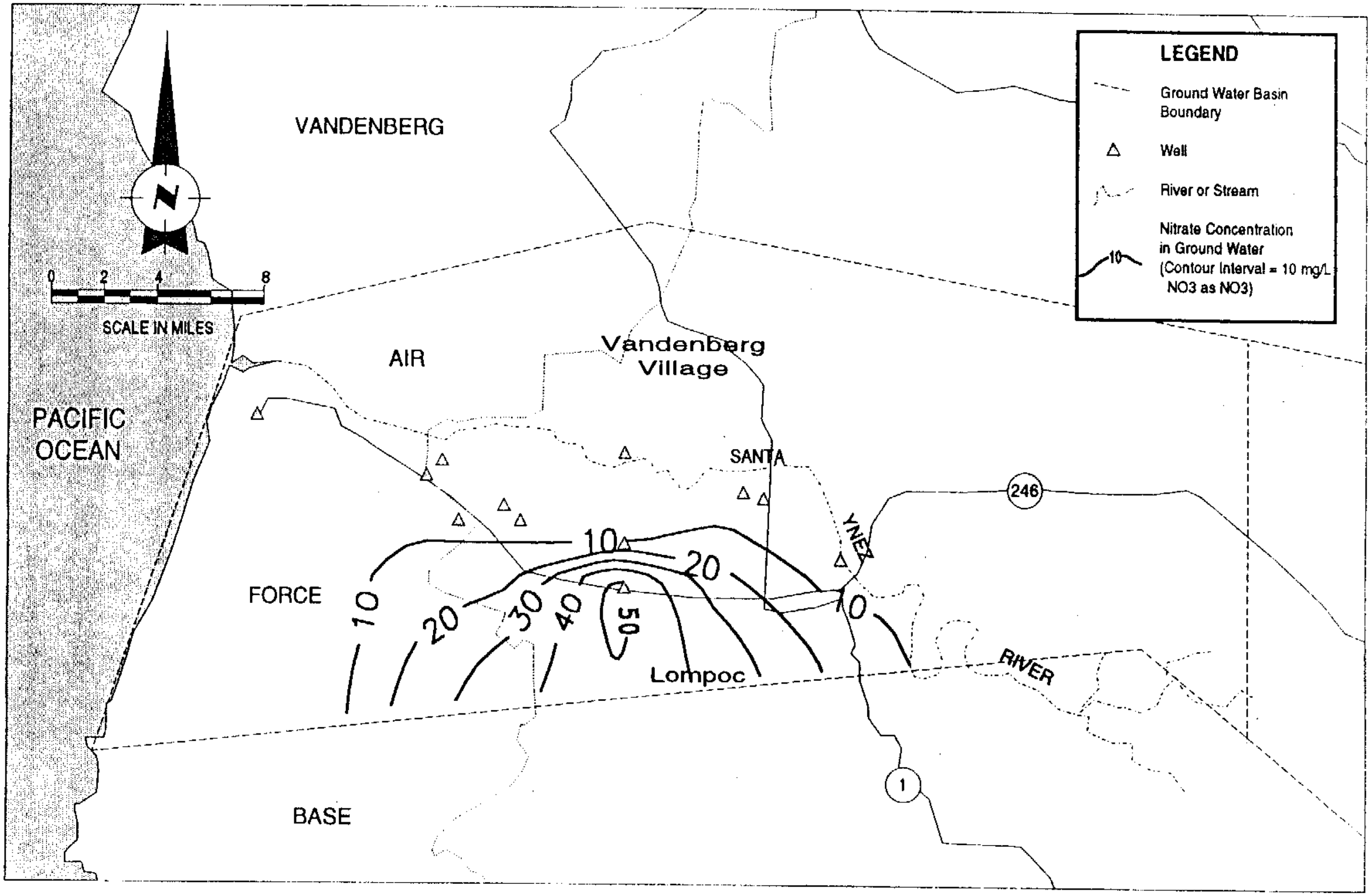


Figure XVIII-5. Average Nitrate Concentrations in the Upper Aquifer of the Lompoc Sub-Basin from 1953 to 1969

