SNL 0003

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Mr. John Kieling, Manager
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Dear Mr. Kieling:

Enclosed is a copy of the "Tijeras Arroyo Groundwater Continuing Investigation Report, November 2002". A second copy is being sent directly to the Sandia Site Manager.

If you have any questions, please contact John Gould at (505) 845-6089.

Sincerely,

Karen L. Boardman
Manager

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SNL1235

Sandia National Laboratories

TIJERAS ARROYO GROUNDWATER CONTINUING INVESTIGATION REPORT

November 2002

Environmental Restoration Program

United States Department of Energy
Office of Kirtland Site Operations

Sandia National Laboratories/New Mexico

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Environmental
Restoration
Project

United States Department of Energy
Office of Kirtland Site Operations

EXECUTIVE SUMMARY

The Tijeras Arroyo Groundwater (TAG) Continuing Investigation Report summarizes the findings of the TAG investigation that is being conducted by Sandia National Laboratories/New Mexico (SNL/NM). Relevant findings for Kirtland Air Force Base (KAFB) and the City of Albuquerque (COA) are also summarized. Groundwater investigations conducted during the last ten years by the SNL/NM Environmental Restoration (ER) Project and the KAFB Installation Restoration Program (IRP) have identified trichloroethylene (TCE) and nitrate as the primary contaminants of concern (COCs) in TAG study area groundwater.

Environmental studies in the TAG study area have ascertained Solid Waste Management Unit (SWMU) locations, the hydrogeologic setting, the distribution of TCE and nitrate in groundwater, the occurrence of these and other COCs in soil, and the principal release sites. No ongoing contamination is occurring at the SWMUs. For example, the Technical Area (TA)-II septic systems have been taken out of service. No dumping or disposal of toxic materials is currently allowed at the sites.

Forty-three SNL/NM SWMUs and six Drain and Septic Systems (DSS) are located in the TAG study area, which includes TA-I, TA-II, TA-IV, and the Tijeras Arroyo Operable Unit. KAFB IRP and the COA Environmental Health Department manage approximately 41 sites in the vicinity of the TAG study area.

Most of the SNL/NM characterization work has been completed. At the majority of the SWMUs, only minor amounts of hazardous and/or radioactive materials were released. Therefore, most SWMUs have not required remediation. However, a minor amount of additional soil sampling is planned for 22 SWMUs (as of January 2001) in response to the New Mexico Environment Department's (NMED) comments concerning various No Further Action (NFA) proposals. The planned sampling will further evaluate the shallow distributions of COCs in soil, and will typically involve the collection of soil samples at depths of less than 10 feet (ft). The additional soil sampling is confirmatory in nature and is not expected to produce analytical results that would require a re-interpretation of the TAG conceptual model or the installation of additional monitoring wells. Similarly, additional sampling is expected to confirm that the DSS are not significant sources of TCE or nitrate.

A wide variety of environmental studies have been conducted by SNL/NM to address specific TAG-related data gaps and to investigate the numerous SWMUs in the study area.

- The research work for the SWMUs has consisted of compiling process knowledge by interviewing current and former SNL/NM employees, as well as reviewing historical documents, such as memoranda, aerial photographs, and engineering drawings. The process knowledge revealed that 40 of the 43 SWMUs required site characterization.

- Soil sampling has been conducted at all 40 SWMUs. Soil-vapor sampling has been conducted at 20 of the SWMUs.

- A Field Implementation Plan has been accepted by NMED for the proposed sampling at the six DSS.

- Analytical results are available for all of the SWMUs that required sampling. Based upon these analytical results, NMED has accepted NFA proposals for 18 of the 40 characterized SWMUs. Risk assessments are being, or will be, prepared for the remaining 22 SWMUs.

- As of June 2002, SNL/NM has installed a network of 30 monitoring wells that consists of 25 groundwater and 5 soil-vapor wells. KAFB and the COA have installed approximately 25 groundwater monitoring wells in the vicinity.

- Hydrogeologic investigations have been conducted, such as groundwater elevation measurements, transducer studies, aquifer tests, colloidal borescope measurements, water analyses, and computer modeling.

- Geologic field mapping and other investigations, such as borehole-geophysical, seismic, and aeromagnetic surveys, have been conducted.

Our understanding of the hydrogeologic setting has been synthesized into the TAG conceptual model. The hydrogeologic setting for the TAG study area is well understood based upon a significant number of monitoring wells. Groundwater occurs in both the shallow groundwater system (SGWS) and the regional aquifer. However, the SGWS has a limited lateral extent that encompasses approximately 3.5 square miles of north-central KAFB. The SGWS may extend northward across the KAFB boundary. In the TAG study area, the depth to groundwater for the SGWS ranges from 220 to 330 ft below ground surface (bgs). The uppermost saturated zone in the SGWS varies from approximately 10 to 30 ft thick, depending upon the well location. Borehole geophysical surveys indicate that a few relatively damp intervals are present below the uppermost saturated zone, but borehole-yield testing has revealed that most of these deeper intervals are too thin to yield volumes of water sufficient for the construction of monitoring wells. The SGWS is not used for water supply.

The direction of groundwater flow in the SGWS is to the southeast. Groundwater flows through low-yield, alluvial fan sediments with an average hydraulic gradient of approximately 0.008 ft/ft. Groundwater elevations in the SGWS are decreasing in the northwestern part of the study area, but are increasing in the southeastern part. The SGWS is recharged by both artificial (leaking water-supply/sewer lines and the former sewage lagoons) and natural sources (Tijeras Arroyo and possibly ancestral Tijeras Creek). Principal hydrogeologic controls on the SGWS include: 1) the stratigraphic dip of the alluvial fan sediments, 2) stratigraphic variations (such as braided paleochannels), and 3) multiple recharge locations in the northwestern part of the TAG study area.

Multiple overlapping lenses of low conductivity, mostly unsaturated sediments, serve as a perching horizon beneath the SGWS. Beneath the central TAG study area, a layer of approximately 180 to 280 ft of these unsaturated sediments separate the SGWS from the regional aquifer. Groundwater in the SGWS merges with the regional aquifer southeast of Tijeras Arroyo where the alluvial fan sediments are slightly more permeable.

The regional aquifer is more laterally extensive than the SGWS, underlying the entire TAG study area as well as the Albuquerque basin. Across the TAG study area, the depth to the regional aquifer ranges from approximately 440 to 570 ft bgs. The regional aquifer is composed of both the Ancestral Rio Grande fluvial facies and alluvial fan facies. Groundwater in the regional aquifer flows to the northwest, in a nearly opposite direction to that of the SGWS. The gradient in the regional aquifer averages approximately 0.009 ft/ft across the study area, but is steeper near the KAFB, COA, and Veteran's Administration (VA) water-supply wells. The regional

aquifer is recharged on the eastern side of the study area by natural sources including mountain-front flow, Tijeras Arroyo, and the SGWS. Groundwater elevations are generally decreasing in the northwestern part of the study area, but are increasing in the southeastern part. Seasonal pumping variations cause sporadic water-level fluctuations near the water-supply wells. The principal hydrogeologic control upon groundwater flow direction in the regional aquifer is the combined drawdown effect of the KAFB, COA, and VA water-supply wells.

The aqueous geochemical signatures of the SGWS and the regional aquifer are unique. The geochemical signatures of the SGWS vary between well locations and tend to exhibit higher concentrations of calcium, sulfate, and chloride than the regional aquifer. Groundwater in the regional aquifer exhibits higher bicarbonate/alkalinity concentrations.

The first TAG investigation groundwater samples were collected in November 1992. As of the January 2001 sampling event, SNL/NM had installed 23 monitoring wells. Eleven monitoring wells are completed in the SGWS, while twelve monitoring wells are completed in the regional aquifer.

The occurrence of TCE in groundwater is predominantly in the SGWS. To date, the maximum concentration of TCE in the SGWS is 9.6 micrograms per liter (μg/L). Only six of the twelve SGWS monitoring wells have yielded detectable concentrations of TCE. TCE concentrations in the SGWS are higher than concentrations in the regional aquifer. The historical trend of TCE concentrations in the SGWS is stable. For January 2001, only one monitoring well had a TCE concentration that exceeded the maximum contaminant level (MCL) of 5 μg/L. The sample from monitoring well TA2-W-26 contained 7.9 μg/L of TCE.

The sporadic distribution of low concentrations of TCE in the SGWS is indicative of discrete TCE occurrences, not widespread contamination. The distribution is most likely due to a few scattered TCE-release sites compounded by the heterogeneity of the alluvial fan deposits that comprise the unsaturated and saturated intervals. The TCE distribution also probably reflects both the lateral and vertical spreading of TCE soil vapor through a 220- to 330-ft-thick vadose zone, possibly aided by large volumes of water discharged at or near the surface. TCE releases have been correlated to historical activities associated with TA-I, TA-II, KAFB, and COA properties. Two SWMUs are potential sources of groundwater contamination involving TCE. Another two sites managed by KAFB, and two sites managed by the COA may have contaminated groundwater with TCE.

The occurrence of TCE in the regional aquifer has no discernible pattern and is more intermittent than the distribution in the SGWS. Excluding the annular-compromised WYO-1, only 2 (PGS-2 and TJA-3) of the 13 regional aquifer monitoring wells have yielded detectable concentrations of TCE. To date, the maximum TCE concentration for the regional aquifer has been 2 μg/L, which is below the federal MCL of 5 μg/L. Dispersion of TCE through the SGWS and the perching horizon has apparently resulted in TCE concentrations at a particular regional aquifer well that cannot be directly attributed to a specific TCE release site.

Based upon our current understanding, the two SNL/NM SWMUs assigned a "high" concern level (TCE release sites that may have impacted groundwater) are SWMU 46 (the SNL/NM Acid Waste Line Outfall) and SWMU 165 (the Building 901 Septic System). At both of these SWMUs, sufficient volumes of waste or septic water were released over the years to have driven TCE deep into the vadose zone, to be modified later through vapor-phase transport. For the same reason, the KAFB Golf Course Main Pond and the KAFB Sewage Lagoons are assigned a "high" concern level. In addition, the COA's Eubank Landfill—Northeast Fill Area

and Eubank Landfill—Southwest Fill Area are assigned a "high" concern level as being TCE release sites that may have impacted groundwater because of past disposal practices. The six sites appear to be the most likely sources of TCE in groundwater. Ongoing investigations by SNL/NM, KAFB, and the COA should improve our understanding of the TCE release sites.

Elevated levels of nitrate have been detected in SGWS groundwater samples. The maximum nitrate concentration in the SGWS to date is 44 milligrams per liter (mg/L) (in well TA2-SW1-320; December 1999), which is above the federal MCL of 10 mg/L. The maximum nitrate concentration in the regional aquifer is 33 mg/L at well TJA-4 (January 2001). For January 2001, the maximum concentration of nitrate in the SGWS was 36 mg/L. A total of 10 SGWS monitoring wells had nitrate concentrations that exceeded the background level of 4 mg/L. Six of the twelve SGWS monitoring wells had nitrate concentrations that exceeded the MCL (10 mg/L). For the regional aquifer, the maximum concentration of nitrate in January 2001 was 33 mg/L. Only two regional aquifer monitoring wells (TA2-NW1-595 and TJA-4) had nitrate concentrations that exceeded the background level (4 mg/L). Only one well (TJA-4) had nitrate concentrations that met or exceeded the MCL (10 mg/L).

Nitrate is suspected of reaching SGWS groundwater as degradation products associated with the disposal of septic water or landfill debris (landscaping waste). Based upon current understanding, three SNL/NM SWMUs are assigned a "high" concern level for being nitrate-release sites that may have impacted groundwater. These three SWMUs are SWMU 46 (Old Acid Waste Line Outfall), SWMU 165 (the Building 901 Septic System in TA-II), and SWMU 187 (the TA-I Sanitary Sewer System). The KAFB Sewage Lagoons, KAFB Golf Course Main Pond, KAFB Sanitary Sewer System, COA Eubank Landfill—Northeast Fill Area, COA 1994 Sanitary Sewer Line Rupture, COA Sanitary Sewer System, and COA Montessa Park/Tree Nursery are also assigned a "high" concern level. These ten sites appear to be the most likely sources of groundwater contamination involving nitrate. Ongoing investigations by SNL/NM, KAFB, and the COA should improve our understanding of the nitrate-release sites.

Based upon a comprehensive review of available information, the following conclusions can be made about groundwater contamination in the TAG study area:

- The distribution of TCE in the SGWS is sporadic across the study area.
- The concentration and distribution of TCE in the regional aquifer is negligible.
- The distribution of nitrate above the background level is laterally widespread in the SGWS, yet discontinuous across the study area.
- In the regional aquifer, concentrations of nitrate above the background level are scattered across the TAG study area.
- The potential sources of TCE and/or nitrate in the TAG study area include sewage lagoons, waste-water outfalls, septic systems, landfills, sewer lines, and the golf course.
- Based upon the historical use and disposal of chlorinated solvents, the extent of TCE in groundwater is probably associated with multiple aqueous releases of solvents and subsequent vapor-phase transport through the vadose zone.

SNL/NM recommends the following approach as part of the continuing environmental studies of the TAG study area.

- Based upon groundwater analytical results, re-evaluate the sampling frequency for each monitoring well. After at least four quarters of sampling have been conducted at a particular well, the sampling frequency can be reduced to an annual basis for analytes that are not COCs.

- Based upon the distribution of monitoring wells, remove some of the well locations that are redundant from the quarterly sampling program.

- At a minimum, analyze groundwater samples for VOCs and nitrate.

- Continue periodic groundwater level measurements in all TAG monitoring wells.

- Complete computer-modeling efforts, including modeling sources of water in the SGWS, performing particle track simulations for the regional aquifer, and differentiating sources of groundwater with a geochemical model.

- Maintain contact with KAFB IRP personnel with respect to the results of TCE- and nitrate-abatement studies.

- As available, obtain groundwater reports from both KAFB and the COA and integrate the results into future SNL/NM reports.

- Perform aquifer tests at TAG monitoring wells, as needed. Depending upon the yield at a particular well, the aquifer tests might consist of either pump tests or slug tests.

- Report future TAG investigation results in the Groundwater Protection Program's Annual Groundwater Monitoring Report.

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ACRONYMS AND ABBREVIATIONS

amsl	above mean sea level
ARG	ancestral Rio Grande
bgs	below ground surface
CAUs	Corrective Action Units
cm/s	centimeter(s) per second
COA	City of Albuquerque
COC	constituent of concern
DCA	dichloroethane
DCE	dichloroethene (dichloroethylene)
DOE	U.S. Department of Energy
DSS	Drain and Septic Systems
E_h	oxidation/reduction potential
EPA	U.S. Environmental Protection Agency
ER	Environmental Restoration
ERCL	Environmental Restoration Chemistry Laboratories
FIP	Field Implementation Plan
FOP	field operating procedure
ft	foot (feet)
ft/ft	foot (feet) per foot
FY	Fiscal Year
GEL	General Engineering Laboratory
GIP	Groundwater Investigation Plan
GPP	Groundwater Protection Program
HE	high explosive(s)
HWB	Hazardous Waste Bureau
IRP	Installation Restoration Program
IT	IT Corporation
KAFB	Kirtland Air Force Base
LF	landfill
MCL	maximum contaminant level
µg/L	microgram(s) per liter (equivalent to parts per billion)
mg/L	milligrams per liter (equivalent to parts per million)
NFA	no further action
NMAC	New Mexico Administrative Code
NMED	New Mexico Environment Department
NOD	Notice of Deficiency
PCE	tetrachloroethene (perchloroethene)
ppbv	parts per billion volume
RSI	Request for Supplemental Information
SGWS	shallow groundwater system
SLO	State Land Office
SMO	Sample Management Office
SNL/NM	Sandia National Laboratories/New Mexico
SVOC	semivolatile organic compound
SWHC	Site-Wide Hydrogeologic Characterization Project
SWMU	solid waste management unit
TA	Technical Area

ACRONYMS AND ABBREVIATIONS (Concluded)

TAG	Tijeras Arroyo Groundwater
TAL	Target Analyte List
TCA	trichloroethane
TCE	trichloroethylene (trichloroethene)
TJAOU	Tijeras Arroyo Operable Unit
VA	Veterans Administration
VOC	volatile organic compound
VW	Vapor Well (soil-vapor monitoring well)
yr	year

1.0 INTRODUCTION

The Sandia National Laboratories/New Mexico (SNL/NM) Environmental Restoration (ER) Project has previously reported concentrations of trichloroethylene (TCE) exceeding the U.S. Environmental Protection Agency (EPA) maximum contaminant level (MCL) in groundwater samples from several Tijeras Arroyo Groundwater (TAG) investigation monitoring wells. The other primary groundwater contaminant at the TAG study area is nitrate, which also has exceeded the EPA MCL in several monitoring wells. Groundwater contamination is primarily restricted to a shallow groundwater system (SGWS) that overlies the regional aquifer.

1.1 Purpose

This document presents an updated conceptual model of the TAG investigation based upon activities that have been conducted since the submittal of the "Sandia North [now referred to as Tijeras Arroyo (Collins December 2000)] Groundwater Investigation Plan" (SNL/NM March 1996) (hereinafter referred to as the GIP) in 1996. Currently, no reporting requirements have been specified by the New Mexico Environment Department's (NMED) Hazardous Waste Bureau (HWB) for the information contained herein. Two previous annual reports submitted by the SNL/NM ER Project have contained mostly data summaries with modest amounts of synthesis and interpretation. This Continuing Investigation Report compiles the existing data that have been collected voluntarily by SNL/NM and provided to the U.S. Department of Energy (DOE) and NMED/HWB to keep them informed of the work that has been completed. This report describes the current status of the site investigation work proposed in the GIP. Additional site characterization work in the TAG study area is ongoing, and it is anticipated that impending activities will be reported in future summary documents.

The TAG study area is located on the north central portion of Kirtland Air Force Base (KAFB) (Figure 1.1-1). Three of the five SNL/NM Technical Areas (TAs) are located in the TAG study area. Together, the three TAs (TA-I, TA-II, and TA-IV) encompass approximately 641 acres. About 7,600 employees and contractors work in the 470 structures that are located in the three TAs (DOE October 1999). The structures primarily consist of office buildings, research laboratories, workshops, shipping facilities, and warehouses.

Investigations of groundwater quality in the TAG study area have been conducted over the past nine years (Table 1.1-1). In 1992, SNL/NM began to investigate groundwater quality as part of the overall TA-II investigation with the installation of three groundwater monitoring wells. During this initial investigation, the SGWS was discovered at a depth of approximately 320 feet (ft) below ground surface (bgs). In October 1994, analytical results of a groundwater sample from the SGWS identified TCE at a concentration of 1 microgram per liter (µg/L), which alerted SNL/NM to further investigate groundwater contamination in the study area. A complete summary of specific information that had been collected prior to March 1996 was reported in the GIP (SNL/NM March 1996).

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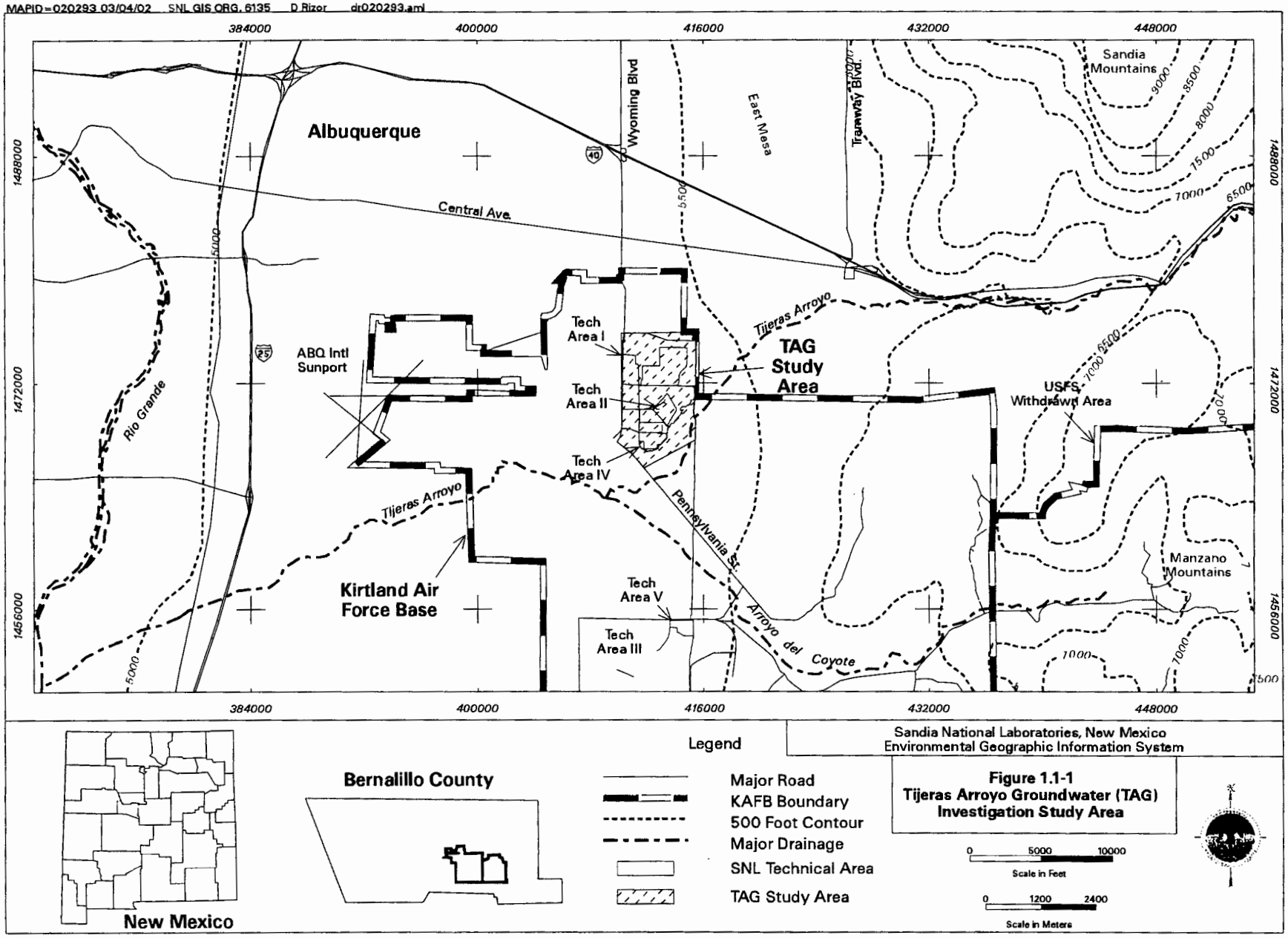


Table 1.1-1
Tijeras Arroyo Groundwater Investigation Historical Timeline

Month	Year	Event	Reference
November–July	1992–1993	SNL/NM began investigation of TA-II groundwater. SGWS discovered as first wells installed (TA2-SW1-320, TA2-NW1-325, and TA2-NW1-595).	SNL/NM March 1995
March–July	1994	Installed monitoring wells TA2-W-01 and TJA-2.	SNL/NM March 1995
October	1994	Analytical results from groundwater sampling first detected TCE.	SNL/NM March 1996
August–September	1995	Installed monitoring wells WYO-1, WYO-2, and PGS-2.	SNL/NM March 1996
November	1995	Analytical results from groundwater sampling first detected TCE above the EPA MCL of 5 µg/L.	SNL/NM March 1996
November	1995	Installed monitoring well TA2-W-19.	SNL/NM March 1996
March	1996	The Sandia North (now Tijeras Arroyo) Groundwater Investigation Plan was submitted to the NMED/HWB.	SNL/NM March 1996
September	1996	The Shallow Water-Bearing Zone Hydrologic Evaluation was prepared.	Wolford September 1996
November	1996	Pressure transducer program initiated for select monitoring wells.	SNL/NM March 1998
November–December	1996	Installed TA-II soil vapor monitoring wells: TA2-VW-20 and TA2-VW-21.	IT January 1997
March	1997	Sandia North Geological Investigation Project Report prepared.	Fritts and Van Hart March 1997
March–April	1997	Installed monitoring wells: TAI-W-01, TA2-W-25.	SNL/NM March 1998
August	1997	Borehole geophysical investigation (electromagnetic induction, neutron and natural gamma) completed on 21 SNL/NM and KAFB monitoring wells.	SNL/NM March 1998
January–February	1998	Installed monitoring wells: TAI-W-02, TAI-W-03, TAI-W-06, TA2-W-24, TA2-W-26, and TA2-W-27.	SNL/NM June 2000
March	1998	Fiscal Year 1997 Sandia North Groundwater Investigation Annual Report submitted to NMED/HWB.	SNL/NM March 1998
August–December	1998	Installed monitoring wells: TAI-W-04, TAI-W-05, TAI-W-07, TJA-3, TJA-4, and TJA-5.	SNL/NM June 2000
May–June	1999	Colloidal borescope investigation performed on 18 SNL/NM and KAFB monitoring wells.	AquaVISION July 1999
October	1999	Analysis of the USGS Aeromagnetic Survey performed to revise the interpretation SNL/KAFB Area geologic structure.	Van Hart et al. October 1999
June	2000	Fiscal Year 1998 Sandia North Groundwater Investigation Annual Report submitted to NMED/HWB.	SNL/NM June 2000
December	2000	Project name changed to the Tijeras Arroyo Groundwater Investigation.	Collins December 2000
January–March	2001	Installed monitoring wells: TJA-6 and TJA-7, and soil vapor monitoring wells: 46-VW-01, 46-VW-02, and 227-VW-01.	This report
February	2001	Preliminary model of the SGWS updated.	BGW February 2001
June	2001	Geologic model of the SGWS updated.	Van Hart June 2001

BGW = Balleau Ground Water, Inc.
EPA = U.S. Environmental Protection Agency.
HWB = Hazardous Waste Bureau.
IT = IT Corporation.
KAFB = Kirtland Air Force Base.
MCL = Maximum Contaminant Level.
µg/L = Microgram(s) per liter.
NMED = New Mexico Environment Department.
SGWS = Shallow groundwater system.
SNL/NM = Sandia National Laboratories/New Mexico.
TA = Technical Area.
TCE = Trichloroethylene.
USGS = U.S. Geological Survey.

Since the preparation of the GIP, the ER Project has voluntarily undertaken various activities to determine the nature and extent of groundwater contamination, in an attempt to identify all potential sources for this contamination. The site characterization activities included:

- Soil-vapor sampling of monitoring wells located in TA-II
- Installing new groundwater and soil-vapor monitoring wells
- Collecting groundwater elevation data monthly
- Collecting quarterly groundwater and soil-vapor samples

In addition to the activities mentioned above, site characterization activities were completed (independent of the groundwater investigation of the TAG study area) at potential source areas at TA-I, TA-II, Tijeras Arroyo sites, septic tanks/drainfields, and at non-SNL/NM properties adjacent to the study area. This report summarizes each of the activities performed as they relate to the groundwater investigation of the TAG study area (see Chapter 2.0).

1.2 Updated TAG Conceptual Model—Summary

The purpose of updating the TAG conceptual model is to provide an integrated description of the geologic setting, hydrologic characteristics, and contaminant distributions. The updated conceptual model is summarized in this section with more details provided below in Chapters 3.0 and 4.0.

Groundwater in the vicinity of the TAG study area is contained in the regional aquifer and the SGWS, both within the upper unit of the Tertiary-age Upper Santa Fe Group. Aquifer tests and drilling data indicate that the regional aquifer is semi-confined to unconfined in the study area, with hydraulic conductivities ranging from approximately 10 to 150 ft/day. Depth to water in the regional aquifer ranges from 450 to 550 ft bgs (4,854 to 4,924 ft above mean sea level [amsl]) in the study area. The direction of groundwater flow in the regional aquifer is principally north-northwest, toward the KAFB, City of Albuquerque (COA), and Veterans Administration (VA) water-supply wells. In the northwest portion of the study area groundwater levels have been declining in the regional aquifer due to pumping from these production wells.

In the eastern section of the TAG study area, the upper portion of the regional aquifer is found within the alluvial fan facies. In the western section of the study area, the upper portion of the regional aquifer is found instead within the Ancestral Rio Grande (ARG) fluvial facies. These two lithofacies exhibit complex interfingering in a north-south line along Wyoming Boulevard. The ARG fluvial facies are typically coarse-grained and well sorted, exhibit relatively continuous and well-connected bedding, and have moderate to high hydraulic conductivity. In contrast, the alluvial fan facies are typically finer grained and poorly sorted, exhibit lenticular bedding that is moderately to well connected, and have low to moderate hydraulic conductivities.

The SGWS consists of multiple perched saturated intervals, located up to 200 ft above the regional water table (5,067 to 5,126 ft amsl) within the alluvial fan facies of the Upper Santa Fe Group. The SGWS is presently understood to cover approximately 3.5 square miles. The flow is in a general southeast direction at a gradient of 0.01 ft per ft (ft/ft), with hydraulic conductivity values ranging from 0.1 to 50 ft/day. Within the study area, the SGWS does not appear to be hydraulically connected to the regional aquifer and saturation is not vertically continuous between the two groundwater systems.

Potential recharge sources for the SGWS include:

- Localized, irrigated (grassy) areas such as the Parade Ground north of TA-I
- A buried ancestral Tijeras Arroyo channel (supplying water from portions of Tijeras Arroyo upstream of KAFB)
- Leaking water mains or sewer lines
- The high-volume, acid-waste line (now inactive)
- The KAFB sewage lagoons (now inactive)

The data available from previous and ongoing site investigations have identified TCE and nitrate as the two major constituents of concern (COCs). Volatile organic compounds (VOCs) such as TCE, 1,1-dichloroethane [DCA], and cis-1,2-dichloroethene [DCE] have been confirmed in SGWS monitoring wells. The concentrations of these VOCs are low, ranging from less than 1.0 (J-values) to 9.6 µg/L, with only three monitoring wells (TA2-W-19, TA2-W-26, and WYO-2) historically exhibiting concentrations above the EPA MCL for TCE of 5.0 µg/L. The VOC contamination in the uppermost-saturated interval of the SGWS is laterally widespread, yet discontinuous. The distribution of VOC contamination does not point to a single source. Based upon the historical use of solvents throughout the KAFB and SNL/NM area, it is believed that numerous, small releases have occurred.

Nitrate contamination above the EPA MCL of 10 milligrams per liter (mg/L) has been found consistently in one SGWS monitoring well (TA2-SW1-320) and in an intermediate groundwater system monitoring well (TJA-4). The levels of nitrate contamination in these wells range up to 44 mg/L. The nitrate at TA2-SW1-320 is associated with a former high-volume septic tank leach field (SWMU 165) located in TA-II. The source of nitrate at TJA-4 is possibly the KAFB golf course.

Contaminant transport in the SGWS is postulated to be in the direction of the hydraulic gradient of each individual perched zone. For the uppermost zone, that direction is toward the southeast. No water-supply wells extract water from the SGWS. The pathways for recharge to the regional aquifer are currently unknown, but are likely to be very complex. The fate of contaminants along the SGWS flow paths (such as attenuation and/or degradation) also is unknown.

1.3 Primary COCs in Groundwater

The COCs in groundwater for the TAG study area are TCE and nitrate. Unlike TCE, which is a synthetic compound, nitrate can be naturally derived from geologic deposits. However, most nitrate occurrences result from the disposal of sewage. Sections 1.3.1 and 1.3.2 discuss the use and characteristics for TCE, respectively. The origins for nitrate are discussed in Section 1.3.3.

1.3.1 SNL/NM Use of Petroleum Products and Chlorinated Solvents

During the more than 50 years that SNL/NM has been in operation, a diverse suite of chemicals and radionuclides has been used. Acids, bases, solvents, petroleum products, high explosive (HE) compounds, reactives, metals, and radionuclides were used. Because SNL/NM was involved with nuclear weapons research in an era of rapidly expanding technologies, a wide variety of experiments and tests were conducted. Unfortunately, much of the early work was not well documented. Process knowledge also has been difficult to acquire because waste-management policies were not developed until the 1980s, after SNL/NM had already been in operation for more than 30 years. Therefore, a complete understanding of chemical usage and disposal at SNL/NM is not possible. The available information relevant to the TAG investigation is based upon the surviving archived records, memoranda, and employee interviews.

Table 1.3.1-1 lists the VOC-related solvents, petroleum fuels, and miscellaneous liquids that have been used by SNL/NM in the TAG study area. The list is as accurate as the available process knowledge allows. The most commonly used chemicals have now been identified with respect to the TAG investigation.

Table 1.3.1-1
VOC-Related Solvents, Petroleum Fuels, and Miscellaneous Liquids Used by SNL/NM in the TAG Study Area

Solvents	Petroleum fuels	Miscellaneous liquids
Acetone	Diesel	Butyl acetate
Carbon tetrachloride	Gasoline	Ethylene glycol
Dioxane	Kerosene	Freon™ compounds
Hexane		Hydraulic fluids
Methyl ethyl ketone		Isopropanol
Methylene chloride		Machining oils
Nitromethane		Methanol
1,1,1-TCA		Motor oils
TCE		Naphthalene
Toluene		Paint strippers
Xylene		Paints
		Polychlorinated biphenyls

SNL/NM = Sandia National Laboratories/New Mexico.
TAG = Tijeras Arroyo Groundwater.
TCA = Trichloroethane.
TCE = Trichloroethylene (trichloroethene).
VOC = Volatile organic compound.

1.3.2 Characteristics of TCE

TCE is a colorless, synthetic, moderately volatile liquid that is widely used as a metal degreaser. TCE is especially useful because of its excellent cleansing properties, non-corrosiveness, and low flammability (HSIA November 1986; HSIA February 2001). Chlorinated solvents such as TCE have been used in a wide variety of industrial applications for decades. Besides being widely used as a degreaser, TCE also is used to a much lesser extent in adhesives, paints, and coatings. First synthesized in 1864, TCE has been used worldwide for about 70 years. Demand for TCE was generated mainly by the development of vapor degreasing after the

1920s and by the growth of the dry-cleaning industry in the 1930s. TCE was replaced for dry-cleaning use by PCE in the mid-1950s. Production of TCE in the United States peaked in 1977. TCE still is used widely today, especially in metal degreasing and chemical processing.

The qualities which make TCE so useful in numerous industrial applications also cause TCE to be a persistent environmental contaminant. Chemically stable with a low vapor pressure, TCE is more dense than water at 1.46 grams per gram and is slightly soluble. The maximum solubility of TCE in water is 1,100 μg/L. Above that concentration, TCE will precipitate and sink through a water column as a dense non-aqueous phase liquid. Transport of TCE in the environment can occur as either vapor phase or liquid phase in the form of either free product or dissolved in water.

Typically referred to as a chlorinated solvent, TCE is more formally classified as an unsaturated aliphatic halogenated hydrocarbon (HSIA November 1986; HSIA February 2001). TCE has numerous synonyms including trichloroethene, ethylene trichloride, and 1,2-trichloroethylene as well as several trade names, such as Algylen, Chlorylen, and Trichloran (IARC 1994). The typical grades of TCE contain greater than 99 percent TCE. Two primary grades are manufactured. Degreaser grades are used for cleaning; technical grades are used for formulating other compounds such as hydrofluorocarbon refrigerants and polyvinyl chloride. The two grades primarily differ in the amount and type of added stabilizers and inhibitors. More than 50 stabilizers and inhibitors are known to have been used worldwide. These additives include isobutanol, acetone, and methyl ethyl ketone. Various impurities also have been documented in commercially produced TCE. These impurities are carbon tetrachloride, benzene, 1,2-DCA, trans-1,2-DCE, and cis-1,2-DCE.

The federal drinking-water standard (MCL) for TCE is 5 μg/L. The State of New Mexico MCL for TCE also is 5 μg/L.

1.3.3 Origins of Nitrate

Nitrate in groundwater can be the result of both anthropogenic and natural sources. Potential anthropogenic-nitrate sources include human sewage, nitrate fertilizers, certain HE materials, and industrial waste streams such as nitric-acid solutions. Nitrate also can leach from geologic deposits, especially sedimentary strata (Holloway et al. October 1998). Animal waste and decomposing plant debris also are nitrate sources. Groundwater contamination resulting from human sewage is typically indicated by the presence of high nitrate levels coupled with high chloride levels (Driscoll 1986). Likewise, isotope studies involving N^{15}/O^{18} are extremely useful for determining whether or not anthropogenic nitrate sources are involved (Carlsen et al. December 2001).

Nitrate is very mobile in soil due to its high solubility in water and weak retention by soil particles (EPA October 2001). The primary mechanism for nitrate transport in the environment occurs by nitrate being dissolved in either soil moisture or water. Nitrate does not volatilize and is likely to remain dissolved in water until consumed by plants or other organisms. Nitrate degradation (denitrification) occurs most rapidly where anaerobic conditions are coupled with the presence of denitrifying bacteria and a suitable carbon source.

The presence of nitrogen in water may be reported by analytical laboratories in various formats such as nitrate, nitrite, nitrate plus nitrite, total nitrogen, or Total Kjeldahl Nitrogen. Care must

be taken in evaluating nitrogen values and the respective water-quality standards. Dinwiddie (September 1997) set a nitrate plus nitrite background concentration of 4 mg/L for SNL/NM that was based upon Moats and Winn (January 1995). However, this value was not "reliably established" (Moats and Winn January 1995). The KAFB Nitrate Abatement Program uses the background nitrate plus nitrite concentration of 4 mg/L (Montgomery Watson August 2000). The U.S. EPA has established various water-quality standards for nitrogen compounds. The standard most commonly cited is the federal MCL for nitrate of 10 mg/L. The State of New Mexico MCL for nitrate is also 10 mg/L. The federal MCL for nitrite is 1 mg/L, with the nitrate plus nitrite MCL being 10 mg/L.

1.4 Scope of Report

This report provides a brief overview of the operational history and a summary of the environmental investigations completed to date in TA-I, TA-II, and the Tijeras Arroyo Operable Unit (TJAOU) (Chapter 2.0), presents the current understanding of the hydrogeology of the area and an updated conceptual model (Chapter 3.0), and discusses the groundwater quality analytical results for the complete history of each well through May 2001 (Chapter 4.0). Chapter 5.0 summarizes the most likely contamination sources, describes the nature and extent of the contamination, and proposes recommendations for future study.

2.0 DESCRIPTION OF FACILITIES, SITE INVESTIGATIONS, CONSTITUENTS OF CONCERN, AND POTENTIAL RELEASE SITES

This section describes the facilities, site investigations, COCs, and potential release sites. The TAG study area contains three SNL/NM facilities (TA-I, TA-II, and TA-IV), as well as part of the Tijeras Arroyo floodplain (Figure 2-1). Forty-three solid waste management units (SWMUs) are located in the study area, and each has been fully researched. The research work has consisted of compiling process knowledge by interviewing employees and reviewing historical documents, aerial photography, and engineering drawings. Invasive field investigations, such as soil sampling, have been conducted at 40 of the 43 SWMUs. These investigations have revealed that minor amounts of hazardous and/or radioactive materials were released at most of the sites. The remaining three sites (SWMUs 25, 73, and 104) were researched and found to not require field investigations (see Section 2.1).

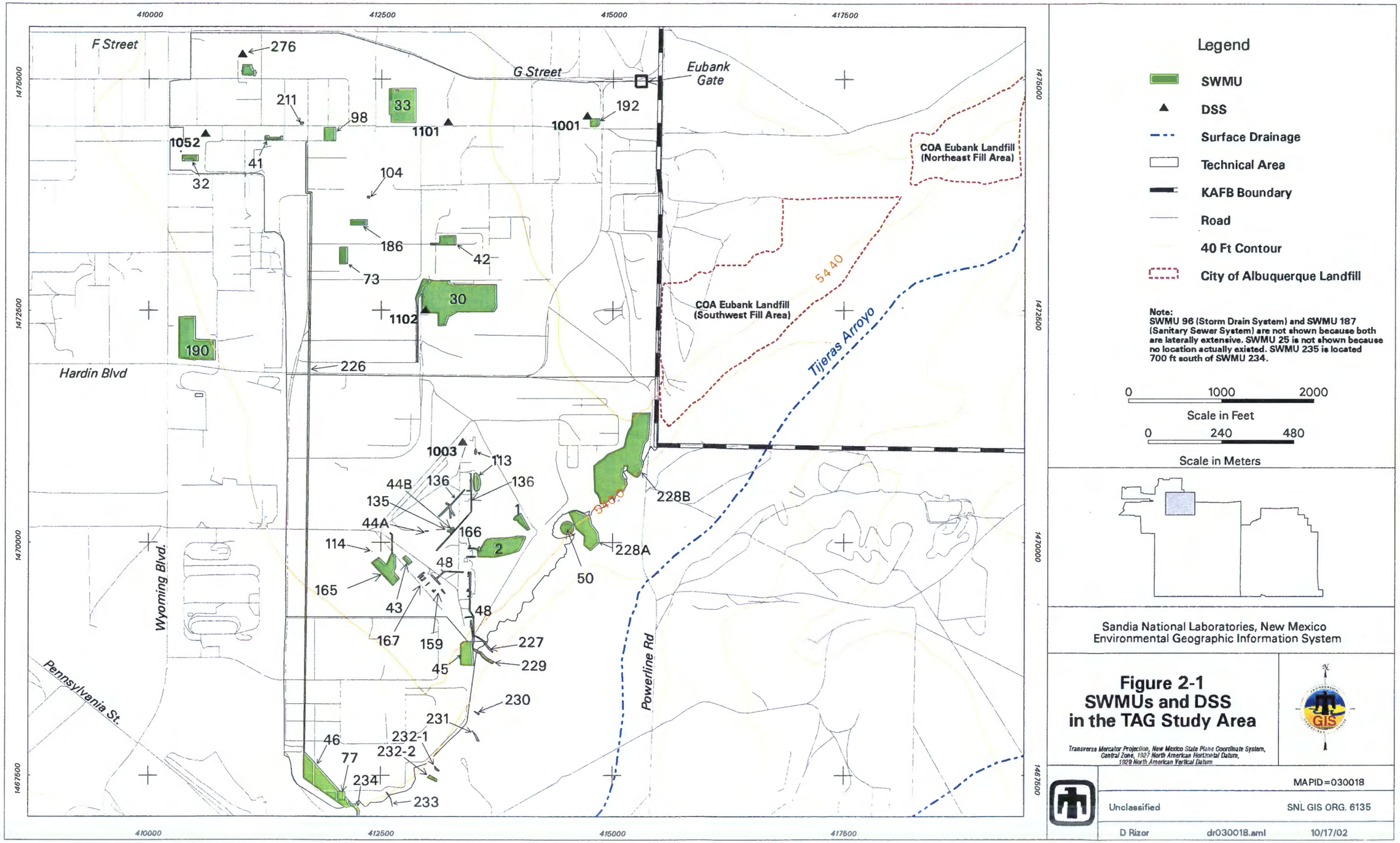
The water-type terminology used in this report is as follows. Waste water refers to waters derived from research/testing operations, machine workshops, photographic development, and foundries. Septic water refers to sewage (sanitary waste) from restrooms and bathing showers. Storm water consists of ephemeral overland flow and precipitation-related water falling from overhead.

Since submittal of the 1996 GIP (SNL/NM March 1996) and the 1998 annual report (SNL/NM June 2000), numerous investigations have been conducted by SNL/NM in the TAG study area. For example, the number of SNL/NM monitoring wells has been increased to a total of 25 groundwater and 5 soil-vapor monitoring wells. Sections 2.1 through 2.5 update the investigatory and regulatory status for each site. Other SNL/NM potential release sites with environmental concerns such as the Drain and Septic Systems (DSS) are also discussed below. The SNL/NM website http://ertrack/erhome.cfm provides additional information for the SWMUs. Detailed discussions of issues such as climate and geographic setting are discussed in the Site-Wide Environmental Impact Statement (DOE October 1999).

Section 2.6 discusses the potential of the SNL/NM SWMUs to have impacted groundwater. Besides the SWMUs that SNL/NM suspects may be potential sources of groundwater contamination, KAFB and the COA continue to study other potential release sites that may have impacted groundwater (Figure 2-2). KAFB and off-base sites are discussed below in Sections 2.7 and 2.8, respectively. Section 2.9 summarizes the potential release sites that are considered to have a high concern level for causing TCE and nitrate groundwater contamination in the TAG study area.