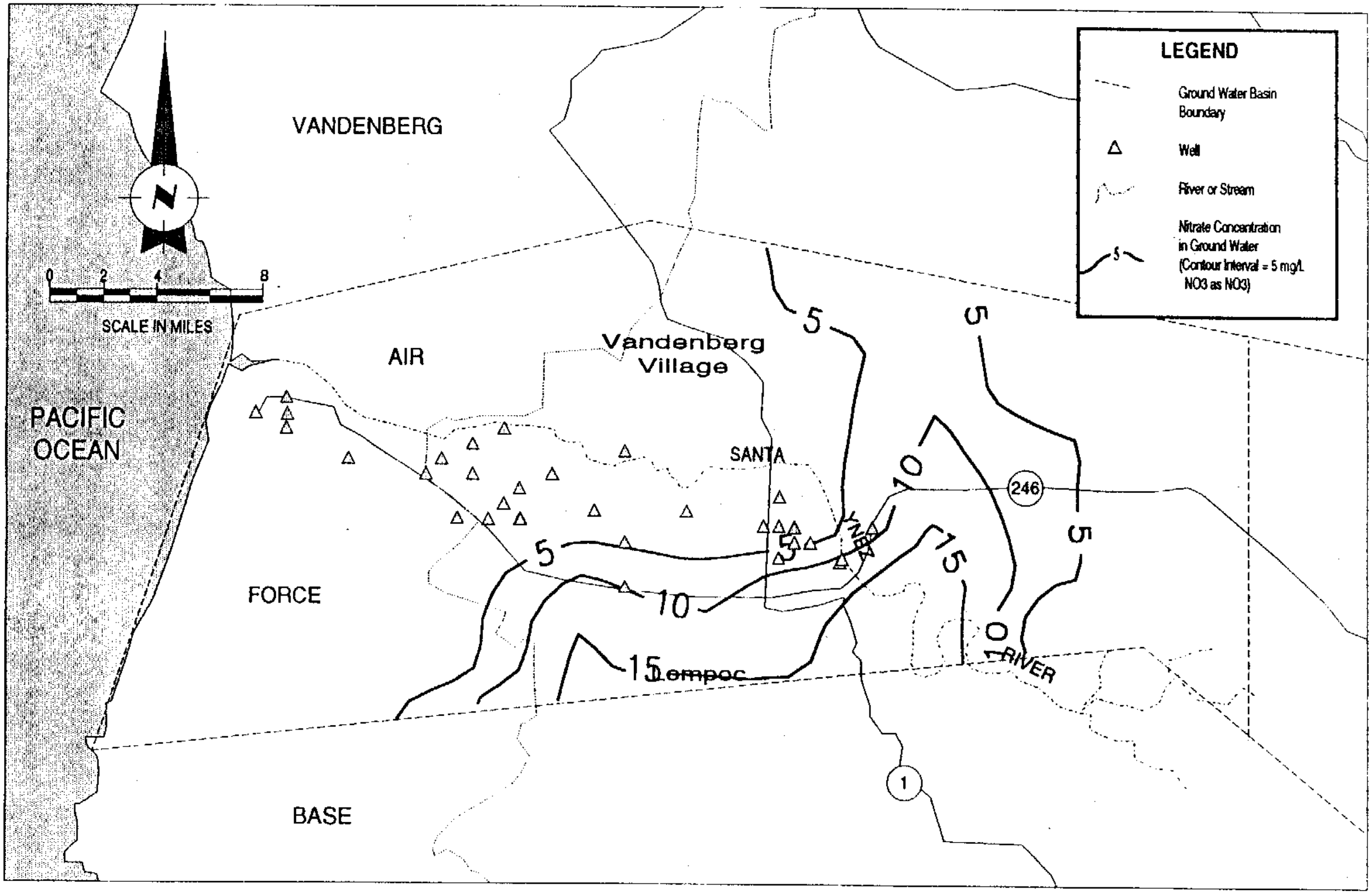


Figure XVIII-6. Average Nitrate Concentrations in the Upper Aquifer of the Lompoc Sub-Basin From 1970 to 1984

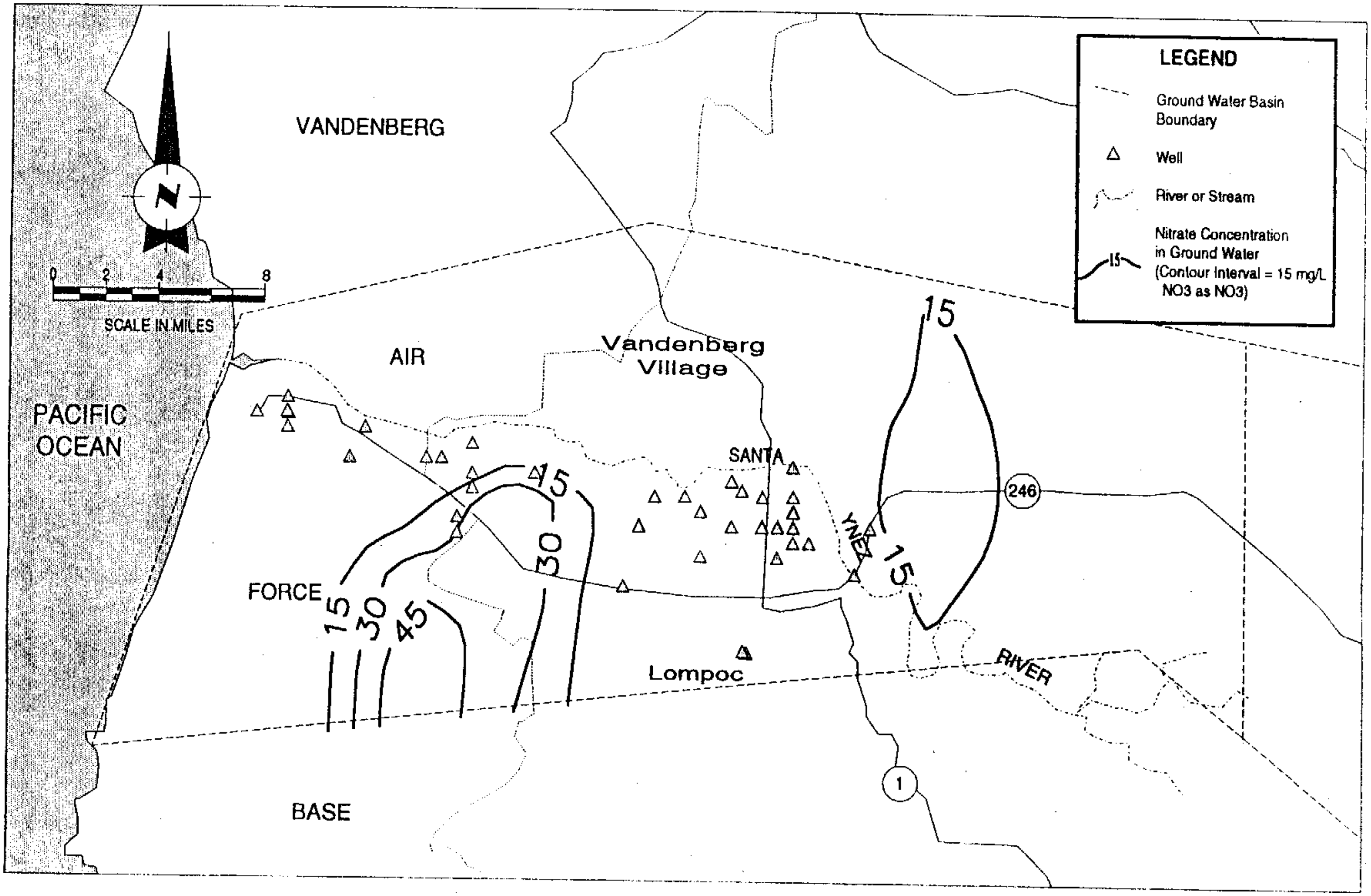


Figure XVIII-7. Average Nitrate Concentrations in the Upper Aquifer of the Lompoc Sub-Basin from 1985 to 1992

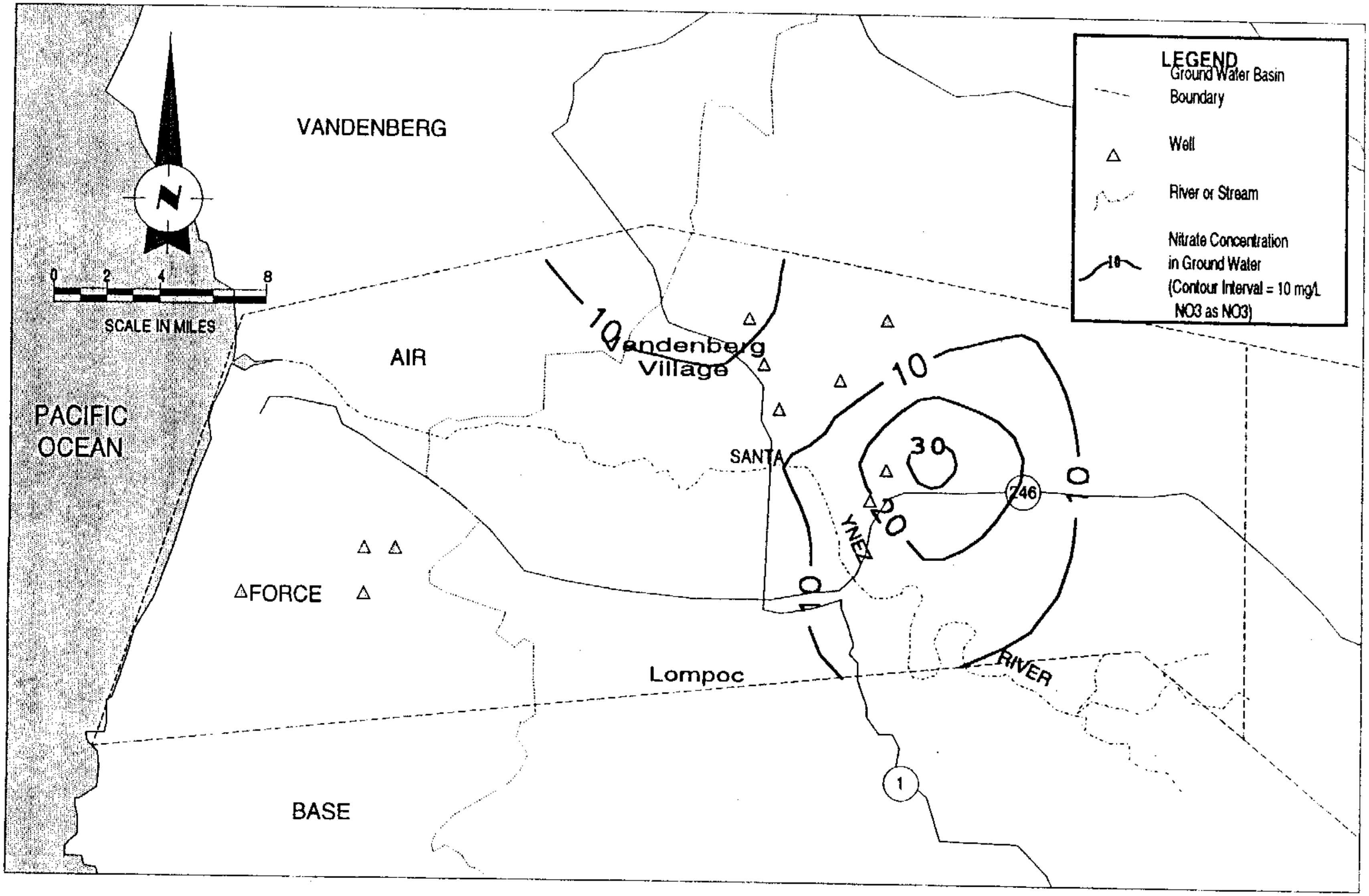


Figure XVIII-8. Average Nitrate Concentrations in the Lower Aquifer of the Lompoc Sub-Basin from 1953 to 1969

Figure XVIII-5 shows nitrate contamination in the Lompoc Sub-Basin's upper aquifer from 1953 to 1969. A plume above the southern border shows a peak contour of 50 mg/l nitrate, as NO3. This plume results from one well (well 06N/34W-05H05); however, this well was only sampled in this time period. To examine the current trends, this well needs further testing. Figure XVIII-7, 1985 to 1992, shows a high nitrate plume in the southwestern portion of the Lompoc Sub-Basin's upper aquifer. This plume attains a peak contour of 45 mg/l nitrate, as NO3, just at the state Maximum Contaminant Level. Appendix N-2 indicates several wells in this area showing nitrate readings well above 45 mg/l nitrate, as NO3, with some wells above 100 mg/l nitrate, as NO3 (see wells 318, 458, 495, and 461). Due to the contouring program, however, the extremely high levels of nitrate are averaged with lower readings and result in the highest average contour line of only 45 mg/l nitrate, as NO3, Figure XVIII-7.

The only time frame that showed high nitrate concentrations in the lower aquifer of the Lompoc Sub-Basin occurred between 1953 to 1969. Figure XVIII-8 shows one plume of 30 mg/l nitrate, as NO3, present from 1953 to 1969. With the exception of this well, the more recent years, from 1970 to 1992, displayed nitrate at or below 5 mg/l nitrate, as NO3. Although Regional Board staff obtained enough nitrate readings from an adequate number of wells to create contour maps, the nitrate levels were low enough to exclude maps from 1970 to 1992 for this sub-basin.

Table XVIII-1. Well Recommended for Further Testing in the Santa Ynez Valley Ground Water Basin.

06N/34W-05H05

References

United States Geological Survey (USGS). "Ground-Water Hydrology and Quality in the Lompoc Area, Santa Barbara County, California, 1987-1988." 1992.

United States Geological Survey (USGS). "Ground-Water Quality in the Santa Rita, Buellton, and Los Olivos Hydrologic Subareas of the Santa Ynez River Basin, Santa Barbara County, California." 1985.

XIX. SCOTTS VALLEY GROUND WATER BASIN

Introduction

The Scotts Valley ground water basin lies just north of the City of Santa Cruz with the City of Scotts Valley at the basin's center. Approximately 12 square miles, this basin's water is used for municipal and industrial water supplies, as well as for some agricultural purposes.

Nitrate Concentrations in the Scotts Valley Ground Water Basin

Starting from the surface down, the Santa Margarita Sandstone, the Monterey Shale, and the Lompico Sandstone, comprise the Scotts Valley ground water basin's three different water bearing formations (Watkins-Johnson, 1992). These three aquifers form a synclinal basin with the Monterey and the Lompico Formations mainly surfacing on the outer edges of the basin. However, because the Monterey and the Lompico layers also surface in other areas throughout the basin, the basin picture is very complicated.