2.1 TA-I

TA-I is the northernmost of the TAs in the TAG study area. Since 1928, the vicinity of TA-I has served a variety of land uses including municipal airport, U.S. Army airfield, post-World War II aircraft dismantlement site, nuclear weapons research, and the current DOE research facility known as SNL/NM, which began research operations at TA-I in 1949.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412500
415000
417500
1476000
1472500
1470000
1467500
F Street
G Street
Eubank Gate
Hardin Blvd
Wyoming Blvd.
Pennsylvania St.
Powerline Rd
Tijeras Arroyo
5440
3470
COA Eubank Landfill (Northeast Fill Area)
COA Eubank Landfill (Southwest Fill Area)
276
211
98
33
192
1001
1101
1052
41
32
104
186
42
73
30
1102
190
226
1003
113
136
136
44B
135
44A
166
114
2
48
165
43
167
159
48
227
229
45
228B
228A
50
230
231
232-1
232-2
46
77
234
233
Legend
SWMU
DSS
Surface Drainage
Technical Area
KAFB Boundary
Road
40 Ft Contour
City of Albuquerque Landfill
Note:
SWMU 96 (Storm Drain System) and SWMU 187 (Sanitary Sewer System) are not shown because both are laterally extensive. SWMU 25 is not shown because no location actually existed. SWMU 235 is located 700 ft south of SWMU 234.
0 1000 2000
Scale in Feet
0 240 480
Scale in Meters
Sandia National Laboratories, New Mexico
Environmental Geographic Information System
Figure 2-1
SWMUs and DSS
in the TAG Study Area
Transverse Mercator Projection, New Mexico State Plane Coordinate System, Central Zone, 1927 North American Horizontal Datum, 1929 North American Vertical Datum
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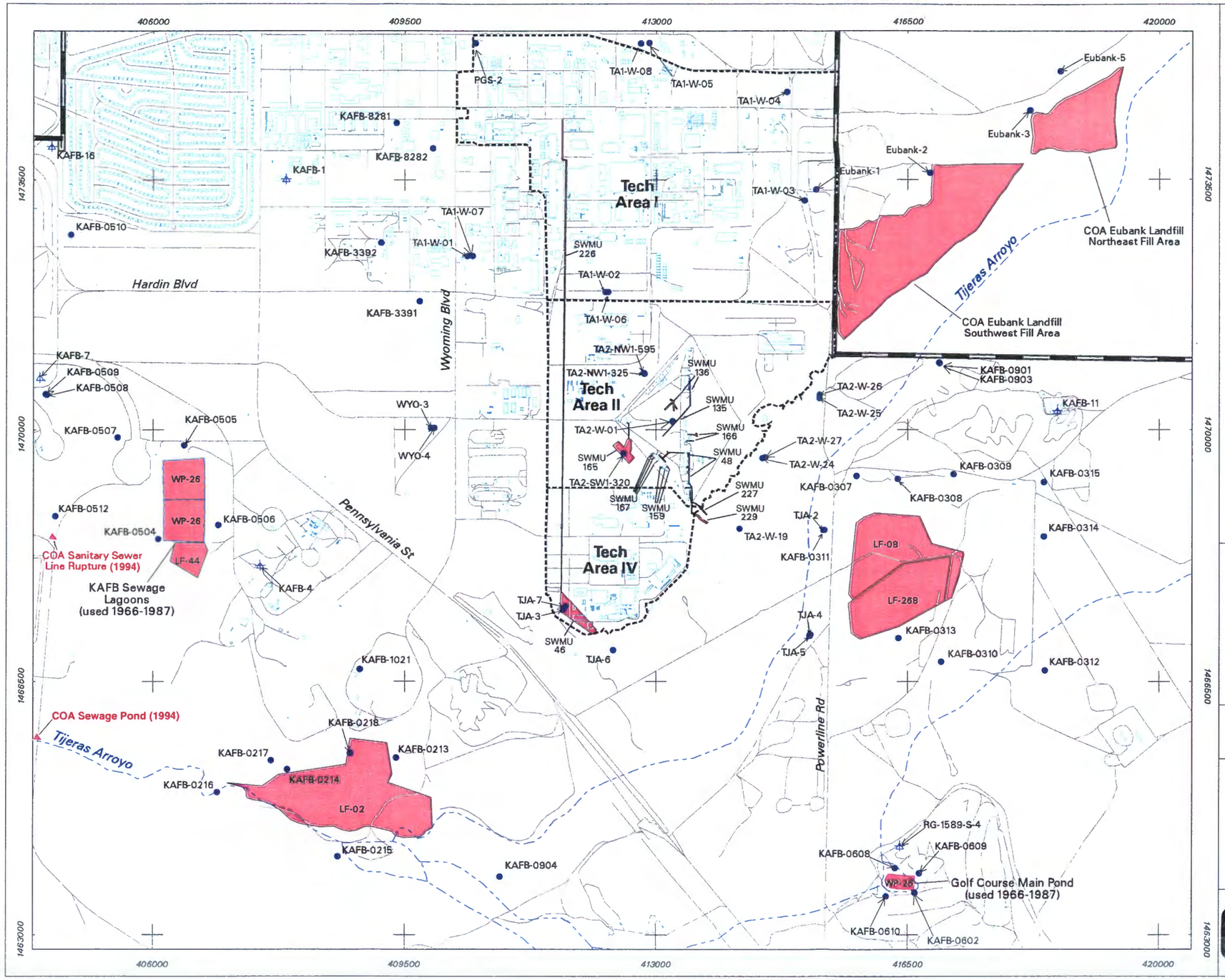


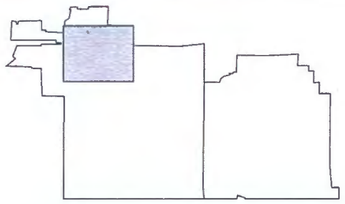
Legend

- Monitoring Well (groundwater, active)
- Water-Supply Well
- Potential Release Site
- Roadway
- Building
- Surface Drainage
- Tech Area Boundary
- KAFB Boundary

Note: Four sites are not shown because each is laterally extensive. SWMU 96 (Storm Drain System) and SWMU 187 (Sanitary Sewer System) extend across much of TA-I. COA and KAFB sanitary sewer lines extend across much of the TAG Study Area.

0 1500 3000
Scale in Feet

0 360 720
Scale in Meters



Sandia National Laboratories, New Mexico
Environmental Geographic Information System

Figure 2-2
Monitoring and Water-Supply Wells and Potential Release Sites in the Vicinity of the TAG Study Area

Transverse Mercator Projection, New Mexico State Plane Coordinate System, Central Zone, 1927 North American Horizontal Datum, 1929 North American Vertical Datum

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Unclassified		SNL EGIS ORG. 6135
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2.1.1 Facility Description

TA-I presently comprises approximately 355 acres and is the most densely developed and populated of the TAs, with more than 6,600 employees and 370 structures (DOE April 1999). The TA-I structures primarily consist of office buildings, research laboratories, workshops, and warehouses.

2.1.2 Previous Investigations

Sixteen SWMUs are located in TA-I. Table 2.1.2-1 summarizes the COCs, investigations, and regulatory status for each TA-I site. NMED has accepted no further action (NFA) proposals for 10 of the sites and is reviewing proposals for two other sites. NMED has requested more sampling at three sites (SWMUs 96, 187, and 226). However, this additional sampling is required to address only the distribution of COCs in near-surface soil. The remaining site (SWMU 190 - the Steam Plant Tank Farm) is undergoing bio-venting remediation of diesel-fuel contaminated soils.

The available soil-sampling results demonstrate that 13 of the TA-I sites pose little or no risk to groundwater. This is demonstrated by the presence of COCs in soil at background and/or acceptable risk-based levels (Table 2.1.2-1). However, the three TA-I sites listed below are associated with significant volumes of either storm water or waste water that may have reached groundwater.

- SWMU 96, Storm Drain System (extending across much of TA-I)
- SWMU 187, TA-I Sanitary Sewer System (extending across much of TA-I)
- SWMU 226, Old Acid Waste Line (TA-I waste water)

Groundwater sampling has been conducted on a quarterly basis at eight monitoring wells in TA-I. Analytical results from the TAG groundwater-monitoring network suggest that these three sites are not significant sources of groundwater contamination (see Chapter 4.0).

2.2 TA-II

TA-II is located between TA-I to the north and TA-IV to the south. For several decades, the name TA-II referred to a diamond-shaped area that was surrounded by a high-security fence and guard towers. Assembly of nuclear weapons began at TA-II in 1948, but was discontinued in either 1958 or 1959 (SNL/NM March 1996). Since then, TA-II activities have principally involved the research of HE components for military and commercial applications.

2.2.1 Facility Description

Presently, TA-II spans Wyoming Boulevard on the west and Power Line Road on the east. TA-II is bounded by Hardin Boulevard on the north and by TA-IV on the south. TA-II encompasses 205 acres, including the historic 45-acre diamond-shaped area. Approximately 440 people presently work in TA-II (DOE October 1999). The 30 structures there consist of

Table 2.1.2-1
Summary of Investigations Conducted at SWMUs Located in TA-I

SWMU Number	SWMU Name	Potential COCs	Investigations	Investigation Results	Regulatory Status
25	Burial Site (South of TA-I)	HE	• Air photo investigation and field inspections (1994)	• No burials found at the 12 candidates	NFA accepted (1995)
			• Review of historical records (1994)	• No reliable evidence found	
30	Reclamation Yard	Metals, PCBs, TPH	• VCM conducted to excavate PCB-contaminated soil above 1 mg/L; confirmatory sampling conducted (2000)	• Site successfully remediated	NFA submitted (August 2001)
			• Soil sampling to 5 ft bgs (1995)	• PCB cleanup areas identified; no other COCs required cleanup	
			• Soil sampling (1986, 1991/1992)	• PCBs detected up to 6,200 µg/L	
32	Steam Plant Oil Spill	TPH (diesel fuel)	• Soil sampling to maximum depth of 107 ft bgs for surface spill (1992)	• Low levels of TPH present above 80 ft bgs; no remediation necessary	NFA accepted (July 1995)
33	Motor Pool	TPH, SVOCs, VOCs, Metals	• Soil sampling to 30 ft bgs (1995)	• Low levels of VOCs, SVOCs, and metals detected; all below action levels	NFA proposed (October 1996) (closure letter pending)
			• Soil sampling around UST to 30 ft bgs (1991)	• TPH detected up to 1,120 mg/L	
41	Building 838 Mercury Release	Mercury	• Soil sampling to 3 ft bgs (1993 and 1994)	• No mercury detected	NFA accepted (July 1995)
42	Building 870 Water Treatment Facility	Acids/bases, metals, VOCs	• Soil sampling to 30 ft bgs (1995)	• No VOCs, SVOCs, or metals exceeded risk-based cleanup levels	NFA accepted (December 1999)
			• Soil sampling to 22 ft bgs (1993)	• No anomalous pH values; minor amounts of metals, VOCs, and SVOCs	
73	Building 895 Hazardous Waste Repackaging/Storage	None	• Research of documents; personnel interviews (1994)	• No releases of chemicals or hazardous material were identified	NFA accepted (July 1995)
96	Storm Drain System	Metals, PCBs, Radionuclides, SVOCs, VOCs, Acids/bases, TPH	• Soil sampling to 12 ft bgs (1995)	• No VOCs, SVOCs, TPH, metals, radionuclides, or PCBs exceeded risk-based cleanup levels	NFA submitted (May 1997); More soil sampling requested by NMED

Refer to footnotes at end of table.

Table 2.1.2-1 (Continued)
Summary of Investigations Conducted at SWMUs Located in TA-I

SWMU Number	SWMU Name	Potential COCs	Investigations	Investigation Results	Regulatory Status
96 (cont.)	Storm Drain System	Metals, PCBs, Radionuclides, SVOCs, VOCs, Acids/bases, TPH	• Pipeline camera survey and trenching • Soil samples to 8 ft bgs (1993)	• Pipe breaks identified • No metals, PCBs, radionuclides, SVOCs, and VOCs detected	NFA submitted (May 1997); More soil sampling requested by NMED
			• Soil sampling at Building 870 (1993)	• Several metals detected	
			• Discharge area and channel surface soil sampling (1992)	• Some radionuclides detected	
			• Storm water sampling (1992)	• Concentrations below COA NPDES limits	
98	Building 863 TCA and Photochemical Releases	TCA, TCE, Acids/bases, Silver	• Soil and soil-vapor sampling to 140 ft bgs (1999)	• No VOCs detected in soil samples; low levels of VOCs detected in soil-vapor samples	NFA accepted (December 2000)
			• Soil and soil-vapor sampling to 30 ft bgs (1995)	• No VOCs, SVOCs, or elevated metals detected in soil samples; low levels of VOCs detected in soil-vapor samples	
104	PCB Spill, Computer Facility	PCBs	• Review of historical documents; personnel interviews (1994)	• Spills of PCB oils were confined to building interior	NFA accepted (July 1995)
186	Building 859 TCE Disposal	TCE	• Soil-vapor sampling (1999)	• Low levels of Freon-113 were identified in soil-vapor along pipe chases, but not at original surface-spill location	NFA accepted (March 2000)
			• Soil-vapor sampling to 20 ft bgs; soil sampling to 30 ft bgs (1995)	• No significant levels of VOCs detected in soil or soil vapor	
187	TA-I Sanitary Sewer System	Metals, PCBs, Radionuclides, SVOCs, VOCs, Nitrate	• Soil sampling to 12 ft bgs (1995)	• VOCs, SVOCs, PCBs, metals, and radionuclides below risk-based cleanup levels	NFA submitted (May 1997); additional soil sampling requested by NMED
			• Building 824 soil sampling (1994)	• No VOCs, SVOCs, or elevated metals and radionuclides detected	
			• Building 838 and 839 soil sampling (1994)	• No VOCs, SVOCs, or elevated metals and radionuclides detected	
			• Building 870 soil sampling (1994)	• No VOCs, SVOCs, or elevated metals and radionuclides detected	

Refer to footnotes at end of table.

Table 2.1.2-1 (Concluded)
Summary of Investigations Conducted at SWMUs Located in TA-I

SWMU Number	SWMU Name	Potential COCs	Investigations	Investigation Results	Regulatory Status
187 (cont.)	TA-I Sanitary Sewer System	Metals, PCBs, Radionuclides, SVOCs, VOCs, Nitrates	• Building 814 soil sampling (1993) • Building 870 soil sampling to 11 ft bgs (1993) • Pipeline camera survey and trenching (1993)	• No VOCs, SVOCs, or elevated metals and radionuclides detected	NFA submitted (May 1997); additional soil sampling requested by NMED
				• No VOCs, SVOCs, or elevated metals and radionuclides detected • Pipe breaks identified	
190	Steam Plant Tank Farm	TPH, diesel fuel, VOCs, SVOCs	• Bio-vent remediation wells installed (1998)	• Reduction of TPH in soil-vapor samples	Continuing remediation
			• Hollow-stem-auger soil sampling to 120 ft bgs (1997)	• TPH concentrations greater than 100 mg/L confined to depths of 80 ft or less	
			• GeoProbe soil sampling to 50 ft bgs (1995)	• TPH detected up to 52,100 mg/L	
			• Soil sampling to 5 ft bgs (1991)	• TPH detected up to 17,200 mg/L	
192	TA-I Waste Oil Tank	TPH, VOCs, SVOCs, PCBs, Metals	• Soil sampling to 30 ft bgs (1995)	• No COCs detected in soil samples	NFA accepted (December 1999)
211	Building 840 Former UST 840-1	TPH, Metals, PCBs, SVOCs, VOCs	• Soil sampling to 30 ft bgs for metals, PCBs, SVOCs, and VOCs (1995)	• No COCs detected in soil samples	NFA accepted (March 2000)
			• Soil sampling in tank excavation for SVOCs and VOCs (1989)	• No COCs detected in soil samples	
226	Old Acid Waste Line	TAL Metals, PCBs, SVOCs, VOCs, Cyanide, Tritium, Gamma-Emitting Radionuclides	• GeoProbe soil sampling to 14 ft bgs along entire 1.3 miles of line; sediment sampling from line (1995) • Soil sampling at Building 839 to 14 ft bgs (1994) • Pipeline camera survey and trenching (1993)	• No significant levels of VOCs, SVOCs, PCBs, TAL metals; tritium, gamma-emitting radionuclides detected	NFA submitted (May 1997); Additional soil sampling requested by NMED
				• Low levels of radionuclides and metals detected • Pipe breaks identified	
			• Soil sampling at K and 9th streets to 8 ft bgs (1992)	• No COCs detected	

bgs = Below ground surface.
COA = City of Albuquerque.
COC = Constituent of concern.
ft = Foot (feet).
HE = High explosive(s).
µg/L = Microgram(s) per liter.
mg/L = Milligram(s) per liter.
NFA = No Further Action.
NMED = New Mexico Environment Department.
NPDES = National Pollutant Discharge Elimination System.
PCB = Polychlorinated biphenyl(s).
SVOC = Semivolatile organic compound.
SWMU = Solid Waste Management Unit.
TA = Technical Area.
TAL = Target Analyte List.
TCA = Trichloroethane.
TCE = Trichloroethene (trichloroethylene).
TPH = Total petroleum hydrocarbon(s).
VCM = Voluntary Corrective Measure.
VOC = Volatile organic compound.
UST = Underground storage tank.

research facilities, storage yards, warehouses, office trailers, and shipping facilities. Most of the historic structures are presently inactive at TA-II, and demolition activities are being conducted at several of the structures. Most research operations were moved outside of the diamond-shaped area to the nearby Explosive Components Facility in 1995.

2.2.2 Previous Investigations

Fourteen SWMUs are located in TA-II. Table 2.2.2-1 summarizes the COCs, investigations, and regulatory status for each TA-II site. NMED has accepted NFA proposals for four of the fourteen sites (SWMUs 43, 44A, 44B, and 113).

Several rounds of excavation work have been conducted at TA-II as part of voluntary corrective measures. The Radioactive Waste Landfill (SWMU 1) and the Classified Waste Landfill (SWMU 2) have been fully excavated and the landfill contents removed; the excavation work confirmed that neither landfill had been used for the disposal of liquids. Excavation work also has been conducted at all of the ER septic systems to confirm the locations of distribution boxes and leachfields (Galloway 2001a; Galloway 2001b).

No SNL/NM testing or disposal activities involving HE material are suspected of being nitrate-release sites in the TAG study area. Any possible concern about HE compounds in soil at TA-II SWMUs 113 and 114 potentially degrading to nitrate can be negated because of the lack of such HE compounds in soil samples (Table 2.2.2-1). SWMU 113 (the Area II Firing Sites) has been approved for NFA status (Table 2.2.2-1). SWMU 114 (the Explosive Burn Pit) has been extensively sampled and excavated (Table 2.2.2-1). An RSI response for SWMU 114 is currently being prepared.

Soil samples have been collected at all of the TA-II sites. NMED has requested more sampling at nine sites (Table 2.2.2-1). However, this additional sampling is required to only address the distribution of COCs in near-surface soil.

The available soil-sampling results demonstrate that 10 of the TA-II sites pose little or no risk to groundwater. This is demonstrated by the presence of COCs in soil at background and/or acceptable risk-based levels (Table 2.2.2-1).

The seven TA-II sites associated with significant volumes of waste water and/or septic water that may have reached groundwater are:

- SWMU 48, Building 904 Septic System
- SWMU 135, Building 906 Septic System
- SWMU 136, Building 907 Septic System
- SWMU 159, Building 935 Septic System
- SWMU 165, Building 901 Septic System
- SWMU 166, Building 919 Septic System
- SWMU 167, Building 940 Septic System

Characterization of the sites is continuing with the collection of groundwater and soil-vapor samples. The analytical results are summarized in Table 2.2.2-1, and groundwater results are discussed more fully in Chapter 4.0. Groundwater sampling has been conducted on a quarterly basis at seven monitoring wells in the vicinity of TA-II. Soil-vapor samples also have been

Table 2.2.2-1
Summary of Investigations Conducted at SWMUs Located in TA-II

SWMU Number	SWMU Name	Potential COCs	Investigations	Investigation Results	Regulatory Status
1	Radioactive Waste Landfill (and Chemical Disposal Pit)	VOCs, SVOCs, Metals, Radionuclides	• Soil-staging area clearance (2001) • Additional verification soil sampling (1999)	• COCs below risk-based levels • COCs below risk-based levels	NFA submitted (September 1997); Preparing RSI response and revised risk assessment
			• Confirmatory soil sampling (1997)	• COCs below risk-based levels	
			• VCM excavation (1996)	• Entire landfill contents removed	
			• Historical records research (1995)	• Process knowledge acquired; Site 1 boundary enlarged to encompass Site 3	
			• Historical Air Photo Interpretation (1994)	• Chemical disposal pit identified within RWL. Disturbances noted in RWL from 1951 to 1959	
			• Surface Geophysical Surveys (1993, 1994)	• Magnetic anomalies detected in trench and pit areas	
			• Surface and Near-Surface Soil Sampling – NESHAPS (1993, 1994)	• No activities detected above background	
			• Soil-vapor survey (1993)	• No VOCs or SVOCs identified in Petrex tubes	
			• Organic Vapor Walk-Over Survey (1991)	• No organic vapor identified	
			• Radiation Survey (1991)	• No activities detected above background	
2	Classified Waste Landfill	VOCs, SVOCs, PCBs, HE, Metals, Radionuclides	• Additional soil-pile sampling (2001) • Confirmatory soil sampling (2000)	• Low levels of PCBs require additional sampling • COCs below risk-based levels	NFA to be submitted (2001)
			• VCM excavation (1998–2000)	• Entire landfill contents removed	
			• Surface geophysical survey (1997)	• Eighty-four anomalies identified	
			• Historical records research (1996)	• Process knowledge acquired	
			• Soil samples to 100 ft bgs (1994)	• Acetone, methylene chloride, and bis (2-ethylhexyl) phthalate detected. Low levels of COC metals detected. Tritium and low levels of uranium identified	
			• Surface Geophysical Surveys (1993, 1994)	• Surveys identified burial trenches and pits	
			• Soil-vapor survey (1993)	• Two, small, separate vapor plumes of TCE and PCE identified. Minor BTEX and other VOCs also identified in Petrex tubes	
			• Organic Vapor Walk-Over Survey (1991)	• No organic vapors detected	
			• Radiation Survey (1991)	• No elevated radiation at ground level	
			• Organic Vapor Survey (1988)	• Low levels of VOCs detected	
			• Radiation Survey (1988)	• Gamma radiation at or below background levels	

Refer to footnotes at end of table.

Table 2.2.2-1 (Continued)
Summary of Investigations Conducted at SWMUs Located in TA-II

SWMU Number	SWMU Name	Potential COCs	Investigations	Investigation Results	Regulatory Status
43	Radioactive Material Storage Yard	Metals and Radionuclides	• Surface soil samples (1999)	• Tritium not detected; COCs below risk-based levels	NFA accepted (December 1999)
			• Surface and Near-Surface (to 2 ft bgs) Soil Samples (1994)	• Low levels of radionuclides above background	
			• Surface and Near-Surface (to 3 ft bgs) Soil Samples (1993)	• Low levels of radionuclides and metals above background	
			• Surface Soil Samples (1991) • Surface Radiation Survey (1991)	• Tritium and uranium above background • Radioactive soil detected	
44A	Uranium Calibration Pits (UCPs)	Metals and Radionuclides	• Confirmatory soil sampling (1994)	• COCs below risk-based levels	NFA accepted (December 1999)
			• VCM excavation (1994)	• UCP culverts and contaminated soil removed	
			• Downhole Radiation Survey (in UCPs) (1994)	• UCP 1 and 2 had elevated radiation. No elevated radiation detected above background in UCP 3 or 4	
			• Organic Vapor Survey (1991)	• No VOCs detected	
			• Radiation Survey (1991)	• No elevated radiation	
44B	Decontamination Areas	Metals and Radionuclides	• Surface Soil Sampling (1994)	• COCs below risk-based levels	NFA accepted (December 1999)
			• Surface Radiation Survey (1994)	• Activities above background were measured at three locations	
			• Surface Geophysical Surveys (1993, 1994)	• Magnetic anomalies identified as the Building 906 septic system, utilities, fence lines, and surface debris	
			• Soil-vapor survey (1993)	• No VOCs or SVOCs detected in Petrex tubes	
			• Organic Vapor Survey (1991)	• Low levels of VOCs and SVOCs	
			• Radiation Survey (1991)	• No elevated radiation	
48	Building 904 Septic System	VOCs, SVOCs, HE, Metals, Cyanide, Radionuclides	• Quarterly soil-vapor sampling (April 2001) • Review of engineering drawings and historical aerial photography (2001) • Trenching and soil sampling (2000) • Soil-vapor monitor well TA2-VW-021 installed with sampling ports set at 50 and 92 ft bgs (1997)	• TCE maximum of 1,000 ppbv, total VOCs at 1,064 ppbv • Historical discharge from Site 48 documented at Sites 227 and 229 • Risk assessment pending • May 1998 sampling: TCE = 230 ppbv, total VOCs = 253 ppbv	NFA submitted (June 1995); Preparing RSI response
			• Soil sampling to 50 ft bgs (1994)	• Barium detected above background; VOCs, SVOCs, HE, metals, cyanide, tritium, and gamma-emitting radionuclides not evaluated with respect to current risk-based levels	
			• Historic Air Photo Interpretation (1994)	• Vegetation apparent along both sanitary and HE lines between 1964 and 1992	
			• Soil-vapor surveys (1993, 1995)	• Low levels of BTEX and PCE identified in Petrex tubes, but not indicative of contamination	

Refer to footnotes at end of table.

Table 2.2.2-1 (Continued)
Summary of Investigations Conducted at SWMUs Located in TA-II

SWMU Number	SWMU Name	Potential COCs	Investigations	Investigation Results	Regulatory Status
48 (cont.)	Building 904 Septic System	VOCs, SVOCs, HE, Metals, Cyanide, Radionuclides	• Soil sampling along Septic Line Trench (1993)	• No VOCs, SVOCs, HE, metals, tritium, and radioisotopes were detected above RCRA Subpart S action levels	
			• Organic Vapor Survey (1991)	• No VOCs detected	
			• Radiation Survey (1991)	• No elevated radiation detected	
113	Area II Firing Sites	Metals, HE	• Surface and Shallow Soil Sampling (1994)	• COCs below risk-based levels	NFA accepted (April 2001)
			• Surface Radiation Survey (1994)	• No elevated radiation	
			• Geophysical Survey (1993)	• No magnetic anomalous identified	
			• Soil-vapor survey (1993)	• No VOCs or SVOCs identified in Petrex tubes	
114	Explosive Burn Pit	Metals, HE	• RSI excavation of surrounding area (2001) • Confirmatory sampling (2000)	• No debris or additional burn pits found • No soil contamination detected	NFA proposed (June 1996); Preparing RSI response
			• VCM excavation; confirmatory soil sampling (1995 and 1996)	• All burn pit material removed, metals below levels	
			• Historical Air Photo Interpretation (1995)	• Additional EBP areas identified	
			• Soil sampling to a maximum of 12 ft bgs (1994)	• Barium concentrations exceeded background	
			• Soil-vapor survey (1993)	• Low BTEX levels identified in Petrex tubes	
			• Soil sampling to 6 ft bgs (1992)	• Barium concentrations exceeded background	
135	Building 906 Septic System	Metals, Radionuclides, HE, VOCs, SVOCs, PCBs, Herbicides	• Trenching and soil sampling (2000)	• Risk assessment pending	NFA proposed (August 1994); Preparing RSI response
			• Soil samples collected to 52 ft bgs (1994)	• Low levels of VOCs and SVOCs detected. All other COCs within background or acceptable risk	
			• Surface Radiation Survey (1994)	• Three anomalies identified	
			• Soil-vapor survey (1993)	• No VOCs or SVOCs identified in Petrex tubes	
			• Surface Geophysical Survey (1993)	• No buried magnetic anomalies identified	
136	Building 907 Septic System	VOCs, SVOCs, HE, Metals, Cyanide, Radionuclides	• Quarterly soil-vapor sampling (April 2001) • Trenching and soil sampling (2000) • Soil-vapor monitor well T2-VW-020 installed with sampling port at 72 ft bgs (1997)	• TCE maximum of 21 ppbv; total VOCs at 189 ppbv • Risk assessment pending • May 1998 sampling: TCE = 9 ppbv, total VOCs = 65 ppbv	NFA proposed (June 1995); Preparing RSI response
			• Soil sampling to 50 ft bgs (1994)	• No significant VOCs, SVOCs, HE, or radioisotopes detected	
			• Soil-vapor survey (1993)	• No VOCs detected in Petrex tubes	
			• Septic Line Trench Soil Samples to 3 ft bgs (1993)	• Low levels of COCs detected	
			• Organic Vapor Survey (1991)	• No VOCs detected	
			• Radiation Survey (1991)	• No elevated radiation	

Refer to footnotes at end of table.

Table 2.2.2-1 (Concluded)
Summary of Investigations Conducted at SWMUs Located in TA-II

SWMU Number	SWMU Name	Potential COCs	Investigations	Investigation Results	Regulatory Status
159	Building 935 Septic System	HE, Metals, Radionuclides, VOCs, SVOCs, PCBs, Nitrate	• Trenching and soil sampling (2000)	• Risk assessment pending	NFA proposed (June 1995); Preparing RSI response to be submitted (late 2001)
			• Soil sampling to 100 ft bgs (1994)	• No COCs detected and/or above background	
			• Soil-vapor survey (1994)	• No VOCs or SVOCs detected in Petrex tubes	
			• Soil sampling to 50 ft bgs (1994)	• Some metals above background; no VOCs, PCBs, SVOCs, or HE detected; radioisotopes within background	
			• Soil-vapor survey (1993)	• No VOCs detected in Petrex tubes	
			• Soil sampling to 50 ft bgs (1992)	• Barium above background; other COCs either non-detect or below background	
			• Soil sampling to 150 ft bgs (1992)	• No COCs identified above background levels	
			• Surface soil sampling (1992)	• Tritium detected above background; other radionuclides within background	
165	Building 901 Septic System	VOCs, SVOCs, HE, Metals, Radionuclides, Nitrate	• Trenching and soil sampling (2000)	• Risk assessment pending	NFA proposed (June 1995); Preparing RSI response
			• Soil-vapor survey (1993)	• No VOCs detected in Petrex tubes	
			• Soil sampling to 50 ft (1992)	• Lead and mercury above background; other COCs (VOCs, SVOCs, HE, and TAL metals) either non-detect or below background	
			• Soil sampling to 300 ft bgs (1992)	• No COCs (TAL metals, VOCs, HE, PCBs, pesticides, SVOCs, radioisotopes, cyanide, phosphates, and nitrate) detected	
166	Building 919 Septic System	VOCs, SVOCs, HE, Metals, Radionuclides, Nitrate	• Trenching and soil sampling (2000)	• Risk assessment pending	NFA proposed (June 1995); Preparing RSI response
			• Historical Air Photo Interpretation (1994)	• Identified septic lines	
			• Soil sampling to 50 ft bgs (1994)	• Barium, lead, and zinc above background; other COCs either non-detect or below background	
			• Soil-vapor survey (1993)	• No VOCs or SVOCs detected in Petrex tubes	
			• Septic line trench soil sampling to 3 ft bgs (1993)	• COCs either non-detect or below background	
167	Building 940 Septic System	Lead, HE, VOCs, SVOCs	• Trenching and soil sampling (2000)	• Risk assessment pending	NFA proposed (June 1995); Preparing RSI response
			• Historical Air Photo Interpretation (1994)	• Septic lines identified through vegetation changes	
			• Soil sampling to 50 ft bgs (1994)	• Nickel and zinc above background; other COCs either non-detect or below background	
			• Soil-vapor survey (1993)	• No VOCs or SVOCs detected in Petrex tubes	

bgs = Below ground surface.
BTEX = Benzene, toluene, ethylbenzene, and xylene.
COC = Constituent of concern.
EBP = Explosive Burn Pit.
ft = Foot (feet).
HE = High explosive(s).
NESHAP = National Emissions Standards for Hazardous Air Pollutants.
NFA = No Further Action.
PCB = Polychlorinated biphenyl(s).
PCE = Tetrachloroethene.
ppbv = Parts per billion by volume.
RCRA = Resource Conservation and Recovery Act.
RWL = Radioactive Waste Landfill.
RSI = Request for Supplemental Information.
SVOC = Semivolatile organic compound.
SWMU = Solid Waste Management Unit.
TA = Technical Area.
TAL = Target analyte list.
TCE = Trichloroethylene.
UCP = Uranium Calibration Pits.
VCM = Voluntary corrective measures.
VOC = Volatile organic compound.

collected quarterly at SWMU 136 (the Building 907 Septic System) and SWMU 48 (the Building 904 Septic System) from vapor wells TA2-VW-20 and TA2-VW-21, respectively. SWMUs 48 and 136 were uniquely designed to handle more waste water than the other TA-II septic systems. Instead of just being connected to buried disposal components (leachfields, seepage pits, and/or dry wells), these two SWMUs also discharged into open ditches. The disposal ditches were used for the disposal of waste water, not septic water because of the obvious odor and health problems inherent in exposure to septic waste.

2.3 TA-IV

TA-IV covers 81 acres and is the southernmost TA in the TAG study area. Construction of TA-IV began in 1977. As the newest TA at SNL/NM, TA-IV has always operated with modern environmental considerations. Pulsed-power and particle-beam fusion research operations are conducted at TA-IV.

2.3.1 Facility Description

Approximately 546 people presently work in TA-IV (DOE October 1999). The 70 structures there primarily consist of accelerator facilities, office buildings, aboveground transformer-oil tanks, and storage trailers.

2.3.2 Previous Investigations

Two SWMUs are located in TA-IV. However, neither SWMU 45 nor SWMU 46 are the result of TA-IV research operations. For logistical reasons, these two sites are managed by the TJAOU and are discussed below in Section 2.4. No TA-IV operations are suspected of impacting groundwater.

2.4 Tijeras Arroyo

Tijeras Arroyo trends across the southern boundary of the TAG study area with a 100-year floodplain that varies in width from approximately 2,500 to 3,000 ft. The northern rim of the arroyo is quite steep with slopes averaging approximately 40 degrees. The topographic relief averages about 50 ft between the arroyo floodplain and the East Mesa on which TA-I, TA-II, and TA-IV are located.

In response to storms, surface water flows sporadically in Tijeras Arroyo on about a dozen days per year along a narrow channel that varies in width from approximately 50 to 100 ft. As shown on Plate 1, the nearest spring (Echo Canyon Spring) is located upstream of the TAG study area in Tijeras Canyon, approximately four miles east of the KAFB Eubank Gate. No springs are located within or downstream of the TAG study area.

2.4.1 Facility Description

Most of Tijeras Arroyo in the study area is undeveloped except for utilities and roads. SNL/NM does not manage any occupied buildings on the floodplain.

2.4.2 Previous Investigations

Thirteen SWMUs are located along the northern rim of Tijeras Arroyo. Table 2.4.2-1 summarizes the COCs, investigations, and regulatory status for each site. NMED has accepted NFA proposals for four of the sites (SWMUs 50, 77, 228A, and 228B). Soil sampling has been conducted at all of the sites, but NMED has requested more shallow-soil sampling at nine sites (Table 2.4.2-1). Except for SWMUs 46, 227, and 229, the additional sampling is required to only address the distribution of COCs in soil at depths less than 5 ft.

The available soil-sampling results demonstrate that 10 of the TJAOU sites pose little or no risk to groundwater. This is demonstrated by the presence of COCs in soil at background and/or acceptable risk-based levels (Table 2.4.2-1). However, three sites (SWMUs 46, 227, and 229) are associated with significant volumes of waste water that may have reached groundwater. It should be noted that the historical name for SWMU 229 ("Storm Drain System Outfall") is misleading; SWMUs 229 and 227 were actually the two waste-water outfalls for the TA-II SWMU 48 septic system.

Even though the waste waters discharged at SWMUs 46, 227, and 229 were generated at other SWMUs in either TA-I or TA-II, the environmental activities for the three sites are managed by the TJAOU. To summarize, the three TJAOU sites associated with significant volumes of waste water that may have reached groundwater are:

- SWMU 46, Old Acid Waste Line Outfall (waste water from TA-I via SWMU 226)
- SWMU 227, Building 904 Outfall (waste water from TA-II via SWMU 48)
- SWMU 229, Storm Drain System Outfall (waste water from TA-II via SWMU 48)

SWMU 46 was the outfall for the Old Acid Waste Line (ER Site 226), that was connected to six research buildings in TA-I. From about 1948 through late 1974, the waste line discharged into a series of three ditches at the southwest corner of what was to become TA-IV. The waste water contained a variety of COCs including TCE (Table 2.4.2-1). The amount of discharge was not well documented or metered, but may have been about 130,000 gallons of acid-waste water per day (DOE September 1987). Over a period of 27 years, this flow rate would equate to approximately 1.3 billion gallons of waste water.

SWMUs 227 and 229 were the two waste-water outfalls connected to SWMU 48 (Building 904 Septic System). SWMUs 227 and 229 were open ditches that received waste water from about 1948 until 1992. The ditches received an unspecified amount of TA-II floor washdown water that may have contained COCs such as HE compounds and VOCs (Table 2.4.2-1). The volume of waste water is unknown, but is estimated from historical aerial photography to have been just a few percent of what was discharged at SWMU 46 (Acid Waste Line Outfall).

Characterization of these three sites is continuing through the quarterly collection of groundwater and soil-vapor samples. Groundwater sampling has been conducted on a quarterly basis at 10 monitoring wells along Tijeras Arroyo. As shown in Table 2.4.2-1,

Table 2.4.2-1
Summary of Investigations Conducted at SWMUs Located Along Tijeras Arroyo

SWMU Number	SWMU Name	Potential COCs	Previous Investigations	Results	Regulatory Status
45	Liquid Discharge	VOCs, SVOCs, metals	• Historical aerial photography review (2001)	• No suspicious environmental problems evident	NFA submitted (September 1997); Additional sampling and excavation planned
			• Excavation of metallic anomalies; soil sampling at 3 ft bgs (1995)	• Metallic items were excavated, no drums or stained soil evident; no VOCs detected, metals below background	
			• Geophysical survey (1995)	• Buried metallic items identified	
			• GeoProbe soil sampling to 14 ft bgs (1995)	• Barium slightly above background, other metals and radionuclides below background; no VOCs detected	
			• Soil-vapor sampling (1995)	• No VOCs or SVOCs detected in Petrex tubes	
			• Surface-soil sampling (1995)	• No VOCs detected, metals and radionuclides within background	
			• Historical aerial photography review (1994)	• No stained soil evident; typical cut and fill soil piles present	
			• Surface radiation survey (1994)	• No elevated radiation	
			• Soil sampling in sewer-line trench (1993)	• No VOCs, SVOCs, or HE detected; metals and radionuclides below background	
			• Surface UXO survey (1994)	• No UXO visible	
46	Old Acid Waste Line Outfall	VOCs, SVOCs, TAL Metals, Chromium-VI, Cyanide, PCBs, Tritium, Gamma-Emitting Radionuclides	• Geoprobe sampling to 18 ft bgs near waste line (August 2001)	• Analytical results pending	NFA submitted (June 1995); Characterization work continues
			• Quarterly groundwater sampling (April 2001)	• TCE at 0.51J, MEK at 42 µg/L, ethylbenzene at 0.63J µg/L, methylene chloride at 1.2J µg/L, perchlorate at 1.27 µg/L	
			• Quarterly soil-vapor sampling (April 2001)	• Soil vapor at north end of site, maximum TCE concentration of 46,000 ppbv at 115 ft bgs, low levels of other VOCs detected from 15 to 265 ft bgs. Soil vapor at south end of site, maximum TCE concentrations of 250 ppbv at 96 ft bgs; low levels of other VOCs detected in soil vapor from 46 to 296 ft bgs	
			• Soil sampling to 3 ft bgs near acid-waste line (April 2001)	• Most RCRA metals significantly above background; total PCBs at 50 mg/L, TCE at 2 µg/L, low levels of other VOCs and SVOCs detected; radionuclides within background	
			• Backhoe trenching	• Outfall ends of acid-waste line identified	
			• Groundwater monitoring wells installed; soil samples collected to 295 ft bgs (2001)	• Shallow groundwater present near the north end of site at 300 ft bgs; metal concentrations in soil at background levels, no significant VOCs	
			• Soil-vapor (FLUTe) monitor wells installed (2001)	• TCE detected in soil vapor	
			• Historical aerial photography review (2000)	• Three outfall ditches identified at end of acid-waste line	
			• Soil-vapor survey (1999)	• Low levels of 17 COCs, including TCE, detected in VaporTec tubes	

Refer to footnotes at end of table.

Table 2.4.2-1 (Continued)
Summary of Investigations Conducted at SWMUs Located Along Tijeras Arroyo

SWMU Number	SWMU Name	Potential COCs	Previous Investigations	Results	Regulatory Status
46 (cont.)	Old Acid Waste Line Outfall	VOCs, SVOCs, TAL Metals, Chromium-VI, Cyanide, PCBs, Tritium, Gamma-Emitting Radionuclides	• Monitor well installed; soil samples collected to 237 ft bgs; soil-vapor samples collected to 312 ft bgs (1998)	• Regional aquifer present at 500 ft bgs; metal concentrations in soil at background levels; 16 VOCs detected in soil vapor with TCE maximum of 10,000 ppbv at 137 ft bgs	
			• Soil sampling (1994)	• Samples incorrectly collected from surface-water ditch (error determined in 2000)	
			• Surface radiation survey (1994)	• No elevated radiation	
			• Surface UXO survey (1994)	• No UXO visible	
50	Oil Centrifuge Site	HE, DU, Metals	• Surface-soil sampling (1999)	• Radionuclides within background	NFA accepted (October 2000)
			• Soil sampling (1994)	• No HE detected, all radionuclides and metals within background	
			• Surface radiation survey (1994)	• No elevated radiation	
			• Surface-soil sampling (1989)	• No SVOCs, HE, PCBs, pesticides, herbicides; metals and radionuclides within background	
			• Surface UXO survey (1994)	• No UXO visible	
77	Oil Surface Impoundment	PCBs and VOCs	• Obtain NPDES compliance documents for the storm-water impoundment (1998)	• Impoundment already regulated; no releases known	NFA accepted (October 1999)
			• Soil sampling (1994)	• No PCBs or VOCs detected	
227	Building 904 Outfall (one of the two discharge points for TA-II SWMU 48)	VOCs, SVOCs, Metals, HE, Cyanide, Radionuclides	• Quarterly soil-vapor sampling (April 2001)	• TCE maximum of 4,900 ppbv	NFA submitted (June 1995); Continuing quarterly sampling of soil vapor; NOD/RSI response to be prepared
			• Excavate trench at outfall point; soil sampling to 19 ft bgs at trench and to 3 ft bgs on floodplain (2001)	• Background levels of metals and radionuclides in soil; few "J" values for VOCs and SVOCs; no detected HE or cyanide	
			• Historical aerial photography review (2001)	• Waste water discharge point identified	
			• Installation of FLUTe soil-vapor monitor well with soil-vapor ports to 225 ft bgs; soil samples collected to 200 ft bgs (2001)	• April 2001 concentrations of TCE in soil vapor ranged from 40 ppbv at 25 ft bgs, to 4,900 ppbv at 225 ft bgs, toluene concentrations ranged from 2.1 ppbv at 25 ft bgs to 13 ppbv at 125 ft bgs; metal concentrations in soil at background levels, no significant VOCs	
			• Soil-vapor survey (1995)	• No VOCs or SVOCs detected in Petrex tubes	
			• Soil sampling to 3 ft bgs (1994)	• No VOCs, SVOCs, HE, or cyanide detected; all radionuclides, metals and nitrate within background	
			• Surface radiation survey (1994)	• No elevated radiation	
			• Surface UXO survey (1994) • Soil-vapor survey (1993)	• No UXO visible • No VOCs or SVOCs detected in Petrex tubes	

Refer to footnotes at end of table.

Table 2.4.2-1 (Continued)
Summary of Investigations Conducted at SWMUs Located Along Tijeras Arroyo

SWMU Number	SWMU Name	Potential COCs	Previous Investigations	Results	Regulatory Status
228	Centrifuge Dump Site	228A: DU, Metals, HE, VOCs, SVOCs	• Confirmatory soil sampling (1998–1999)	• No HE detected; low levels of VOCs and SVOCs detected; metal and radionuclides within background	228A: NFA accepted (March 2000)
			• Confirmatory geophysical surveys (1998–1999)	• No anomalies identified	
			• VCM remediation (1998–1999)	• 1,800 cubic yards of soil excavated; DU fragments and debris segregated from soil	
			• Geophysical and radiation survey (1997)	• Identified buried debris and DU fragments	
			• Historical document research and aerial photography review (1997)	• Process knowledge acquired	
			• Soil-vapor survey (1997)	• No VOCs detected	
			• Surface-water survey (1997)	• Discovered gully erosion and scattered DU fragments on floodplain	
			• Surface radiation survey (1995)	• DU fragments identified in gully; gully partially excavated and 13 drums filled with DU fragments and DU contaminated soil	
			• Soil-vapor survey (1995)	• No VOCs detected in Petrex tubes	
			• Surface UXO survey (1994)	• No UXO visible	
		228B: Friable Asbestos	• Confirmatory soil sampling (2000)	• No friable asbestos detected	228B: NFA accepted (March 2001)
			• Confirmatory geophysical surveys (1999–2000)	• No buried anomalies identified	
			• Housekeeping remediation (1999–2000)	• Entire site excavated; approximately 20,000 cubic yards of construction-demolition debris and soil hauled to KAFB landfill	
			• Geophysical and radiation surveys (1998)	• Buried debris identified; no radioactive anomalies found	
			• Sampling of construction-demolition debris (1998)	• Friable asbestos identified at one small area	
			• Trenching for utilities installation (1997 and 1998)	• No buried debris identified along perimeter of site	
			• Surface radiation surveys (1994 and 1995)	• One radioactive anomaly (a household electrical part) identified and removed from site	

Refer to footnotes at end of table.

Table 2.4.2-1 (Continued)
Summary of Investigations Conducted at SWMUs Located Along Tijeras Arroyo

SWMU Number	SWMU Name	Potential COCs	Previous Investigations	Results	Regulatory Status
228 (cont.)	Centrifuge Dump Site	228B: Friable Asbestos	• Historical aerial photography review	• Dumping identified across 5 acres of site	
			• Surface UXO survey (1994)	• No UXO visible	
229	Storm Drain System Outfall (one of the two discharge points for TA-II SWMU 48)	VOCs, SVOCs, Metals, HE, Cyanide, Radionuclides	• Excavate trench at outfall point; soil sampling to 7 ft bgs at trench and to 5 ft bgs on floodplain (2001)	• Background levels of metals and radionuclides in soil; few "J" values for VOCs and SVOCs	NFA submitted (June 1995); NOD/RSI response to be prepared with SWMU 227 soil-vapor results
			• Historical aerial photography review (2001) • Soil-vapor survey (1995)	• Waste water discharge point identified • No VOCs or SVOCs detected in Petrex tubes	
			• Soil sampling to 3 ft bgs (1994)	• No VOCs, SVOCs, cyanide, HE, or TPH detected; all radionuclides, metals, and nitrate within background	
			• Surface radiation survey (1994)	• No elevated radiation	
			• Surface UXO survey (1994) • Soil-vapor survey (1993)	• No UXO visible • No VOCs or SVOCs detected in Petrex tubes	
230	Storm Drain System Outfall (from TA-IV)	VOCs, SVOCs, Metals	• Backhoe soil sampling to 5 ft bgs (2001)	• Analytical results pending	NFA submitted (June 1995); NOD/RSI response to be prepared
			• Soil sampling to 3 ft bgs (1994)	• No VOCs or SVOCs detected, TPH maximum of 120 mg/kg; all radionuclides, metals, and nitrate within background	
			• Surface radiation survey (1994)	• No elevated radiation	
			• Surface UXO survey (1994)	• No UXO visible	
231	Storm Drain System Outfall (from TA-IV)	VOCs, SVOCs, Metals	• Backhoe soil sampling to 5 ft bgs (2001)	• Analytical results pending	NFA submitted (June 1995); NOD/RSI response to be prepared
			• Soil sampling to 3 ft bgs (1994)	• No VOCs or SVOCs detected, TPH maximum of 130 mg/kg; all radionuclides, metals, and nitrate within background	
			• Surface radiation survey (1994)	• No elevated radiation	
			• Surface UXO survey (1994)	• No UXO visible	
232	Storm Drain System Outfall (from TA-IV)	232-1: VOCs, SVOCs, TPH, Metals	• Backhoe soil sampling to 10 ft bgs (2001)	• Analytical results pending	NFA submitted (August 1997); NOD/RSI response to be prepared
			• GeoProbe soil sampling to 10 ft bgs (1995)	• TPH concentrations up to 32 mg/L	
			• Soil sampling to 3 ft bgs (1994)	• No VOCs or SVOCs detected; metals and radionuclides within background; TPH concentrations up to 860 mg/L	

Refer to footnotes at end of table.