The Santa Margarita Sandstone, the uppermost water bearing unit of this basin, supplies the main source of water for the Scotts Valley area. The unconfined Santa Margarita Sandstone Formation attains a maximum depth around 200-300 ft. at the center of the basin and tapers off from 0-50 ft. around the basin's edges. The Santa Margarita Sandstone Formation supplies the water for the majority of the wells in this assessment.

For the purposes of this study, the Monterey Shale and Lompico Sandstone layers are designated the lower aquifer. The deeper Lompico Sandstone Formation surfaces on the outside rim of the basin's southwestern edge.

Only recently have the Monterey Shale and Lompico Sandstone Formations been utilized as a water source. Because the majority of the wells and well sampling data are from the Santa Margarita Sandstone Formation, only a small percentage of the data represent the water drawn strictly from the lower aquifer. Six wells, representing 274 nitrate readings, are located in the lower aquifer. Of these 274 nitrate readings, only four readings recorded nitrates above 5 mg/l nitrate, as NO3. In fact, the majority of the remaining 271 nitrate readings documented levels below 1 mg/l nitrate, as NO3. Therefore, Regional Board staff assume that the nitrate contamination has not reached the lower aquifer. Figure XIX-1 shows these minimal nitrate concentrations in the lower aquifer of the Scotts Valley ground water basin.

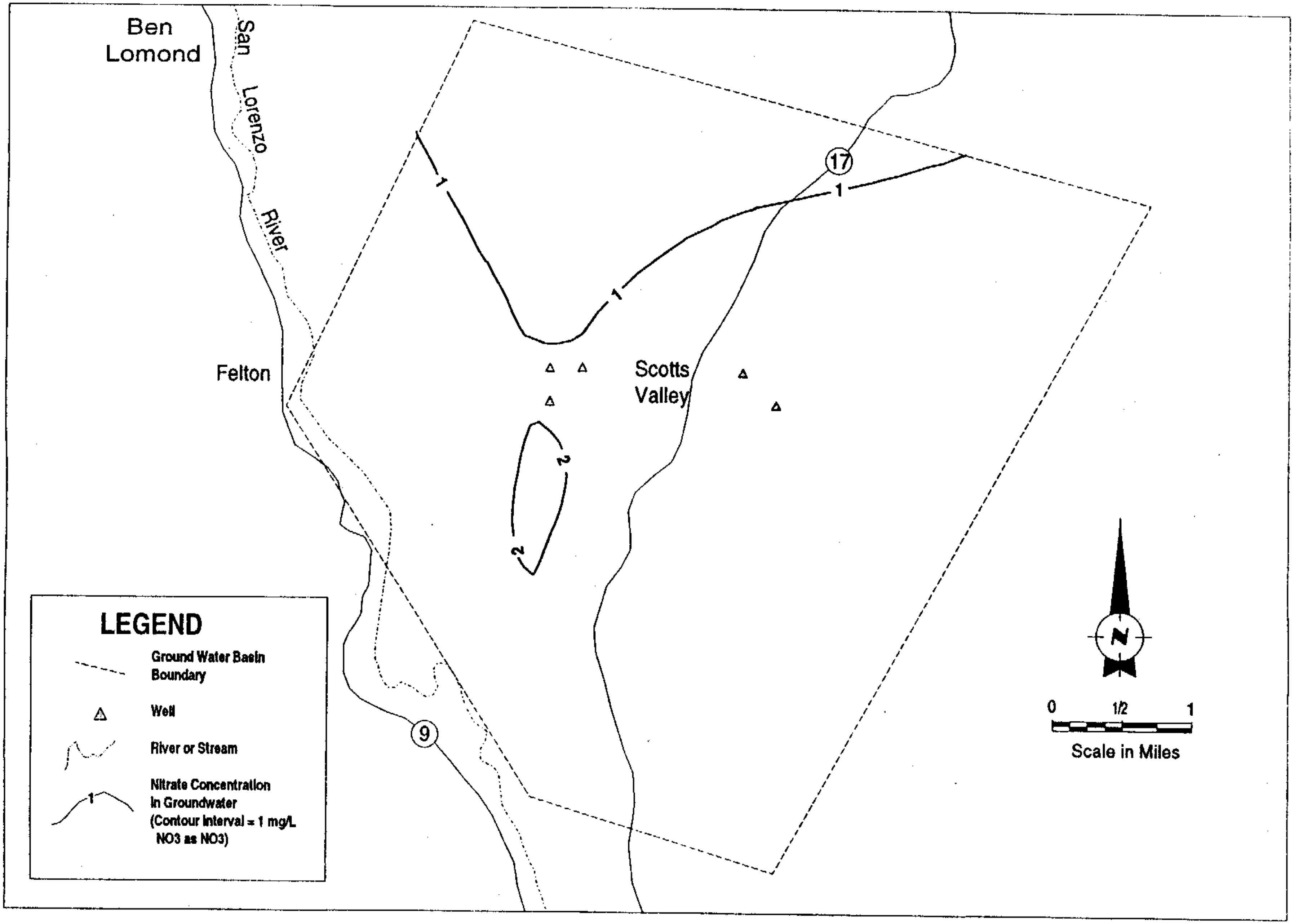


Figure XIX-1. Average Nitrate Levels in the Lower Aquifer of the Scotts Valley Ground Water Basin from 1968 to 1994

The Regional Board staff created the upper Santa Margarita Sandstone aquifer contours from nearly 1000 nitrate readings of over thirty wells. Because the nitrate concentrations vary little between 1968 and 1994, only Figure XIX-2 shows the nitrate contours of the upper aquifer for these years.

The central southwest portion of the basin contains the upper aquifer's only significant nitrate plume, peaking at 30 mg/l nitrate, as NO3. Three wells, with almost 200 nitrate readings between them, adequately support this plume.

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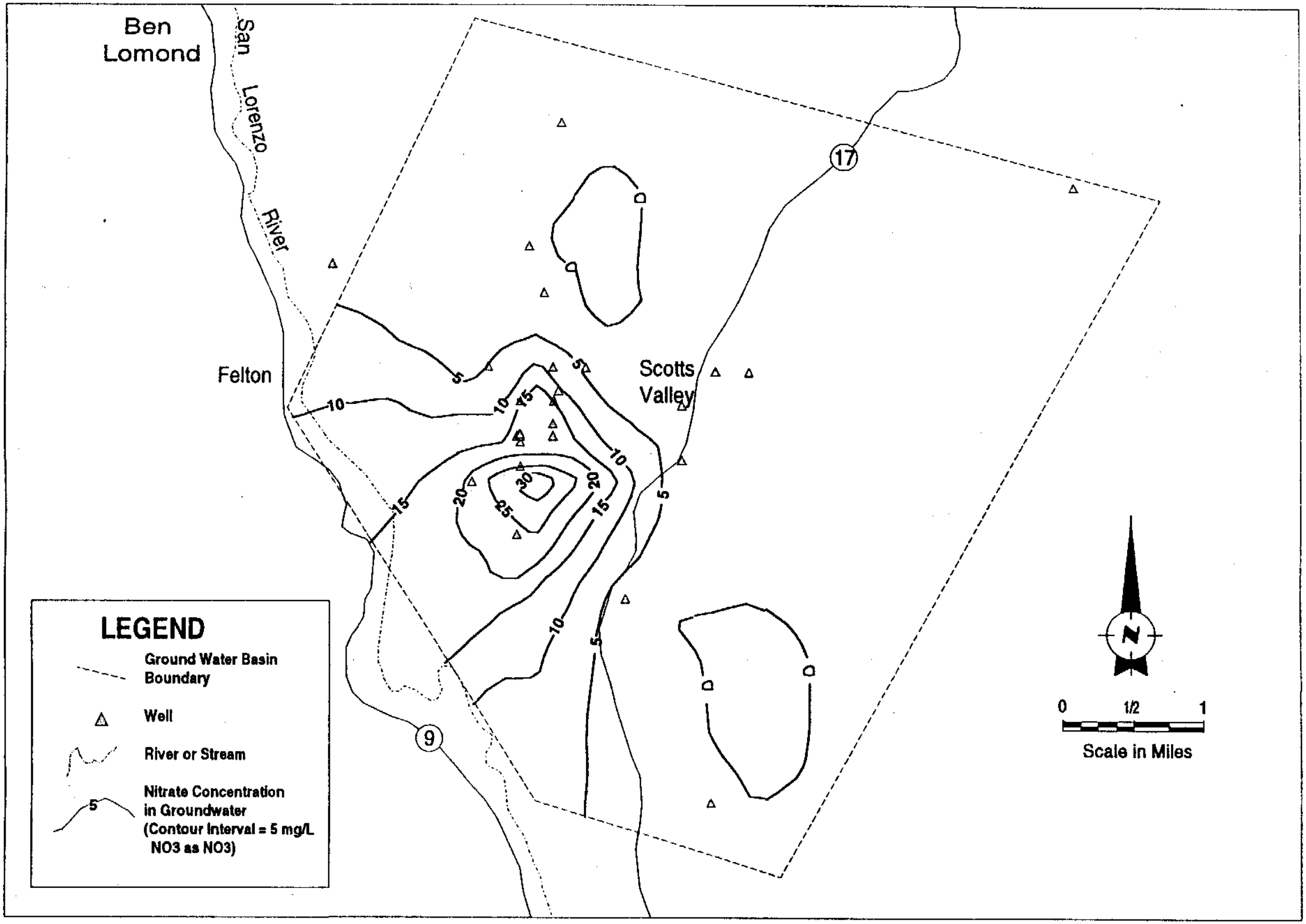

Figure XIX-2. Average Nitrate Levels in the Upper Aquifer of the Scotts Valley Ground Water Basin from 1968 to 1992

XX. SEASIDE GROUND WATER BASIN

Introduction

The Seaside ground water basin lies northeast of the Monterey Peninsula on the Monterey coast, in Monterey County. This ground water basin services the Monterey, Seaside, and Marina communities.

Nitrate Concentrations in the Seaside Ground Water Basin

With little evidence to support the existence of any continuous confining layer, the Seaside ground water basin is generally considered a single unconfined ground water aquifer (Snow, 1993). Mapped as one continuous hydrologic unit, the Seaside ground water basin's nitrate concentrations are compared among three time periods: 1952 to 1962, 1963 to 1981, and 1982 to 1992, seen in Figures XX-1, XX-2 and XX-3, respectively.

Figures XX-1 and XX-2 show areas near the cities of Marina and Seaside with average nitrate concentrations exceeding the State Maximum Contaminant Level of 45 mg/l nitrate, as NO_3. Although present in the 1952 to 1962 and 1963 to 1981 time periods, these high concentrations are not evident in the most recent years, Figure XX-3. These high nitrate wells lacked sampling data between 1982 and 1992; therefore, Regional Board staff offer no conclusion concerning a reduction in nitrate concentrations. In order to better determine the extent of the present nitrate contamination, staff recommend further testing of the wells listed in Table XX-1.

Table XX-1. Wells Recommended for Further Testing in the Seaside Ground Water Basin.

15S/01E-27F02	15S/01E-21R03	14S/01E-25R02
15S/01E-27E01	14S/02E-31F01	14S/01E-25K01
15S/02E-28F01	14S/02E-30P02	14S/01E-24Q02
15S/01E-22N01	14S/02E-30C02	14S/01E-24K01
15S/01E-21R01	14S/02E-19M01	14S/01E-24Q04