Table 2.4.2-1 (Concluded)
Summary of Investigations Conducted at SWMUs Located Along Tijeras Arroyo

SWMU Number	SWMU Name	Potential COCs	Previous Investigations	Results	Regulatory Status
232 (cont.)	Storm Drain System Outfall (from TA-IV)	232-1: VOCs, SVOCs, TPH, Metals	• Surface radiation survey (1994)	• No elevated radiation	NFA submitted (August 1997); NOD/RSI response to be prepared
			• Surface UXO survey (1994)	• No UXO visible	
		232-2: VOCs, SVOCs, TPH, Metals	• Backhoe soil sampling to 5 ft bgs (2001)	• Analytical results pending	
			• Confirmatory soil sampling to 10 ft bgs (1994)	• Maximum remaining TPH in soil was 32 mg/L; no stained soil present	
			• VCM excavation (1994)	• About 429 cubic yards of soil excavated and shipped off site; action level was 100 mg/L TPH	
			• Inspection of July 1994 mineral-oil spill (1994)	• Oil-stained soil extended about 50 ft from outfall	
			• Surface radiation survey (1994)	• No elevated radiation	
			• Surface UXO survey (1994)	• No UXO visible	
233	Storm Drain System Outfall (from TA-IV)	VOC, SVOC, Metals	• Backhoe soil sampling to 5 ft bgs	• Analytical results pending	NFA submitted (June 1995); NOD response to be prepared
			• Soil sampling to 3 ft bgs	• No VOCs or SVOCs detected; TPH maximum of 140 mg/kg; all radionuclides, metals, and nitrate within background and/or below risk criteria	
			• Surface radiation survey	• No elevated radiation	
			• Surface UXO survey	• No UXO visible	
234	Storm Drain System Outfall (from TA-IV)	VOCs, SVOCs, Metals	• Excavate trench at suspected outfall; soil sampling with backhoe to 5 ft bgs	• Analytical results pending	NFA submitted (June 1995); NOD response to be prepared
			• Soil sampling to 3 ft bgs	• No VOCs, SVOCs, or TPH detected; all radionuclides, metals, and nitrate within background and/or below risk criteria	
			• Surface radiation survey	• No elevated radiation	
			• Surface UXO survey	• No UXO visible	
235	Storm Drain System Outfall (from TA-I and KAFB)	VOCs, SVOCs, Metals	• Soil sampling to 3 ft bgs (1994)	• No VOCs, SVOCs, or TPH detected; all radionuclides, metals, and nitrate within background	NFA accepted (March 2000)
			• Surface radiation survey (1994)	• No elevated radiation	
			• Surface UXO survey (1994)	• No UXO visible	

bgs = Below ground surface.
COCs = Constituents of concern.
DU = Depleted uranium.
FLUTe = Flexible Liner Underground Technology, Inc.
ft = Foot (feet).
HE = High explosive(s).
J = Estimated quantity.
KAFB = Kirtland Air Force Base.
µg/L = Microgram(s) per liter.
mg/kg = Milligram(s) per kilogram.
MEK = Methyl ethyl ketone.
mg/L = Milligrams per liter.
NFA = No Further Action.
NOD = Notice of Deficiency.
NPDES = National Pollution Discharge Elimination System.
PCB = Polychlorinated biphenyl(s).
ppbv = Parts per billion by volume.
RCRA = Resource Conservation and Recovery Act.
RSI = Request for Supplemental Information.
SVOC = Semivolatile organic compound.
SWMU = Solid Waste Management Unit.
TA = Technical Area.
TAL = Target analyte list.
TCE = Trichloroethylene.
TPH = Total petroleum hydrocarbon(s).
UXO = Unexploded ordnance.
VCM = Voluntary corrective measures.
VOC = Volatile organic compound.

soil-vapor samples also have been collected quarterly at SWMUs 46, 227, and 229 using three soil-vapor monitor wells (46-VW-01, 46-VW-02, 227-VW-01). The analytical results for both types of sampling are summarized in Table 2.4.2-1, and groundwater analytical results through May 2001 are discussed more fully in Chapter 4.0.

2.5 Drain and Septic Systems

Forty-five DSS are located in the TAG study area (SNL/NM November 2001). Because the TAs were constructed with sanitary-sewer lines, sanitary and industrial wastes were typically not plumbed to the DSS. Instead, the majority of the DSS in the study area were used for the disposal of small volumes of water from evaporative coolers, air conditioning units, or precipitation. The DSS typically consisted of seepage pits and dry wells, rather than leachfields.

2.5.1 Facility Description

The majority of the DSS in TA-I are in the TAG study area (38). TA-II and TA-IV contain five and two DSS, respectively. NMED has determined that 39 of the 45 DSS do not require environmental characterization work and will therefore not be classified as SWMUs. The other six DSS are, or will be, designated as SWMUs and each will require the collection of near-surface samples consisting of either soil and/or soil vapor (SNL/NM November 2001).

The small septic system for TA-II Building 915/922 is connected to DSS 1003. As shown in Figure 2-1, five of the six sites are located in TA-I and consist of:

- the Building 803 seepage pit (DSS 1052)
- the Building 885 septic system (DSS 1101)
- the Building 889 septic system (DSS 1102)
- the Building 898 septic system (DSS 1001)
- the silver-recovery sump/seepage pit (SWMU 276) for Building 829X

2.5.2 Previous Investigations

To date, much of the environmental work for the DSS has been confined to the review of engineering drawings and field checks. Some soil and passive soil-vapor sampling has occurred at the DSS. The non-ER DSS Field Implementation Plan (FIP) (SNL/NM November 2001) presents the decision logic for determining future vadose zone and/or groundwater investigations. The six DSS in the TAG study area will be sampled in accordance with the FIP (SNL/NM November 2001) and NMED/HWB guidance (Moats February 2002). The soil and soil-vapor sampling will be completed in 2002.

2.6 SWMUs with Potential for Creating Groundwater Contamination

Table 2.6-1 is a synopsis of all the SWMUs in the TAG study area and summarizes the COCs and field investigations that were discussed earlier in Tables 2.1.2-1, 2.2.2-1, and 2.4.2-1. Also

Table 2.6-1
Summary of Field Investigations Conducted at SWMUs in the TAG Study Area[a]

SWMU Number	SWMU Name	Potential COCs												Field Investigation															Potential Source Criteria			Potential Source of TCE or Nitrate	Type of Potential source relevant to groundwater
														Survey						Sampling					Remediation		Monitoring Well						
		Volatile organic compounds	Semivolatile organic compounds	Total petroleum hydrocarbons	Polychlorinated biphenyls	High explosives	Metals	Radionuclides	Cyanide	Acids/Bases	Herbicides/Pesticides	Asbestos	Nitrate	Geophysical—ground surface	Organic-vapor—breathing zone	Pipeline camera—buried piping	Radiation survey—ground surface	Trench—below grade	Unexploded ordnance—ground surface	Groundwater	Sediment (from buried piping)	Soil (maximum depth in feet)	Soil vapor	Storm water	Bio-venting wells	Excavation and removal of debris and/or contaminated soil	Soil vapor	Shallow groundwater	Regional aquifer	NFA proposal approved	Soil above background[b]	Significant water volume		
1	Radioactive Waste Landfill (includes SWMU 3, Chemical Disposal Pit)	•	•				•	•						•	•		•					11	•			•				No	No	No	No	
2	Classified Waste Landfill	•	•		•	•	•	•						•	•		•					100	•			•				No	I	No	No	
30	Reclamation Yard			•	•		•															5				•				No	No	No	No	
32	Steam Plant Oil Spill				•																	107								Yes	No	No	No	
33	Motor Pool	•	•	•			•															30								No	No	No	No	
41	Building 838 Mercury Release						•															3								Yes	No	No	No	
42	Building 870 Water Treatment Facility	•					•			•												30								Yes	No	No	No	
43	Radioactive Material Storage Yard						•	•									•					3								Yes	No	No	No	
44A	Uranium Calibration Pits						•	•							•		•					8				•				Yes	No	No	No	
44B	Decontamination Areas						•	•						•	•		•			•		3	•							Yes	I	No	No	
45	Liquid Discharge	•	•				•							•			•	•	•			14	•							No	I	No	No	
46	Old Acid Waste Line Outfall	•	•		•		•	•	•								•	•	•	•		295	•				•	•	•	No	Yes	Yes	Yes	TCE, Nitrate
48	Building 904 Septic System	•	•			•	•	•	•				•		•		•	•		•		50	•				•	•	•	No	I	Yes	Yes	TCE, Nitrate
50	Oil Centrifuge Site					•	•	•									•		•			3								Yes	No	No	No	
77	Oil Surface Impoundment	•			•																	3		•						Yes	No	No	No	
96	Storm Drain System	•	•	•	•		•	•		•						•		•		•		12		•						No	I	Yes	Yes	TCE
98	Building 863 Trichloroethane and Photochemical Releases	•					•			•												140	•							Yes	No	No	No	
113	Area II Firing Sites					•	•							•			•					2	•							Yes	No	No	No	
114	Explosive Burn Pit					•	•											•				12	•			•				No	I	No	No	
135	Building 906 Septic System	•	•		•	•	•	•			•			•			•	•		•		52	•							No	I	Yes	No	TCE
136	Building 907 Septic System	•	•			•	•	•	•				•		•		•	•		•		50	•				•	•	•	No	I	Yes	Yes	TCE, Nitrate
159	Building 935 Septic System	•	•		•	•	•	•					•					•		•		150	•							No	I	Yes	No	TCE, Nitrate
165	Building 901 Septic System	•	•			•	•	•					•					•		•		300	•					•	•	No	I	Yes	Yes	TCE, Nitrate
166	Building 919 Septic System	•	•			•	•	•					•					•		•		50	•					•	•	No	I	Yes	Yes	TCE, Nitrate
167	Building 940 Septic System	•	•			•	•						•					•		•		50	•							No	I	Yes	No	TCE, Nitrate
186	Building 859 TCE Disposal	•																				30	•							Yes	No	No	No	
187	TA-I Sanitary Sewer System	•	•		•		•	•					•			•				•		12						•	•	No	I	Yes	Yes	TCE, Nitrate
190	Steam Plant Tank Farm	•	•	•																•		120	•		•			•	•	No	I	No	No	
192	TA-I Waste Oil Tank	•	•	•	•		•															30								Yes	No	No	No	
211	Building 840 Former Underground Storage Tank 840-1	•	•	•	•		•											•				30								Yes	No	No	No	
226	Old Acid Waste Line	•	•		•		•	•	•							•				•	•	14						•	•	No	I	Yes	Yes	TCE
227	Building 904 Outfall (discharge point for TA-II SWMU 48)	•	•			•	•	•	•								•	•	•	•		19	•				•	•	•	No	I	Yes	Yes	TCE
228	Centrifuge Dump Site (consists of SWMUs 228A and 228B)	•	•			•	•	•				•		•			•	•	•	•		3	•			•				Yes	No	No	No	
229	Storm Drain System Outfall (discharge point for TA-II SWMU 48)	•	•			•	•	•	•								•	•	•	•		7	•					•	•	No	I	Yes	Yes	TCE
230	Storm Drain System Outfall (from TA-IV)	•	•				•										•		•			5		•						No	I	No	No	
231	Storm Drain System Outfall (from TA-IV)	•	•				•										•		•			5		•						No	I	No	No	
232	Storm Drain System Outfall (consists of SWMUs 232-1 and 232-2)	•	•	•			•										•		•			10		•		•				No	I	No	No	
233	Storm Drain System Outfall (from TA-IV)	•	•				•										•		•			5		•						No	I	No	No	
234	Storm Drain System Outfall (from TA-IV)	•	•				•										•	•	•			5		•						No	I	No	No	
235	Storm Drain System Outfall (from TA-I and Kirtland Air Force Base)	•	•				•										•		•			3		•						Yes	No	No	No	

[a]Field investigations were not required at SWMUs 25, 73, and 104; NFA proposals have been accepted for all three SWMUs. The six DSS will be added to the table after each site is sampled.

[b]The potential-source criteria of "soil above background" refers to COC concentrations in soil samples with respect to both background levels (Dinwiddie September 1997) and risk-based levels (site-specific NFA proposals).

COC = Constituent of concern. I = Improbable, recent (not yet reviewed by NMED) soil results indicate no significant contamination. DSS = Drain and Septic Systems. NFA = No Further Action. NMED = New Mexico Environment Department. SWMU = Solid Waste Management Unit.
TA = Technical area. TAG = Tijeras Arroyo Groundwater. TCE = Trichloroethylene.

listed in Table 2.6-1 are the three criteria that were used to determine if a particular site was to be considered a "potential source" of TCE and/or nitrate that could threaten groundwater.

The first criteria was based upon whether or not NMED had approved an NFA proposal for a site. Inherent in an NFA proposal is the evaluation of historical operations, the COCs, sampling results, survey findings, and the preparation of a risk assessment if needed. If NMED had approved the respective NFA proposal, the site need not be considered as a potential source of groundwater contamination (Moats November 2001).

In order to make this report as up-to-date as possible, the second criteria addressed sampling results that have not yet been fully reviewed by NMED. Sites with soil samples that contained levels of COCs below background and/or risk-based levels were not considered to be potential sources. Risk assessments are expected to support the second criteria and will be submitted to NMED with the appropriate Notice of Deficiency (NOD)/Request for Supplemental Information (RSI) responses.

The third criteria addressed the volume of water (waste, septic, or storm) that was associated with each site. The water volume was assumed to be a useful criteria because the vadose zone beneath the TAG study area varies in thickness from approximately 250 to 300 ft. Waste-water outfalls and sewer-line systems were considered to be significant because of their multi-year operations that potentially involved millions of gallons of water. On the other hand, a small volume of water, such as the one-time discharge of a dust-suppression water tanker at SWMU 45, was not considered to be significant. Storm water from parking lots was considered insignificant because of the desert climate at SNL/NM.

As a conservative measure, each of the TA-II septic systems was assumed to have discharged a significant volume of water. As shown in Table 2.6-2, the TA-II septic systems were used from the late 1940s until the early 1990s. The systems were connected to Buildings 901/902, 904, 906, 907, 919, 935, and 940. Each TA-II septic system was unique with respect to its construction details. The systems were constructed of one or more buried, effluent-disposal components consisting of leachfields, seepage pits, and/or drywells (Table 2.6-2).

In the TAG study area, SNL/NM has various types of potential sources including:

- Leachfields/seepage pits/drywells at seven SWMUs (48, 135, 136, 159, 165, 166, 167)
- Waste-water disposal ditches at four SWMUs (46, 136, 227, 229)
- A storm-water channel/culvert system (SWMU 96)
- A sanitary sewer-line system (SWMU 187)
- An acid-waste line (SWMU 226)

Table 2.6-2 lists each potential source of TCE and/or nitrate along with the type of water, years of operation, and relevant comments.

Thirteen of the SNL/NM SWMUs listed in Table 2.6-2 are considered to be potential sources of groundwater contamination involving TCE. TA-I and TA-II have three and seven sites,

Table 2.6-2
Concern Level for Potential Sources of TCE and Nitrate in the TAG Study Area

Potential Source	TCE Concern	Nitrate Concern	Years of Use	Type of Water	Summary of Process Knowledge
SNL/NM SWMU 46, Old Acid Waste Line Outfall	**High**	**High**	1948–1974	TA-I waste water and possibly septic water	Estimated 1.3 billion gallons of waste water from six TA-I research/office buildings (839, 840, 841, 860, 863, 892) discharged into the three outfall ditches at south end of SWMU 226. Possible TCE in waste water. Septic water from possible cross-connects between the SWMU 226 waste line and sewer lines may have discharged at SWMU 46. In 2000, two soil-vapor monitoring wells installed at SWMU 46; soil-vapor sampling conducted quarterly. Well 46-VW-01 located near waste-line outfall; sampling ports set at 50-ft intervals from 15 to 265 ft bgs; maximum TCE concentration to date of 46,000 ppbv from 115 ft bgs. Well 46-VW-02 located 900 ft farther southeast with sampling ports set at 50-ft intervals from 46 to 296 ft bgs; maximum TCE concentration to date of 650 ppbv from 96 ft bgs.
SNL/NM SWMU 48, Building 904 Septic System	Medium	Medium	1947–1992	TA-II septic and waste water	Two systems connected to large research/office Building 904. First system (leachfield/seepage pit) discharged septic water near center of TA-II. Second system (pair of outfall ditches at SWMUs 227 and 229) discharged waste water outside the southern apex of TA-II. Possible TCE and HE in waste water. Soil samples collected along the SWMU 48 piping contain no significant contamination. In 1997, soil-vapor monitoring well TA2-VW-21 installed near SWMU 48 piping with sampling ports set at 50 and 92 ft bgs. Soil-vapor sampling conducted quarterly with maximum TCE concentration to date of 1,500 ppbv at 92 ft bgs.
SNL/NM SWMU 96, Storm Drain System	Low	None	1948–Present	TA-I storm water	Storm-water channels and culverts extend across TA-I. No significant contamination detected in soil samples.
SNL/NM SWMU 135, Building 906 Septic System	Low	Low	1950–1992	TA-II waste water	Leachfield (drywell previously) connected to small research Building 906. No significant contamination detected in soil samples.
SNL/NM SWMU 136, Building 907 Septic System	Medium	Medium	1948–1992	TA-II septic and waste water	Two systems connected to large research/office Building 907. First system (leachfield/seepage pit) discharged septic water west of Building 907. Second system (ditch in center of TA-II) discharged waste water which possibly contained TCE and HE. In 1997, soil-vapor monitoring well TA2-VW-20 installed near ditch with sampling port set at 72 ft bgs. Soil-vapor sampling conducted quarterly with maximum TCE concentration to date of 47 ppbv.
SNL/NM SWMU 159, Building 935 Septic System	Low	Low	1963–1991	TA-II waste and septic water	Drywells and seepage pit connected to small research/office Building 935. Possible TCE and HE in waste water. No significant contamination detected in soil samples.
SNL/NM SWMU 165, Building 901 Septic System	**High**	**High**	1948–1992	TA-II septic and waste water	Leachfield connected to personnel shower/laundry facility (Building 901) and small research/machine shop Building 902. Possible TCE and HE in waste water. No significant contamination detected in soil samples. Groundwater samples from perched-system monitoring well TA2-SW1-320 have contained maximum TCE and nitrate concentrations of 3.9 µg/L and 44 mg/L, respectively.
SNL/NM SWMU 166, Building 919 Septic System	Low	Medium	1969–1990	TA-II waste and septic water	Leachfield, seepage pit, and drywell connected to large office/research Building 919. Possible TCE and HE in waste water. No significant contamination detected in soil samples.
SNL/NM SWMU 167, Building 940 Septic System	Low	Low	1965–1990	TA-II waste and septic water	Seepage pits connected to small research/office Building 940. Possible TCE and HE in waste water. No significant contamination detected in soil samples.
SNL/NM SWMU 187, TA-I Sanitary Sewer System	Low	**High**	1948–Present	TA-I septic and waste water	Possibly leaking sewer lines and several cross-connects with waste-water lines. System connected to numerous research/office buildings in TA-I. No significant contamination detected in soil samples.
SNL/NM SWMU 226, Old Acid Waste Line Outfall	Low	None	1948–1974	TA-I waste water	Waste-water line from six TA-I research/office buildings discharged at the three SWMU 46 outfall ditches. No significant contamination detected in soil samples collected along the SWMU 226 piping.
SNL/NM SWMU 227, Bunker 904 Outfall	Medium	None	1947–1992	TA-II waste water	Waste water from SWMU 48 discharged into outfall ditch at SWMU 227. Possible TCE and HE in waste water. No significant contamination detected in soil samples. In 2000, soil-vapor monitoring well 227-VW-01 installed with sampling ports set at 50-ft intervals from 25 to 225 ft bgs. Soil-vapor sampling conducted quarterly with maximum TCE concentration to date of 14,000 ppbv at 225 ft bgs.
SNL/NM SWMU 229, Storm Drain System Outfall (Building 904 Outfall)	Medium	None	1947–1992	TA-II waste water	Waste water from SWMU 48 discharged into outfall ditch at SWMU 229. Possible TCE and HE in waste water. No significant contamination detected in soil samples.
KAFB Landfill LF-02	Low	Medium	1945–1967	Storm water	Industrial and residential waste, landscape debris; unlined landfill covers 50 acres (KAFB 2000b). Estimated debris volume is 1,000,000 million cubic yards. No drums found in test pits dug in 2000.
KAFB Landfill LF-08	Low	Medium	1960–1989	Storm water	Industrial and residential waste, landscape debris, possible buried drums; unlined landfill covers 30 acres; Estimated debris volume is 600,000 cubic yards (KAFB 2000b). No drums found in test pits dug in 2000. TCE detected in soil vapor up to 1,100 ppbv, but modeling indicates that TCE will not reach groundwater.
KAFB Landfill LF-44	None	Medium	1979–1988	Storm water	Landscape debris; unlined landfill covers 2 acres; debris volume is not known. Most debris removed in 1992 and 1993 (KAFB 2000b).
KAFB Landfill LF-268	None	Medium	1989–Present	Storm water	Construction-demolition debris, landscape debris; landfill covers 45 acres; debris volume is not known (KAFB 2000b).
KAFB Sewage Lagoons	**High**	**High**	1966–1987	KAFB and TA-I septic and waste water	Most of the estimated 7.3 billion gallons of water discharged at the two lagoons, the remainder piped to the golf-course pond (Montgomery Watson August 2000). TCE detected in 1987 sewage lagoon water samples.
KAFB Golf Course Main Pond	**High**	**High**	1966–1987	KAFB and TA-I septic and waste water	Lagoon (septic) water piped to pond, and used for turf irrigation (Montgomery Watson August 2000). Unknown amount of water may have leaked through pond liner. TCE detected in 1987 pond-water samples. Pond refurbished in 1998 and currently used for storing turf-irrigation water pumped from extraction well.
KAFB Sanitary Sewer Lines	Low	**High**	1940s–Present	KAFB septic water	Leaking sewers lines may be ongoing problem across KAFB.
KAFB Septic Tank Systems	Low	Medium	1940s–Present	Septic water	Approximately 30 septic-tank systems located in study area.
KAFB Manzano Training Area (Base) Blasting	None	Medium	1950s	Storm water	Dynamite blasting associated with construction of storage bunkers may have left residual explosive material that has degraded to nitrate.
COA Eubank Landfill – Northeast Fill Area	**High**	**High**	1974?–1984	Storm and septic water	Residential and industrial waste dumped in unlined landfill (Nelson June 1997). Landfill covers 27 acres, waste depth of 30 to 40 ft. Estimated debris volume is 1,000,000 million cubic yards. Residential sewage lagoons installed nearby and used for disposal of septic water from mobile home park, some sewer lines crossed the landfill (CH2M Hill April 1996). September 2001 soil-vapor samples contained PCE at 1,100 ppbv and TCE at 620 ppbv (DBS&A, April 2002). Maximum soil-vapor sampling depth of 10 ft bgs.
COA Eubank Landfill – Southwest Fill Area	**High**	Medium	Early 1960s–1973?	Storm water	Residential and industrial waste dumped in unlined landfill (Nelson June 1997). Landfill covers 60 acres; maximum waste depth of 36 to 40 ft. Volume of debris is unknown. September 2001 soil-vapor samples contained PCE at 7,100 ppbv and TCE at 2,000 ppbv (DBS&A, April 2002). Ongoing uncontrolled dumping of household waste, landscape debris, and vehicles.
COA Sanitary Sewer Line Rupture / Temporary Sewage Pond	Low	**High**	1994	COA septic water	100 million gallons spilled. Unknown volume of septic water recovered from temporary pond on floodplain (Montgomery Watson August 2000).
COA Sanitary Sewer Lines	Low	**High**	1940s–Present	COA septic water	Leaking sewer lines may be ongoing problem on KAFB.
COA Montessa Park/Tree Nursery	None	**High**	1950s-Present	Septic water/ Irrigation water	Sewage lagoon used at Montessa Park Correctional Facility. Irrigation ponds and fertilizer used at tree nursery operated by U.S. Department of Agriculture from approximately 1959 until mid-1990s.

bgs = Below ground surface
COA = City of Albuquerque.
ft = Foot (feet).
HE = High explosive(s).
KAFB = Kirtland Air Force Base.
µg/L = Microgram(s) per liter.
mg/L = Milligram(s) per liter.
PCE = Perchloroethylene (tetrachloroethylene).
ppbv = Parts per billion by volume.
SNL/NM = Sandia National Laboratories/New Mexico.
SWMU = Solid Waste Management Unit.
TA = Technical Area.
TAG = Tijeras Arroyo Groundwater.
TCE = Trichloroethylene.

respectively. The TA-I sites are SWMUs 96, 187, and 226. The seven sites at TA-II are SWMUs 48, 135, 136, 159, 165, 166, and 167. Three sites (SWMUs 46, 227, and 229) managed by the TJAOU also were categorized as being potential TCE sources.

Eight of the SWMUs listed in Table 2.6-2 are considered to be potential nitrate sources resulting from septic water. TA-I has one site, SWMU 187, that is a potential nitrate source. TA-II has six potential nitrate sources (SWMUs 48, 136, 159, 165, 166, and 167). The disposal of TA-I waste water containing nitrate at the Acid Waste Line Outfall (SWMU 46) is possible, but is not highly suspected. The disposal of septic waste into open ditches was not supposed to occur because of obvious odor and health issues. However, utility construction in TA-I found inadvertent cross-connects at various sewer lines. Such cross-connects to the Acid Waste Line (SWMU 226) have not been documented, but may have occurred. If present, the cross-connects may have inadvertently allowed septic water to discharge along with waste water at the Acid Waste Line Outfall (SWMU 46).

A qualitative level of concern is listed in Table 2.6-2 for each potential-source site with regards to TCE and nitrate. The concern level was subjectively assigned as "none," "low," "medium," or "high." The concern level was based upon the type of historical activities conducted at each SWMU; associated building operations, if applicable; chemicals/radionuclides used; waste-disposal activities; engineering drawings; and water volume, if known.

For TCE, the concern level was primarily based upon the type and scale of historical operations conducted at the buildings that were associated with the respective SWMU. The references (site histories, field inspections, engineering drawings, etc.) discussed in Chapter 2.0 were useful in determining the concern levels. For example, the more locations in a building where TCE might have been used and/or disposed of, such as test cells, machine workshops, floor drains, and/or laboratory sinks, the greater the concern level. A SWMU connected to a building that was used primarily for office space and secondarily for research/testing/machining operations was assigned a "low" concern level for TCE. A SWMU connected to a building that was used primarily for testing/research/machining operations was assigned a "medium" level for TCE. A SWMU that was connected to multiple buildings with research/testing/machining operations was assigned a "high" concern level for TCE.

For nitrate, the concern level was based primarily upon building occupancy. Buildings constructed with no bathrooms were assigned an obvious concern level of "none" for nitrate. A "low" concern level for nitrate was assigned to those septic systems that served small buildings where a staff of only about ten or so worked. Large buildings where dozens of personnel worked were considered to be a "medium" level of concern. SWMUs that were connected to multiple buildings containing bathrooms were assigned a "high" concern level for nitrate.

Because some HE compounds can degrade to nitrate, the TA-II buildings in which HE materials were handled that were also connected to waste-water disposal systems were evaluated for anthropogenic nitrate. Using the rationale discussed above for TCE, the concern level for HE-derived nitrate was based upon the type and scale of historical operations that were conducted at each building.

The concern levels listed in Table 2.6-2 for the KAFB and COA sites are based upon the discussions which are presented later in Sections 2.7 and 2.8. The KAFB sewage lagoons and the KAFB Golf Course Main Pond were considered to be a "high" level of concern for both TCE and nitrate because 7.3 billion gallons of waste and septic water are estimated to have been disposed of at the two sites. In the 1980s, nitrate and TCE were detected in water that was

discharging at both the KAFB sewage lagoons and the Golf Course Main Pond. The COA sanitary-sewer line rupture was considered to be a "high" level of concern for nitrate because approximately 100 million gallons of septic water were spilled in 1994; an unknown amount of the septic water was recovered and pumped back into the COA system. KAFB groundwater results suggest that septic leakage from COA sewer lines and/or Montessa Park/Tree Farm (Plates 1 and 2) may be an ongoing nitrate problem.

2.7 KAFB

KAFB-controlled facilities extend along the north, west, south, and southeast boundaries of the three TAs (TA-I, TA-II, and TA-IV).

2.7.1 Properties Description

KAFB controls properties with a variety of land uses and facilities. The land located along the northern and western sides of the TAG study area is developed, comprising KAFB housing, office buildings, emergency-response facilities, training schools, a museum, machine workshops, storage yards, a brig, a diesel-fuel tank farm, an electromagnetic research facility, and the inactive sewage lagoons. Bordering the southern and southeastern edges of the study area are undeveloped open spaces, active landfills, and closed landfills.

2.7.2 Previous Investigations

The U.S. Air Force Installation Restoration Program (IRP) manages the environmental characterization and remediation projects at KAFB. Groundwater investigations at KAFB are conducted as part of both Resource Conservation and Recovery Act corrective action investigations and a NMED-mandated Nitrate Abatement Program (Montgomery Watson August 2000). A TCE program is currently being prepared by CH2M Hill (Holmes July 2001). NMED oversees the IRP work and has assigned various naming conventions to the IRP sites (Sillerud July 2001). The IRP sites also are known as Corrective Action Units (CAUs).

Approximately 40 KAFB CAUs are located within a mile of TA-I, TA-II, and TA-IV. The CAUs include oil/water separators, surface spills, oil-storage tanks, septic systems, drum-storage yards, ordnance-training sites, landfills, sewage lagoons, and a contractor yard (KAFB 2000a). KAFB has installed monitoring wells in the vicinity of the landfills as well as in the sewage lagoons (Figure 2-2). Most of the 40 CAUs do not pose a threat to groundwater. However, the potential impacts of the KAFB landfills and the sewage lagoons are not well understood.

As shown in Table 2.7.2-1, the KAFB landfills contain a variety of waste, including general refuse (household trash), concrete rubble, industrial refuse, landscape debris, asphalt rubble, and possibly 55-gallon drums of various chemicals and solvents. Soil-vapor studies have been conducted at most of the landfills, but these studies have focused primarily on methane production (KAFB 2000b). At LF-08, soil-vapor samples have contained TCE and tetrachloroethene (PCE) concentrations in excess of NMED soil-screening levels; however, SESOIL modeling indicates that these VOCs have a low probability of reaching groundwater (Foster Wheeler May 2001). Test pits dug at LF-02 and LF-08 in 2000 did not uncover any buried drums.

Table 2.7.2-1
KAFB and Off-Base Landfills Located in the Vicinity of TAG Study Area
(KAFB 2000b, CH2M Hill April 1996, Copland July 2001)

Name (Alternate Name)	Owner	Size (acres)	Waste Volume (yd^3)	Dates of Use	Contents
LF-02 (CAU 6-2)	KAFB	50	1,000,000	1945–1967	General refuse, concrete/asphalt rubble, landscape debris (trees, shrubs, grass), industrial refuse, possibly hazardous materials including 55-gallon drums containing liquid solvents and plastic wastes.
LF-07 (CAU 6-3)	KAFB	7	6,000	1972–1977	Burned aircraft parts.
LF-08 (CAU 6-4)	KAFB	30	600,000	1960–1989	General refuse, concrete/asphalt rubble, landscape debris (trees, shrubs, grass), industrial refuse, possibly hazardous materials including chemical drums.
LF-09 (CAU 6-10)	KAFB	31	NA	NA	None, area was a practice-bombing site.
LF-44 (CAU 6-11)	KAFB	2	Unknown	1970s–1988	Construction-demolition debris including concrete, asphalt, landscape debris (trees, shrubs, grass), roofing shingles, metal sheets, motor-oil pans, and bottles. (Most material removed in 1992 and 1993.)
LF-268 (C&D)	KAFB	45	Unknown	1989–present	General refuse, landscape debris (trees, shrubs, grass), construction-demolition debris, asbestos.
Eubank Landfill-Northeast Fill Area	COA	27	Unknown	1974?–1984	Household waste, possibly industrial waste.
Eubank Landfill-Southwest Fill Area	COA	60	Unknown	1960s–1973? by COA. Ongoing dumping by trespassers.	Household waste, possibly industrial waste. Visible waste consists of landscape debris (trees, shrubs, grass), furniture, appliances, lumber, automobiles, general refuse, scrap metal, concrete/asphalt rubble.

C&D = Construction and demolition.
CAU = Corrective Action Unit.
COA = City of Albuquerque.
KAFB = Kirtland Air Force Base.
LF = Landfill.
NA = Not applicable.
TAG = Tijeras Arroyo Groundwater.
yd^3 = Cubic yard(s).

The KAFB Sewage Lagoons and the Golf Course Main Pond together comprise CAU WP-26 (Montgomery Watson August 2000). Combined, the two lagoons, which are adjacent to each other, cover approximately 14 acres. The lagoons are located approximately 0.9 miles west of TA-IV (Figure 2-2). Findings based upon recent interpretation of aerial photographs reveal that the lagoons were used from 1966 to 1987 (BGW September 2002). KAFB operated the lagoons, which received untreated sewage from both KAFB and SNL/NM through an interconnected sanitary-sewer system. The lagoons were used seasonally from April through October as settling basins for approximately 330 million gallons of untreated (raw) sewage being disposed of annually (Montgomery Watson August 2000). Over a period of 22 years, such a rate would equate to 7.26 billion gallons. The majority of the water percolated into the soil. However, the ratio of percolation to evaporation is not known. While the lagoons were in service, an unknown volume of untreated sewage from the lagoons was piped into the 2.6-acre Golf Course Main Pond that is located approximately one mile southeast of TA-IV (Figure 2-2). The sewage was mixed with storm water and groundwater, and used to irrigate the golf course.

Effluent (water) samples collected on April 25, 1987, from the sewage lagoons contained up to 47 µg/L of 1,1,1-trichloroethane (TCA) and 4 µg/L of TCE (New Mexico Health and Environment Department April 1987). Effluent samples from the golf course pond contained similar concentrations of TCA and TCE. As a result, disposal of sanitary waste at both the lagoons and the pond was discontinued in October 1987. Sediment samples from the lagoons and pond also have contained nitrate and TCE.

The lagoons have not been used since 1987. However, in 1998, the Golf Course Main Pond was refurbished and used for the storage of water for turf irrigation (Montgomery Watson August 2000). The water was a blend of nitrate-impacted water pumped from a golf-course extraction well (RG-1589-S-4), storm water, and potable water from a KAFB production well.

KAFB and the COA have been jointly investigating another nitrate-release site, the COA Sanitary-Sewer Line Rupture (Montgomery Watson August 2000). In 1994, an 8-ft diameter COA line ruptured about 1,500 ft west of the KAFB sewage lagoon (Figure 2-2). Approximately 100 million gallons of untreated sewage flowed from the rupture along Munitions Haul Road and ponded on the Tijeras Arroyo floodplain. Some of the sewage was pumped back into COA sewer system, but an unknown volume was allowed to evaporate or infiltrate. Silt deposits consisting of sewage sludge were 2 to 3 ft thick in some places. Inspection of the sewer line revealed that the line may have leaked for some time before rupturing. This suggests that septic leakage from COA sanitary-sewer lines may be an ongoing problem.

2.8 Off-base Properties

Properties located outside of the KAFB Eubank Gate, east of TA-I, are managed by a variety of land owners including the COA, the New Mexico State Land Office (SLO), Saint John's Church, Albuquerque Public Schools, and the Public Service Company of New Mexico.

2.8.1 Properties Descriptions

As shown on Figure 2-2, the Eubank Landfill is located approximately 0.5 miles southeast of the KAFB Eubank Gate. The Eubank Landfill is managed by the COA and consists of two inactive disposal areas, the Northeast Fill Area and the Southwest Fill Area (COA July 2001, Earp

January 2002). Both fill areas are located on the northern rim of Tijeras Arroyo and are prone to erosion. The years of operation for the two fill areas are not well known.

The Northeast Fill Area covers approximately 27 acres and contains household waste and possibly industrial waste (Nelson June 1997). The area was used by the COA from approximately 1974 to 1984 (Tables 2.6-2 and 2.7.2-1). Native soil was used to cover the waste; an engineered cap was not installed (CH2M Hill April 1996). After the fill area was closed and until about 1984, sanitary waste from the adjacent Four Hills Mobile Home Park discharged to the ground surface at the Northeast Fill Area via un-permitted septic tanks and sewage lagoons (CH2M Hill April 1996). Storm water from the mobile home park and vicinity also has flowed onto the fill area.

The Southwest Fill Area covers approximately 60 acres and contains household waste and possibly industrial waste (Nelson June 1997). The eastern part of the fill area overlies an old gravel quarry. The Southwest Fill Area was used by the COA from the early 1960s until 1973 (Tables 2.6-2 and 2.7.2-1). Native soil was used to cover the waste; no engineered cap was installed. The Southwest Fill Area continues to be used by trespassers for the dumping of household waste and for off-road vehicle recreation.

2.8.2 Previous Investigations

The COA Environmental Health Department has conducted various environmental investigations at the Eubank Landfill. For example, soil-vapor investigations were conducted in 1996 and 2001. During the 1996 investigation, soil-vapor sampling probes were set at a grid spacing of 100 ft across the Northeast Fill Area with sampling depths ranging from 1.5 to 4.5 ft bgs (CH2M Hill April 1996). The maximum TCE and PCE concentrations were 71 and 96 ppbv, respectively. Methane from the decomposition of garbage had a maximum concentration of 230,000 ppbv. No investigations were conducted at the Southwest Fill Area in 1996. Also in 1996, the COA installed a soil-cement retaining wall along the southeast corner of the landfill where occasional surface-water flow in Tijeras Arroyo was undercutting the landfill.

In September 2001, soil-vapor sampling was conducted at scattered locations across both fill areas to a maximum depth of 10 ft bgs (DBS&A April 2002). Twenty-seven VOCs were detected in the soil-vapor samples. For the Northeast Fill Area, the maximum TCE and PCE concentrations in soil vapor were 620 and 1,100 ppbv, respectively. For the Southwest Fill Area, the maximum concentrations of TCE and PCE in soil vapor were 2,000 and 7,100 ppbv, respectively.

The COA has installed five regional aquifer monitoring wells in the vicinity of the Eubank Landfill. Groundwater quality is discussed below in Section 4.

2.9 Summary of High Potential Sources for TCE and/or Nitrate

The potential sources that were assigned a high concern level in the TAG study area are listed in Table 2.9-1. Six potential TCE sources are assigned a high level of concern. Ten potential nitrate sources are assigned a high level of concern.

Table 2.9-1
Potential Sources with High Concern Level for
Causing Groundwater Contamination

Potential Source	TCE	Nitrate	Site Owner
Old Acid Waste Line Outfall (SWMU 46)	X	X	SNL/NM
Building 901 Septic System (SWMU 165)	X	X	SNL/NM
TA-I Sanitary Sewer System (SWMU 187)		X	SNL/NM
Sewage Lagoons	X	X	KAFB
Golf Course Main Pond	X	X	KAFB
KAFB Sanitary Sewer System		X	KAFB
Eubank Landfill – Northeast Fill Area	X	X	COA
Eubank Landfill – Southwest Fill Area	X		COA
1994 Sanitary Sewer Line Rupture		X	COA
COA Sanitary Sewer System		X	COA
Montessa Park / Tree Nursery		X	COA

COA = City of Albuquerque.
KAFB = Kirtland Air Force Base.
SNL/NM = Sandia National Laboratories/New Mexico.
SWMU = Solid Waste Management Unit.
TA = Technical Area.
TCE = Trichloroethylene.

SNL/NM has three potential sources of high concern (SWMUs 46, 165, and 187). The Old Acid Waste Line Outfall (SWMU 46) involves both TCE and nitrate. The Building 901 Septic System (SWMU 165) also involves both TCE and nitrate. The TA-I Sanitary Sewer System (SWMU 187) involves only nitrate.

KAFB has three potential sources of high concern. The Sewage Lagoons and the Golf Course Main Pond involve both TCE and nitrate. The KAFB Sanitary Sewer System is considered to have a high concern level for nitrate.

The COA has five potential sources of high concern. The Eubank Landfill—Southwest Fill Area involves only TCE. The Eubank Landfill—Northeast Fill Area involves both TCE and nitrate. The COA's 1994 Sanitary Sewer Line Rupture, Sanitary Sewer System, and Montessa Park/ Tree Nursery involve only nitrate.

3.0 HYDROGEOLOGIC DATA SUMMARY

The geologic setting, monitoring-well network, and the hydrogeologic setting of the TAG study area are discussed below in Sections 3.1, 3.2, and 3.3, respectively.

3.1 Geology

The ER Project's Site-Wide Hydrogeologic Characterization Project (SWHC) provided the framework for our geologic interpretation of the TAG study area (SNL/NM March 1994, March 1995, February 1998, February 2001). A site-wide conceptual model for the KAFB area, including SNL/NM, was presented in the most recent SWHC report (SNL/NM February 1998) and the Long-Term Monitoring Strategy report (SNL/NM February 2001). This section provides further description of the stratigraphy and structures specific to the study area.

3.1.1 Geologic Data Set

The geologic information used to better comprehend the site geology included geologic mapping of surface deposits, surface geophysical surveys, borehole geologic descriptions, and borehole geophysical logs, as well as various types of geophysical surveys, such as aeromagnetic, seismic-reflection, gravity, and magnetotelluric.

3.1.2 Stratigraphy

3.1.2.1 Regional Stratigraphic Setting

The TAG study area overlies the eastern margin of the Albuquerque Basin. Our geologic studies have focused primarily on the Upper Santa Fe Group, which is composed mostly of two interfingering facies: an alluvial fan facies and a fluvial facies. Both facies are less than 5 million years old and are composed of unconsolidated-to-poorly-cemented gravel, sand, silt, and clay (Stone et al. February 2000). The alluvial fan facies consist of poorly sorted piedmont-slope deposits derived from the Sandia, Manzanita, and Manzano Mountains east of the study area. The fluvial facies are derived from the ARG to the north and are typically well sorted with correspondingly high hydraulic conductivity. Much of the Upper Santa Fe Group in the TAG study area is covered by poorly developed soil. Conversely, the depth to bedrock underlying the Upper Santa Fe Group is estimated to be approximately 3,500 ft near the center of the study area.

3.1.2.2 Local Stratigraphic Setting

The TAG study area, located on a partially-dissected piedmont surface, was formed by coalescing Holocene and Pleistocene alluvial fans originating from the Sandia and Manzanita Mountains. The alluvial fan deposits are primarily derived from Tijeras Canyon, which bisects the Sandia and Manzanita Mountains. Tijeras Arroyo extends westward from Tijeras Canyon

and across the southern portion of the study area. The alluvial fan deposits consist of poorly-sorted, weakly-stratified sand and gravel in a silt/clay matrix. The sources of these clastic materials are the granitic and sedimentary lithologies of the Sandia Mountains, and the metamorphic and sedimentary lithologies from the Manzanita Mountains. Fine-grained facies in the alluvial fan deposits produce low-permeability zones that significantly influence water movement in both the unsaturated (vadose) and saturated zones.

The borehole strata encountered during the installation of monitoring wells in the TAG study area were highly variable, consisting of alternating layers of gravels, sands, silts, and clays. Gravelly sand lenses, up to 20 ft thick, were present at various depths. The lithology of these coarse fractions mainly consisted of limestone, granite, and various metamorphic rock types. Layers of clayey-silty sand, ranging from 2 to 10 ft thick, were present throughout the drilled sequence, but were more prevalent and thicker at depths below 300 ft bgs. These clayey-silty sand layers are suspected of being able to perch groundwater.

3.1.3 Site-Wide Structural Context

3.1.3.1 Regional Structural Setting

The TAG study area is situated within the Albuquerque Basin, which is bounded on both the eastern and western margins by north-south trending faults related to the Rio Grande rift system. The Albuquerque Basin is a segment of the tectonic, hydrologic, and topographic basins extending from central Colorado to the border of Mexico at El Paso, Texas. North-south trending fault systems control these basins (Hawley and Haase 1992). The faults on the eastern margin of the Albuquerque Basin nearest the TAG study area mostly trend parallel to the Sandia-Manzanita mountain front. These faults are down-to-the-west, normal faults that offset Precambrian through Recent strata. The overall hydrologic effect of faults near the study area is not completely understood. At other locations in the Albuquerque Basin, normal faults affect the basin hydrogeology by: 1) influencing the distribution of the higher conductivity sediments; 2) partitioning the aquifer by juxtaposition of sediments with contrasting hydraulic properties; and 3) possibly providing planes of preferential cementation (Smith and Kuhle February 1998). Investigations conducted immediately south of the TAG study area show that the effects of normal faults range from sealing off groundwater flow to acting as preferential pathways. Groundwater flow across the faults may be localized, both horizontally and vertically (Reiter March 1998).

3.1.3.2 Local Structural Setting

The most recent structural interpretation (Van Hart June 2001; Attachment A) of the TAG study area was based upon the findings presented earlier in documents by Fritts and Van Hart (March 1997) and Van Hart et al. (October 1999). In the recent interpretation, Van Hart (June 2001) integrated additional borehole and geophysical data from monitoring wells recently installed in the TAG study area. This interpretation also utilized aeromagnetic, seismic-reflection, gravity, magnetotelluric, and outcrop data. The principal faults in the KAFB area are shown on Figure 3.1.3-1 and are immediately discussed below. The roles that these structures play in controlling groundwater flow are discussed in Section 3.3.2 along with the TAG conceptual model.