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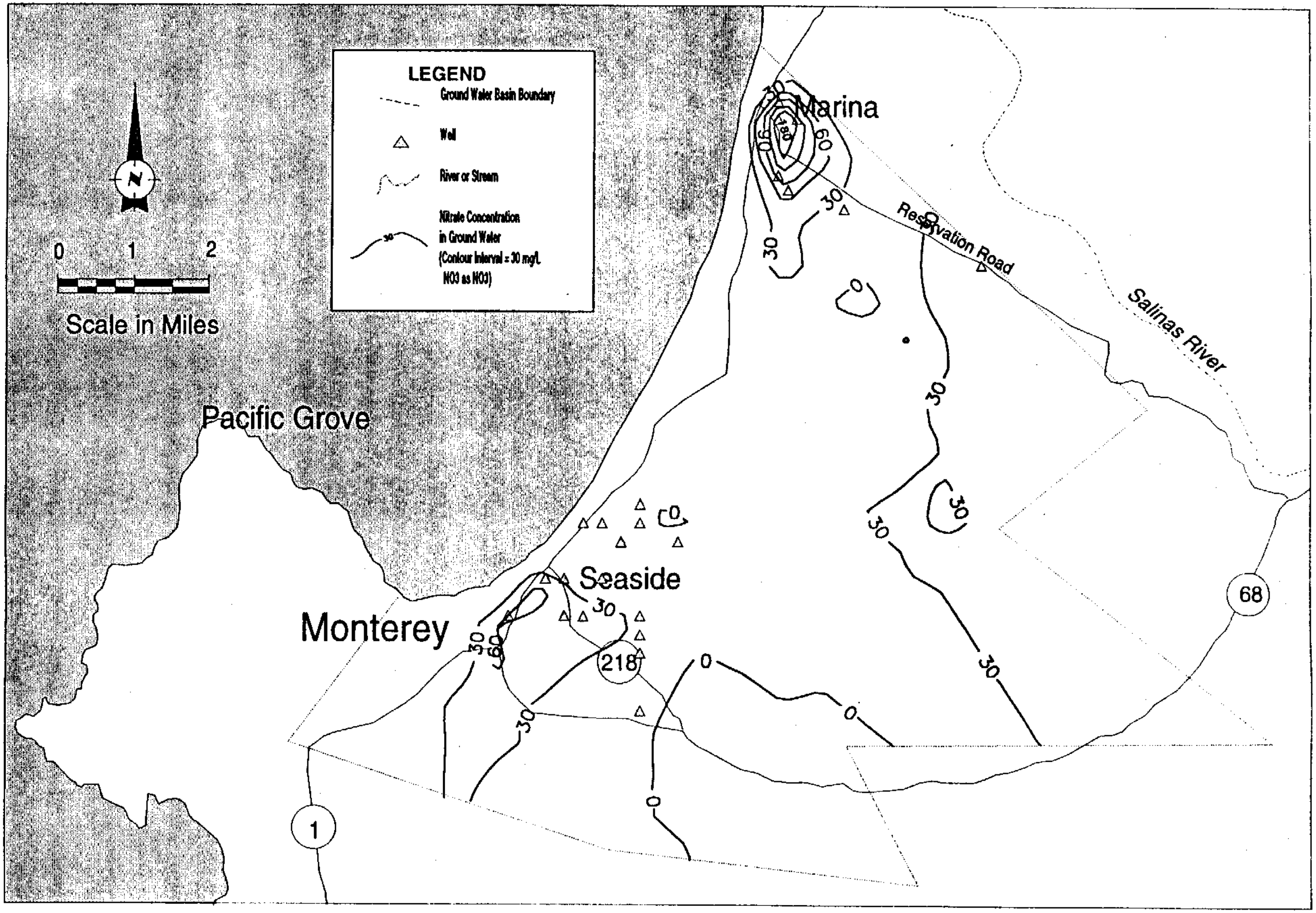

Figure XX-1. Average Nitrate Concentrations in the Seaside Ground Water Basin from 1952 to 1962

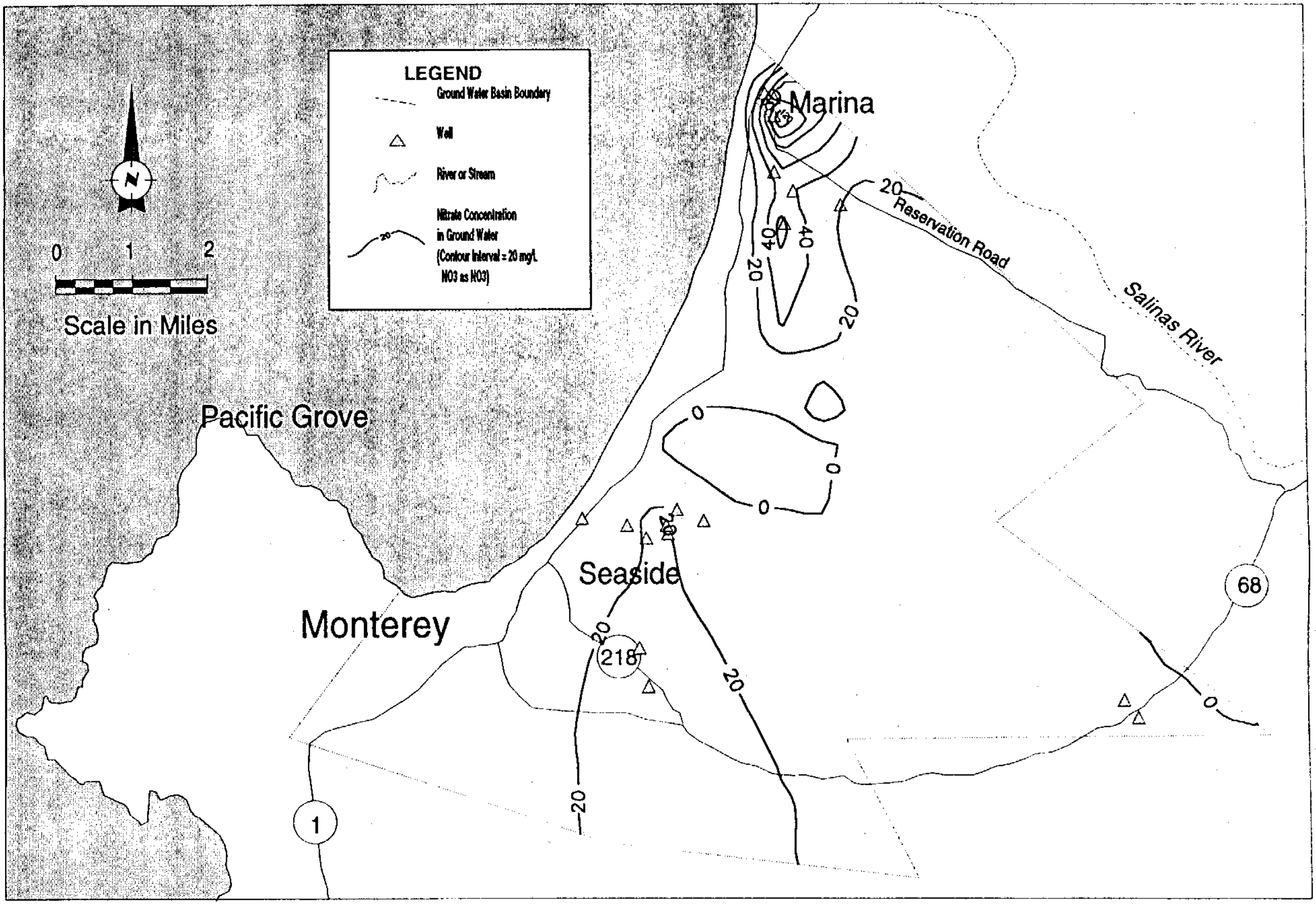

Figure XX-2. Average Nitrate Concentrations in the Seaside Ground Water Basin from 1963 to 1981

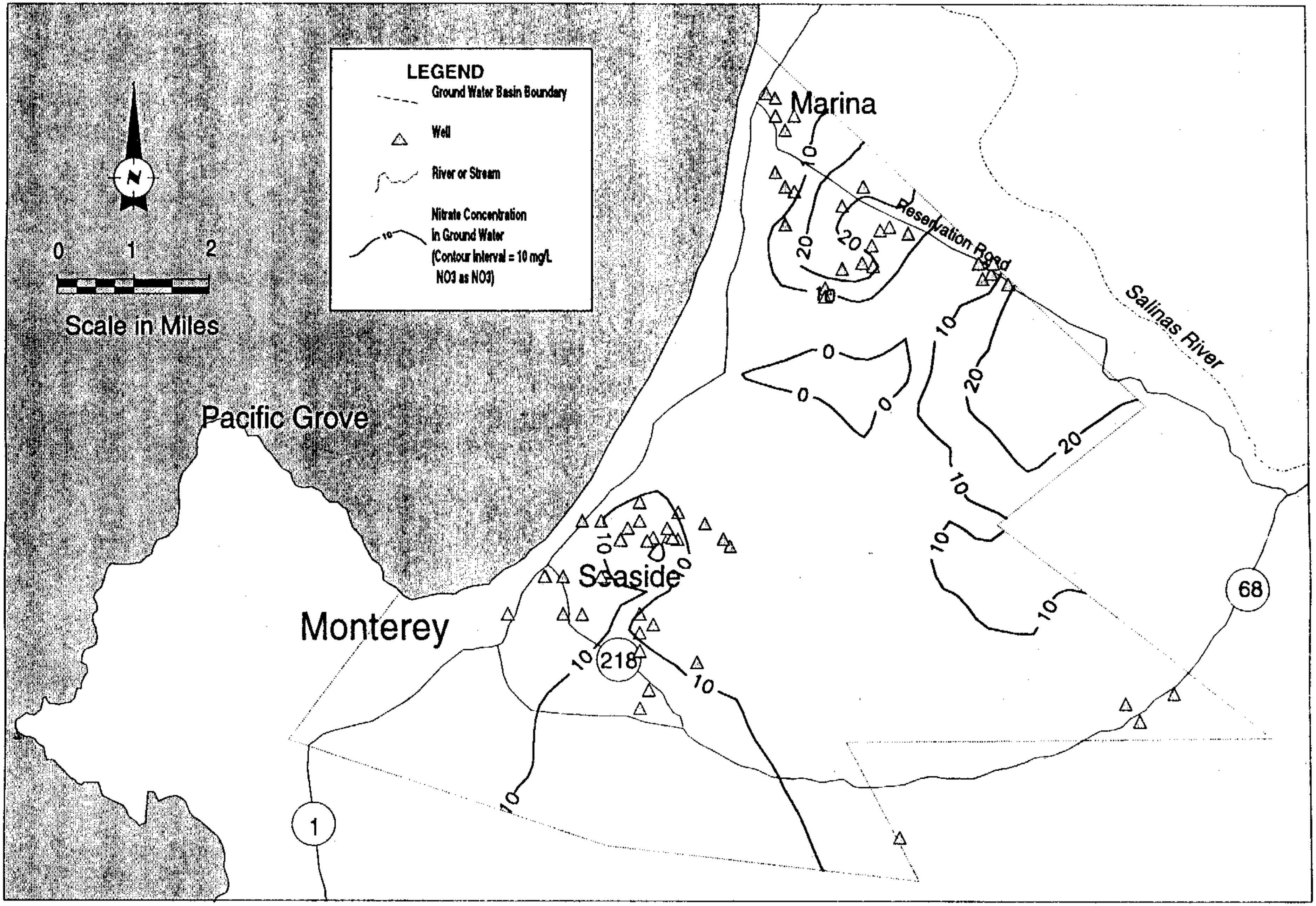

Figure XX-3. Average Nitrate Concentrations in the Seaside Ground Water Basin from 1982 to 1992

XXI. FINAL BASIN RANKING AND ANALYSIS

Regional Board staff identified fifteen ground water basins experiencing nitrate contamination. Next, Regional Board staff plan to investigate nitrogen sources and determine remedial action for each basin experiencing contamination. However, staff resources are not available to investigate all fifteen basins at one time. Therefore, Regional Board staff recommend a priority ranking of all fifteen basins to use as a basis to allocate staff resources.

Before identifying the main sources of nitrate contamination, Regional Board staff recommend a more detailed hydrogeologic analysis of the contaminated ground water basins. Additionally, staff need to collect more nitrate data from any additional data sources not available at the onset of this report. Finally, those wells not only registering past high nitrate values but also lacking recent nitrate data need to be tested. These wells are listed in their respective chapters, as well as in Chapter XXII.

Ranking Process

Chapter Five identified fifteen ground water basins experiencing nitrate contamination. To determine a logical priority of the fifteen contaminated ground water basins, Regional Board staff devised a ranking system according to four criteria: nitrate concentration, population, reliability and amount of data, and area (size) of contamination.

Staff allocated a maximum of five points per criterion. Examining the condition of each basin separately, staff applied a score to each of the four criterion. These four scores are combined to obtain a total score for each basin. Regional Board staff gave the basins with the highest total score the highest priority. The scores used in this ranking system, however, are not based strictly on quantitative attributes. Regional Board staff based scores on clearly definable characteristics and best professional judgement. The ranking criteria parameters are described below:

Ranking Criteria

Nitrate Concentration - This category ranks the ground water basins according to severity of the nitrate concentration within the basin. A score of one to five is assigned to each basin based on the highest nitrate concentration shown on the contour map. The most recent contour maps of the basins were used to assign scores. Table XXI-1 displays the scoring system.

Table XXI-1. Scoring system for the Nitrate Concentration Criterion.