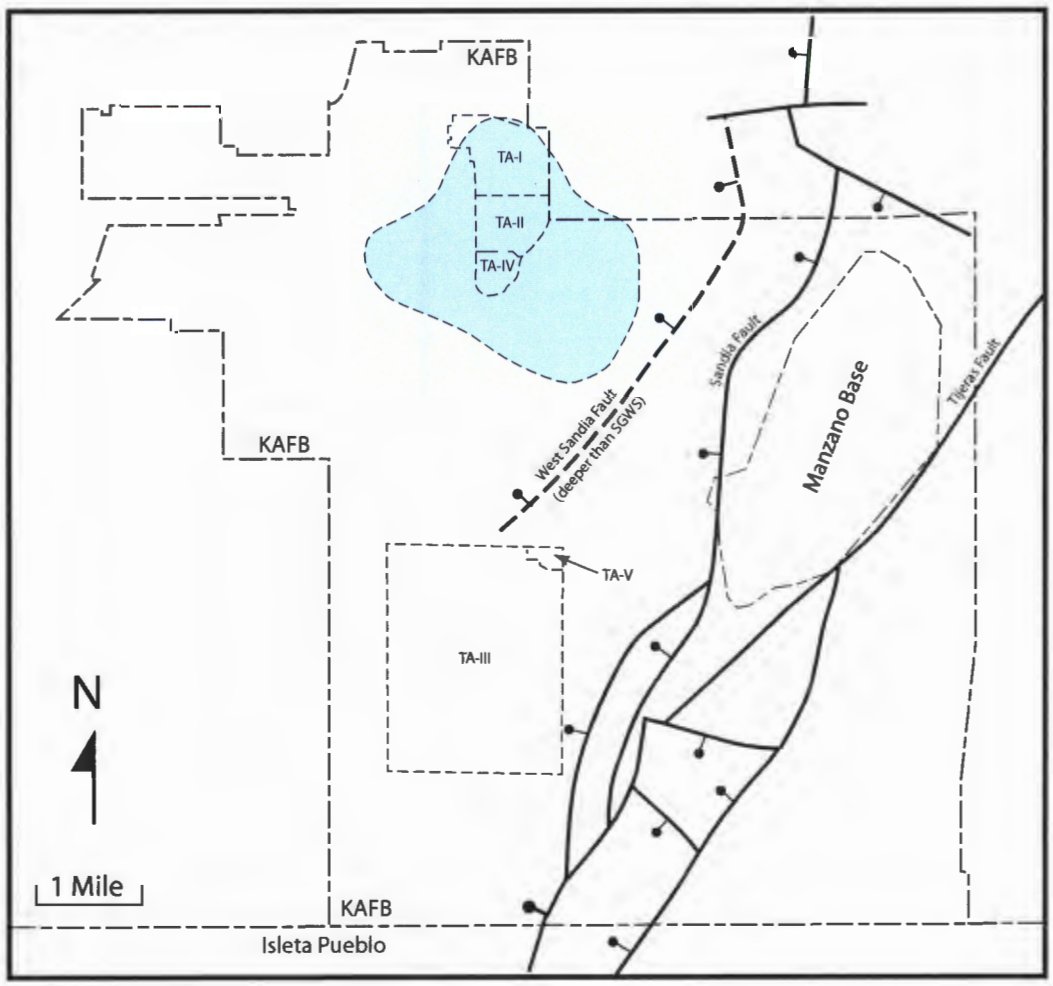


Figure 3.1.3-1
Principal Faults in the KAFB Area
(Known extent of Shallow Groundwater System shaded)

Sandia Fault

The major basin-bounding fault on the west side of the Manzanita Mountains is the Sandia fault. The fault was previously exposed in La Cañada Park near the intersection of Central Avenue and Tramway Boulevard. Precambrian granite on the east of the fault scarp was juxtaposed against rift-fill alluvium on the west (SNL/NM February 1998). Apparently the fault is not exposed farther south on KAFB. However, about 4.7 miles to the south-southwest of the previously exposed fault scarp, Pleistocene fan deposits appear to be offset on a series of vintage 1957 aerial photographs (SNL/NM February 1998). The offset has unfortunately been obliterated by the construction of Lovelace Road. As shown on Figure 3.1.3-1, the Sandia fault is interpreted to connect these two areas along a traverse passing to the west of a number of granite exposures in arroyo floors located along the western flank of Manzano Base (SNL/NM February 1998). This interpreted location of the Sandia fault also is supported by strong aeromagnetic features on the west flank of Manzano Base.

West Sandia Fault

The existence of a West Sandia fault, at least on KAFB, is not as well constrained as the Sandia fault. In previous reports, the West Sandia fault has been a highly inferred feature. Kelley (1954) was the first to interpret the basin-boundary fault system on the west side of both the Sandia and Manzanita Mountains as a doublet of north-south trending faults, consisting of the Sandia fault and the Rincón fault, which is exposed on Sandia Pueblo land. Other proponents of this doublet style include Woodward et al. (1978), Lozinsky (1988 and 1994), and Hawley and Haase (1992). SNL/NM (February 1998) proposed that the West Sandia fault was shallowly buried in the TAG study area. Van Hart (June 2001) further resolved the hypothesized location of the West Sandia fault in the subsurface. As shown in Figure 3.1.3-1, the fault extends north-south across the TAG study area. However, Van Hart (June 2001) noted that the location of the West Sandia fault is not conclusively defined.

Syncline

The existence of a south-plunging syncline in the TAG study area was first proposed by Fritts and Van Hart (March 1997) using a structure map of the Santa Fe Group sediments. The datum for the structure map was a stratigraphic marker on the borehole geophysical logs that approximately defined the contact between predominantly coarse-grained alluvial fan sediments above from predominantly fine-grained alluvial fan sediments below. An updated structure map from Van Hart (June 2001) is presented as Figure 3.1.3-2. Structural contours on the coarse-grained/fine-grained marker show that the axis of the south-plunging syncline trends north-south and parallel to the Sandia fault and the mountain front. Such parallelism is typical of rift-related structures. The syncline is significant because the bedding of the Upper Santa Fe Group dips eastward under most of the TAG study area. The bedding dips average approximately one degree eastward along the western limb of the syncline.

3.1.3.3 Structural and Stratigraphic Controls on Groundwater Flow

This section provides an overview on the relationship of geology to groundwater occurrence in the TAG study area; however, the specifics of the hydrogeology are provided in Section 3.3. As

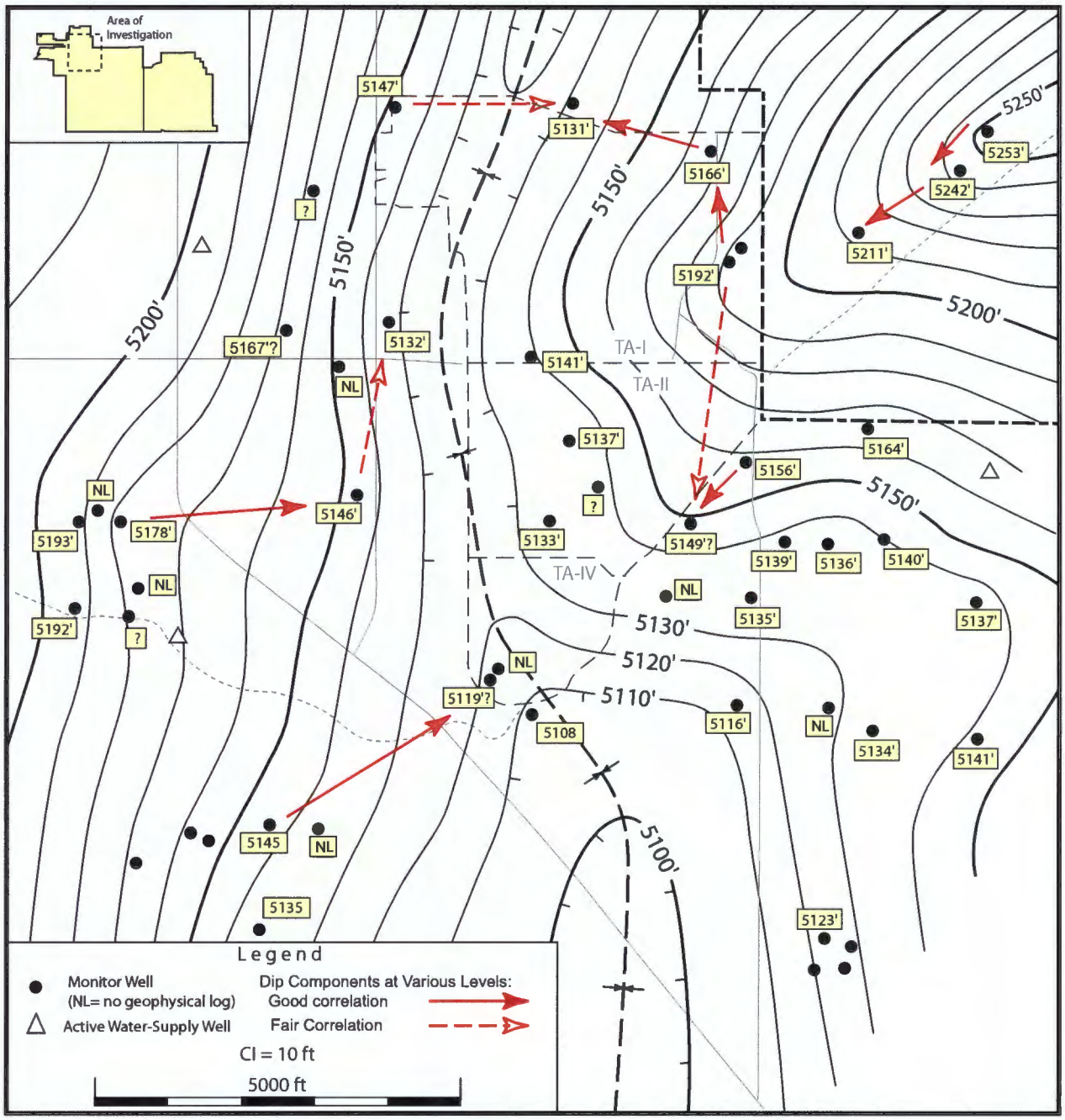


Figure 3.1.3-2

Structure Map on Datum near the Top of the Fine-Grained Alluvial Fan Lithofacies, Tijeras Arroyo Area (modified from Van Hart, June 2001)

part of the Van Hart (June 2001) work, a geophysical-log correlation net (similar to a fence diagram) was constructed using borehole geophysical logs from each well or well pair (a regional-aquifer well located adjacent to a SGWS well) in the TAG study area. Thirty-nine control points were used. Six cross-sections (Annex A) with broad stratigraphic correlations were constructed using the correlation net. Depicted on the cross-sections is the coarse-grained/fine-grained datum that was used to construct the structure map (Figure 3.1.3-2) The vertical transition from predominantly coarse-grained to fine-grained sediments has wide regional significance, and probably was formed by both tectonic and climatic events (Pazzaglia et al. September 1999; Van Hart June 2001[Annex A]).

Over most of the TAG study area, the regional aquifer is contained within the fine-grained alluvial fan facies. However, along the western side of the study area paralleling Wyoming Boulevard, the regional aquifer is contained within the interfingering highly conductive ARG fluvial facies. The potentiometric surface of the regional aquifer shows that groundwater flows uniformly to the northwest (Figure 3.1.3-3) toward the KAFB, COA, and VA water-supply wells.

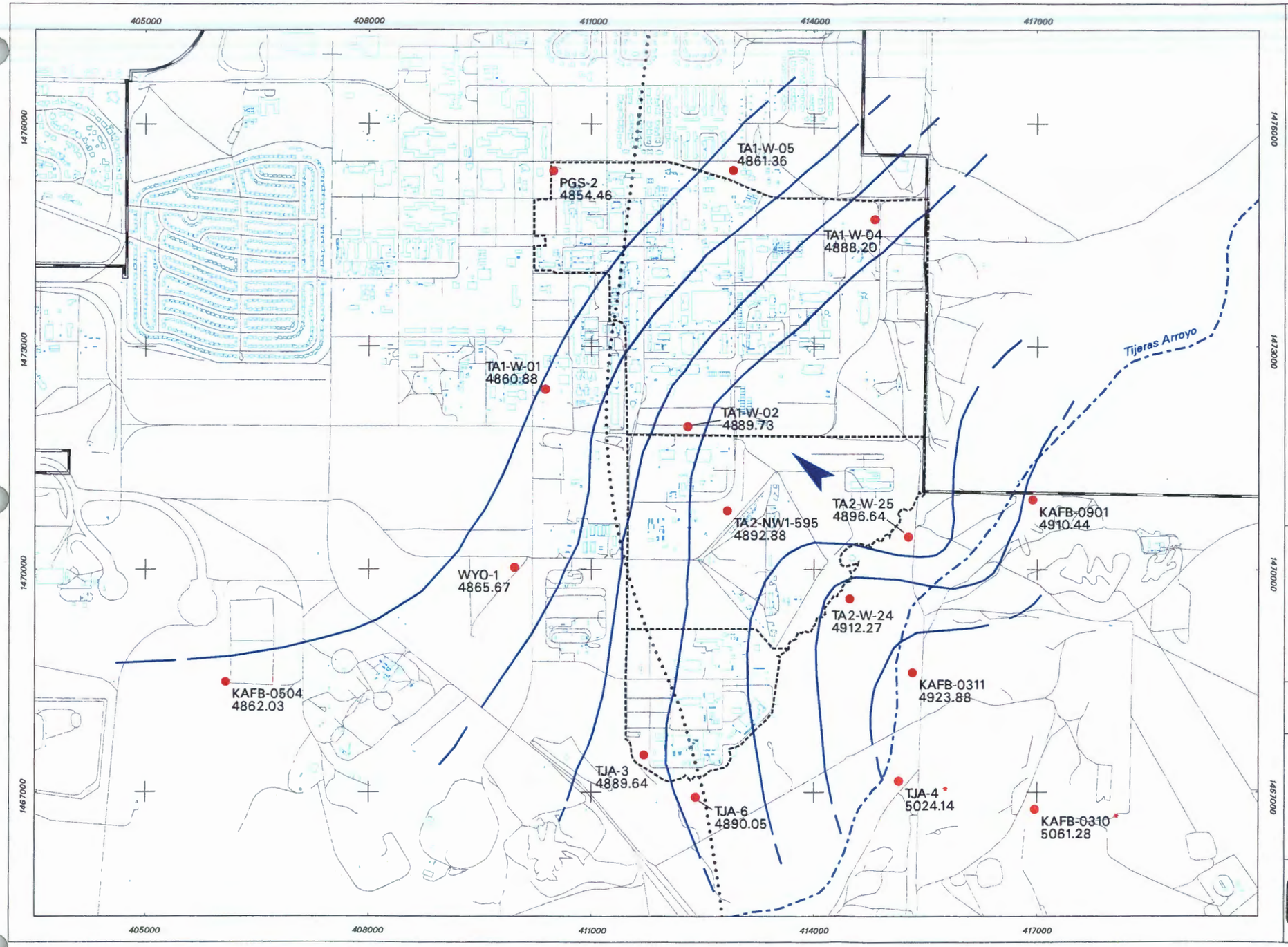
Groundwater in the SGWS is solely contained in the fine-grained alluvial fan facies, but flow in the SGWS is to the southeast, opposite to that of the regional system. This difference in the direction of groundwater flow may be governed by a combination of the interfingering facies, bedding dip associated with the syncline, and unique recharge sources. Bedding dip does not appear to be the sole control of groundwater flow direction because the potentiometric-surface contours (Figure 3.1.3-4) are not directly parallel to the structure contours (Figure 3.1.3-2).

As shown in Figures 3.1.3-5 and 3.1.3-6, groundwater in the SGWS appears to merge with that of the regional aquifer. The rate of convergence between the SGWS and the regional aquifer is shown by an isopach of the distance between the upper surfaces of the two systems (Figure 3.1.3-6). The distance decreases from greater than 260 ft in the northwest portion of the study area to less than 160 ft in the southeast portion, as the two groundwater systems converge near the southeast corner of the TAG study area in the vicinity of the KAFB Golf Course and KAFB Landfill LF-08. The intermediate water-bearing zone screened by monitoring well TJA-4 provides additional evidence that groundwater in the SGWS serves to recharge the regional aquifer in the area of convergence.

3.2 Groundwater Monitoring Well Network

Section 3.2 summarizes the current status of the TAG monitoring well network. Table 3.2-1 summarizes the monitor well data, and includes four KAFB wells that are part of the water-level measurement program. All the SNL/NM wells listed in Table 3.2-1 are used for both water-level measurements and water-quality monitoring.

Water level data at SNL/NM and KAFB are collected by several organizations. Quarterly and monthly water level data are summarized in annual groundwater surveillance reports consolidated by the SNL/NM Groundwater Protection Program (Department 3121, formerly Department 7131) that are submitted to the NMED and the EPA. For the TAG investigation, water levels from monitoring wells are currently measured on a monthly basis. The SNL/NM wells in this network were installed from 1992 through 2000; the wells installed from 1992 to 1995 were part of investigations of TA-II or the SWHC. Since 1997, wells in the study area



Legend

- Monitoring Well - with groundwater elevation (ft, amsl)
- Groundwater Flow Direction
- Groundwater Elevation Contours (10-ft interval, Dashed = approx.)
- Eastern Limit of Ancestral Rio Grande Facies
- Building
- Surface Drainage
- Tech Area Boundary
- Roadway
- KAFB Boundary

* Note: TJA-4 & KAFB-0310 are completed in intermediate-water bearing zones, and are not used for contouring.

0 1400 2800
Scale in Feet

0 336 672
Scale in Meters

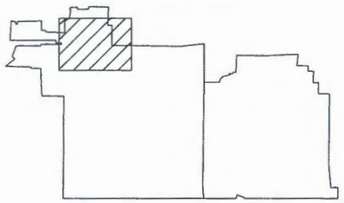


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Figure 3.1.3-3
Tijeras Arroyo
Goundwater Investigation
Potentiometric Surface Map for the Regional Aquifer
(May 2001)

Transverse Mercator Projection, New Mexico State Plane Coordinate System, Central Zone, 1927 North American Horizontal Datum, 1929 North American Vertical Datum

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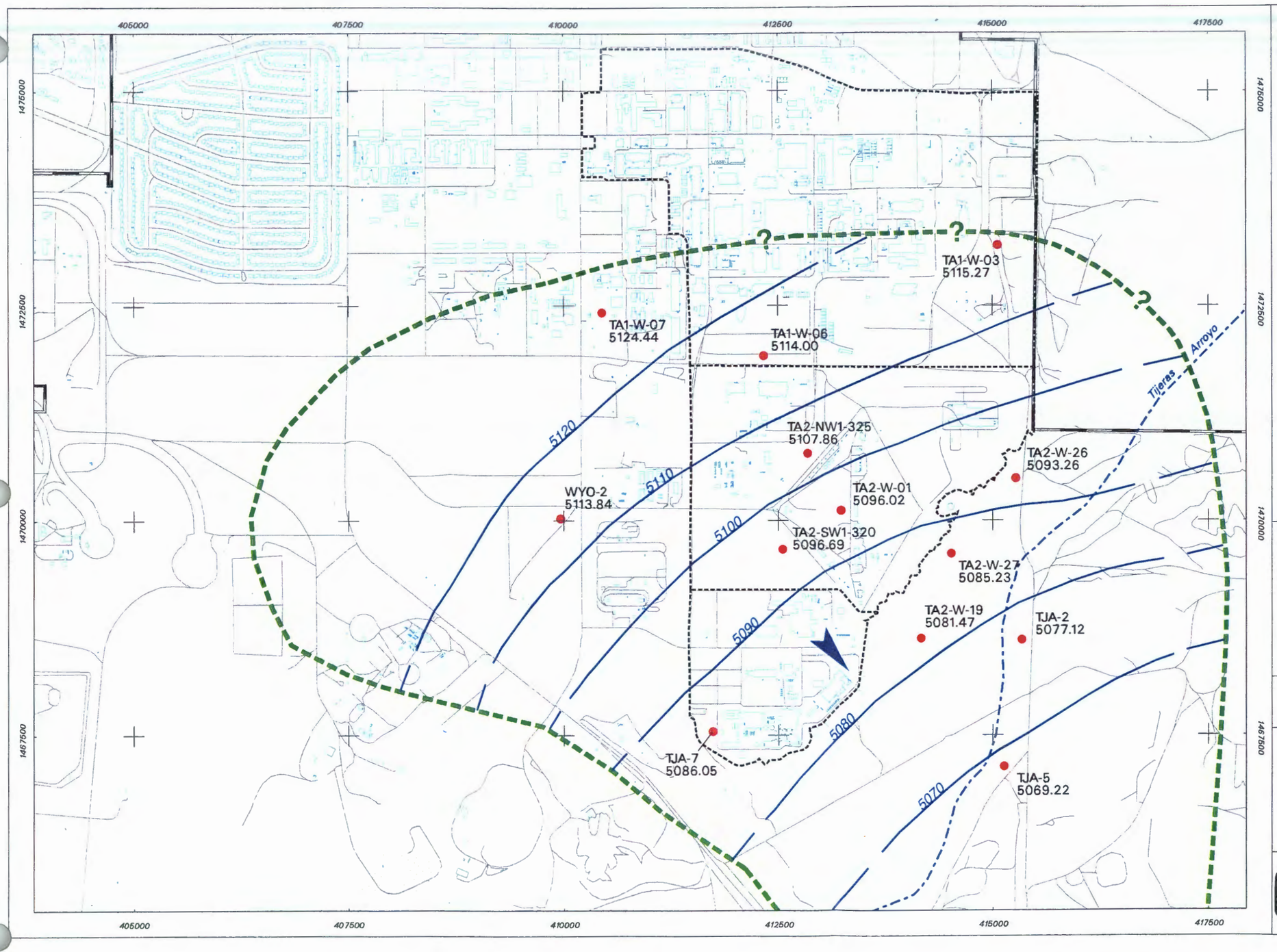

Legend

- Monitoring Well - with groundwater elevation (ft, amsl)
- Groundwater Flow Direction
- Groundwater Elevation Contours (10-ft interval, Dashed = approx.)
- Extent of Shallow Groundwater System (Queried Where Uncertain)
- Building
- Surface Drainage
- Tech Area Boundary
- Roadway
- KAFB Boundary

0 1200 2400
Scale in Feet

0 288 576
Scale in Meters

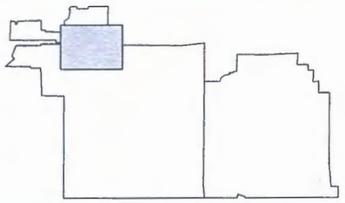

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Figure 3.1.3-4
Tijeras Arroyo Groundwater Investigation Potentiometric Surface Map for the Shallow Groundwater System (May 2001)

Transverse Mercator Projection, New Mexico State Plane Coordinate System, Central Zone, 1927 North American Horizontal Datum, 1929 North American Vertical Datum

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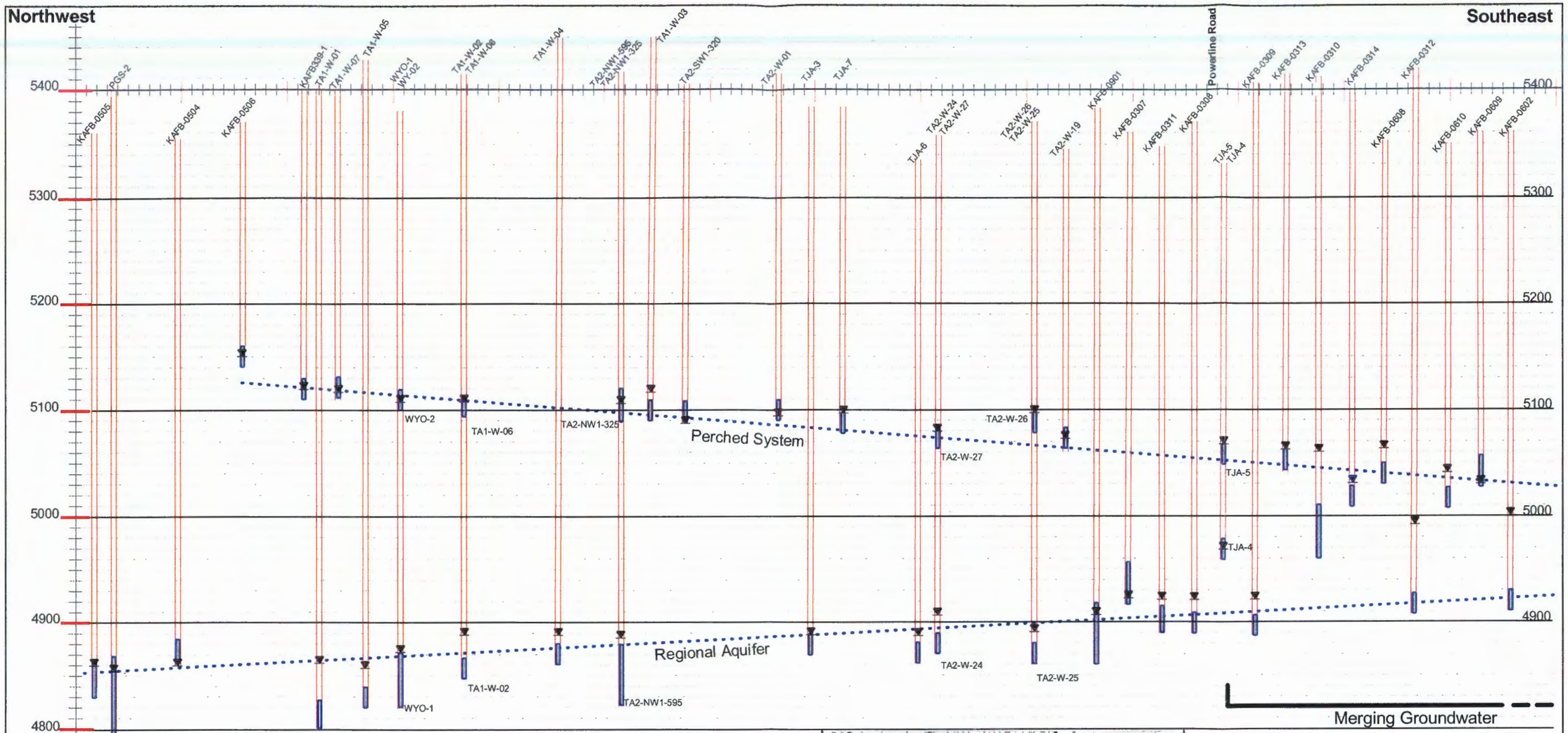

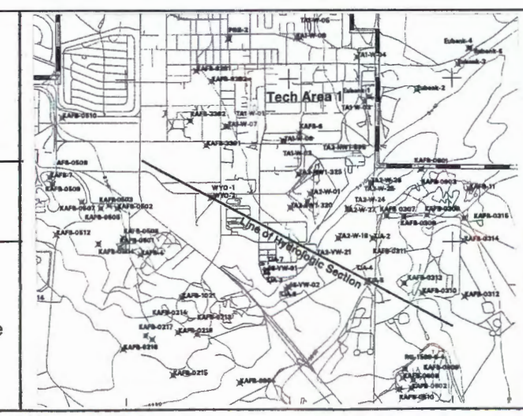

Figure 3.1.3-5
TAG Hydrologic Section

Legend

- Monitoring Well
- Well Screen
- Water Level Elevation (ft amsl May 2001)
- Projected Potentiometric Surface

Notes:
1. Monitoring wells are projected perpendicular onto a N 60 degree W trending line that passes directly through TJA-4 and WYO-1/WYO-2.
2. ft amsl = feet above mean sea level.
3. Well locations are depicted on Figure 3.2-1.

Approximate Scale:
Horizontal 0 50
Vertical 0 100

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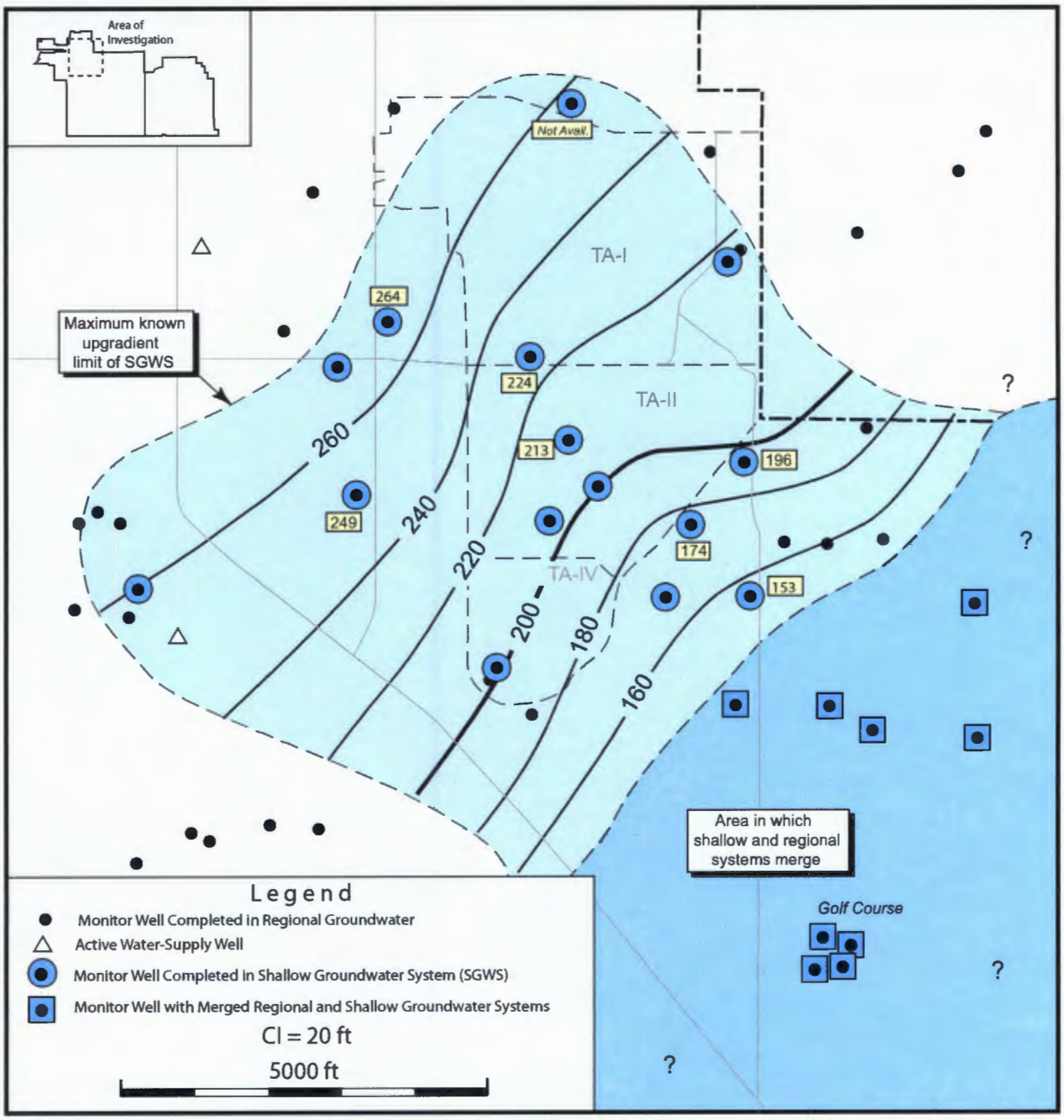


Figure 3.1.3-6

Isopach Map of Vertical Distance between Shallow Groundwater System and Regional Aquifer, Tijeras Arroyo Area (modified from Van Hart, June 2001)

Table 3.2-1
Tijeras Arroyo Groundwater Investigation—
Monitoring Well Hydrograph Summary (Water Level Trends)

Well ID	Screened Interval	Installation Date	Depth to Water (ft btoc) May 2001	Water Level Elevation (ft amsl) May 2001	Maximum Elevation		Minimum Elevation		Overall Groundwater Elevation Trend (Increasing/ Decreasing)	Approximate Rate of Trend (ft/year)	KAFB/COA Pumping Cycles Apparent (Yes/No)
					Date	ft amsl	Date	ft amsl			
KAFB-0310	Regional (?)	27-Aug-91	352.53	5061.28	May-01	5061.28	Jul-97	5055.20	Increasing	+ 1.5	No
KAFB-0311	Regional	24-Jul-92	426.74	4923.88	Apr-01	4923.94	Jan-97	4920.49	Increasing	+ 0.7	No
KAFB-0504[a]	Regional	21-Jan-90	492.19	4862.03	Sep-97	4866.71	Mar-01	4861.33	Decreasing	- 1.5	No
KAFB-0901	Regional	15-Mar-90	476.69	4910.44	Mar-01	4910.64	Jul-97	4907.75	Increasing	+ 0.7	No
PGS-2	Regional	22-Sep-95	551.16	4854.46	May-96[b]	4853.82	Aug-98	4849.51	Decreasing [c]	- 0.5	Yes
TA1-W-01	Regional	22-Mar-97	540.27	4860.88	Apr-97	4863.99	Jan-01	4860.30	Decreasing	- 0.9	Yes
TA1-W-02	Regional	27-Feb-98	524.22	4889.73	Mar-01	4889.96	Aug-98	4884.08	Increasing	+ 0.6	Yes
TA1-W-03	SGWS	27-Jan-98	339.09	5115.27	Mar-98	5116.83 [d]	Jan-01	5115.15	Decreasing	- 0.6	No
TA1-W-04	Regional	6-Oct-98	570.11	4888.20	Mar-01	4888.30	Dec-98	4883.84	Increasing	+ 1.8	No
TA1-W-05	Regional	16-Nov-98	571.75	4861.36	Mar-01	4861.91	Jul-99	4856.66	Increasing [c]	+ 0.6	Yes
TA1-W-06	SGWS	27-Feb-98	300.43	5114.00	Mar-98	5115.08	Aug-00	5113.74	Decreasing	- 0.4	No
TA1-W-07	SGWS	13-Aug-98	277.81	5124.44	Dec-98	5126.89	Jan-01	5124.17	Decreasing	- 1.1	No
TA2-NW1-325	SGWS	1-Apr-93	311.41	5107.86	Oct-93	5110.77	Apr-97	5107.03	Decreasing	- 0.4	No
TA2-NW1-595	Regional	27-Jul-93	525.71	4892.88	Mar-01	4893.07	Aug-93	4884.99	Increasing	+ 0.8	Yes
TA2-SW1-320	SGWS	30-Nov-92	312.49	5096.69	Mar-97	5098.93	Jan-01	5096.41	Decreasing	- 0.2	No
TA2-W-01	SGWS	27-Jun-94	321.30	5096.02	Sep-94	5097.83	Nov-99	5095.74	Decreasing	- 0.2	No
TA2-W-19	SGWS	9-Nov-95	267.07	5081.47	Nov-00	5081.92	Jan-97	5080.58	Increasing	+ 0.1	No
TA2-W-24	Regional	9-Feb-98	448.72	4912.27	Apr-01	4912.33	Apr-98	4909.84	Increasing	+ 0.8	No
TA2-W-25	Regional	1-Apr-97	475.55	4896.64	Mar-01	4896.98	Oct-97	4891.67	Increasing	+ 1.3	Yes
TA2-W-26	SGWS	19-Jan-98	279.84	5093.26	Nov-00	5093.52	Apr-98	5092.82	Even [e]	--	No
TA2-W-27	SGWS	9-Feb-98	274.95	5085.23	Nov-00	5085.66	Apr-98	5084.74	Even [e]	--	No
TJA-2	SGWS	12-Jul-94	273.41	5077.12	Nov-00	5077.44	Nov-95	5075.63	Increasing	+ 0.3	No
TJA-3	Regional	31-Aug-98	498.25	4889.64	Aug-99	4890.02	Jan-01	4889.31	Even [e]	--	No
TJA-4	Regional (?)	4-Aug-98	314.35	5024.14	Apr-01	5024.19	Dec-98	5020.62	Increasing	+ 1.4	No
TJA-5	SGWS	7-Aug-98	269.57	5069.22	Mar-01	5069.39	Feb-99	5067.21	Increasing	+ 0.9	No
WYO-1	Regional	27-Aug-95	524.16	4865.67	May-96	4868.93 [f]	Jan-01	4864.75	Decreasing	- 0.8	No
WYO-2	SGWS	27-Aug-95	275.99	5113.84	Dec-95	5118.13	Mar-01	5113.79	Decreasing	- 0.8	No

[a]KAFB-0504 was used to measure water levels beginning in August 1999 due to KAFB-0501 being plugged and abandoned due to declining water levels.
[b]Suspect measurements possibly due to poor well development, omitted first 3 data points.
[c]KAFB/COA pumping cycles partially obscure a trend.
[d]Two anomalous data points removed from the data set.
[e]Trend line too flat to determine trend.
[f]Suspect measurements possibly due to poor well development, omitted first 2 data points.
amsl = Above mean sea level.
btoc = Below top of casing.
COA = City of Albuquerque.
ft = Foot (feet).
ID = Identification.
KAFB = Kirtland Air Force Base.
SGWS = Shallow Groundwater System.
(?) = Uncertainty exists as to the unit of completion, may represent an intermediate water-bearing unit associated with the merger of the SGWS and the regional aquifer.
-- = Indeterminate trend.

were installed according to monitoring well installation procedures and the sampling methods discussed in Section 5.5 of the GIP (SNL/NM March 1996) as well as in SNL/NM ER Project field operating procedures (FOPs). Section 5.5 of the GIP also addresses the rationale that determined the well locations (Figure 3.2-1). The overall intent of drilling these wells was to establish a groundwater-monitoring network for detecting possible contaminants in the SGWS and the regional aquifer. In this report, monitoring wells and associated data through May 2001 are evaluated. Eleven of the wells are completed in the regional aquifer. Shallow groundwater horizons were identified during drilling for some of the regional aquifer wells. As a result, 12 shallow companion wells were installed and completed in the first shallow groundwater horizon at locations within 40 ft laterally from each of the deeper wells. Five soil-vapor monitoring wells also have been installed.

In May 2001, the depth to water in the regional wells range from 427 to 572 ft bgs and in the SGWS from 267 to 339 ft bgs (Table 3.2-1). Two wells (TJA-4 and KAFB-0310) with depths to water of 314 and 352 ft bgs, respectively, are interpreted to be completed in intermediate water–bearing zones below the SGWS. These depths to water are anomalous given their locations, and until additional evaluation of the hydrologic data is performed, these wells should be considered as intermediate groundwater wells between the regional aquifer and the SGWS. For purposes of discussion, wells TJA-4 and KAFB-0310 have been grouped together with the regional aquifer wells. The monthly water-level data (well number, date collected, depth to water, and groundwater elevation) are discussed in Section 3.3; well hydrographs are presented in Annex B.

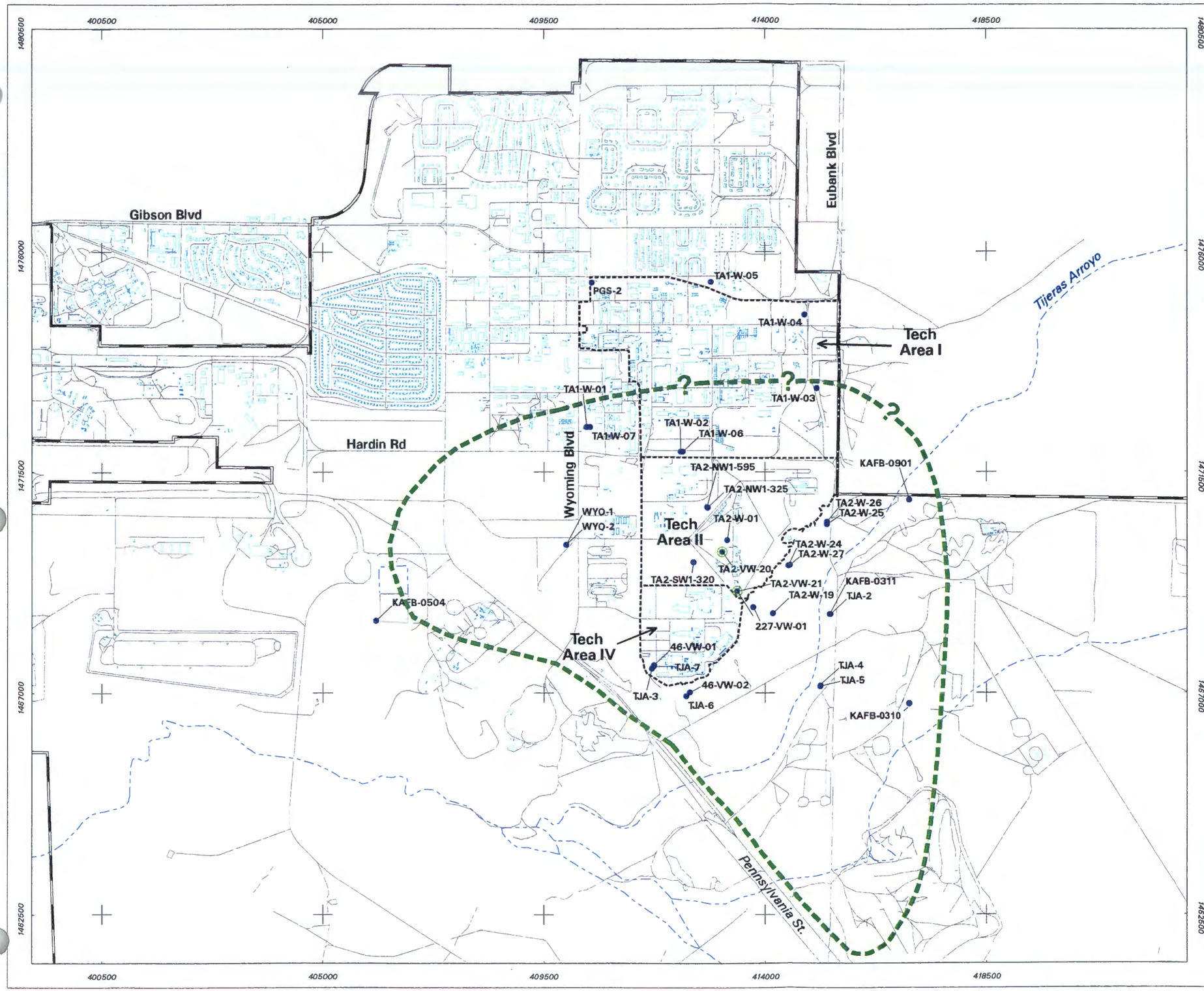
The TAG hydrologic section is presented as Figure 3.1.3-5 and approximates a northwest-to-southeast-trending line of section across the study area. The section depicts the ground surface, location of the wells, depth of the screened intervals and the elevations of groundwater as of May 2001. Most of the monitor wells do not fall exactly on the line, but have been projected into the line. The section clearly demonstrates that the SGWS potentiometric surface dips to the southeast and the regional-aquifer potentiometric surface dips to the northwest. Also, as briefly discussed above and further evaluated in Section 3.3, the two groundwater systems are apparently merging in the southeast portion of the TAG study area.

3.3 Hydrology

Section 3.3 discusses the regional and local hydrologic setting, aquifer parameters, flow gradients, and estimated flow velocities. Sections 3.3.1 and 3.3.2 summarize the regional and local hydrologic settings pertaining to the TAG Investigation. Section 3.3.3 summarizes the TAG conceptual model and Section 3.3.4 summarizes the regional-aquifer characteristics (flow direction, gradients, elevation changes, aquifer parameters, flow velocities, and modeling results). Section 3.3.5 summarizes the SGWS characteristics (flow direction, gradients, elevation changes, aquifer parameters, flow velocities, and modeling results).

3.3.1 Regional Hydrology

The regional hydrology in the vicinity of SNL/NM has been thoroughly described in SWHC reports (SNL/NM February 1998; SNL/NM February 2001). SNL/NM is located in the eastern portion of the Albuquerque Basin, a tectonic and hydrologic feature. The COA and KAFB rely heavily on groundwater in this basin as the principal water supply. The Albuquerque Basin (also



Legend

- Monitoring Well
- Soil Vapor Well
- Extent of the Shallow Groundwater System (Queried Where Uncertain)
- Roadway
- Building
- Surface Drainage
- Tech Area Boundary
- KAFB Boundary

0 2000 4000
Scale in Feet

0 480 960
Scale in Meters

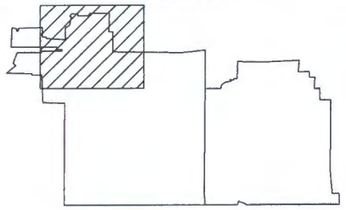


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Figure 3.2-1
Tijeras Arroyo Groundwater Investigation Monitoring Well Locations (May 2001)

Transverse Mercator Projection, New Mexico State Plane Coordinate System, Central Zone, 1927 North American Horizontal Datum, 1929 North American Vertical Datum

		MAPID=030022
Unclassified		SNL GIS ORG. 6135
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known as the Middle Rio Grande basin in some literature) covers approximately 2,100 square miles of central New Mexico. The basin is 70 miles long and ranges up to 40 miles wide near the center of the basin.

The major fresh-water aquifers in the basin are located within the Upper Santa Fe Group sediments, specifically the fluvial and alluvial fan facies. Local cones of depression, associated with the large groundwater withdrawal at the COA well fields, have altered the direction of groundwater flow around these fields. Seasonal fluctuations in the water table elevation are common, and groundwater mining has led to significant long-term declines of the regional water table superimposed over seasonal fluctuations. The long-term water table decline is not horizontally uniform and is most pronounced along the eastern boundary of the basin due to population centers, facies distribution, and effects attributable to basin-bounding faults. The area of largest water-level decline is immediately north of KAFB, where water levels have decreased approximately 140 ft in the past 40 years (Thorn et al. 1993).

3.3.2 Local Groundwater Setting

On KAFB, the basin-bounding fault system described in Section 3.1.3 divides the groundwater system into three distinct hydrogeologic regions (SNL/NM February 1998). Hydrogeologic Region 1 underlies the TAG study area, is located west of the fault system, and is characterized by Upper Santa Fe Group sediments. Hydrogeologic Region 2 is associated with the fault system and is characterized by both unconsolidated and bedrock water-bearing units. Hydrogeologic Region 3 is located east of the fault system and is characterized by predominantly deep-fractured bedrock aquifers in the Manzanita Mountains. Regions 2 and 3 have little bearing on the TAG study area and are therefore not discussed any further in this report.