Concentration of Highest Nitrate Plume (mg/l Nitrate, as NO3)	Score
Less than 30 mg/l	1
30 mg/l to 45 mg/l	2
45 mg/l to 90 mg/l	3
90 mg/l to 150 mg/l	4
greater than 150 mg/l	5

Population - This criterion looks at the population overlying the ground water basin. Staff assigned scores of one through five according to a relative scale, ranking the populations as small, medium and large. The basins with the largest populations are assigned a score of five, while the basins with the smallest populations are assigned a score of one.

Reliability and Amount of Data - This criterion establishes a degree of confidence for each basin based on the number of wells sampled and the number of nitrate readings taken. Nitrate levels based on a large number of wells or readings increase the validity of the contours and consequently increase the justification for a higher priority ranking. A relative scoring scale of one to five is used, with a score of five representing a high degree of confidence in the data of the basin.

Area of Contamination - This criterion is a measure of the area (size) of high nitrate levels, specifically, those areas above 30 mg/l nitrate, as NO3. This measure of the area impacted is ranked relative to the other basins in the study. This criterion is more specific to the size of the area of nitrate contamination, rather than just the entire size of the basin. Relative to the other basins, small areas of contamination receive a score of one, while large contamination areas basins receive a score of five.

Final Ranking

The Regional Board staff applied the four criteria, as described above, to all fifteen ground water basins. Table XXI-2 displays each basin's criterion scores, total score, and final rank. The basins are arranged in order of priority. The Salinas Valley ground water basin, with a total score of 19 and a rank of one, is the highest priority basin.

Table XXI-2. Final Priority Ranking of the Top 15 Ground Water Basins of the Central Coast Region.

Chapter Number	BASIN NAME	Final Ranking	Ranking Criteria				
			NO3 1-5	Population 1-5	Adequate Data Available 1-5	Area Impacted 1-5	Total Score
XV	Salinas Valley Basin	1	4	5	5	5	19
X	Gilroy-Hollister Valley	2	4	3	5	4.5	16.5
XVII	Santa Maria River Valley	3	3.5	3	5	3.5	15
XI	Langley Area	4	3	3	5	3	14
XII	Los Osos Valley	5	3	3	4	2.5	12.5
XIII	Pajaro Valley	6	5	1	4	2	12
XIV	Paso Robles Basin	7	3	2	3.5	3.5	12
VI	Arroyo Grande Valley	8	3	3	3.5	1	10.5
XVI	San Luis Obispo Valley	9	2.5	2	4	2	10.5
IX	Cuyama Valley	10	3	1	3	3	10
VII	Carrizo Plain	11	4	1	2	3	10
XVIII	Santa Ynez River Valley	12	2.5	1	3	2.5	9
VIII	Chorro Valley	13	2	3	3	1	9
XX	Seaside Basin	14	1	2	3.5	2	8.5
XIX	Scotts Valley	15	2	1	3	1	7

XXII. RECOMMENDATIONS

In the initial basin selection process, Regional Board staff eliminated many of the 53 ground water basins due to the lack of adequate nitrate sampling data. Nitrate sampling, therefore, needs to be implemented in these eliminated basins. Table XXII-1 shows a list of Central Coast Region ground water basins that require nitrate sampling.

Table XXII-1. Central Coast Region Ground Water Basins Needing Further Nitrate Sampling.

Basin Number	Basin Name
3-20	Ano Nuevo
3-47	Big Springs
3-30	Bitter Water Valley
3-18	Carpenteria
3-5	Cholame Valley
3-29	Dry Lake Valley
3-31	Hernandez Valley
3-45	Huasana Valley
3-32	Peach Tree Valley
3-24	Quien Sabe Valley
3-46	Rafael Valley
3-43	Rinconda Valley
3-28	San Benito River Valley
3-33	San Carpoforo Valley
3-22	Santa Ana Valley
3-25	Tres Pinos Creek Valley
3-23	Upper Santa Ana Valley

In addition to the further sampling of these eliminated ground water basins, many of the final fifteen basins require further sampling of specific wells within the basin. Table XXII-2 lists the ground water basins that need further nitrate sampling. This report tabulates the specific wells at the end of the chapters mentioned in Table XXII-2.

Table XXII-2. Contaminated Ground Water Basins Containing Wells Recommended for Further Sampling.

Chapter	Basin	No. of Wells to be Sampled
VI	Arroyo Grande Valley	65
VII	Carrizo Plain	19
VIII	Chorro Valley	3[a]
IX	Cuyama Valley	23
X	Gilroy-Hollister	9
XII	Los Osos Valley	11
XIII	Pajaro Valley	22
XVII	Santa Maria Valley	60
XVIII	Santa Ynez Valley	1
XX	Seaside	15

(a) Three specific wells have been identified for further sampling. However, additional sampling of wells in this area is also recommended.

From working on this report, Regional Board staff determined the necessity for statewide improvements in data storage and retrieval methods. With the present system, it took two students approximately one year to collect and save data on computers. This cumbersome collection and retrieval process needs to be improved state-wide in order to monitor ground water quality and to utilize ground water quality data for other studies. First, Regional Board staff recommend the formation of a state task force to establish a central data system to facilitate data retrieval. This centralized system should contain the monitoring data from all agencies. All data systems, including USGS and EPA's STORET, should contain the full spectrum of parameters necessary to determine ground water contamination. The minimum standard data set should include such parameters as latitude, longitude, well depth, perforation intervals, seal depth, depth to ground water, and constituent(s) concentration, as well as sample dates. As the California State Well

Identification system is imprecise, the wells should be identified primarily by latitude/longitude coordinates.

With the availability of such a centralized system, containing all well monitoring data, considerable time will be saved in data collection and retrieval. Additionally, other water quality problems will be more readily identifiable.

Second, Regional Board staff recommend that government officials adopt laws, similar to those in Santa Clara County, which require private well owners to sample water quality. Since private wells can provide useful water quality data, these laws will resolve the scarcity of water quality data. Like with agency data, this ground water quality data will be submitted to a centralized data storage system or the County.

Finally, Regional Board staff recommend that Federal and State officials provide funding to agencies to continue water quality sampling. Staff noticed a decline in the amount of water quality data available since the late 1970's. Although, the U. S. Environmental Protection Agency, California Department of Water Resources, California Department of Health Services, and the United States Geologic Survey provided the majority of the nitrate data for this assessment, they lacked recent ground water quality data. Further ground water monitoring is important to assess water quality. It is imperative that our government support these programs which maintain ground water quality records.

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