The water-bearing units in Region 1 are present within unconsolidated to partially indurated, porous-media. Sediments include a mix of coarse- to fine-grained sands, silts, and clays that create a complex framework with highly variable bedding thickness and continuity. The sedimentary packages and the associated structural controls on groundwater flow are discussed above (Section 3.1.3). Groundwater flow direction, gradients, and elevations are discussed below for both the regional aquifer and the SGWS.

3.3.3 TAG Conceptual Model

The TAG conceptual model is shown in Figure 3.3.3-1 and represents a vertical section that trends from northwest to southeast, which approximates the direction of groundwater flow in the SGWS. Illustrated on the conceptual model are the various components of the hydrogeologic setting of the TAG study area. These components are discussed throughout this chapter.

The TAG conceptual model shows that the vadose zone is thinner in the central TAG study area where the SGWS is present. The SGWS is present only across the north-central part of KAFB within thin lenses of alluvial fan sediments. Discontinuous, yet overlapping multiple lenses of unsaturated alluvial fan sediments serve as a perching horizon beneath the SGWS. Deeper still, the regional aquifer is more extensive both laterally and vertically. Groundwater in the SGWS merges with the regional aquifer in the southeast portion of the study area in the vicinity of well TJA-4.

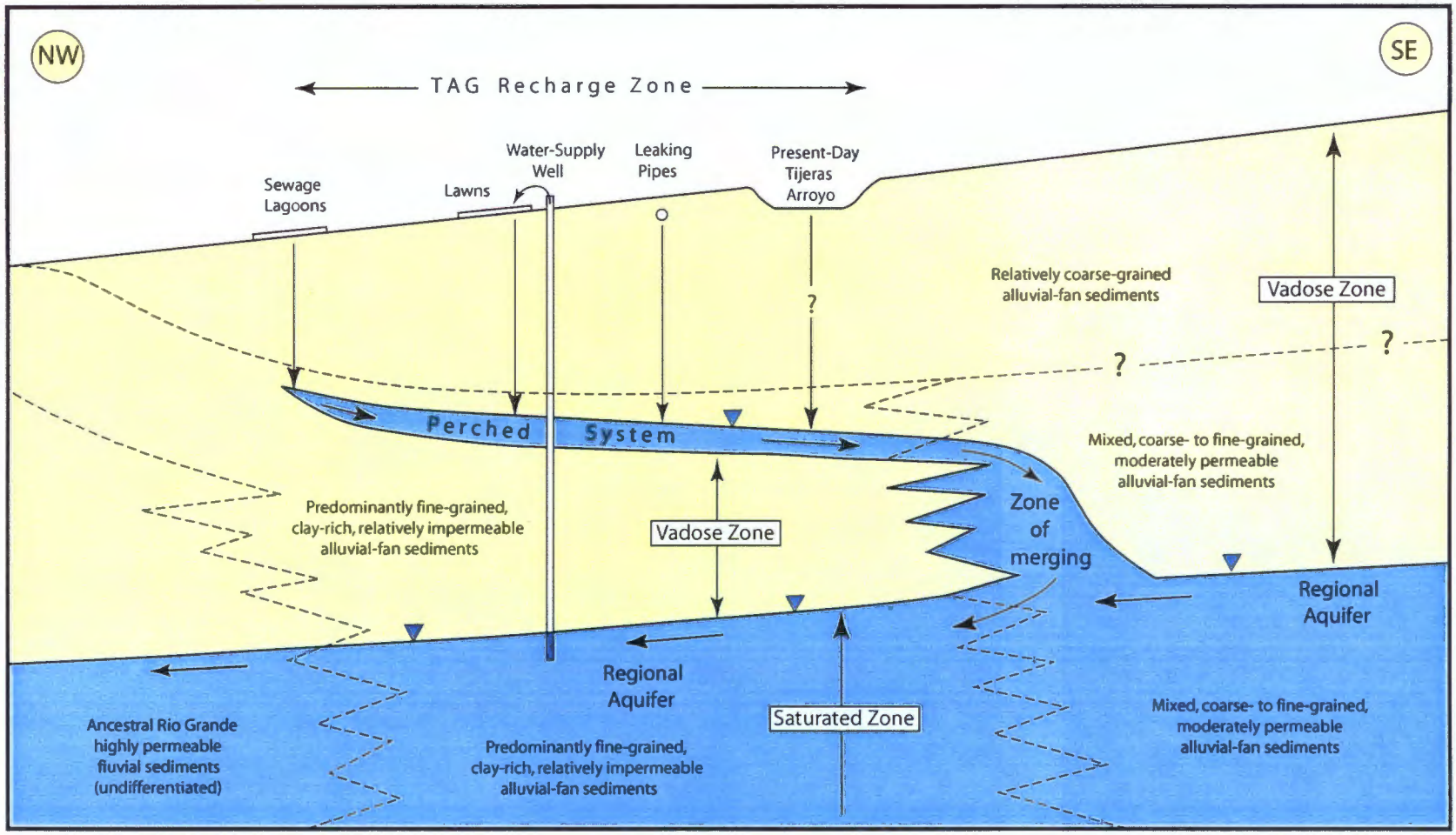


Figure 3.3.3-1. Schematic TAG Conceptual Model

The TAG conceptual model depicts two principal sedimentary facies. The ARG fluvial facies exhibits complex interfingering with the alluvial fan facies along a north-south line approximated by Wyoming Boulevard. The ARG fluvial facies typically:

- are coarse-grained with high (sand + gravel) to (silt + clay) ratios
- are well sorted
- exhibit relatively continuous and well-connected bedding
- have moderate to high hydraulic conductivities (10 to 150 ft/day)
- were deposited in north-south trending, laterally continuous paleochannels that are analogous to the modern Rio Grande.

In contrast, the alluvial fan facies typically:

- are fine-grained with moderate (sand + gravel) to (silt + clay) ratios
- are poorly sorted with greater heterogeneity
- exhibit lenticular, moderately connected bedding
- have low to moderate hydraulic conductivities (0.01 to 50 ft/day)
- were deposited in east-west trending, highly braided paleochannels that were developed on the mountain-front piedmont.

The SGWS is restricted to the alluvial fan facies and exhibits the following characteristics:

- Unconfined (water table) conditions
- Uppermost saturated interval of only about 10 to 30 ft thick
- Groundwater flow direction primarily to the southeast
- Average lateral gradient of approximately 0.008 ft/ft
- Not used for water supply
- Limited lateral extent across north-central KAFB
- Geochemical signatures variable between well locations with high chloride, nitrate, and sulfate concentrations
- Recharged by both artificial (leaking water-supply/sewer lines, the golf course, and the former sewage lagoons) and natural sources (Tijeras Arroyo and possibly ancestral Tijeras Creek)

- Principal hydrologic controls: (1) the stratigraphic dip of the alluvial fan sediments; (2) stratigraphic variations (such as braided paleochannels); and (3) multiple recharge locations in the northwest part of the TAG study area.

The regional aquifer is present in both the ARG fluvial facies and alluvial fan facies, and exhibits the following characteristics:

- Unconfined to semiconfined conditions
- In excess of 1,000 ft thick across much of the study area
- Groundwater flow direction primarily to the northwest toward water supply wells
- Average lateral gradient of approximately 0.009 ft/ft, but steeper near water-supply wells
- Utilized for water supply by KAFB, COA, and VA
- Fluctuating water levels because of seasonal pumping demand
- Laterally extensive across the Albuquerque Basin
- Geochemical signatures consistent between well locations with low calcium concentrations but high bicarbonate/alkalinity concentrations
- Recharged by natural sources, including mountain-front flow, current-day Tijeras Arroyo, and the SGWS
- Principal control upon groundwater flow direction: combined effect of the KAFB, COA, and VA water-supply wells.

3.3.4 Regional Aquifer

As described above, the water levels in the regional aquifer have been measured monthly as part of the TAG Investigation. The results of these measurements are presented below.

3.3.4.1 Groundwater Flow

Groundwater in the regional aquifer is encountered from depths of 427 ft bgs in the southeastern portion of the study area (at KAFB-0311) to 572 ft bgs in the northern portion (at TA1-W-05). The May 2001 potentiometric surface map of the regional aquifer for the TAG study area is shown in Figure 3.1.3-3. As discussed above, TJA-4 and KAFB-0310 were originally installed (and are commonly referred to) as regional-aquifer wells. Because the wells had highly anomalous groundwater elevations, each was excluded from contouring the potentiometric surface of the regional aquifer shown in Figure 3.1.3-3.

As shown in Figure 3.1.3-3, groundwater flow is to the northwest toward the northern boundary of KAFB (toward the COA and KAFB production wells). This general flow direction is locally

perturbed in the vicinity of TA2-W-25, with the elevation anomalously low (on the order of 10 to 20 ft with respect to adjacent wells).

Toward the western portion of the study area in the vicinity of KAFB-0504 near the inactive KAFB sewage lagoons, the flow becomes more northerly. This is consistent with the interpretation made in the SWHC reports (SNL/NM February 1998; SNL/NM February 2001) as regional groundwater in the ARG facies moves readily toward COA and KAFB production wells along a zone of higher conductivity.

3.3.4.2 Groundwater Gradients

Based upon the potentiometric surface contours (Figure 3.1.3-3), the horizontal gradient in the regional aquifer is northwest at approximately 0.0084 ft/ft. This is calculated using the furthest upgradient well (KAFB-0311) and the furthest downgradient well (PGS-2), producing 69.42 ft of groundwater elevation change over a distance of 8,260 ft. Slightly steeper gradients are locally represented, such as in the area of the southeastern portion of the site. For example, between well KAFB-0311 and well TJA-6 the groundwater elevation changes 33.83 ft over a distance of 3,360 ft, equaling a gradient of 0.01 ft/ft.

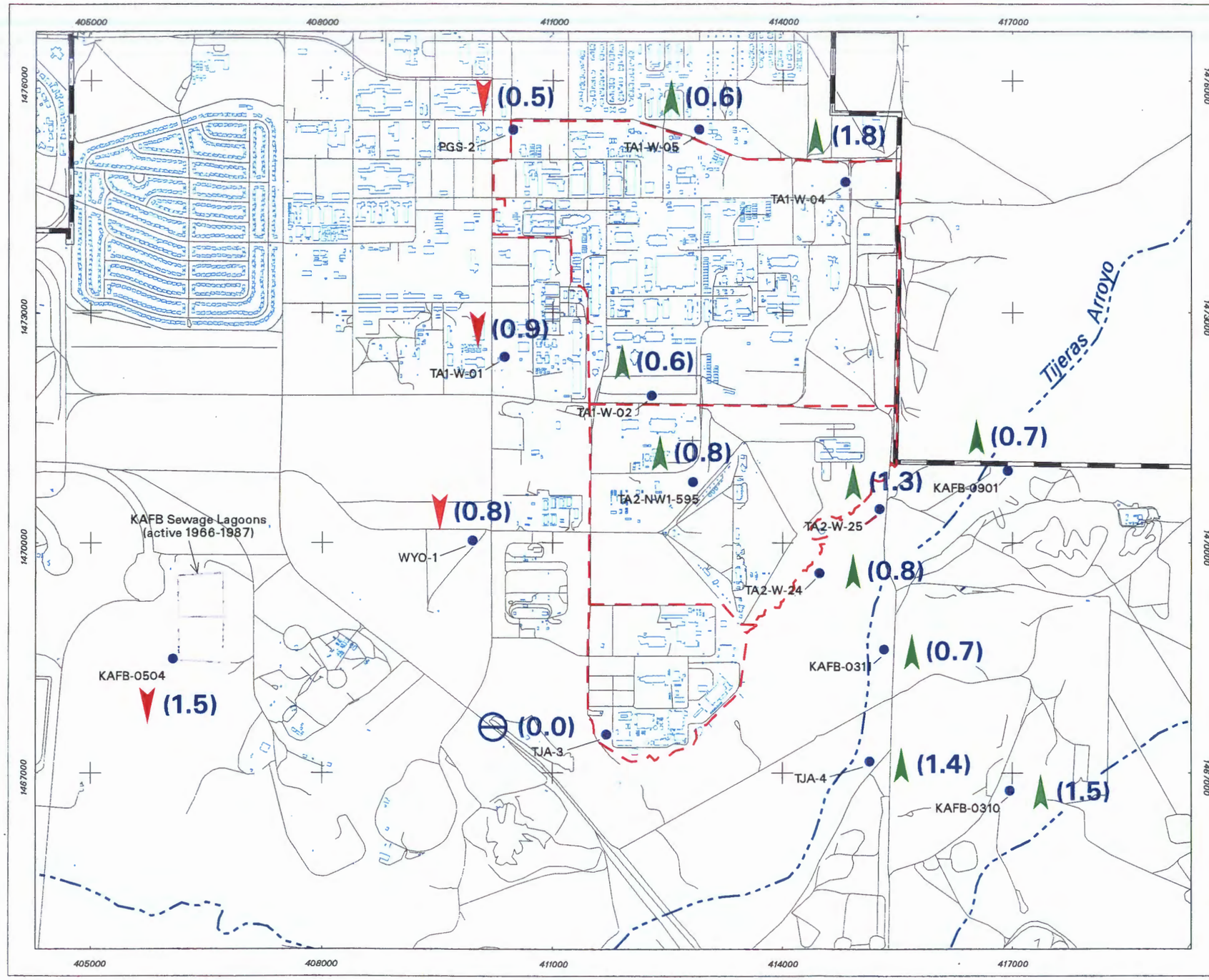
Because all regional-aquifer wells are completed at the water table, vertical flow gradients within the aquifer cannot be estimated, but are assumed to be downward. Vertical flow gradients have been estimated from several well pairs in the TA-III/V area two miles south of the TAG study area. Downward gradients are dependent on the lithofacies of the aquifer materials and range widely from 0.001 to 0.88 ft/ft. Well pairs completed in the ARG facies produce the lower gradients, and well pairs completed in the alluvial fan deposits have the higher gradients (SNL/NM March 1999).

3.3.4.3 Groundwater Elevation Changes

In May 2001, groundwater elevations for the regional aquifer ranged from 4,854 to 4,924 ft amsl. Hydrographs of TAG Investigation wells have been created to evaluate the long-term patterns of water levels in these wells (presented in Annex B).

Throughout the duration of the TAG Investigation, groundwater elevations in each regional-aquifer well have had variable trends ranging from a 1.5 ft per year decline to a 1.8 ft per year increase, or remaining relatively unchanged (Table 3.2-1). The maximum groundwater level decline for any of the wells was reported for KAFB-0504; the maximum groundwater level increase was reported for TA2-NW1-595. Groundwater elevations in the regional aquifer represent transient conditions as shown by the areal distribution of elevation changes (Figure 3.3.4-1).

The overall pattern is one of decreasing water levels in the northwest portion of the study area with increasing water levels in the southeast. The line of demarcation between increasing water levels and decreasing water levels approximates the eastern extent of the ARG facies in the subsurface.



Legend

- Groundwater Elevation Increasing (rate-ft/yr)
- Groundwater Elevation Decreasing (rate-ft/yr)
- Groundwater Elevation Unchanged
- Monitoring Well
- Road
- Building
- Surface Drainage
- Technical Area
- KAFB Boundary

NOTE: Groundwater Elevation Change per Well from Installation until May 2001

0 1400 2800
Scale in Feet

0 336 672
Scale in Meters

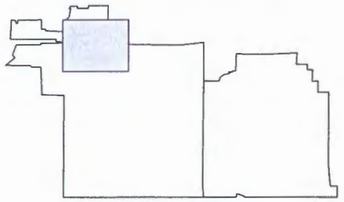


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Figure 3.3.4-1
Tijeras Arroyo Groundwater Investigation, Groundwater Elevation Change per Year for Regional Aquifer Wells

Transverse Mercator Projection, New Mexico State Plane Coordinate System, Central Zone, 1927 North American Horizontal Datum, 1929 North American Vertical Datum

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Unclassified | SNL EGIS ORG. 6135

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3.3.4.4 Aquifer Parameters

Groundwater in the Upper Santa Fe Group regional aquifer is a porous media aquifer that is generally unconfined. However, field data suggests that the uppermost portion of the aquifer is semiconfined in wells completed in the alluvial fan lithofacies (SNL/NM February 1998). This was evident in wells (e.g. TA1-W-01) where the water level rose above the depth where the saturated zone was first encountered during drilling.

Recent hydrologic investigations of the regional aquifer were completed in association with rehabilitation and overpumping of production well KAFB-11 near the northeast corner of the study area (Chace June 2001). Although the water level data were not of sufficient quality to perform quantitative analyses, a few inferences can be made from the results:

- The groundwater system in the alluvial fan facies in the vicinity of KAFB-11 is quite complex and cannot be approximated by a radial flow conceptual model.
- No determination could be made whether the West Sandia Fault produced an aquifer boundary condition.
- During pumping of KAFB-11, only 2 of the 16 instrumented wells (TA2-NW1-595 and TA2-W-25) unequivocally showed a response.
- Wells much closer than TA2-NW1-595 did not respond to pumping of KAFB-11, which leads to the assumption that TA2-NW1-595 and KAFB-11 are preferentially connected hydraulically, possibly due to an east-west trending paleochannel that subparallels Tijeras Arroyo (Chace June 2001).

Although the recent aquifer test did not produce quantitative data, hydraulic conductivity data for the regional aquifer are available from aquifer pumping tests and slug tests performed on wells in other parts of KAFB. The hydraulic conductivities determined for the ARG facies and the alluvial fan facies range from 0.2 to 121.5 ft/day, and .001 to 44.7 ft/day, respectively (SNL/NM February 1998).

3.3.4.5 Groundwater Flow Velocities

Because of the lack of TAG-specific hydrologic data such as pump tests and slug tests, groundwater velocities were not calculated for either the SGWS or regional aquifer. Instead, groundwater velocities for the TAG study area have been inferred from studies conducted for TA-III/V and scattered locations across KAFB. Using the Darcy flow velocity equation, groundwater-flow velocities for the TA-III/V area range from 4 to 10 ft/year (yr). This differs significantly from the horizontal flow velocities calculated for other portions of SNL/NM, which range from 20 to 500 ft/yr (SNL/NM March 1999). It is presumed the lower range of horizontal flow velocities are from wells completed in the alluvial fan facies at TA-III/V. The maximum vertical flow velocity calculated for the TA-III/V data set ranged up to 70 ft/yr, with a more realistic average vertical flow velocity calculated of 4.3 ft/yr (SNL/NM March 1999).

3.3.4.6 Modeling Results

SNL/NM used a saturated flow model of the Albuquerque Basin developed by the U.S. Geological Survey (Tiedeman et al. 1998) to investigate the groundwater capture zones of supply wells on and near KAFB and to estimate groundwater flow directions and travel times for the regional aquifer. Groundwater flow was simulated with the MODFLOW code (McDonald and Harbaugh 1988). The MODPATH code (Pollock 1994) Version 3 was used to perform particle tracking for estimating groundwater travel times and the capture zones of groundwater supply wells.

SNL/NM modified the Albuquerque Basin model to reflect the hydrogeologic characterization results of KAFB (SNL/NM February 1998 and SNL/NM February 2001). The modifications included increasing the hydraulic conductivity of the ARG deposits, moving the eastern ARG boundary farther east, and decreasing the hydraulic conductivity of the alluvial fan deposits. (SNL/NM February 2001)

Water-Supply Well Capture Zone Analysis

To perform the capture zone analyses for the regional aquifer, imaginary parcels of water were released around a water-supply well and the computer model was run backwards in time for a maximum of 100 years. The water-supply wells selected for these capture zone analyses included several wells currently operating on and near KAFB. The results, shown on Figure 3.3.4-2, indicate the capture zones for several of the water-supply wells extend across the TAG study area.

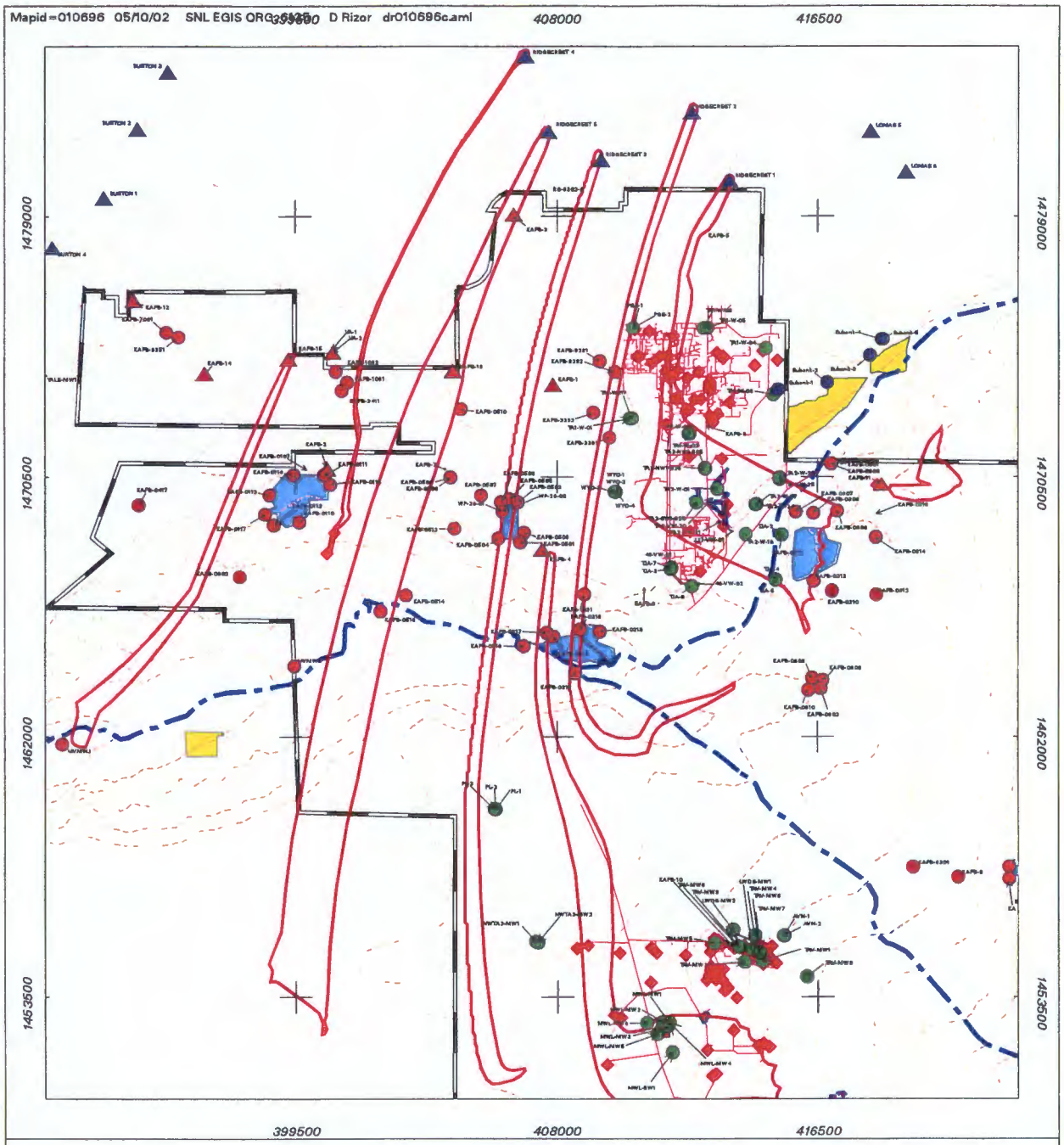
Groundwater Travel Time Analysis

To estimate groundwater flow directions and travel time, a particle tracking analysis was performed for the regional aquifer. The particles were released in the regional aquifer directly below the SGWS boundary. This analysis does not imply that flow tubes connect the SGWS and the regional aquifer; there are no known flow tubes in this area. Furthermore, this analysis cannot include the travel time of a parcel of water through the SGWS since the model was of the regional aquifer only.

Particles were released in 1975 and tracked forward until the year 2100. In the simulation, the fastest particles had travel times that reached production well KAFB-3 between 34 and 59 years. The variation exists because the particles followed different paths. The production wells impacted next were the Ridgecrest wells north of KAFB. Particles reached the Ridgecrest wells between 41 and 68 years. Because of the lower hydraulic conductivity of the alluvial fan facies, particles released on the southeastern side of Tijeras Arroyo were still not captured by production wells by the end of the model run (year 2100).

3.3.5 Shallow Groundwater System

This section discusses groundwater flow characteristics and water-level fluctuations as determined through monthly water-level measurements and continuous pressure transducer



Legend

- SNL/NM monitoring well
- KAFB monitoring well
- KAFB water supply well
- COA monitoring well
- COA water supply well
- Sanitary/Storm Drain
- KAFB boundary
- Arroyo
- 40-foot contour
- Potential SNL/NM source site
- Potential KAFB source site
- Potential COA source site
- Modeled Capture Zone (Regional Aquifer)

Figure 3.3.4-2
Modeled Capture Zones for Certain Water Supply Wells at SNL/NM and KAFB (SNL/NM February 2001)

0 2640 5280
Scale in Feet

0 633.6 1267.2
Scale in Meters

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studies. As described above, the water levels in the SGWS are measured monthly. The results of the various measurements are presented below.

3.3.5.1 Groundwater Flow

Efforts to describe the groundwater flow in the SGWS are based upon two main data sources: the development of potentiometric surface maps and a colloidal borescope study.

Potentiometric Surface Map

As shown on the potentiometric surface map (Figure 3.1.3-4), the general groundwater flow direction in the SGWS is toward the southeast. In the western portion of the study area, in the vicinity of the former sewage lagoons, the flow is more easterly. The potentiometric contours honor the SGWS elevation at KAFB-0506, which has an elevation of approximately 5157 ft amsl. In addition to modifying the direction, the gradient becomes steeper towards the former sewage lagoons, lending support to the hypothesis of groundwater mounding under the former sewage lagoons. Other recent interpretations of the potentiometric surface of the shallow system incorporate elevation data from the golf course area and, therefore, show a predominantly easterly flow direction for the southern portion of the study area (BGW September 2002).

Colloidal Borescope Study

In May and June 1999, a colloidal borescope was used to measure groundwater directions and flow velocities in 18 TAG Investigation and KAFB SGWS wells. The results were reported in "*Colloidal Borescope Investigation of the Sandia North Site, Albuquerque, New Mexico*" prepared by AquaVISION of Palisade, Colorado (AquaVISION July 1999; Annex C), herein referred to as the borescope study. It was anticipated that recent developments and improvements in colloidal borescope technology made this technique well suited for determining not only horizontal groundwater flow directions, but also which portions of the screen interval are the main water-bearing zones, and therefore the most likely zones for contaminant transport (Kearl and Roemer 1998; Kearl 1997). The colloidal borescope directly measured colloids (particles generally 1 to 10 microns in diameter) with a computer-controlled video system to infer real-time local groundwater flow direction and velocity in a monitoring well. The direction of groundwater flow was reported in degrees relative to True North.

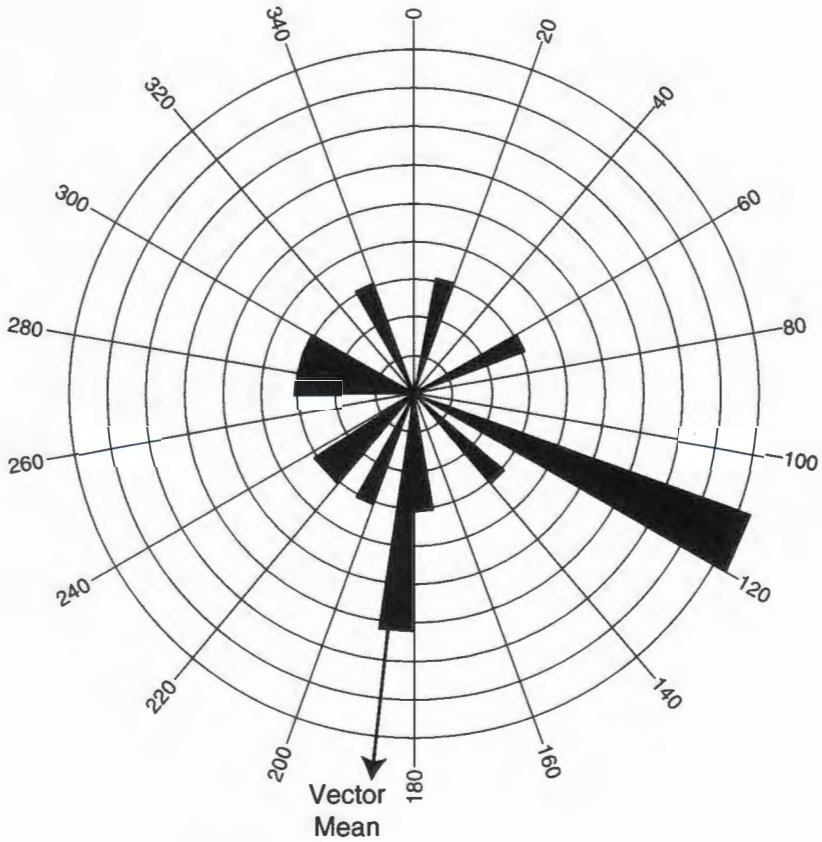
The data presented in the borescope study has been summarized in Table 3.3.5-1 and Figure 3.3.5-1. Across the TAG study area, the groundwater vector mean in the wells was southward at 0.043 centimeters per second (cm/s). Using the AquaVision "order-of-magnitude" rule, groundwater velocity in the SGWS is inferred to be approximately 0.0043 cm/s (equivalent to 12.2 ft/day) southward. In addition to the comments presented in Table 3.3.5-1, the following points were presented in the borescope study report:

Table 3.3.5-1
Tijeras Arroyo Groundwater Investigation—Colloidal Borescope Data Summary for SGWS

Well	Groundwater Flow Direction (degrees)	Groundwater Velocity (cm/s) in Well[a]	Comments
KAFB-0310	110	0.119	Large amounts of debris in the well; highest flow velocity in study.
KAFB-0313	--	0.042	Not shown on figure; flow described as west-southwest.
KAFB-0314	290	0.048	--
KAFB-0506	60	0.028	Direction may indicate radial flow from the former sewage lagoons.
KAFB-3391	--	--	Unable to measure flow; typically swirling flow at low velocities.
TA1-W-03	270	0.060	Marginal reliability due to considerable variation in direction and flow rate.
TA1-W-06	185	0.054	Moderate amount of cyclic variability due to seismic or anthropogenic sources.
TA1-W-07	224	0.038	Very few particles present.
TA2-NW1-325	280	0.046	--
TA2-SW1-320	200	0.040	Periodically disturbed by small pressure waves at approximately 12-minute intervals.
TA2-W-01	230	0.023	Significant number of particles present.
TA2-W-19	180	0.0027	Directional variability due to high gusty winds associated with a storm.
TA2-W-26	330	0.045	Moderate amount of variability.
TA2-W-27	112	0.046	Large vertical component dominated flow.
TJA-2	110	0.038	--
TJA-4	131	0.034	Possibly represents a deeper perched zone.
TJA-5	15	0.048	Unexpected northern flow direction.
WYO-2	174	0.011	Numerous particles present.
Velocity Average	--	0.043	--
Vector Mean	187	--	--

[a]According to the "order-of-magnitude" rule, actual groundwater velocities in the aquifer material are approximately one-tenth the measured value (AquaVISION July 1999).
cm/s = Centimeter(s) per second.
SGWS = Shallow groundwater system.
-- = No data was available or no comments were made.

Data from *Colloidal Borescope Investigation of the Sandia North Site, Albuquerque, New Mexico* (AquaVISION July 1999; Annex C).



Groundwater Flow in Perched Aquifer
Calculated Method.....Frequency
Class Interval.....10 Degrees
Length Interval.....Deactivated
Azimuth Filitering.....Deactivated
Data Type.....Unidirectional
Population.....16
Maximum Percentage.....18.8 Percent
Mean Percentage.....7.7 Percent
Standard Deviation.....3.74 Percent
Vector Mean.....187.18 Degrees
Confidence Interval.....74.73 Degrees
R-mag.....0.26

Figure 3.3.5-1
Tijeras Arroyo Groundwater Investigation, Groundwater Flow Direction in the Shallow Groundwater System as Determined by Colloidal Borescope Data (after AquaVISION July 1999)

- The small amount of colloidal material in TA1-W-07 is related to the coarse-grained sediments in the screened interval, whereas the other wells surveyed had "numerous" to a "significant number" of colloidal particles. This, however, conflicts with the well development log for TA1-W-07 that states the well water was extremely muddy and never cleaned up to less than 1,000 nephelometric turbidity units.

- Well TA2-W-27 shows a large vertical flow component that dominated flow. This implies that a connection from the SGWS to the regional aquifer (or perhaps an intermediate aquifer) is located nearby. However, the water chemistry data presented in Chapter 4.0 does not support this hypothesis. The water chemistry at the well pair TA2-W-27/24 does not appear to be more similar than other well pairs.

- The report concludes that the counter-intuitive flow direction (azimuth of 15°) at TJA-5 is attributed to either: 1) a nearby connection to the regional aquifer or intermediate aquifer (as also proposed for TA2-W-27), or 2) a leak through the annular seal in the paired well at this location (TJA-4). The latter argument is less probable for the following reasons: 1) the wells are almost 20 ft apart; and 2) the annular seal at TJA-4 (bentonite slurry) is the same material used at other paired well locations where anomalous flow directions are not noted. In addition, the water chemistry data presented in Chapter 4.0 does not support this hypothesis and does not appear to be more similar than other well pairs. The existence of a natural connection is more likely, as shown by the existence of an intermediate zone (TJA-4).

- The flow direction at well KAFB-0506 (azimuth of 60°) is purported to be radial flow from a groundwater mound due to historic leakage of the inactive sewage lagoons immediately adjacent to the well. This is somewhat supported by the water levels in wells in the immediate vicinity of the lagoons, as shown on the potentiometric map for the SGWS (Figure 3.1.3-4).

- The multiple anthropogenic sources, such as irrigation, may be responsible for contributing slugs of groundwater to the SGWS (as previously recognized by Wolford September 1996). If still active, these anthropogenic sources may be responsible for localized reversals in flow direction.

- The flow velocities in the preferential flow paths range from 0.011 to 0.119 cm/s (31.2 to 337 ft/day). When the "order-of-magnitude" rule of thumb is applied (AquaVISION July 1999), the average groundwater velocities for the SGWS range from 3 to 34 ft/day. These velocities are similar to the values (17.6 to 50.2 ft/day) presented in Table 3.2.4-3 of the 1995 SWHC (SNL/NM February 1998).

- The colloidal borescope study flow directions were tabulated (Table 3.3.5-1) and loaded into RockWare® RockWorks™ software package for directional analysis. As shown in Figure 3.3.5-1, the azimuth readings were used to generate a rose diagram (directional data frequency plotted as vectors). Although the plot shows a fair amount of scatter, the software calculated a vector mean of 187°. This direction coincides reasonably well with the flow direction of approximately 140° inferred from the SGWS potentiometric surface map (Figure 3.1.3-4). This suggests that although there is considerable local variations in horizontal flow

direction, the overall flow in the SGWS is toward the southeast. Both the flow directions determined from the colloidal borescope study and the inferred flow directions from the potentiometric surface maps for May 2001 indicate that groundwater in the SGWS is traveling in a complex manner in the study area.

- The significant vertical component suggests downward movement from the SGWS. This is strongly supported by the vertical hydraulic gradients of 0.91 to 0.96 ft/ft presented in Table 3.2.4-10 of the 1995 SWHC report (SNL/NM February 1998). However, the geochemical and contaminant distributions demonstrate that, in spite of the high vertical gradient, the intervening 200 or so ft of perching strata is limiting hydraulic communication between the two groundwater systems.

3.3.5.2 Groundwater Gradients

Based upon the potentiometric surface contours, the horizontal gradient in the SGWS is southeast at approximately 0.008 ft/ft. This is calculated using the furthest upgradient well (TA1-W-07) and the furthest downgradient well (TJA-5), producing 55.22 ft of vertical elevation change over a distance of 7,080 ft. Considering the elevation beneath the former sewage lagoons, steeper gradients are locally possible with gradients of 0.013 ft/ft.

Typically, the vertical groundwater flow within and between water-bearing units is indicated when there is a vertical hydraulic head at a single location. Obviously, the mere existence of the SGWS indicates that the vertical flow gradient is downward. Gradients were calculated for two wells in the study area by dividing the difference in water levels between paired wells by the vertical distance between the mid-points of the respective well screens. The vertical gradients for TJA-2 and TA2-NW1-325 are 0.95 and 0.96 ft/ft, respectively (SNL/NM February 1998).

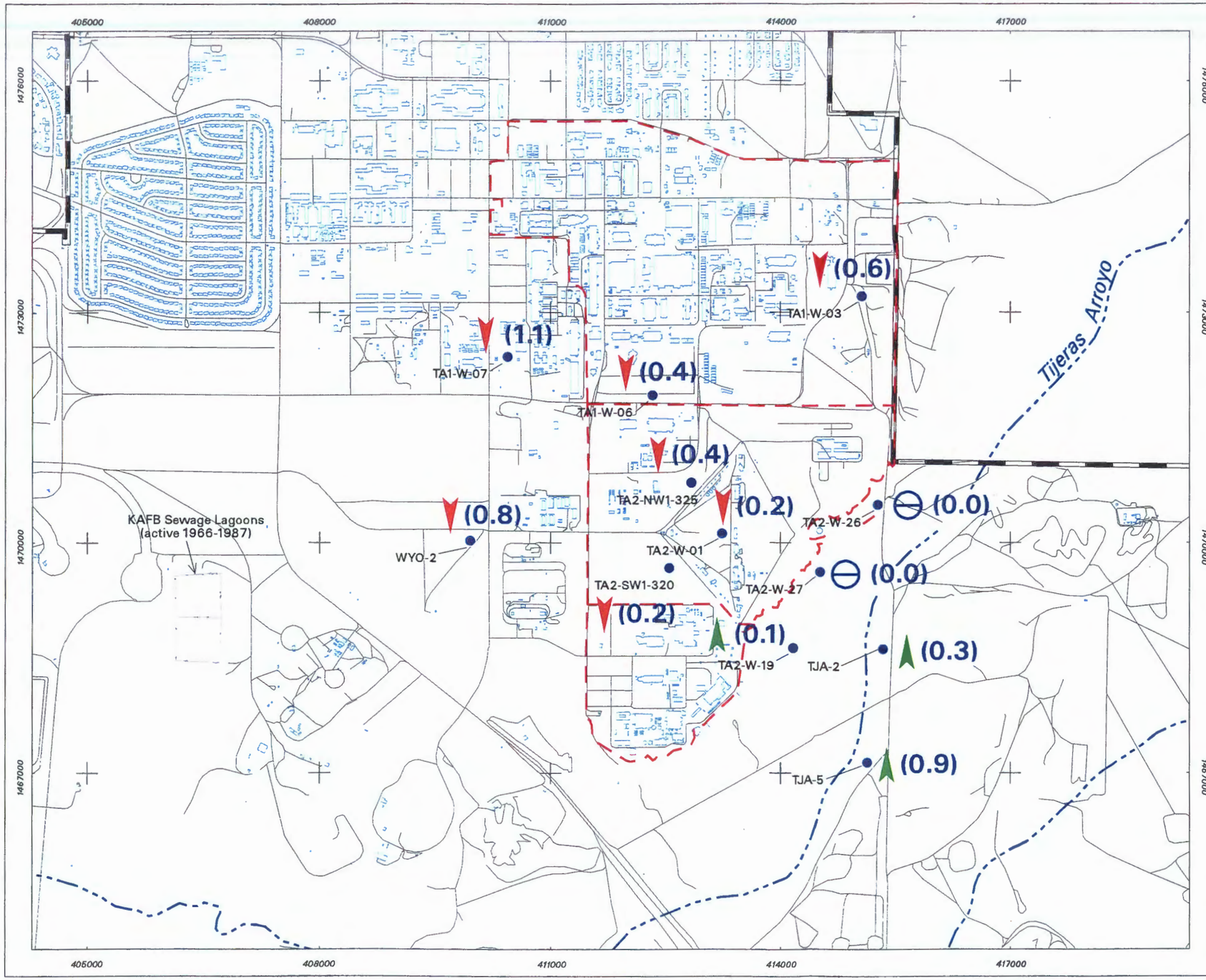
3.3.5.3 Groundwater Elevation Changes

In May 2001, groundwater elevations for the SGWS ranged from 5,124 to 5,069 ft amsl. Hydrographs of TAG Investigation wells help to evaluate the long-term patterns of water levels in these wells (Annex B). Throughout the duration of the TAG Investigation, groundwater elevations in each SGWS well show variable trends ranging from a decline of 1.1 ft/year at TA1-W-07 to an increase of 0.9 ft/year at TJA-5 (Table 3.2-1). Groundwater elevations in the SGWS represent transient conditions, as shown by the areal distribution of elevation changes (Figure 3.3.5-2). Similar to the regional aquifer, the overall pattern is one of decreasing water levels in the northwest portion of the study area with increasing water levels in the southeast.

However, the line of demarcation between increasing water levels and decreasing water levels is shifted further southeast and approximates the northern rim of Tijeras Arroyo.

3.3.5.4 Aquifer Parameters

Groundwater in the SGWS is present within a series of porous media water-bearing units perched on finer grained units of the alluvial fan facies. Recharge may be the result from both natural and manmade sources.



Legend

- Groundwater Elevation Increasing (rate-ft/yr)
- Groundwater Elevation Decreasing (rate-ft/yr)
- Groundwater Elevation Unchanged
- Monitoring Well
- Road
- Building
- Surface Drainage
- Technical Area
- KAFB Boundary

NOTE: Groundwater Elevation Change per Well from installation until May 2001.

0 1400 2800
Scale in Feet

0 336 672
Scale in Meters

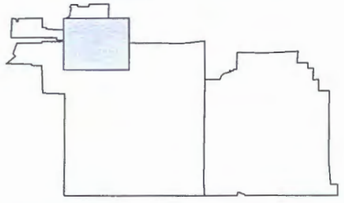


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Figure 3.3.5-2
Tijeras Arroyo Groundwater Investigation, Groundwater Elevation Change per Year Shallow Groundwater System Wells

Transverse Mercator Projection, New Mexico State Plane Coordinate System, Central Zone, 1927 North American Horizontal Datum, 1929 North American Vertical Datum

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Recent hydrologic investigations were completed in association with rehabilitation and overpumping of the production well KAFB-11 (Chace June 2001). The water level data for wells completed in the SGWS did not show any response to the KAFB-11 pumping. Further evaluation of transducer data showed that there was no apparent correlation between water level trends in wells paired in the SGWS and the regional aquifer (Chace August 2001; Annex D).

Although the recent aquifer test (Chace June 2001) did not produce any quantitative data, hydraulic conductivity data for the SGWS are available from aquifer pumping tests and slug tests performed on wells in other parts of KAFB. The hydraulic conductivities at SGWS wells are expected to approximately range from 17.6 to 50.2 ft/day (SNL/NM February 1998). This range of conductivities appears to be very high when compared to anecdotal evidence of water level recovery for SGWS wells regularly sampled. Future aquifer tests will need to be completed to verify the suspected low conductivities in SGWS wells.

3.3.5.5 Groundwater Flow Velocities

Due to the lack of TAG-specific hydrologic data, such as pump tests or slug tests, groundwater velocities were not calculated for the SGWS in the study area.

3.3.5.6 Modeling Results

Limited numerical modeling of the SGWS has been performed. An initial hydrologic evaluation of the SGWS was completed in 1996 in order to estimate aquifer parameters and identify possible sources of recharge (Wolford September 1996, as reported in SNL/NM March 1998). The data set used in 1996 for the development of the conceptual model and the numerical models was not nearly as complete as it is today. Several different simulation models were applied to determine the sources of recharge to the shallow system, but they were not ideally suited to this problem and the results of the 1996 modeling were presented only as a first approximation.

The primary usefulness of the 1996 report has been in the compilation of parameters used to develop the conceptual model for the SGWS, including estimates of the hydrologic parameters and possible sources of potential recharge. As modeled, the potential sources of recharge included the following (Wolford September 1996):

- The inactive KAFB sewage lagoons
- Subsurface flow down a hypothetical buried ancestral channel of Tijeras Arroyo
- Surface water recharge from Tijeras Arroyo within KAFB boundaries
- Excess irrigation of parks and lawns in the northern portion of the base
- Leaks from breaks in water-supply and/or sewer lines

Modeling results from this study suggest that the sewage lagoons may have been the largest historical source of water in the SGWS (Wolford September 1996).

More recently, Balleau Groundwater, Inc. was asked to refine the conceptual model and employ a more applicable numerical model (BGW September 2002). The refined conceptual model was incorporated into a variably saturated, finite-element flow and transport model using the code FEMWATER (Hsin-Chi et al. 1997). The shape of the modeling grid for the model was

based upon stratigraphy of the alluvial fan lithofacies of the Upper Santa Fe Group as described in Section 3.1.3 of this report and in earlier reports (Fritts and Van Hart March 1997).

For recharge inputs, the model included anthropogenic water sources from the KAFB sewage lagoons; three SNL/NM SWMUs (46, 165 and 227); water loss from water lines; a golf-course pond; and turf irrigation at base housing, the parade grounds, and the golf course. In addition, natural recharge was included from the Tijeras Arroyo and Arroyo del Coyote.

Both horizontal and vertical flow was included in the model. Horizontal flow is recognized by rising water levels in southeasterly portions of the SGWS. Vertical flow is indicated by water already reaching the SGWS, the multiple perched zones encountered during well drilling, and by the lack of any absolute barrier (extensive clay lenses) to vertical flow. The model reproduced the areal extent of the SGWS and supported the initial interpretation of data (Wolford September 1996) to indicate that a large fraction of water in the SGWS is derived from past and ongoing anthropogenic sources.

4.0 GROUNDWATER QUALITY

Groundwater quality in the TAG study area has been monitored since November 1992 when the first groundwater monitoring well was installed. The current groundwater quality monitoring well network consists of 25 wells in the study area (Figure 3.2-1). However, monitor wells TJA-6 and TJA-7 were installed in April 2001 and no analytical data from the two wells were available in time for this report.

The analytical data set discussed below covers the time period of November 1992 through May 2001. With few exceptions, groundwater quality at TAG wells has been monitored quarterly since each of the individual wells came on-line. The exceptions to the quarterly sampling events have occurred when sampling was temporarily suspended due to ER Project budget limitations.

Section 4.1 discusses the current groundwater-monitoring program at TAG and includes a brief discussion of sampling field procedures. Section 4.2 presents the groundwater analytical data generated to date. Section 4.3 discusses the distribution of nitrate, TCE, and selenium, which are the COCs that have been consistently detected at levels exceeding the EPA MCLs in TAG groundwater.

4.1 The Tijeras Arroyo Groundwater Investigation Monitoring Program

4.1.1 Sampling Overview

The current (May 2001) TAG monitoring program, managed by the ER Project, consists of an annual full-suite analysis conducted in June and limited-suite analyses conducted during the remaining three quarters of the year (usually September, December, and March). Annual analysis includes VOCs, Target Analyte List (TAL) metals, nitrate/nitrite, major anions, alkalinity, gamma-spec, gross alpha/beta, tritium, and isotopic uranium. Often, there is overlap between the TAG annual sampling event and the SNL/NM Groundwater Protection Program (GPP) annual sampling event at three of the wells (PGS-2, TA1-W-04, and TA-1-W-05). At these locations the analyte list expands to accommodate the GPP's more extensive list. The quarterly analyses are limited to VOCs, TAL metals, nitrate/nitrite, anions, and alkalinity. In addition to the environmental samples collected during quarterly and annual sampling events, the following quality assurance/quality control samples are used: 1) trip blanks; 2) duplicate samples; 3) matrix spike/matrix spike duplicates; and 4) confirmatory samples (off-site laboratory analysis to confirm on-site laboratory analysis).

In accordance with the GIP (SNL/NM March 1996), groundwater samples from each monitoring well were collected with a low-flow dedicated Micro Purge™ pump manufactured by QED Systems. The use of MicroPurge™ pumps was proposed in the GIP (SNL/NM March 1996). The GIP was approved by the NMED Hazardous and Radioactive Material Bureau (now known as the HWB) in 1997 (Garcia February 1997).

A variety of laboratories analyzed the groundwater samples. The on-site ER Chemistry Laboratory (ERCL) performed analyses for VOCs, TAL metals, nitrate, and anions. The on-site

Radiation Protection Sample Diagnostics Program laboratory performed gamma spectroscopy analysis for radionuclides. The off-site laboratory (General Engineering Laboratories [GEL]) analyzed the groundwater samples for semivolatile organic compounds (SVOCs), gross alpha/beta, isotopic uranium, and tritium. For comparison with the ERCL analytical results, GEL analyzed approximately 10 percent of the samples for VOCs, TAL metals, nitrate, and anions.

4.1.2 Sampling Procedures

This section provides a summary of the field activities and methods associated with groundwater monitoring in the TAG study area.

Depth-to-groundwater measurements were obtained prior to purging activities in all monitoring wells using a Solinst™ well sounder. Measurements were performed in accordance with FOP 95-02 (SNL/NM January 1998). Annex E contains monitoring well completion information, and Annex B contains the complete historical measurements of depth to groundwater for all the monitoring wells in the TAG network.

All groundwater samples discussed in this report were collected using dedicated low-flow sample pumps. Each pump is located at the midpoint of the well screen as recommended by the manufacturer. Groundwater is purged at flow rates of approximately 0.1 liter per minute from the well.

Measurement of field parameters was performed in accordance with FOP 94-46 (SNL/NM September 1999) and the GIP (SNL/NM March 1996). Groundwater temperature, specific conductance, pH, and oxidation/reduction potential (E_h) were measured using a YSI™ Model 3500 Water Quality Meter. Turbidity was measured with a Hach Model 2100P portable turbidity meter. Water quality measurements were recorded on Field Measurement Log forms. Groundwater pH, temperature, specific conductance, turbidity, and E_h were measured during purging and after completion of sampling. Annex F-1 contains summary tables for the field parameters (final measurement before sampling).

Samples were collected for laboratory analyses after water quality parameters had stabilized. Groundwater samples were collected directly from the pump discharge tube into laboratory prepared sample containers. Chemical preservatives for samples intended for chemical analyses were added to the sample containers at the onsite or offsite laboratory prior to shipment to the field crew. As required, the SNL/NM Sample Management Office (SMO) provided sample containers for off-site laboratory samples, and the ERCL provided sample containers for on-site laboratory samples.

Immediately after collection, all sample containers were custody-taped, sealed in plastic bags, and placed on ice in shipping containers. Analytical Request/Chain-of-Custody forms were completed at the time of collection and accompanied sample containers to the analytical laboratory. The samples for chemical and radiochemical analyses were shipped via the SMO to the contracted analytical laboratory. Sample management activities followed FOP 94-34 (SNL/NM June 1995).

All purge and decontamination water for each sampling event was containerized in one drum and removed to a 90-day accumulation area pending results of the analyses. Waste labels were placed on all drums, and the corresponding sample numbers were marked on the outside of the drum. The wastes were recorded on a Daily Log of Wastes Generated form and

submitted to the SNL/NM ER waste disposal coordinator. For waste characterization purposes, the purge-water from each 55-gallon drum was sampled and analyzed for VOCs and nitrate/nitrite.

4.2 Groundwater Analytical Data

Historical TAG analytical data from the ER Data Management System are included in Annex F. Annex F-1 presents miscellaneous groundwater data, such as the field parameter measurements of alkalinity, total dissolved solids, pH, and specific conductance. Annex F-2 presents inorganic analytical results, Annex F-3 presents organic analytical results, and Annex F-4 presents radionuclide analytical results.

4.2.1 Major Ion Chemistry

Major ion chemistry data from groundwater quality analyses can typically reveal distinct characteristics useful for interpreting aquifer flow characteristics. To characterize the major ion groundwater chemistry at TAG, groundwater samples have been analyzed since June 1999 for major anions and cations, pH, and specific conductance (Annex F). To evaluate possible changes in groundwater chemistry over time, Piper trilinear and Stiff diagrams were produced.

The following generalizations can be made about the major ion chemistry data:

- No discernable temporal trends are apparent (although the data set is small)
- The regional aquifer and the SGWS have distinct geochemistries (a notable exception is the WYO-1 and WYO-2 well pair, discussed below).
- The regional aquifer geochemical signatures are more consistent between well locations, have lower calcium and higher bicarbonate/alkalinity.
- The SGWS geochemical signatures are less consistent between well locations, have higher chloride, nitrate, and sulfate.

4.2.1.1 Piper Trilinear Diagrams

Piper Trilinear Diagrams were generated for four quarterly water-sampling events, including September 1999, December 1999, and April 2000. Separate plots were generated for regional aquifer (Figures 4.2.1-1 through 4.2.1-3) and SGWS wells (Figures 4.2.1-4 through 4.2.1-6).

For the regional-aquifer wells over the sampling period, the wells had fairly similar geochemistry, with the exception of WYO-1, TA2-NW1-595, and TJA-4, which had high anions, and TA2-W-24, which had anomalously high cations. PGS-2 is the only regional-aquifer well showing any differences between sampling events. This well was redeveloped between December 1999 and April 2000 to remove bentonite slurry grout that had intruded the well screen.

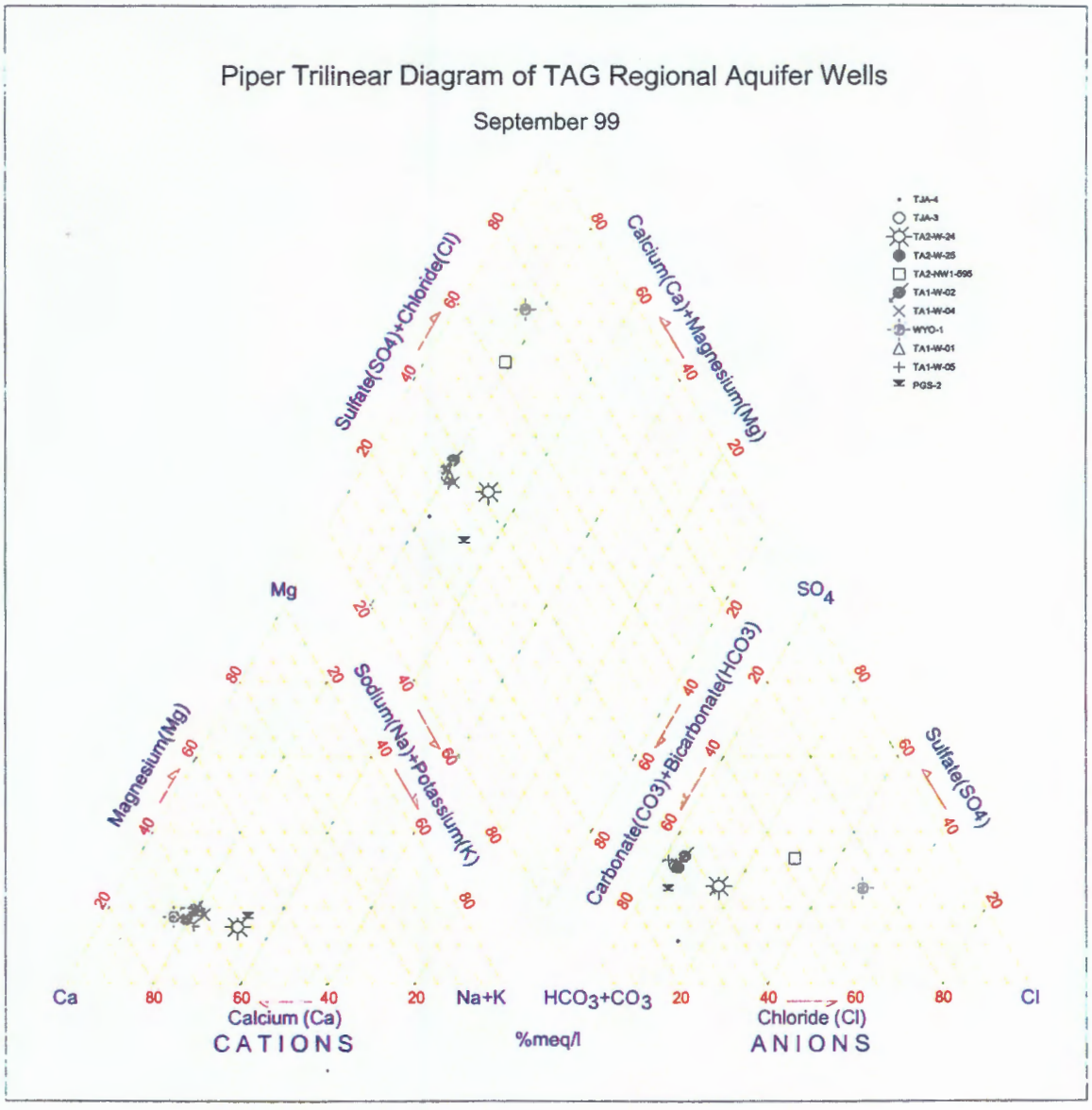

Piper Trilinear Diagram of TAG Regional Aquifer Wells
September 99
TJA-4
TJA-3
TA2-W-24
TA2-W-25
TA2-NW1-595
TA1-W-02
TA1-W-04
WYO-1
TA1-W-01
TA1-W-05
PGS-2
Sulfate(SO4)+Chloride(Cl)
Calcium(Ca)+Magnesium(Mg)
Magnesium(Mg)
Sodium(Na)+Potassium(K)
Carbonate(CO3)+Bicarbonate(HCO3)
Sulfate(SO4)
Mg
SO4
Ca
Na+K
HCO3+CO3
Cl
Calcium (Ca)
CATIONS
%meq/l
Chloride (Cl)
ANIONS

Figure 4.2.1-1

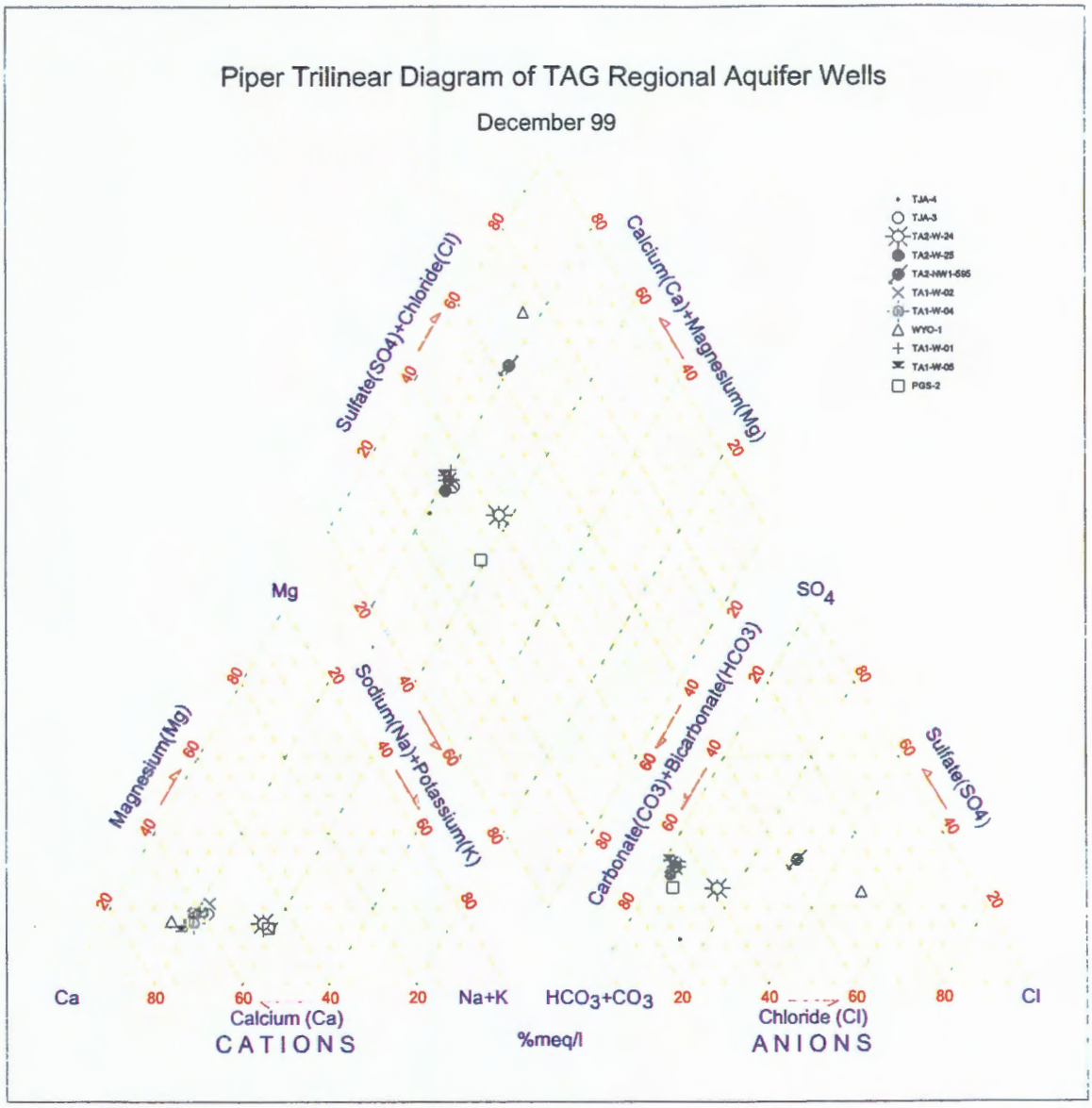

Piper Trilinear Diagram of TAG Regional Aquifer Wells
December 99
TJA-4
TJA-3
TA2-W-24
TA2-W-25
TA2-NW1-595
TA1-W-02
TA1-W-04
WYO-1
TA1-W-01
TA1-W-05
PGS-2
Sulfate(SO4)+Chloride(Cl)
Calcium(Ca)+Magnesium(Mg)
Mg
SO4
Magnesium(Mg)
Sodium(Na)+Potassium(K)
Carbonate(CO3)+Bicarbonate(HCO3)
Sulfate(SO4)
Ca
Na+K
HCO3+CO3
Cl
Calcium (Ca)
CATIONS
%meq/l
Chloride (Cl)
ANIONS

Figure 4.2.1-2

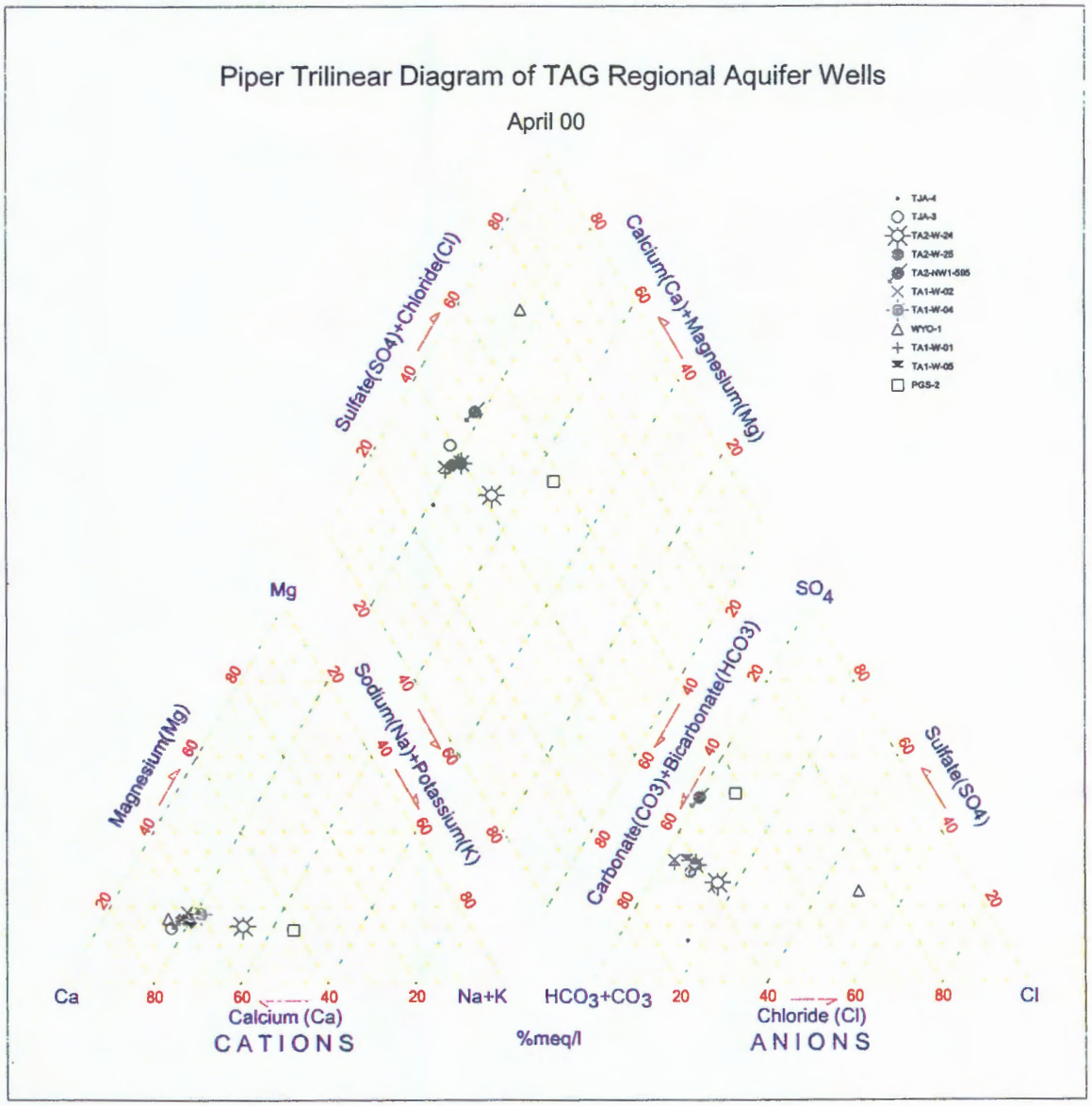

Piper Trilinear Diagram of TAG Regional Aquifer Wells
April 00
TJA-4
TJA-3
TA2-W-24
TA2-W-25
TA2-NW1-595
TA1-W-02
TA1-W-04
WYO-1
TA1-W-01
TA1-W-05
PGS-2
Sulfate(SO4)+Chloride(Cl)
Calcium(Ca)+Magnesium(Mg)
Mg
SO4
Magnesium(Mg)
Sodium(Na)+Potassium(K)
Carbonate(CO3)+Bicarbonate(HCO3)
Sulfate(SO4)
Ca
Na+K
HCO3+CO3
Cl
Calcium (Ca)
CATIONS
%meq/l
Chloride (Cl)
ANIONS

Figure 4.2.1-3

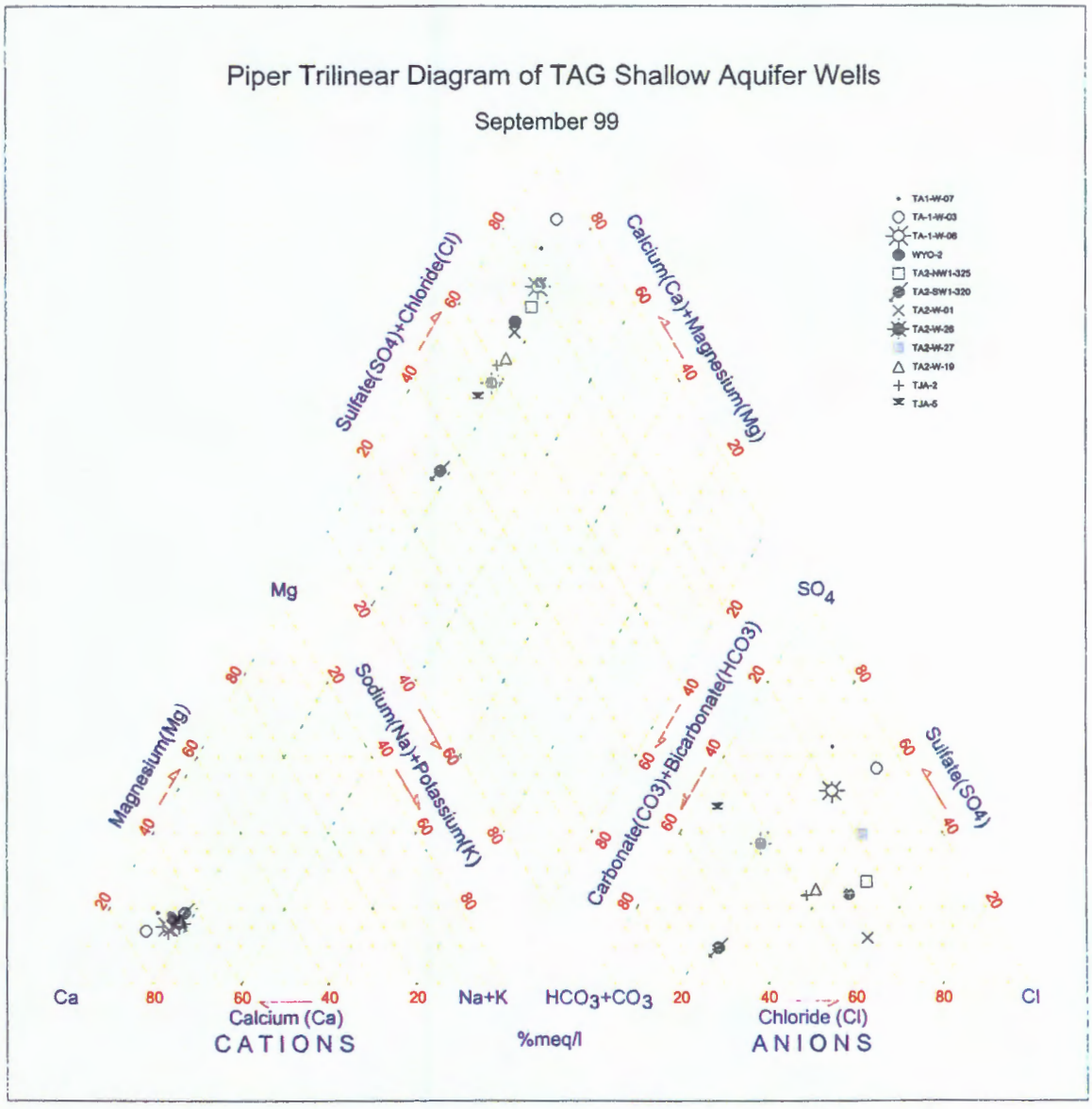

Piper Trilinear Diagram of TAG Shallow Aquifer Wells
September 99
TA1-W-07
TA-1-W-03
TA-1-W-06
WYO-2
TA2-NW1-325
TA2-SW1-320
TA2-W-01
TA2-W-26
TA2-W-27
TA2-W-19
TJA-2
TJA-5
Sulfate(SO4)+Chloride(Cl)
Calcium(Ca)+Magnesium(Mg)
Magnesium(Mg)
Sodium(Na)+Potassium(K)
Carbonate(CO3)+Bicarbonate(HCO3)
Sulfate(SO4)
Mg
SO4
Ca
Na+K
HCO3+CO3
Cl
Calcium (Ca)
CATIONS
%meq/l
Chloride (Cl)
ANIONS

Figure 4.2.1-4

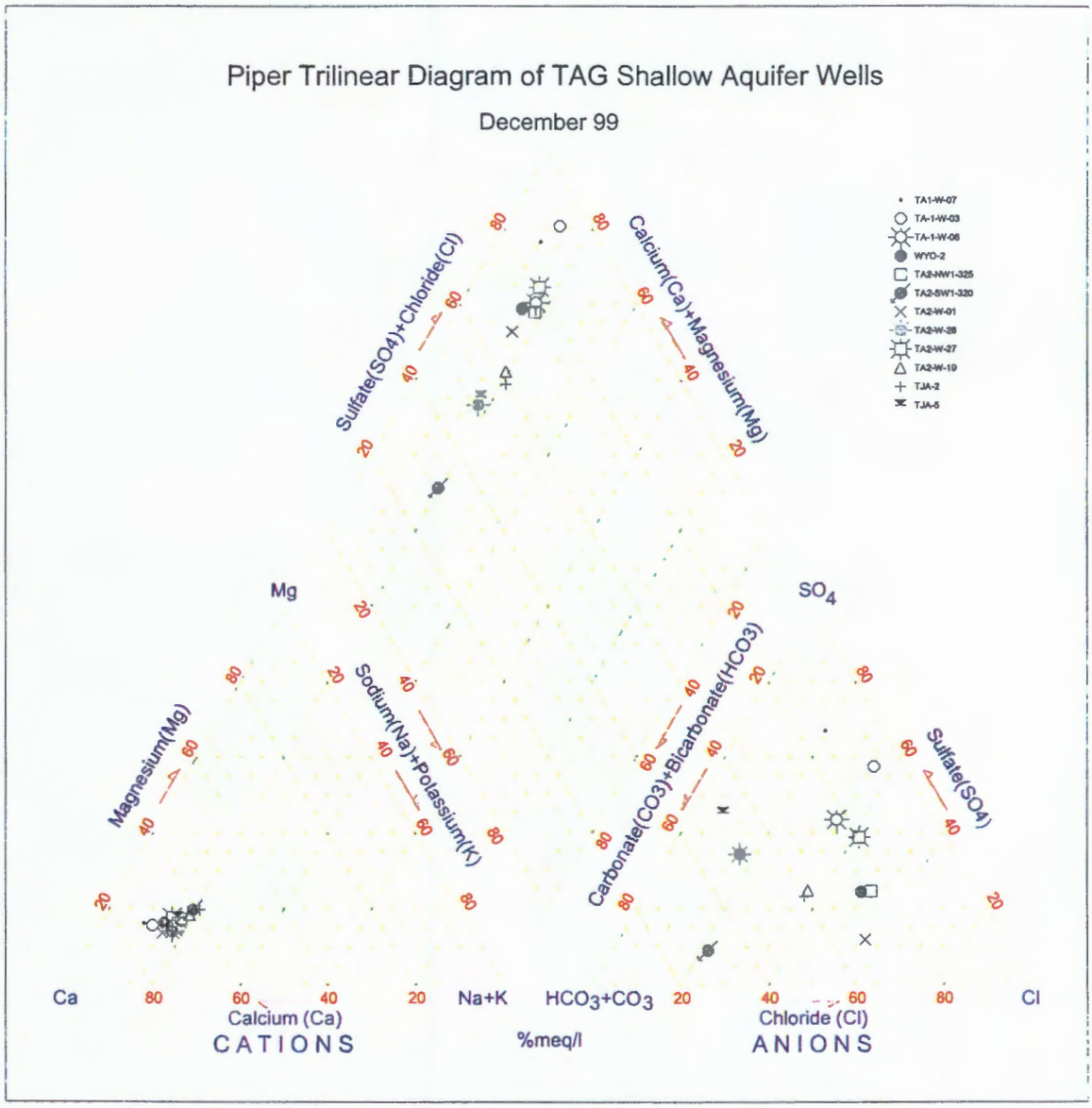

Piper Trilinear Diagram of TAG Shallow Aquifer Wells
December 99
TA1-W-07
TA-1-W-03
TA-1-W-06
WYO-2
TA2-NW1-325
TA2-SW1-320
TA2-W-01
TA2-W-28
TA2-W-27
TA2-W-19
TJA-2
TJA-5
Sulfate(SO4)+Chloride(Cl)
Calcium(Ca)+Magnesium(Mg)
Magnesium(Mg)
Sodium(Na)+Polassium(K)
Carbonate(CO3)+Bicarbonate(HCO3)
Sulfate(SO4)
Mg
SO4
Ca
Na+K
HCO3+CO3
Cl
Calcium (Ca)
CATIONS
%meq/l
Chloride (Cl)
ANIONS

Figure 4.2.1-5

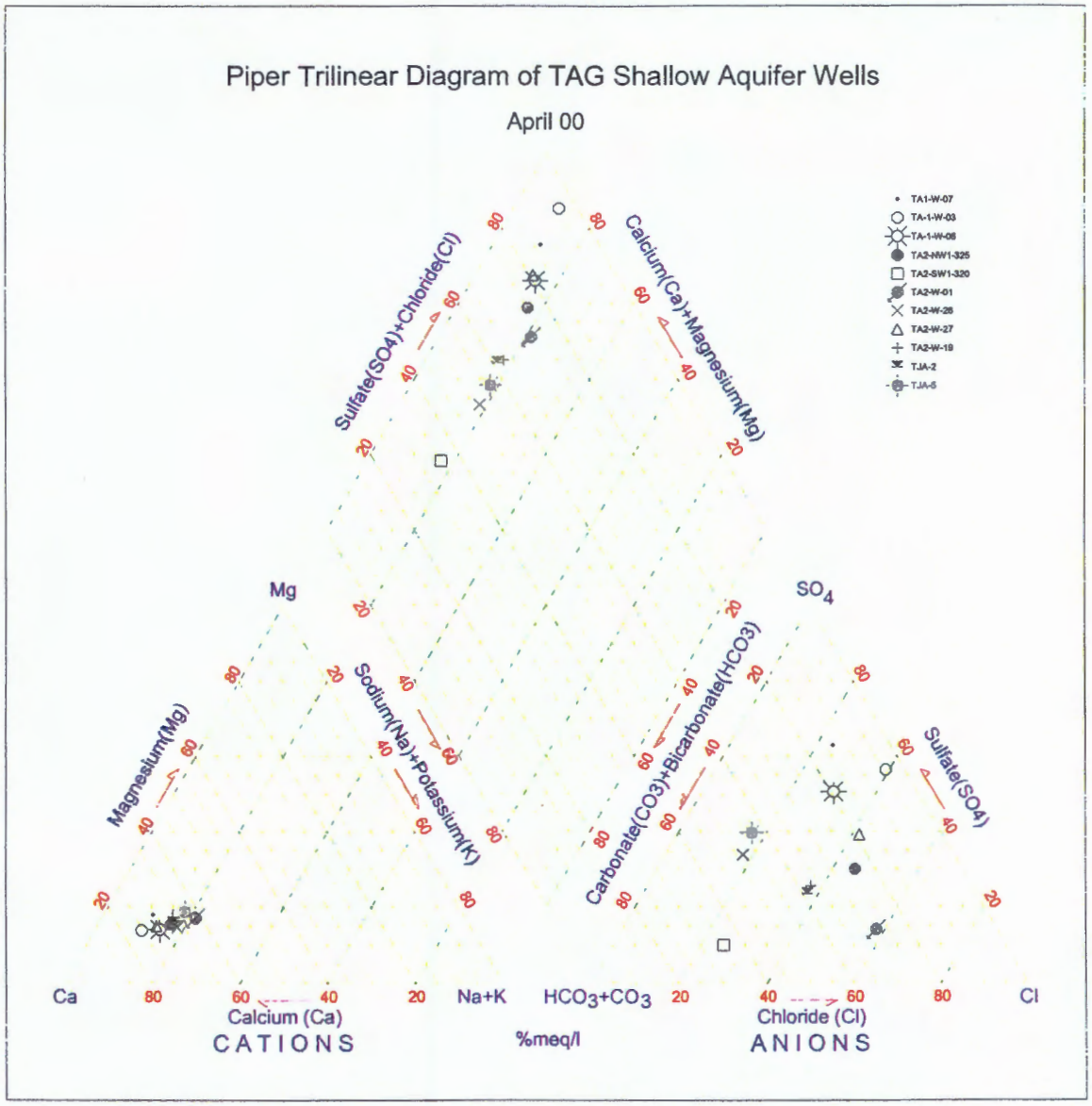

Piper Trilinear Diagram of TAG Shallow Aquifer Wells
April 00
TA1-W-07
TA-1-W-03
TA-1-W-06
TA2-NW1-325
TA2-SW1-320
TA2-W-01
TA2-W-26
TA2-W-27
TA2-W-19
TJA-2
TJA-5
Sulfate(SO4)+Chloride(Cl)
Calcium(Ca)+Magnesium(Mg)
Magnesium(Mg)
Sodium(Na)+Potassium(K)
Carbonate(CO3)+Bicarbonate(HCO3)
Sulfate(SO4)
Mg
SO4
Ca
Na+K
HCO3+CO3
Cl
Calcium (Ca)
CATIONS
%meq/l
Chloride (Cl)
ANIONS

Figure 4.2.1-6

For the SGWS wells, the geochemistry was variable, with the cations remaining consistent but the anions exhibiting an apparent mixing line. Uniquely, the chemistry at TA2-SW1-320 is very similar to the chemistry found in regional aquifer wells and may be the result of the high volume discharge of shower water from the Building 901 Septic System (SWMU 165). Potable water at SNL/NM and KAFB is produced from the regional aquifer.

4.2.1.2 Stiff Diagrams

Stiff Diagrams were generated for four quarterly water-sampling events, including June 1999, September 1999, December 1999, and April 2000. Separate plots were generated for the regional aquifer (Figures 4.2.1-7 through 4.2.1-10) and SGWS wells (Figures 4.2.1-11 through 4.2.1-14).

As shown in the Piper Trilinear Diagrams, the regional-aquifer wells had consistent water geochemistry between wells with the exception of WYO-1 (anomalously high chloride and low bicarbonate plus carbonate), TA2-NW1-595 (high sulfate), and PGS-2 (anomalous sodium plus potassium). Again, it is apparent that the PGS-2 chemistry was affected by the bentonite slurry grout intrusion in the screened interval. For the SGWS wells, the chemistry was variable in both chloride and sulfate concentrations.

4.2.1.3 Well Pairs

The Piper Trilinear and Stiff diagrams were reviewed for six of the well pairs. The following evaluation is based upon the comparisons of these two data representations for each well pair. The data set for the trends of concentrations over time were very limited and showed no trend; temporal issues are therefore not discussed any further.

The well pair TA1-W-02/TA1-W-06 exhibits distinct water types and does not appear to have a local natural structural or stratigraphic connection. The SGWS has greater concentrations of calcium, chloride, and sulfate, whereas the regional aquifer has higher bicarbonate plus carbonate. Concentrations of both sodium plus potassium and magnesium are approximately equivalent.

The well pair TA1-W-01/TA1-W-07 exhibits distinct water types and does not appear to have a hydraulic connection. The SGWS has greater calcium, chloride, and sulfate, whereas the regional aquifer has higher bicarbonate plus carbonate. Concentrations of both sodium plus potassium and magnesium are approximately equivalent.

For undetermined reasons, the well pair TA2-NW1-595/TA2-NW1-325 exhibits less distinct water types than the other well pairs. The SGWS has greater chloride, whereas the regional aquifer has higher bicarbonate plus carbonate. Concentrations of sulfate, sodium plus potassium, calcium, and magnesium are approximately equivalent.

The well pair TA2-W-25/TA2-W-26 exhibits less distinct water types than the other well pairs. The SGWS has greater chloride, sulfate (slightly), and calcium, whereas the regional aquifer has higher bicarbonate plus carbonate. Concentrations of both sodium plus potassium and magnesium are approximately equivalent.

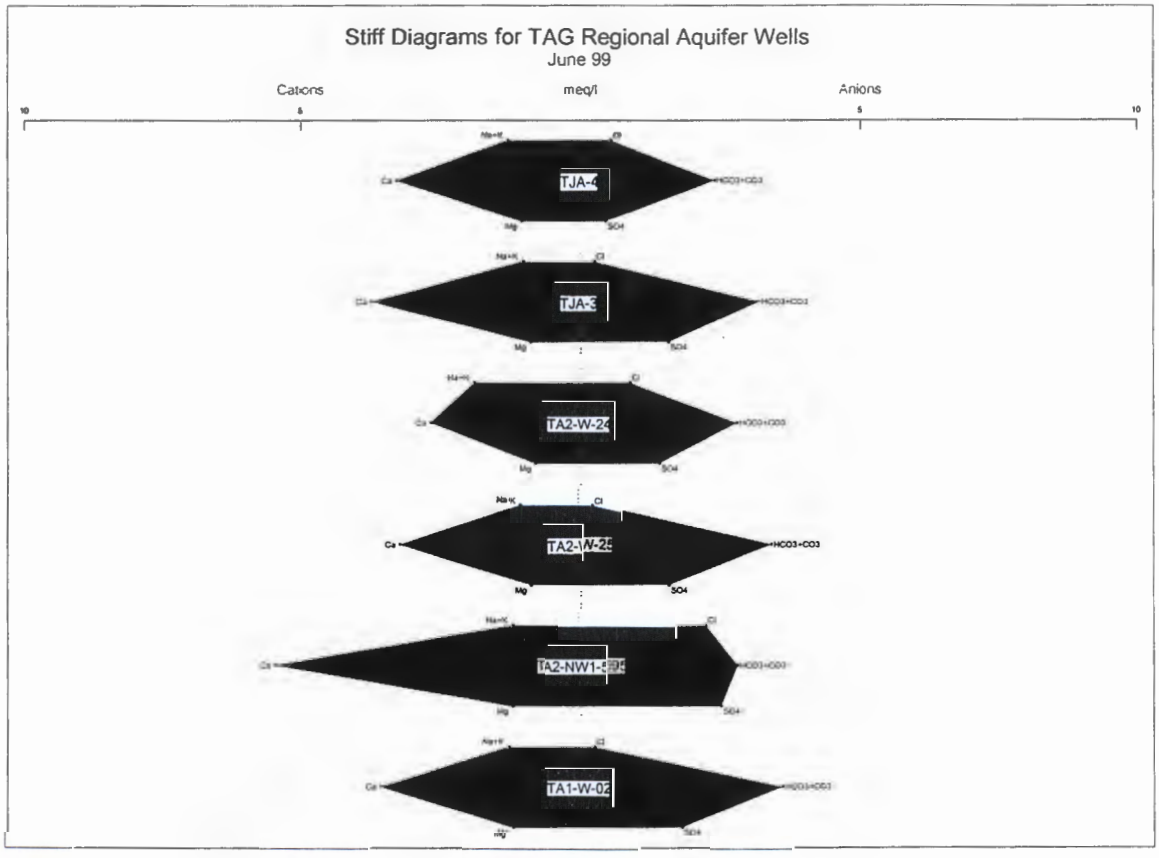

Stiff Diagrams for TAG Regional Aquifer Wells
June 99
Cations
meq/l
Anions
10
5
5
10
Na+K
Cl
Ca
HCO3+CO3
Mg
SO4
TJA-4
TJA-3
TA2-W-24
TA2-W-25
TA2-NW1-
TA1-W-02

Figure 4.2.1-7

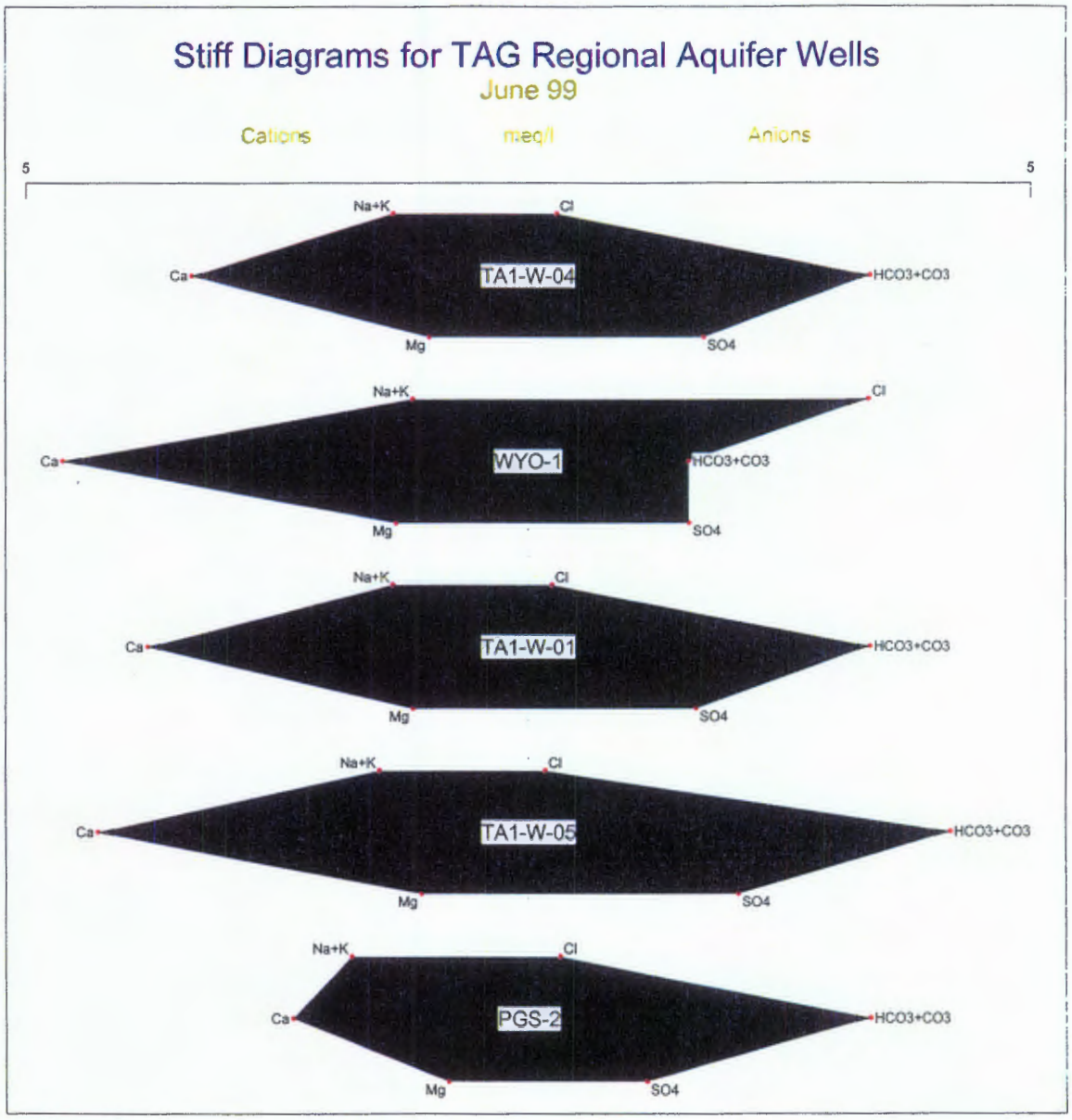


Figure 4.2.1-7 (continued)

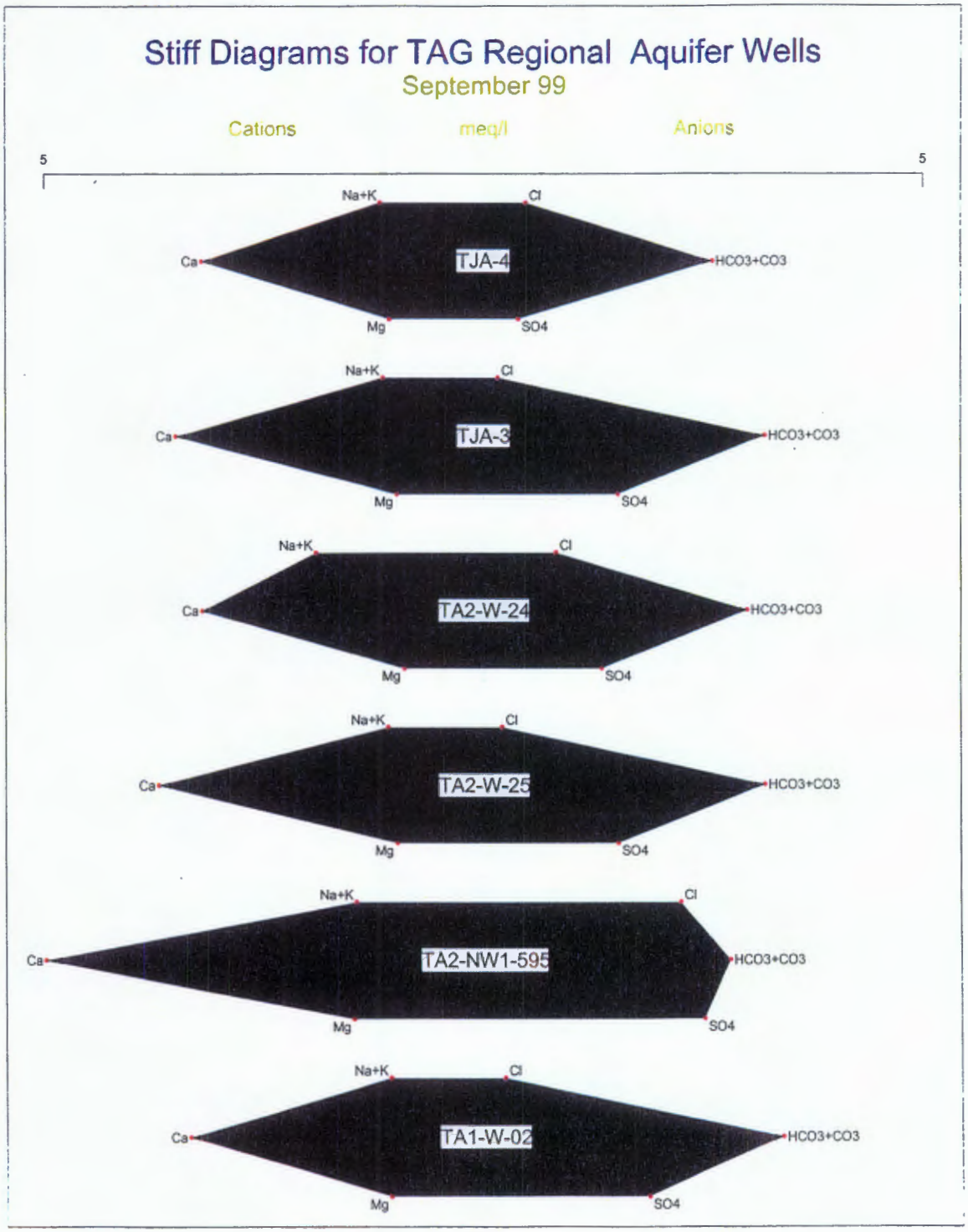

Stiff Diagrams for TAG Regional Aquifer Wells
September 99
Cations
meq/l
Anions
5
5
Na+K
Cl
Ca
HCO3+CO3
Mg
SO4
TJA-4
TJA-3
TA2-W-24
TA2-W-25
TA2-NW1-595
TA1-W-02

Figure 4.2.1-8

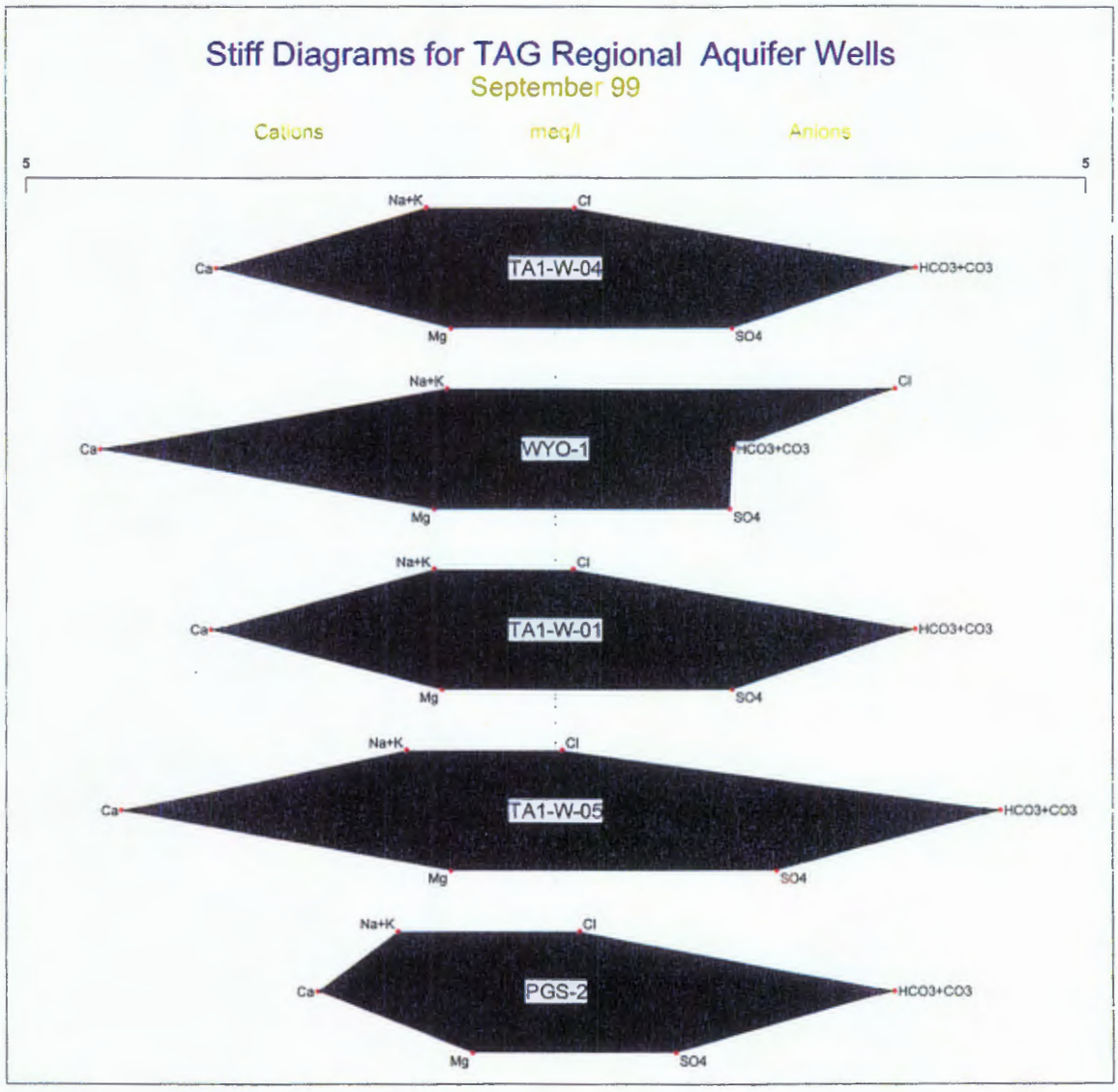


Figure 4.2.1-8 (continued)

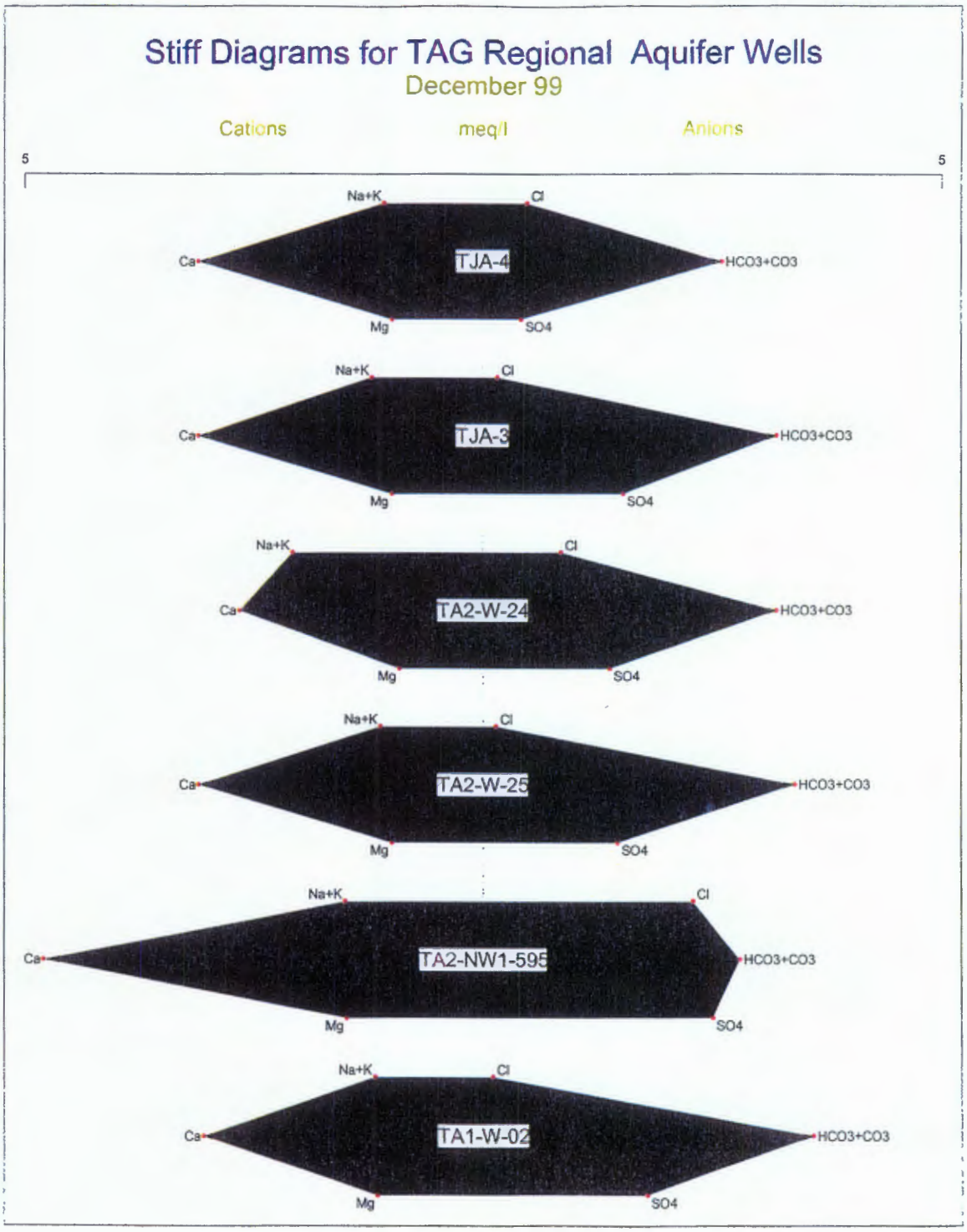

Stiff Diagrams for TAG Regional Aquifer Wells
December 99
Cations
meq/l
Anions
5
5
Na+K
Cl
Ca
HCO3+CO3
Mg
SO4
TJA-4
TJA-3
TA2-W-24
TA2-W-25
TA2-NW1-595
TA1-W-02

Figure 4.2.1-9

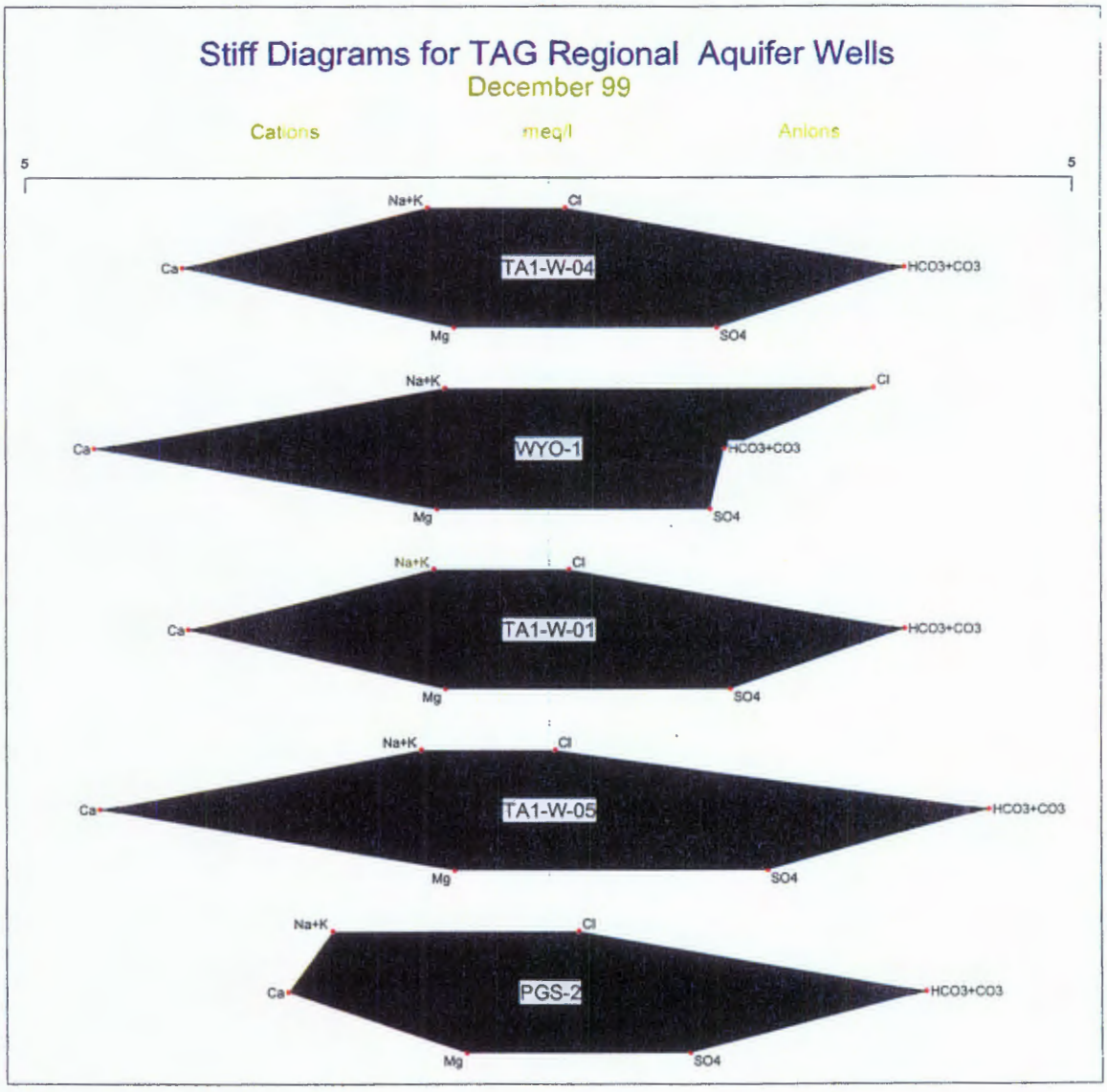


Figure 4.2.1-9 (continued)

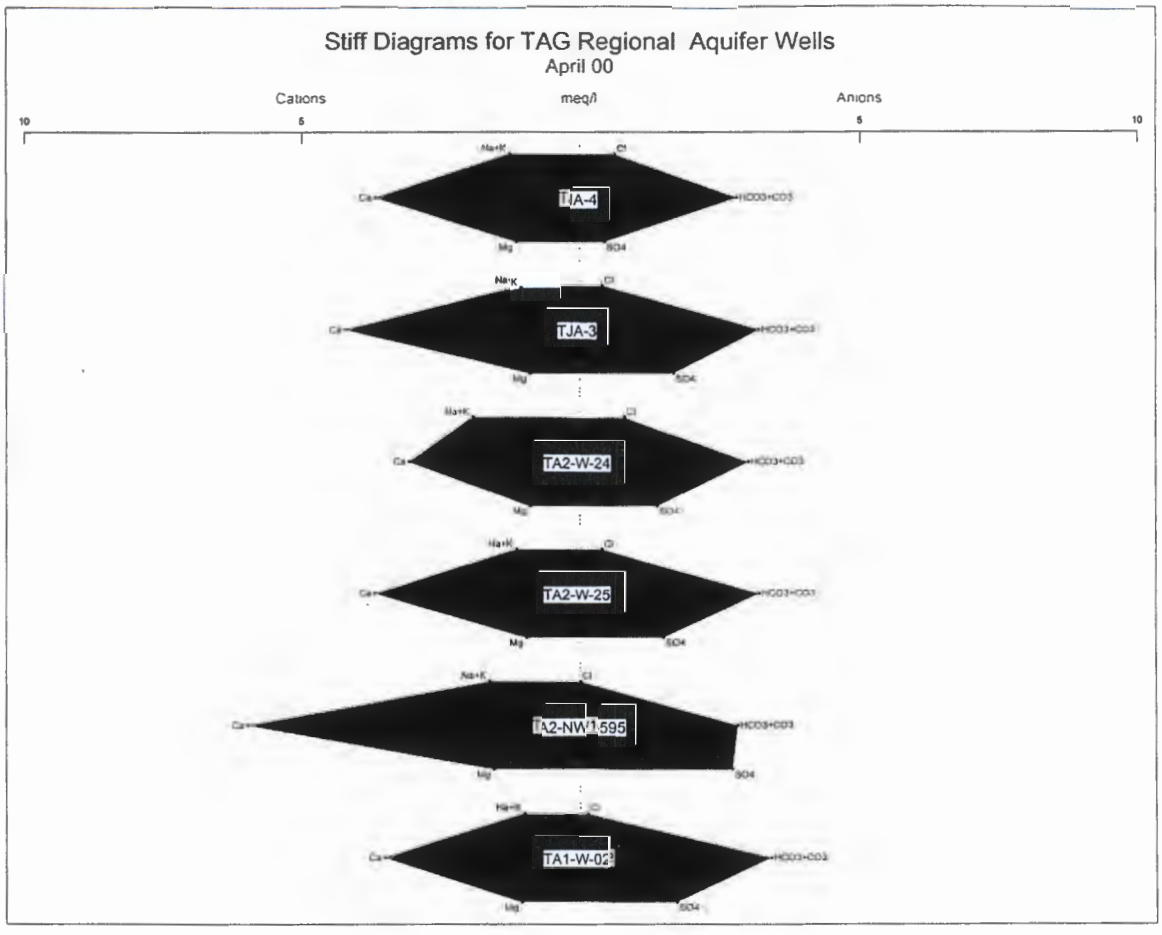


Figure 4.2.1-10

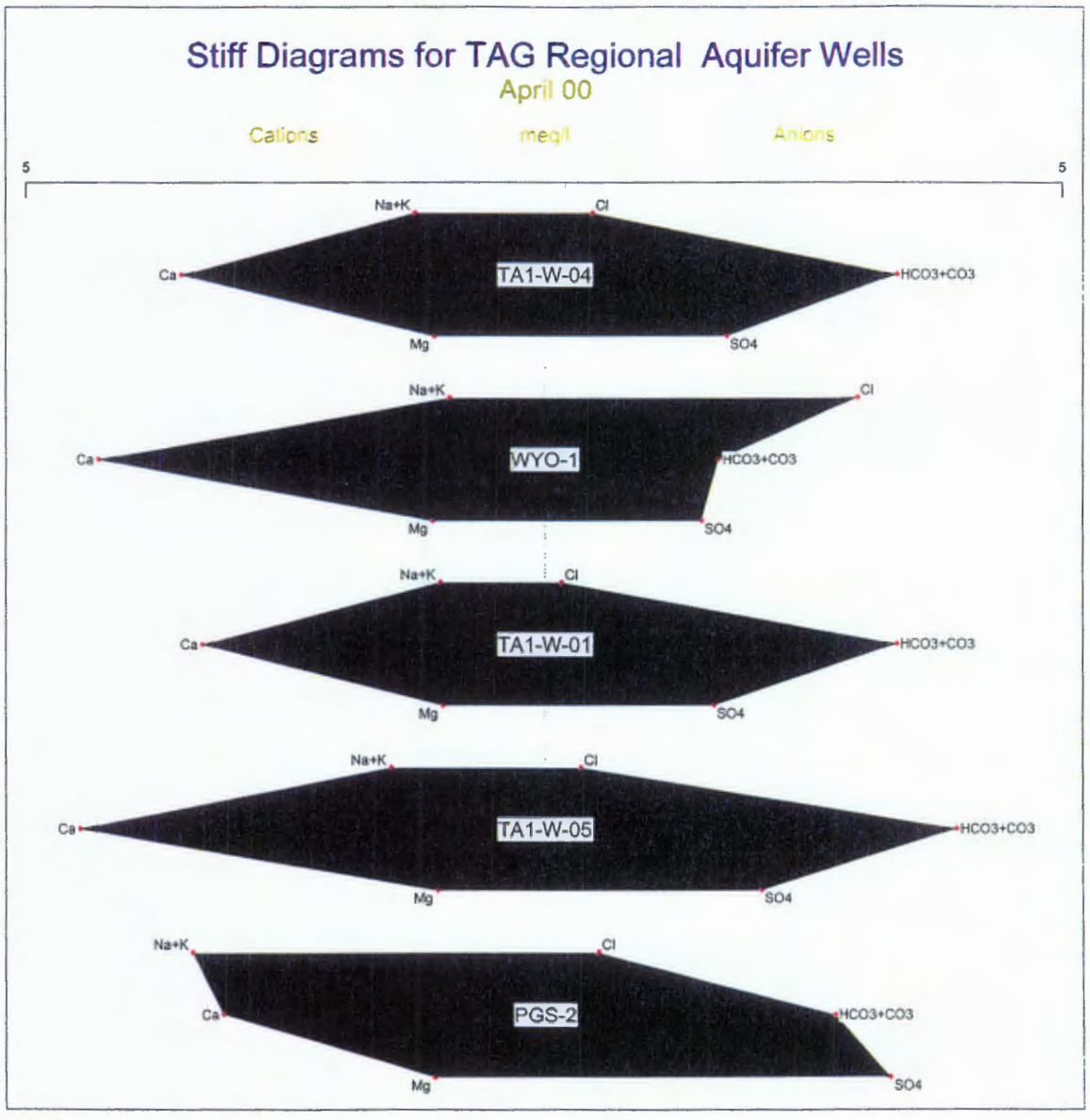


Figure 4.2.1-10 (continued)

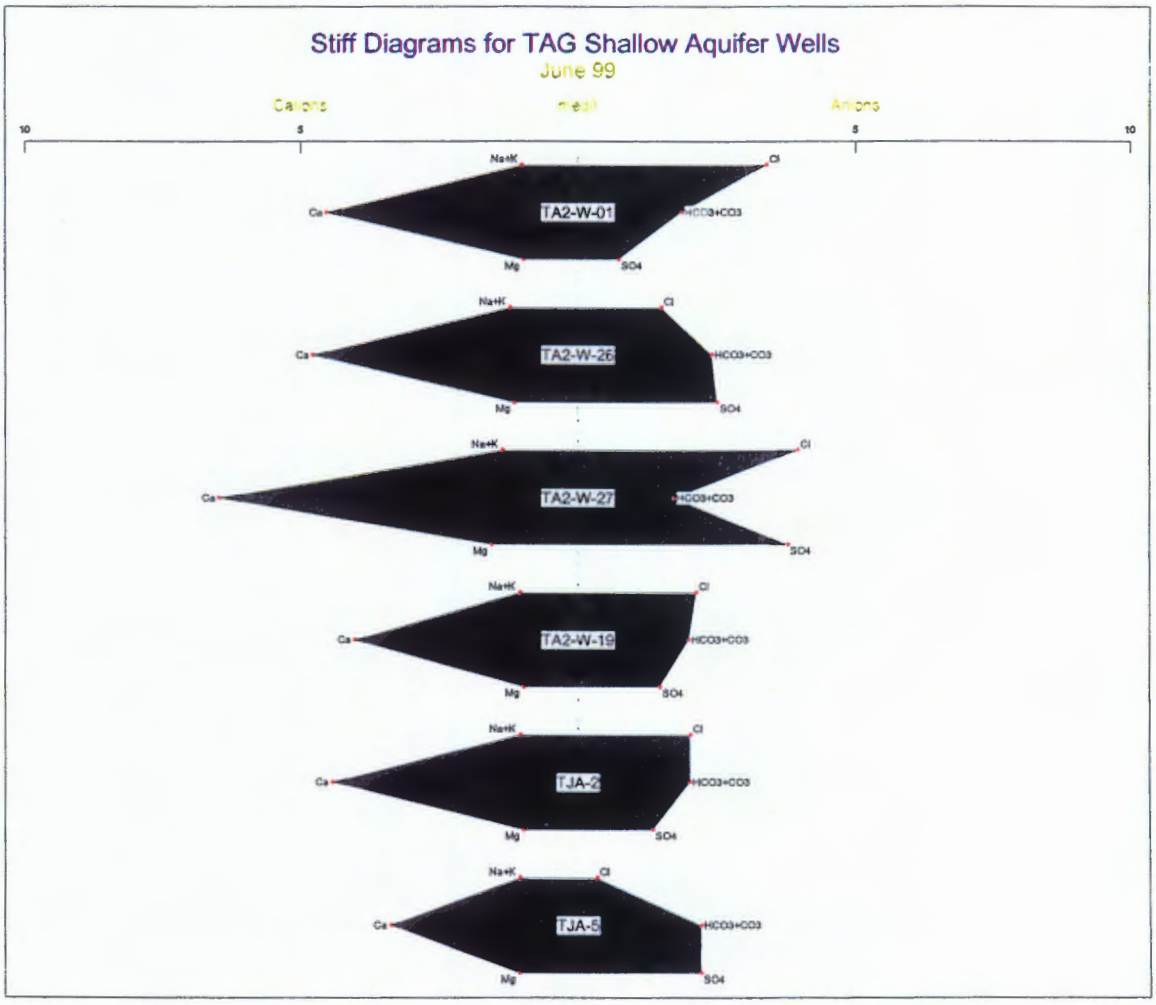


Figure 4.2.1-11

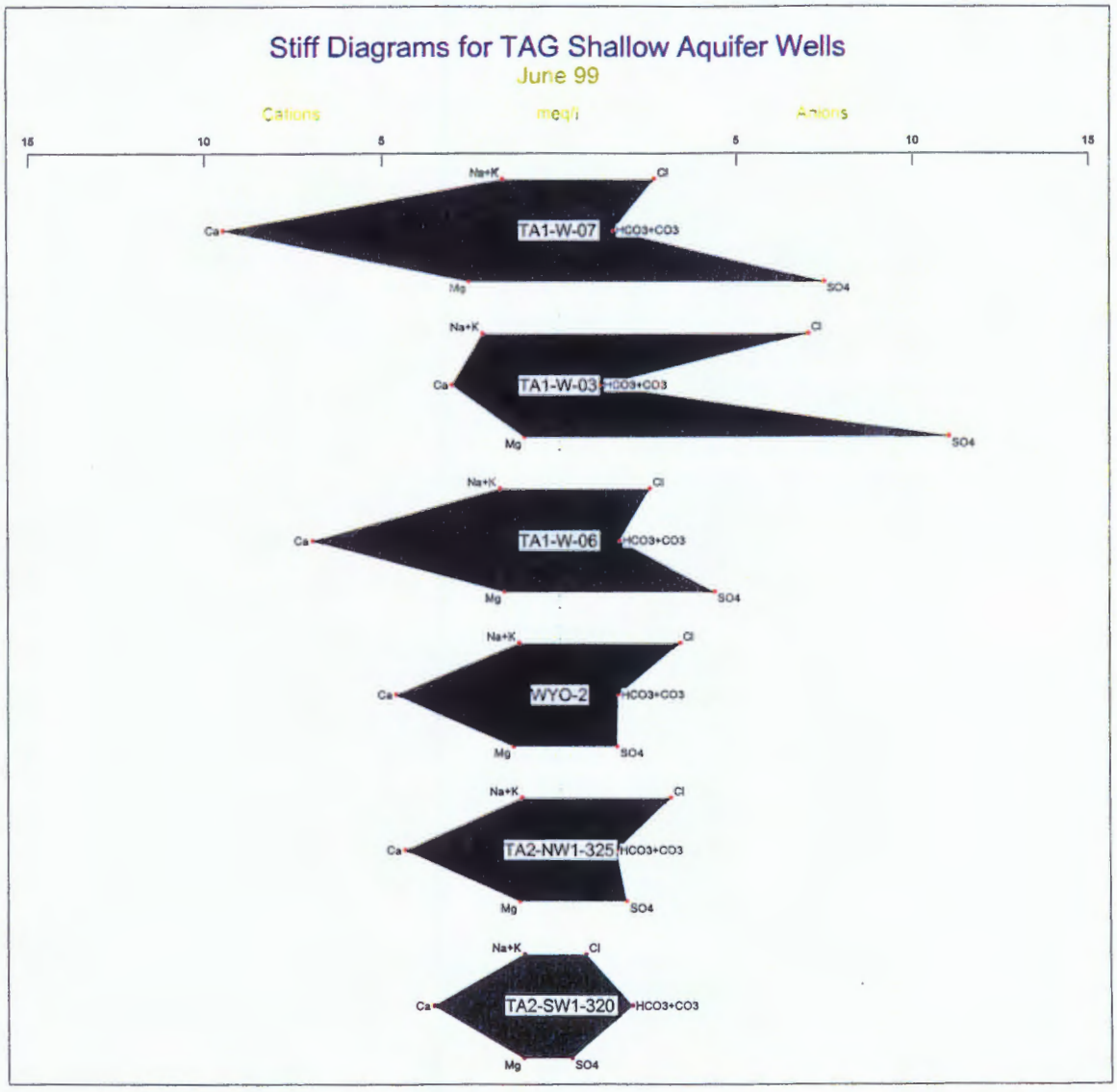


Figure 4.2.1-11 (continued)

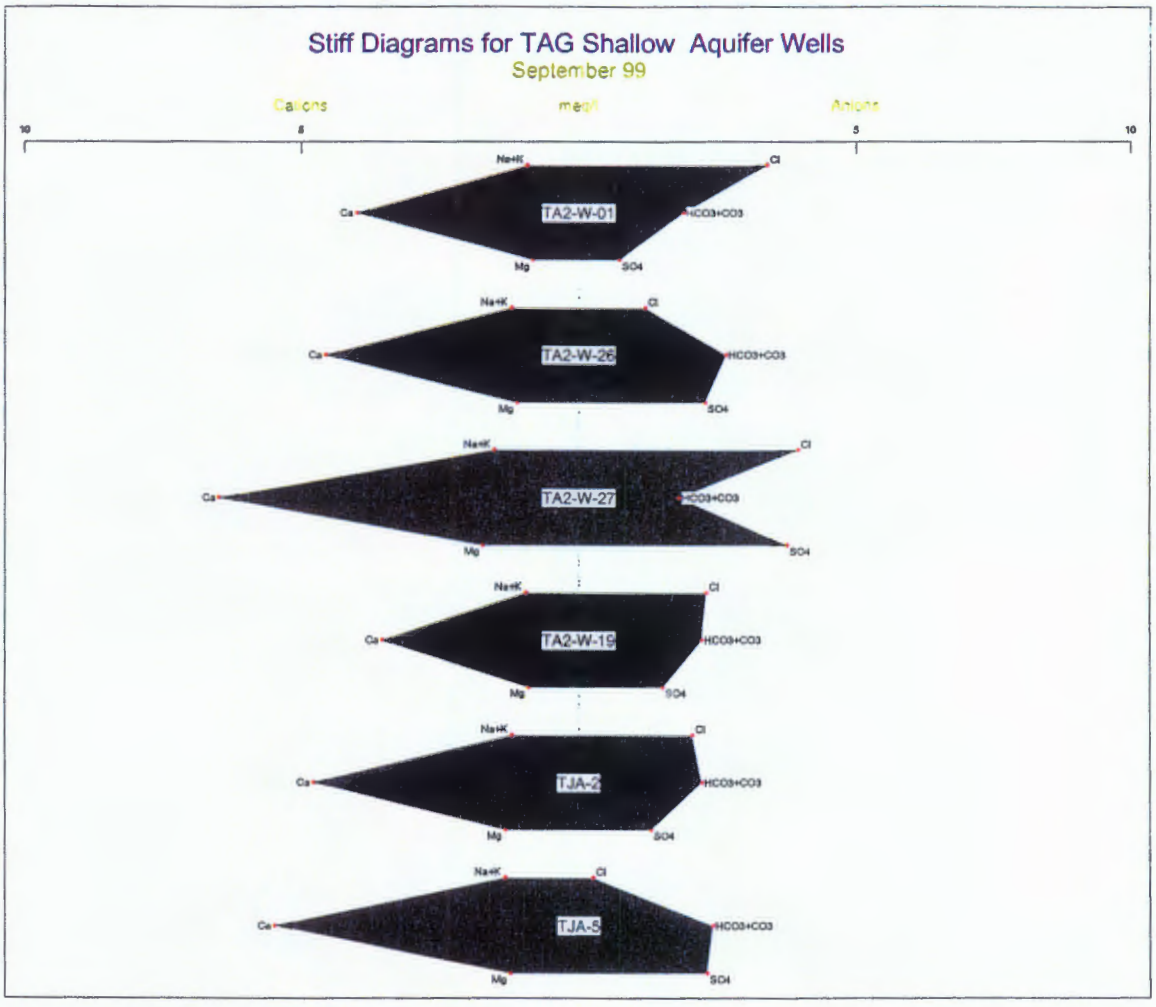


Figure 4.2.1-12

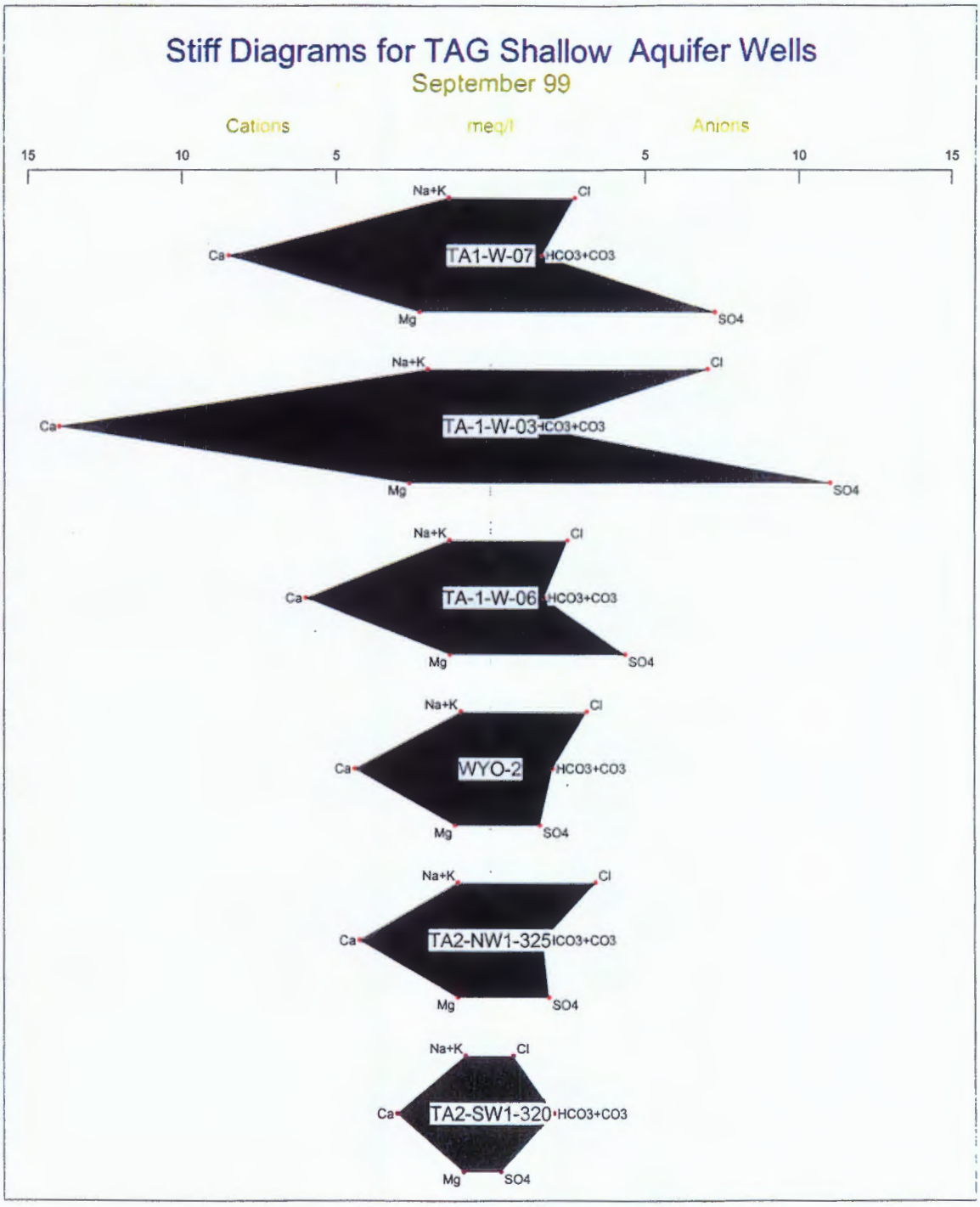


Figure 4.2.1-12 (continued)

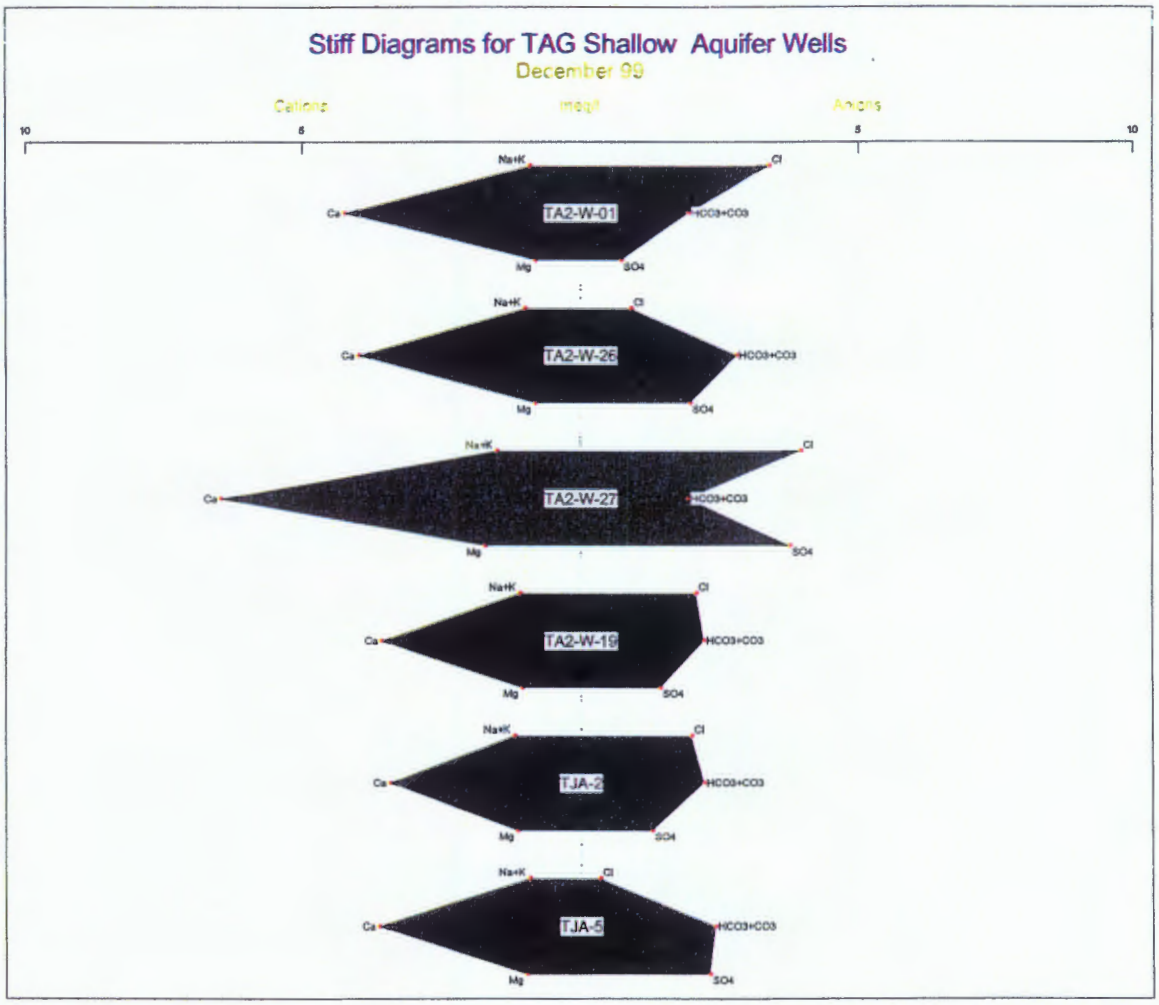


Figure 4.2.1-13

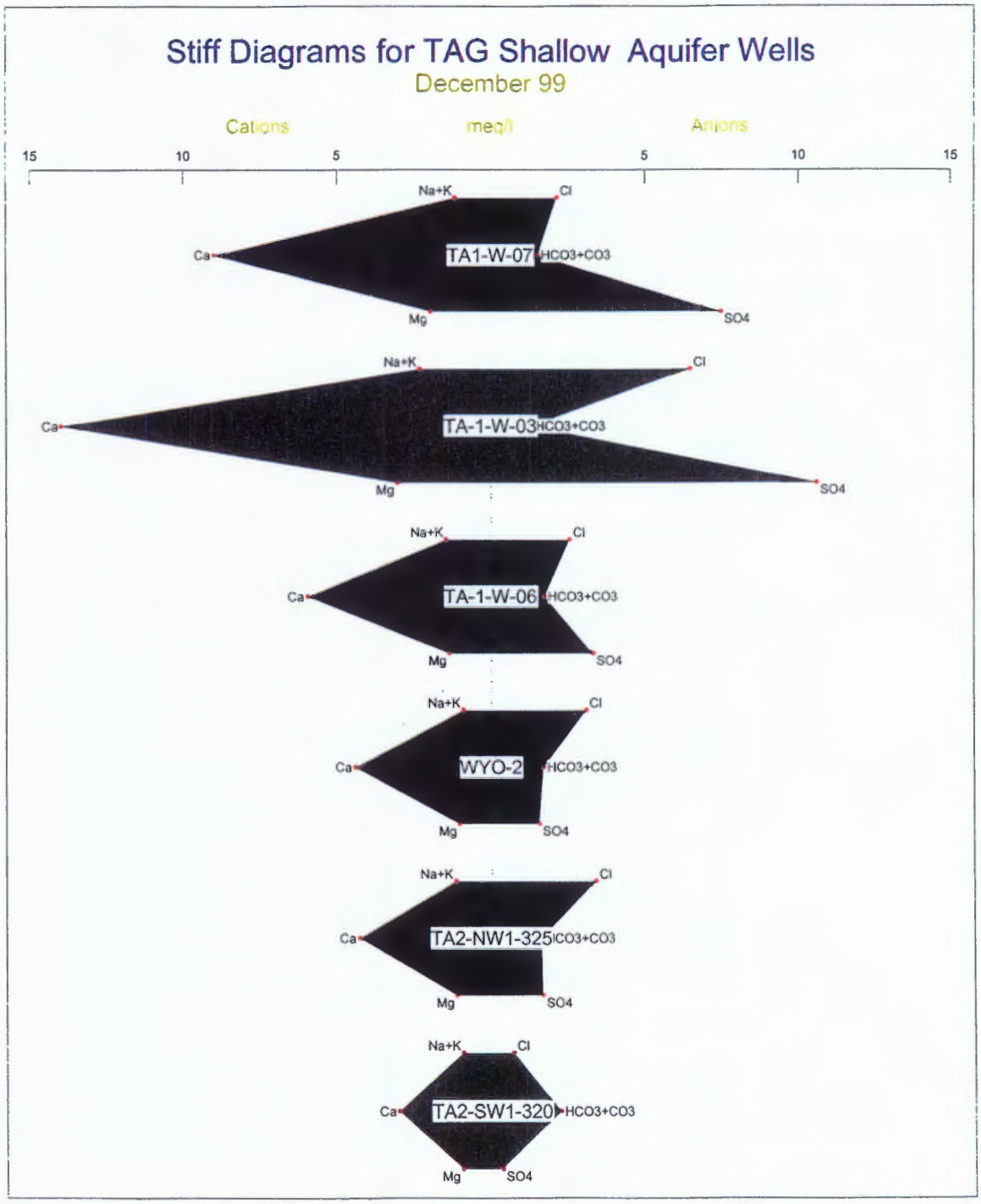


Figure 4.2.1-13 (continued)

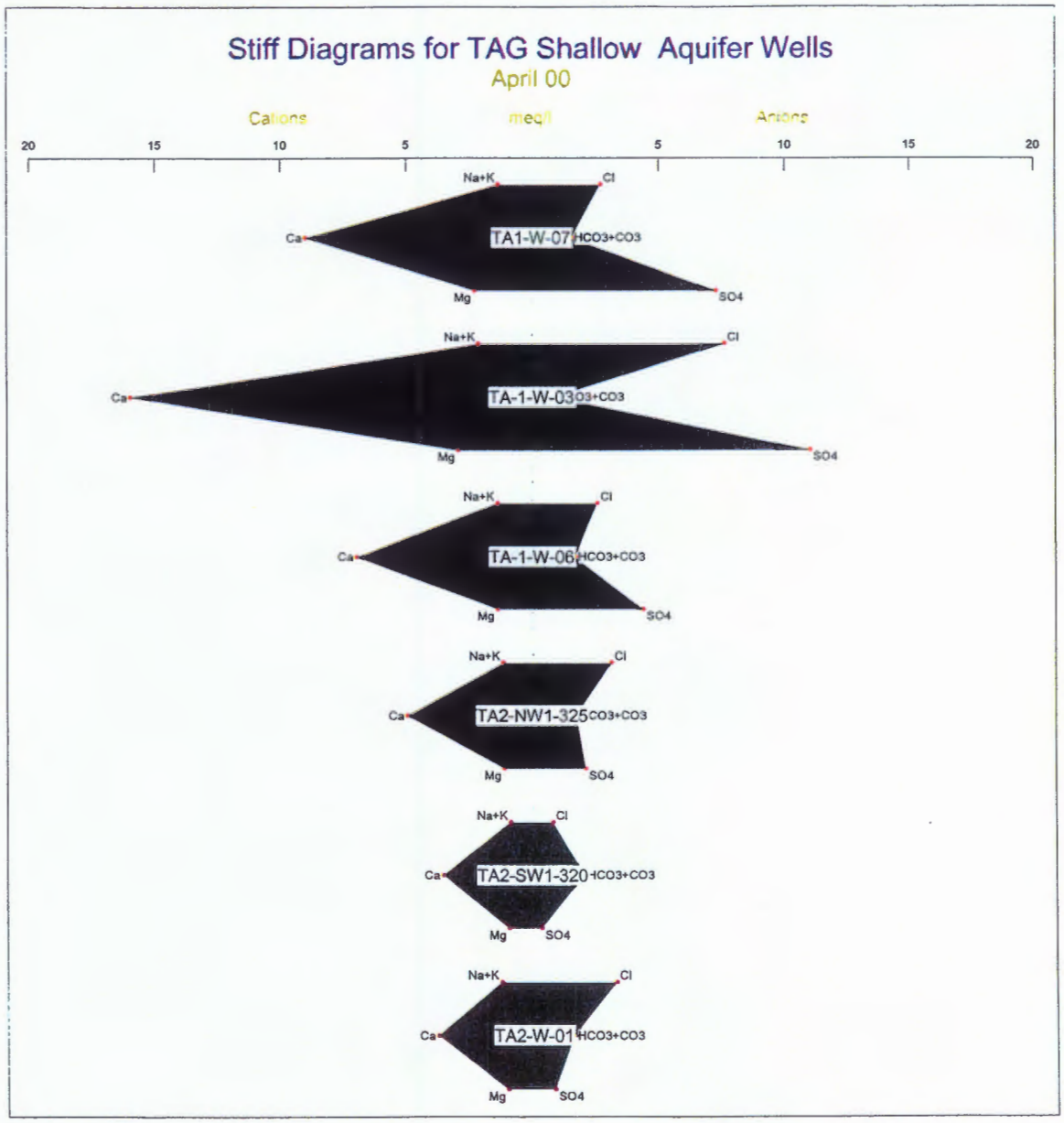


Figure 4.2.1-14

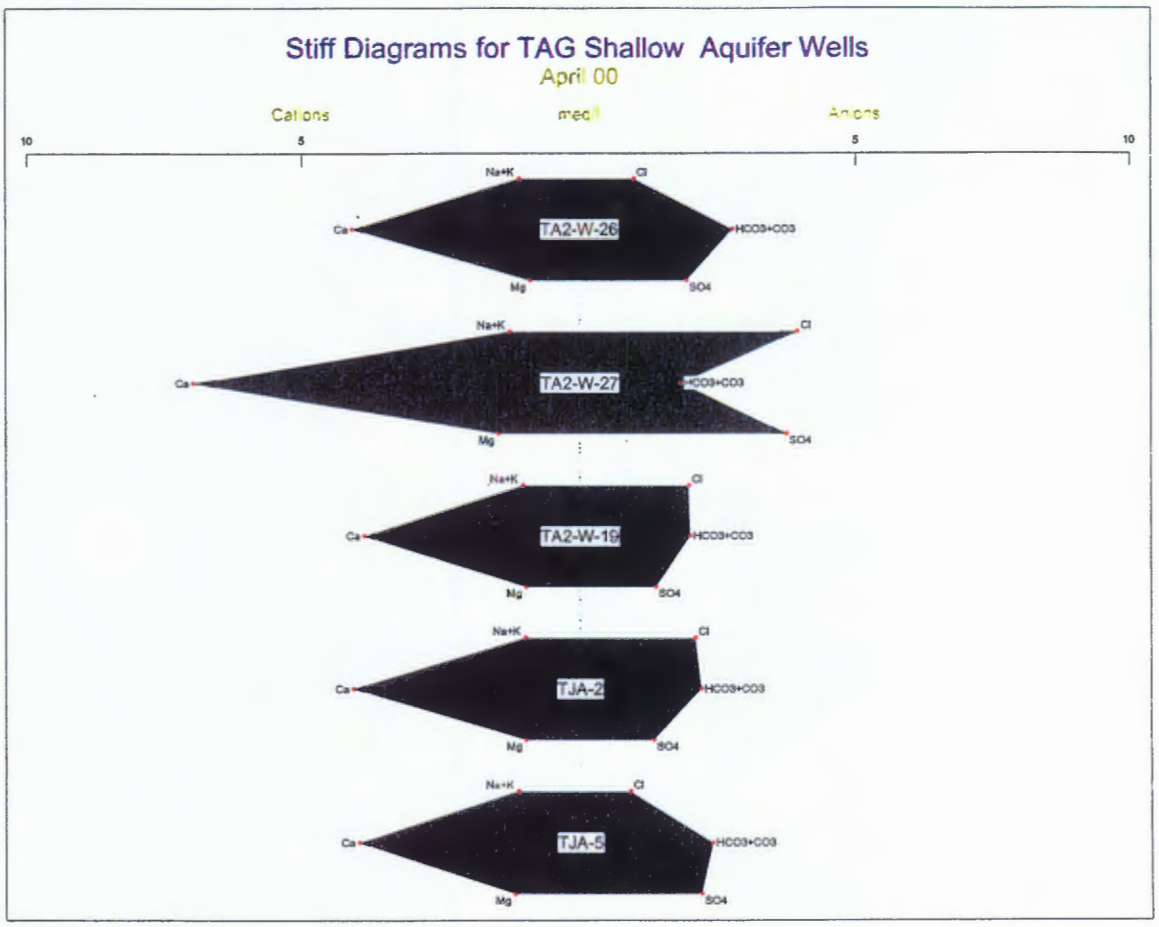


Figure 4.2.1-14 (continued)

The well pair TA2-W-24/TA2-W-27 exhibits distinct water types and does not appear to have a local connection. The SGWS has greater calcium, chloride, sulfate, and magnesium (slightly), whereas the regional aquifer has higher bicarbonate plus carbonate. Concentrations of sodium plus potassium are approximately equivalent. In other regional-aquifer wells, the sodium plus potassium concentrations are equivalent to the magnesium concentrations; however, the sodium plus potassium concentrations in TA2-W-24 exceed the magnesium concentrations.

The well pair TJA-4/TJA-5 exhibits less distinct water types than the other well pairs. The SGWS has greater calcium and sulfate. Concentrations of sodium plus potassium, magnesium, bicarbonate plus carbonate, and chloride are approximately equivalent.

The well pair WYO-1/WYO-2 exhibits nearly indistinguishable water types, more so than any of the other well pairs. The SGWS and regional aquifer have approximately equivalent concentrations of chloride, bicarbonate plus carbonate, sulfate, sodium plus potassium, calcium, and magnesium. It is readily apparent from this data that the two wells are hydraulically cross-connected. The well completion diagrams show that the two wells were completed in a single borehole, and it is now clear that the annular fill materials have been compromised. Due to the uncertainty of a competent annular seal, these two wells have been proposed for abandonment and replacement.

4.2.2 Metals and Nitrate

The TAG monitoring wells are sampled quarterly for metals and nitrate. The metals and nitrate data (detected quantities only) are presented in Annex F-2 and include all the inorganic data for TAG samples.

4.2.2.1 Metals

Concentrations of thirteen metals in the study area groundwater have exceeded the EPA MCL or the NMED/HWB-approved maximum background values (Dinwiddie September 1997) (Annex F-2). At least one result for each of the following analytes exceeded these limits (Table 4.2.2-1).

- Arsenic
- Barium
- Cadmium
- Chromium
- Cobalt
- Copper
- Lead
- Nickel
- Selenium
- Silver
- Thallium
- Vanadium
- Zinc

Table 4.2.2-1
Tijeras Arroyo Groundwater Investigation—Metals Analytical Results
(Exceedences Above Background or Federal MCL Only)

Well Location	Analyte	Amount Detected	Units	Qualifier	MDL	RL	Sample Date	Sample Type
PGS-2	Arsenic	32	µg/L		3.4	13	11-Jun-97	SA
PGS-2	Arsenic	29	µg/L		3.4	14	22-Sep-97	SA
TA2-W-26	Arsenic	26	µg/L		3.4	14	17-Mar-98	DU
PGS-2	Arsenic	24	µg/L		3.4	14	16-Dec-97	SA
PGS-2	Arsenic	17	µg/L		3.4	14	8-Jul-98	SA
PGS-2	Arsenic	0.0268	µg/L		0.00293	0.005	22-Sep-97	SA
PGS-2	Arsenic	0.018	µg/L		0.01		26-Jan-96	SA
TA2-NW1-325	Barium	280	µg/L		4	16	8-Dec-97	SA
TA2-NW1-325	Barium	240	µg/L		3.9	16	9-Jun-97	SA
TA2-SW1-320	Barium	240	µg/L		4	16	6-Jul-98	SA
TA2-SW1-320	Barium	230	µg/L		4	16	19-Nov-99	SA
TA2-NW1-325	Barium	220	µg/L		4	16	26-Sep-97	SA
TA2-NW1-325	Barium	220	µg/L		4	16	15-Sep-98	SA
TA2-SW1-320	Barium	220	µg/L		3.9	16	9-Jun-97	DU
TA2-SW1-320	Barium	220	µg/L		4	16	6-Mar-98	SA
TA2-SW1-320	Barium	220	µg/L		4	16	10-Sep-98	SA
TA2-SW1-320	Barium	220	µg/L		4	16	30-Nov-98	SA
TA2-SW1-320	Barium	220	µg/L		4	16	20-Jul-99	SA
TA2-SW1-320	Barium	220	µg/L		4	16	13-Sep-99	SA
TA2-SW1-320	Barium	220	µg/L		4	16	21-Mar-01	SA
TA2-NW1-325	Barium	210	µg/L		4	16	30-Nov-98	SA
TA2-SW1-320	Barium	210	µg/L		4	16	12-Apr-00	SA
TA2-SW1-320	Barium	210	µg/L		4	16	12-Jan-01	SA
TA2-NW1-325	Barium	200	µg/L		4	16	9-Mar-98	SA
TJA-4	Barium	200	µg/L		4	16	2-Jan-01	SA
TA2-NW1-325	Barium	190	µg/L		4	16	8-Mar-99	SA
TA2-W-01	Barium	190	µg/L		4	16	18-Sep-98	SA
TJA-4	Barium	190	µg/L		4	16	12-Jul-99	DU
TJA-4	Barium	190	µg/L		4	16	20-Sep-99	SA
TJA-4	Barium	190	µg/L		4	16	7-Mar-01	SA
TJA-4	Barium	190	µg/L		4	16	20-Jun-01	SA
TA2-NW1-325	Barium	180	µg/L		4	16	6-Jul-98	SA
TJA-4	Barium	180	µg/L		4	16	4-Mar-99	DU
TJA-4	Barium	180	µg/L		4	16	4-Mar-99	SA
TJA-4	Barium	180	µg/L		4	16	12-Jul-99	SA
TJA-4	Barium	180	µg/L		4	16	29-Nov-99	SA
TJA-4	Barium	180	µg/L		4	16	20-Apr-00	SA
TA2-W-01	Barium	170	µg/L		4	16	24-Jun-98	SA
TA2-W-01	Barium	170	µg/L		4	16	28-Jul-99	SA
TA2-W-01	Barium	170	µg/L		4	16	15-Sep-99	SA
TA2-W-01	Barium	170	µg/L		4	16	17-Jan-01	SA
TA2-W-01	Barium	170	µg/L		4	16	28-Mar-01	SA
TJA-4	Barium	170	µg/L		4	16	15-Dec-98	SA
TA2-W-01	Barium	160	µg/L		3.9	16	6-Jun-97	SA

Refer to footnotes at end of table.

Table 4.2.2-1 (Continued)
Tijeras Arroyo Groundwater Investigation—Metals Analytical Results
(Exceedences Above Background or Federal MCL Only)

Well Location	Analyte	Amount Detected	Units	Qualifier	MDL	RL	Sample Date	Sample Type
TA2-W-01	Barium	160	µg/L		4	16	2-Oct-97	SA
TA2-W-01	Barium	160	µg/L		4	16	8-Dec-97	SA
TA2-W-01	Barium	160	µg/L		4	16	13-Mar-98	SA
TA2-W-01	Barium	160	µg/L		4	16	30-Nov-98	SA
TA2-W-01	Barium	160	µg/L		4	16	9-Mar-99	SA
TA2-W-01	Barium	160	µg/L		4	16	2-Dec-99	SA
TJA-3	Barium	160	µg/L		4	16	11-Apr-00	SA
TA2-NW1-325	Barium	150	µg/L		4	16	15-Jun-99	SA
TA2-NW1-325	Barium	140	µg/L		4	16	15-Sep-99	SA
TA2-NW1-325	Barium	140	µg/L		4	16	17-Nov-99	SA
TA2-NW1-325	Barium	120	µg/L		4	16	21-Mar-01	SA
TA2-SW1-320	Barium	1.9	mg/L		0.02		5-Jan-94	SA
TA2-SW1-320	Barium	1.4	mg/L		0.2		12-Oct-94	DU
TA2-SW1-320	Barium	1.4	mg/L		0.2		12-Oct-94	SA
TA2-W-01	Barium	1.3	mg/L		0.02		20-Jul-94	SA
TA2-SW1-320	Barium	0.44	mg/L		0.02		15-Jul-94	SA
TA2-SW1-320	Barium	0.36	mg/L		0.02		7-Apr-94	SA
TA2-NW1-325	Barium	0.28	mg/L		0.2		27-Sep-95	SA
TA2-NW1-325	Barium	0.26	mg/L		0.2		20-Jun-95	SA
TA2-NW1-325	Barium	0.25	mg/L		0.02		11-Apr-94	SA
TA2-NW1-325	Barium	0.25	mg/L		0.2		25-Jan-96	SA
TA2-NW1-325	Barium	0.24	mg/L		0.02		6-Jan-94	SA
TA2-NW1-325	Barium	0.24	mg/L		0.02		11-Apr-94	DU
TA2-NW1-325	Barium	0.24	mg/L		0.02		18-Jul-94	DU
TA2-NW1-325	Barium	0.23	mg/L		0.02		18-Jul-94	SA
TA2-NW1-325	Barium	0.23	mg/L		0.2		13-Oct-94	SA
TA2-SW1-320	Barium	0.23	mg/L		0.01		12-Oct-94	SA
TA2-SW1-320	Barium	0.22	mg/L		0.2		27-Sep-95	SA
TA2-SW1-320	Barium	0.21	mg/L		0.2		20-Jun-95	DU
TA2-SW1-320	Barium	0.21	mg/L		0.2		20-Jun-95	SA
TA2-SW1-320	Barium	0.19	mg/L	J	0.2		25-Jan-96	SA
TA2-SW1-320	Barium	0.17	mg/L		0.01		17-Dec-92	SA
TJA-4	Barium	0.17	mg/L		0.00051	0.005	4-Mar-99	SA
WYO-2	Barium	0.17	mg/L	J	0.2		24-Jan-96	SA
PGS-2	Barium	0.16	mg/L	J	0.2		26-Jan-96	SA
TA2-SW1-320	Barium	0.16	mg/L		0.01		17-Dec-92	SA
TA2-NW1-325	Barium	0.15	mg/L		0.01		26-Mar-93	SA
TA2-NW1-325	Barium	0.15	mg/L	J	0.1	0.38	25-Jan-96	SA
TA2-W-01	Barium	0.15	mg/L	J	0.2		26-Jan-96	SA
TA2-W-25	Cadmium	10	µg/L		0.23	0.91	13-Sep-99	SA
TA1-W-06	Cadmium	1.7	µg/L		0.23	0.91	17-Mar-00	SA
TA1-W-03	Cadmium	1.6	µg/L		0.23	0.91	17-Sep-98	SA
TA2-NW1-325	Cadmium	1.4	µg/L		0.23	0.91	15-Sep-98	SA
TA2-W-19	Cadmium	1.3	µg/L		0.23	0.91	6-Mar-98	SA
TA2-W-19	Cadmium	1.1	µg/L		0.22	0.9	10-Jun-97	SA

Refer to footnotes at end of table.

Table 4.2.2-1 (Continued)
Tijeras Arroyo Groundwater Investigation—Metals Analytical Results
(Exceedences Above Background or Federal MCL Only)

Well Location	Analyte	Amount Detected	Units	Qualifier	MDL	RL	Sample Date	Sample Type
TA2-SW1-320	Cadmium	1	µg/L		0.23	0.91	10-Sep-98	SA
TA1-W-03	Cadmium	0.92	µg/L		0.23	0.91	14-Sep-99	SA
TA2-NW1-595	Cadmium	0.78	µg/L	J	0.23	0.91	8-Mar-99	SA
TJA-5	Cadmium	0.73	µg/L	J	0.23	0.91	20-Jun-01	SA
TA2-W-01	Cadmium	0.72	µg/L	J	0.23	0.91	15-Sep-99	SA
TA2-NW1-595	Cadmium	0.62	µg/L	J	0.23	0.91	15-Sep-99	SA
WYO-1	Cadmium	0.62	µg/L	J	0.23	0.91	14-Sep-98	SA
WYO-1	Cadmium	0.58	µg/L	J	0.23	0.91	28-Aug-98	SA
PGS-2	Cadmium	0.55	µg/L	J,B	0.23	0.91	22-Sep-97	SA
TA2-W-01	Cadmium	0.49	µg/L	J,B	0.23	0.91	2-Oct-97	SA
TA2-W-25	Cadmium	0.47	µg/L	J	0.23	0.91	28-Apr-00	SA
TA2-W-01	Cadmium	0.0048	mg/L	J	0.005		26-Jan-96	SA
TA1-W-03	Cadmium	0.00047	mg/L	J	0.00044	0.005	17-Sep-98	SA
TA2-SW1-320	Chromium	0.05	mg/L		0.02		7-Apr-94	SA
TJA-4	Cobalt	6.1	µg/L		0.23	0.91	29-Nov-99	SA
TA2-W-24	Cobalt	4.1	µg/L	B	0.23	0.91	9-Sep-99	SA
TA1-W-07	Cobalt	3.8	µg/L	B	0.23	0.91	16-Sep-99	SA
TA1-W-03	Cobalt	3.7	µg/L	B	0.23	0.91	14-Sep-99	SA
TA1-W-03	Cobalt	3.3	µg/L	B	0.23	0.91	24-Nov-99	SA
PGS-2	Cobalt	2.7	µg/L	B	0.23	0.91	22-Sep-97	SA
WYO-1	Cobalt	0.009	mg/L	J	0.05		25-Jan-96	SA
WYO-2	Cobalt	0.0059	mg/L	J	0.05		24-Jan-96	SA
TA2-SW1-320	Cobalt	0.0042	mg/L	J	0.01		12-Oct-94	SA
PGS-2	Cobalt	0.0041	mg/L	J	0.05		26-Jan-96	SA
TA2-W-19	Cobalt	0.0041	mg/L	J	0.05		24-Jan-96	DU
TA2-SW1-320	Copper	0.061	mg/L		0.02		17-Dec-92	SA
TA2-SW1-320	Copper	0.05	mg/L		0.025		12-Oct-94	DU
PGS-2	Lead	0.023	mg/L		0.003		26-Jan-96	SA
WYO-2	Lead	0.012	mg/L		0.003		24-Jan-96	SA
TA2-W-19	Nickel	130	µg/L		1.1	4.5	6-Jul-01	SA
PGS-2	Nickel	45	µg/L		1.1	4.5	16-Dec-97	SA
PGS-2	Nickel	45	µg/L		1.1	4.5	12-Apr-00	SA
PGS-2	Nickel	43	µg/L		1.1	4.5	8-Dec-98	SA
PGS-2	Nickel	31	µg/L		1.1	4.5	22-Sep-97	SA
TA1-W-03	Selenium	74	µg/L		1.7	6.8	10-Apr-00	SA
TA1-W-03	Selenium	59	µg/L		1.7	6.8	17-Sep-98	SA
TA1-W-03	Selenium	58	µg/L		1.7	6.8	24-Nov-99	SA
TA1-W-03	Selenium	54	µg/L		1.7	6.8	11-Mar-98	SA
TA1-W-03	Selenium	54	µg/L	B	1.7	6.8	14-Sep-99	SA
TA1-W-03	Selenium	49	µg/L		1.7	6.8	1-Jul-98	SA
TA1-W-03	Selenium	47	µg/L		1.7	6.8	26-Mar-01	SA
TA1-W-03	Selenium	42	µg/L		1.7	6.8	26-Jun-01	SA
TA1-W-03	Selenium	40	µg/L	B	1.7	6.8	5-Jan-01	SA
TA1-W-03	Selenium	27	µg/L		1.5	6	10-Mar-99	SA
TA2-W-27	Selenium	26	µg/L		1.7	6.8	8-Jul-99	SA

Refer to footnotes at end of table.

Table 4.2.2-1 (Continued)
Tijeras Arroyo Groundwater Investigation—Metals Analytical Results
(Exceedences Above Background or Federal MCL Only)

Well Location	Analyte	Amount Detected	Units	Qualifier	MDL	RL	Sample Date	Sample Type
TA2-W-27	Selenium	26	µg/L		1.7	6.8	23-Nov-99	SA
TA1-W-07	Selenium	24	µg/L	B	1.7	6.8	21-Jul-99	SA
TA1-W-06	Selenium	22	µg/L		1.7	6.8	21-Sep-98	SA
TA1-W-07	Selenium	21	µg/L		1.7	6.8	10-Jan-01	SA
TA2-W-27	Selenium	21	µg/L		1.7	6.8	14-Mar-00	SA
TA2-W-27	Selenium	21	µg/L	B	1.7	6.8	12-Mar-01	SA
TA1-W-06	Selenium	20	µg/L		1.7	6.8	22-Nov-99	DU
TA1-W-06	Selenium	20	µg/L		1.7	6.8	22-Nov-99	SA
TA2-W-01	Selenium	20	µg/L	B	1.7	6.8	28-Jul-99	SA
TA2-W-27	Selenium	20	µg/L		1.7	6.8	24-Sep-98	SA
TA2-W-27	Selenium	20	µg/L	B	1.7	6.8	9-Sep-99	SA
TA1-W-06	Selenium	19	µg/L	B	1.7	6.8	27-Jul-99	SA
TA1-W-07	Selenium	19	µg/L		1.7	6.8	16-Dec-98	SA
TA1-W-07	Selenium	19	µg/L		1.7	6.8	16-Mar-00	SA
TA2-NW1-325	Selenium	19	µg/L		1.7	6.8	15-Sep-98	SA
TA2-W-01	Selenium	19	µg/L		1.7	6.8	18-Sep-98	SA
TA2-W-26	Selenium	19	µg/L		1.7	6.8	17-Mar-98	SA
TA2-W-27	Selenium	19	µg/L		1.7	6.8	23-Jun-98	SA
WYO-1	Selenium	19	µg/L	B	1.7	6.8	14-Jul-99	SA
WYO-2	Selenium	19	µg/L	B	1.7	6.8	19-Jul-99	SA
TA2-NW1-325	Selenium	18	µg/L		1.7	6.8	8-Dec-97	SA
TA2-NW1-325	Selenium	18	µg/L		1.7	6.8	17-Nov-99	SA
TA1-W-07	Selenium	17	µg/L		1.7	6.8	6-Dec-99	SA
TA1-W-07	Selenium	17	µg/L		1.7	6.8	15-Mar-01	SA
TA2-NW1-325	Selenium	17	µg/L		1.7	6.8	21-Mar-01	SA
TA2-W-27	Selenium	17	µg/L		1.7	6.8	3-Dec-98	SA
TA1-W-06	Selenium	16	µg/L		1.7	6.8	3-Dec-98	SA
TA1-W-07	Selenium	16	µg/L	B	1.7	6.8	16-Sep-99	SA
TA2-NW1-325	Selenium	16	µg/L		1.7	6.8	15-Jun-99	SA
TA2-NW1-325	Selenium	16	µg/L		1.7	6.8	11-Jan-01	SA
TA2-NW1-595	Selenium	16	µg/L		1.7	6.8	18-Nov-99	SA
TA2-W-01	Selenium	16	µg/L		1.7	6.8	17-Jan-01	SA
TA2-W-27	Selenium	16	µg/L		1.7	6.8	22-Jun-01	SA
WYO-2	Selenium	16	µg/L		1.7	6.8	14-Sep-98	SA
TA1-W-06	Selenium	15	µg/L	B	1.7	6.8	10-Sep-99	SA
TA1-W-06	Selenium	15	µg/L	B	1.7	6.8	22-Mar-01	SA
TA1-W-06	Selenium	15	µg/L		1.7	6.8	28-Jun-01	SA
TA1-W-07	Selenium	15	µg/L		1.7	6.8	27-Jun-01	SA
TA2-NW1-325	Selenium	15	µg/L		1.7	6.8	8-Mar-99	SA
TA2-NW1-595	Selenium	15	µg/L		1.7	6.8	15-Sep-98	SA
TA2-W-01	Selenium	15	µg/L		1.7	6.8	28-Mar-01	SA
TA2-W-19	Selenium	15	µg/L		1.7	6.8	16-Jun-99	SA
TJA-2	Selenium	15	µg/L		1.7	6.8	30-Nov-99	SA
WYO-1	Selenium	15	µg/L	B	1.7	6.8	9-Dec-97	SA

Refer to footnotes at end of table.

Table 4.2.2-1 (Continued)
Tijeras Arroyo Groundwater Investigation—Metals Analytical Results
(Exceedences Above Background or Federal MCL Only)

Well Location	Analyte	Amount Detected	Units	Qualifier	MDL	RL	Sample Date	Sample Type
WYO-1	Selenium	15	µg/L		1.7	6.8	14-Sep-98	SA
TA1-W-06	Selenium	14	µg/L		1.7	6.8	17-Mar-00	SA
TA2-NW1-325	Selenium	14	µg/L	B	1.7	6.8	15-Sep-99	SA
TA2-W-01	Selenium	14	µg/L	B	1.7	6.8	8-Dec-97	SA
TA2-W-01	Selenium	14	µg/L		1.7	6.8	13-Mar-98	SA
WYO-1	Selenium	14	µg/L	B	1.7	6.8	9-Dec-97	SA
TA1-W-06	Selenium	13	µg/L		1.7	6.8	24-Mar-98	SA
TA2-NW1-325	Selenium	13	µg/L		1.7	6.8	26-Sep-97	SA
TA2-NW1-325	Selenium	13	µg/L		1.7	6.8	6-Jul-98	SA
TA2-NW1-325	Selenium	13	µg/L		1.7	6.8	30-Nov-98	SA
TA2-NW1-325	Selenium	13	µg/L		1.7	6.8	21-Apr-00	SA
TA2-NW1-595	Selenium	13	µg/L		1.7	6.8	8-Mar-99	SA
TA2-NW1-595	Selenium	13	µg/L	B	1.7	6.8	20-Mar-01	SA
TA2-W-01	Selenium	13	µg/L		1.7	6.8	9-Mar-99	SA
TA2-W-01	Selenium	13	µg/L		1.7	6.8	2-Dec-99	SA
TA2-W-27	Selenium	13	µg/L	B	1.7	6.8	3-Jan-01	SA
TJA-3	Selenium	13	µg/L		1.7	6.8	11-Apr-00	SA
WYO-1	Selenium	13	µg/L		1.7	6.8	28-Aug-98	SA
WYO-1	Selenium	13	µg/L		1.7	6.8	28-Aug-98	SA
WYO-2	Selenium	13	µg/L	B	1.7	6.8	9-Dec-97	SA
WYO-2	Selenium	13	µg/L		1.7	6.8	16-Jan-01	DU
WYO-2	Selenium	13	µg/L		1.7	6.8	16-Jan-01	SA
PGS-2	Selenium	12	µg/L		1.7	6.8	22-Sep-97	SA
TA1-W-06	Selenium	12	µg/L		1.7	6.8	1-Jul-98	SA
TA2-NW1-325	Selenium	12	µg/L		1.7	6.8	10-Jul-01	SA
TA2-NW1-595	Selenium	12	µg/L		1.7	6.8	15-Jun-99	SA
TA2-NW1-595	Selenium	12	µg/L		1.7	6.8	11-Jan-01	SA
TA2-W-01	Selenium	12	µg/L		1.7	6.8	24-Jun-98	SA
TA2-W-01	Selenium	12	µg/L	B	1.7	6.8	15-Sep-99	SA
TA2-W-26	Selenium	12	µg/L		1.7	6.8	22-Jun-98	SA
TJA-2	Selenium	12	µg/L		1.7	6.8	16-Dec-97	SA
TJA-2	Selenium	12	µg/L		1.7	6.8	16-Sep-98	SA
WYO-1	Selenium	12	µg/L		1.7	6.8	28-Aug-98	SA
WYO-1	Selenium	12	µg/L	B	1.7	6.8	19-Mar-01	SA
PGS-2	Selenium	11	µg/L		1.7	6.8	16-Dec-97	SA
TA2-NW1-325	Selenium	11	µg/L		1.7	6.7	9-Jun-97	SA
TA2-NW1-325	Selenium	11	µg/L		1.7	6.8	9-Mar-98	SA
TA2-NW1-595	Selenium	11	µg/L	B	1.7	6.8	15-Dec-97	SA
TA2-NW1-595	Selenium	11	µg/L		1.7	6.8	30-Nov-98	SA
TA2-NW1-595	Selenium	11	µg/L		1.7	6.8	21-Apr-00	SA
TA2-SW1-320	Selenium	11	µg/L		1.7	6.8	12-Apr-00	SA
TA2-W-01	Selenium	11	µg/L		1.7	6.8	2-Oct-97	SA
TA2-W-01	Selenium	11	µg/L		1.7	6.8	30-Nov-98	SA
TA2-W-19	Selenium	11	µg/L	B	1.7	6.8	10-Dec-97	SA

Refer to footnotes at end of table.

Table 4.2.2-1 (Continued)
Tijeras Arroyo Groundwater Investigation—Metals Analytical Results
(Exceedences Above Background or Federal MCL Only)

Well Location	Analyte	Amount Detected	Units	Qualifier	MDL	RL	Sample Date	Sample Type
TA2-W-26	Selenium	11	µg/L		1.7	6.8	14-Dec-98	SA
TJA-2	Selenium	11	µg/L		1.7	6.8	24-Jun-98	SA
WYO-1	Selenium	11	µg/L		1.7	6.8	1-Dec-99	SA
WYO-1	Selenium	11	µg/L		1.7	6.8	21-Jun-01	SA
WYO-2	Selenium	11	µg/L		1.7	6.8	1-Oct-97	SA
WYO-2	Selenium	11	µg/L		1.7	6.8	10-Jun-98	SA
TA2-NW1-595	Selenium	10	µg/L		1.7	6.8	9-Mar-98	SA
TA2-W-19	Selenium	10	µg/L		1.7	6.8	9-Mar-99	SA
TA2-W-19	Selenium	10	µg/L		1.7	6.8	30-Nov-99	SA
TA2-W-26	Selenium	10	µg/L		1.7	6.8	25-Sep-98	SA
TA2-W-26	Selenium	10	µg/L		1.7	6.8	7-Jul-99	SA
TA2-W-27	Selenium	10	µg/L		1.5	6	11-Mar-99	SA
TJA-2	Selenium	10	µg/L		1.7	6.8	16-Jun-99	SA
WYO-1	Selenium	10	µg/L		1.7	6.8	1-Oct-97	SA
WYO-1	Selenium	10	µg/L		1.7	6.8	10-Jun-98	SA
WYO-1	Selenium	10	µg/L		1.7	6.8	5-Mar-99	SA
WYO-1	Selenium	10	µg/L	B	1.7	6.8	16-Sep-99	DU
WYO-1	Selenium	10	µg/L	B	1.7	6.8	16-Sep-99	SA
WYO-1	Selenium	10	µg/L		1.7	6.8	12-Jan-01	SA
WYO-2	Selenium	10	µg/L		1.7	6.8	1-Dec-99	DU
WYO-2	Selenium	10	µg/L		1.7	6.8	21-Jun-01	SA
PGS-2	Selenium	9.9	µg/L		1.7	6.7	11-Jun-97	SA
TA1-W-06	Selenium	9.9	µg/L	B	1.7	6.8	9-Jan-01	SA
TJA-2	Selenium	9.9	µg/L		1.7	6.8	22-Jun-01	SA
WYO-1	Selenium	9.9	µg/L		1.7	6.8	28-Aug-98	SA
TA2-NW1-595	Selenium	9.8	µg/L	B	1.7	6.8	15-Sep-99	SA
TA2-W-19	Selenium	9.8	µg/L		1.7	6.8	8-Mar-01	SA
TA2-W-24	Selenium	9.8	µg/L		1.7	6.8	19-Mar-98	SA
TA1-W-07	Selenium	9.7	µg/L		1.5	6	10-Mar-99	SA
TA2-W-01	Selenium	9.7	µg/L		1.7	6.7	6-Jun-97	SA
TA2-W-19	Selenium	9.7	µg/L		1.7	6.8	16-Sep-98	DU
WYO-2	Selenium	9.7	µg/L	B	1.7	6.8	16-Sep-99	SA
TA2-SW1-320	Selenium	9.6	µg/L		1.7	6.8	19-Nov-99	SA
TA2-W-26	Selenium	9.6	µg/L		1.7	6.8	2-Dec-99	SA
WYO-2	Selenium	9.6	µg/L		1.7	6.8	5-Mar-99	SA
TA2-NW1-595	Selenium	9.5	µg/L		1.7	6.8	30-Sep-97	SA
TA2-W-19	Selenium	9.5	µg/L		1.7	6.8	16-Sep-98	SA
TJA-2	Selenium	9.5	µg/L		1.7	6.8	15-Mar-00	SA
WYO-2	Selenium	9.5	µg/L		1.7	6.7	5-Jun-97	SA
TA2-W-19	Selenium	9.3	µg/L		1.7	6.8	15-Mar-00	SA
TA2-SW1-320	Selenium	9.2	µg/L	B	1.7	6.8	20-Jul-99	SA
TA2-W-26	Selenium	9.2	µg/L	B	1.7	6.8	9-Sep-99	DU
TA2-NW1-595	Selenium	9.1	µg/L		1.7	6.8	30-Sep-97	DU
WYO-1	Selenium	9.1	µg/L		1.7	6.7	5-Jun-97	SA

Refer to footnotes at end of table.

Table 4.2.2-1 (Continued)
Tijeras Arroyo Groundwater Investigation—Metals Analytical Results
(Exceedences Above Background or Federal MCL Only)

Well Location	Analyte	Amount Detected	Units	Qualifier	MDL	RL	Sample Date	Sample Type
TA2-W-19	Selenium	8.9	µg/L		1.7	6.7	10-Jun-97	SA
TA2-W-19	Selenium	8.8	µg/L		1.7	6.8	2-Dec-98	DU
TJA-5	Selenium	8.8	µg/L	B	1.7	6.8	14-Sep-99	SA
TA2-NW1-595	Selenium	8.7	µg/L		1.7	6.7	10-Jun-97	SA
TA2-W-27	Selenium	8.7	µg/L		1.7	6.8	19-Mar-98	SA
TA2-W-19	Selenium	8.6	µg/L		1.7	6.8	8-Jul-98	SA
TA2-W-19	Selenium	8.3	µg/L		1.7	6.8	2-Dec-98	SA
TA2-W-26	Selenium	8.3	µg/L	B	1.7	6.8	9-Sep-99	SA
WYO-2	Selenium	8.3	µg/L		1.7	6.8	1-Dec-99	SA
TJA-2	Selenium	8.2	µg/L		1.7	6.8	8-Mar-01	SA
TJA-5	Selenium	8.2	µg/L		1.7	6.8	28-Jun-99	SA
TJA-4	Selenium	8.1	µg/L	B	1.7	6.8	12-Jul-99	DU
WYO-1	Selenium	8.1	µg/L		1.7	6.8	5-Mar-98	SA
TA2-NW1-595	Selenium	8	µg/L		1.7	6.8	6-Jul-98	SA
TA2-SW1-320	Selenium	7.8	µg/L		1.7	6.8	21-Mar-01	SA
TA2-W-19	Selenium	7.8	µg/L		1.7	6.8	6-Jul-01	SA
TJA-2	Selenium	7.8	µg/L		1.7	6.8	4-Mar-99	SA
TA2-SW1-320	Selenium	7.7	µg/L		1.7	6.8	10-Sep-98	SA
TA2-W-26	Selenium	7.6	µg/L	B	1.7	6.8	13-Mar-01	SA
TJA-2	Selenium	7.6	µg/L		1.7	6.8	2-Dec-98	SA
TJA-5	Selenium	7.6	µg/L	B	1.7	6.8	7-Mar-01	DU
TA2-SW1-320	Selenium	7.5	µg/L		1.7	6.8	12-Jan-01	SA
TJA-2	Selenium	7.5	µg/L		1.7	6.8	10-Mar-98	SA
TA2-W-19	Selenium	7.4	µg/L		1.7	6.8	29-Sep-97	SA
TA2-W-26	Selenium	7.4	µg/L		1.7	6.8	17-Mar-98	DU
WYO-2	Selenium	7.4	µg/L		1.7	6.8	6-Mar-98	SA
PGS-2	Selenium	7.3	µg/L		1.7	6.8	8-Jul-98	SA
TJA-2	Selenium	7.3	µg/L		1.7	6.7	12-Jun-97	SA
TJA-4	Selenium	7.3	µg/L	B	1.7	6.8	12-Jul-99	SA
TJA-2	Selenium	7.2	µg/L		1.7	6.8	29-Sep-97	SA
TA2-SW1-320	Selenium	7.1	µg/L		1.7	6.8	6-Jul-98	SA
TA2-W-19	Selenium	7.1	µg/L	B	1.7	6.8	24-Sep-99	SA
TJA-5	Selenium	7	µg/L		1.7	6.8	28-Jun-99	DU
TA1-W-04	Selenium	6.9	µg/L		1.7	6.8	10-Apr-00	SA
TA2-W-19	Selenium	6.9	µg/L		1.7	6.8	6-Mar-98	SA
TJA-5	Selenium	6.9	µg/L		1.7	6.8	29-Nov-99	SA
TA1-W-06	Selenium	6.8	µg/L		1.5	6	15-Mar-99	SA
TJA-5	Selenium	6.8	µg/L		1.7	6.8	20-Jun-01	SA
TJA-5	Selenium	6.7	µg/L	J	1.7	6.8	28-Apr-00	DU
TJA-5	Selenium	6.7	µg/L	J,B	1.7	6.8	7-Mar-01	SA
TJA-4	Selenium	6.6	µg/L	J	1.7	6.8	29-Nov-99	SA
TA1-W-02	Selenium	6.5	µg/L	J	1.7	6.8	22-Nov-99	SA
TJA-5	Selenium	6.5	µg/L	J	1.7	6.8	28-Apr-00	SA
TJA-2	Selenium	6.4	µg/L	J,B	1.7	6.8	13-Sep-99	SA

Refer to footnotes at end of table.

Table 4.2.2-1 (Continued)
Tijeras Arroyo Groundwater Investigation—Metals Analytical Results
(Exceedences Above Background or Federal MCL Only)

Well Location	Analyte	Amount Detected	Units	Qualifier	MDL	RL	Sample Date	Sample Type
TA2-SW1-320	Selenium	6.3	µg/L	J	1.7	6.8	30-Nov-98	SA
TJA-4	Selenium	6.2	µg/L	J	1.7	6.8	15-Dec-98	SA
TJA-4	Selenium	6.2	µg/L	J	1.7	6.8	20-Apr-00	SA
PGS-2	Selenium	6	µg/L	J	1.7	6.8	30-Jun-99	SA
TA2-SW1-320	Selenium	6	µg/L	J	1.7	6.8	6-Mar-98	SA
TA2-SW1-320	Selenium	6	µg/L	J,B	1.7	6.8	13-Sep-99	SA
TJA-4	Selenium	6	µg/L	J	1.7	6.8	20-Jun-01	SA
TA2-W-26	Selenium	5.9	µg/L	J,B	1.7	6.8	8-Jan-01	DU
TJA-5	Selenium	5.9	µg/L	J	1.7	6.8	4-Mar-99	SA
TA1-W-02	Selenium	5.8	µg/L	J	1.7	6.8	21-Sep-98	SA
TA2-W-24	Selenium	5.8	µg/L	J	1.7	6.8	23-Jun-98	SA
TA2-W-19	Selenium	5.7	µg/L	J,B	1.7	6.8	4-Jan-01	SA
TJA-3	Selenium	5.7	µg/L	J	1.7	6.8	29-Nov-99	SA
TA1-W-01	Selenium	5.6	µg/L	J	1.7	6.8	17-Sep-98	SA
TJA-2	Selenium	5.6	µg/L	J,B	1.7	6.8	4-Jan-01	SA
TJA-4	Selenium	5.6	µg/L	J,B	1.7	6.8	20-Sep-99	SA
TJA-5	Selenium	5.6	µg/L	J	1.7	6.8	15-Dec-98	SA
TJA-3	Selenium	5.3	µg/L	J	1.7	6.8	8-Mar-99	SA
TJA-5	Selenium	5.3	µg/L	J	1.7	6.8	4-Mar-99	DU
PGS-2	Selenium	5.2	µg/L	J	1.7	6.8	3-Dec-99	SA
TA2-W-25	Selenium	5.2	µg/L	J,B	1.7	6.8	13-Sep-99	SA
TJA-5	Selenium	5.2	µg/L	J,B	1.7	6.8	2-Jan-01	SA
TA2-SW1-320	Selenium	5.1	µg/L	J	1.7	6.7	9-Jun-97	DU
TA2-W-24	Selenium	5.1	µg/L	J	1.7	6.8	23-Nov-99	SA
TA1-W-01	Selenium	5	µg/L	J,B	1.7	6.8	22-Jul-99	SA
TA1-W-04	Selenium	5	µg/L	J	1.7	6.8	30-Jun-99	SA
TA2-W-26	Selenium	5	µg/L	J	1.7	6.8	25-Jun-01	SA
TJA-3	Selenium	5	µg/L	J	1.7	6.8	16-Jun-99	SA
TJA-4	Selenium	5	µg/L	J	1.7	6.8	7-Mar-01	SA
TA1-W-03	Selenium	0.035	mg/L		0.00271	0.005	17-Sep-98	SA
PGS-2	Selenium	0.019	mg/L		0.005		26-Jan-96	SA
TA2-W-27	Selenium	0.012	mg/L		0.0014	0.005	19-Mar-98	SA
TA2-NW1-325	Selenium	0.0094	mg/L		0.005		27-Sep-95	SA
TA1-W-07	Selenium	0.00916	mg/L		0.00271	0.005	10-Mar-99	SA
TA1-W-06	Selenium	0.00911	mg/L		0.0014	0.005	18-Jun-98	SA
TA2-NW1-325	Selenium	0.008	mg/L		0.002		11-Apr-94	SA
TA1-W-06	Selenium	0.00773	mg/L		0.00271	0.005	22-Nov-99	SA
TA2-NW1-325	Selenium	0.007	mg/L		0.002		11-Apr-94	DU
TA2-W-01	Selenium	0.0069	mg/L		0.005		27-Sep-95	SA
WYO-2	Selenium	0.00678	mg/L		0.0014	0.005	1-Oct-97	SA
TA2-NW1-325	Selenium	0.0066	mg/L	J	0.01		26-Mar-93	SA
WYO-1	Selenium	0.00604	mg/L		0.00228		5-Jun-97	DU
TA2-NW1-325	Selenium	0.006	mg/L		0.002		18-Jul-94	DU
TA2-NW1-325	Selenium	0.006	mg/L		0.002		18-Jul-94	SA
WYO-1	Selenium	0.00591	mg/L		0.00236	0.005	1-Jun-00	SA

Refer to footnotes at end of table.

Table 4.2.2-1 (Continued)
Tijeras Arroyo Groundwater Investigation—Metals Analytical Results
(Exceedences Above Background or Federal MCL Only)

Well Location	Analyte	Amount Detected	Units	Qualifier	MDL	RL	Sample Date	Sample Type
WYO-1	Selenium	0.00577	mg/L		0.00228		5-Jun-97	SA
WYO-1	Selenium	0.00569	mg/L		0.00139	0.005	16-Sep-99	SA
TA2-NW1-325	Selenium	0.0056	mg/L		0.005		25-Jan-96	SA
PGS-2	Selenium	0.00552	mg/L		0.0014	0.005	22-Sep-97	SA
TA2-W-01	Selenium	0.0055	mg/L		0.005		27-Sep-95	DU
TA2-W-26	Selenium	0.00543	mg/L		0.00139	0.005	9-Sep-99	SA
TA2-W-19	Selenium	0.0052	mg/L		0.005		24-Jan-96	SA
TJA-2	Selenium	0.0052	mg/L		0.005		24-Jan-96	SA
WYO-1	Selenium	0.0052	mg/L		0.005		25-Jan-96	SA
WYO-2	Selenium	0.00518	mg/L		0.0014	0.005	1-Oct-97	DU
TA2-W-26	Selenium	0.0051	mg/L		0.00271	0.005	14-Dec-98	SA
TA2-NW1-325	Selenium	0.005	mg/L		0.002		6-Jan-94	SA
TA2-NW1-325	Selenium	0.005	mg/L		0.005		13-Oct-94	SA
TA2-W-01	Selenium	0.005	mg/L		0.005		14-Oct-94	SA
TA2-W-19	Selenium	0.005	mg/L		0.005		24-Jan-96	DU
PGS-2	Silver	17	µg/L		0.23	0.91	12-Apr-00	SA
TA1-W-03	Silver	0.0837	mg/L		0.00073	0.005	17-Sep-98	SA
PGS-2	Thallium	2.4	µg/L	J	1.5	6	12-Mar-99	SA
TA1-W-03	Thallium	0.0292	mg/L		0.00308	0.01	17-Sep-98	SA
WYO-2	Thallium	0.00955	mg/L	J	0.00263	0.01	1-Oct-97	SA
WYO-2	Thallium	0.00571	mg/L	J	0.00263	0.01	1-Oct-97	DU
TA2-SW1-320	Thallium	0.0048	mg/L	J	0.01		12-Oct-94	SA
TJA-2	Thallium	0.0047	mg/L	J	0.01		24-Jan-96	SA
TA2-W-26	Thallium	0.00427	mg/L	J	0.00308	0.01	14-Dec-98	SA
TA2-W-19	Thallium	0.004	mg/L	J	0.01		24-Jan-96	SA
TJA-3	Thallium	0.00371	mg/L	J	0.00308	0.01	15-Dec-98	SA
TA2-SW1-320	Thallium	0.0036	mg/L	J	0.01		25-Jan-96	SA
WYO-2	Thallium	0.0036	mg/L	J	0.01		24-Jan-96	SA
TA2-NW1-325	Thallium	0.0033	mg/L	J	0.01		25-Jan-96	SA
TA2-W-19	Thallium	0.003	mg/L	J	0.01		24-Jan-96	DU
PGS-2	Vanadium	21	µg/L		2.8	11	11-Jun-97	SA
PGS-2	Vanadium	21	µg/L		2.8	11	22-Sep-97	SA
PGS-2	Vanadium	19	µg/L		2.8	11	16-Dec-97	SA
TA2-W-26	Vanadium	19	µg/L		2.8	11	17-Mar-98	DU
PGS-2	Vanadium	18	µg/L		2.8	11	8-Jul-98	SA
PGS-2	Vanadium	18	µg/L		2.8	11	12-Apr-00	SA
PGS-2	Vanadium	13	µg/L		2.5	10	12-Mar-99	SA
PGS-2	Vanadium	0.026	mg/L	J	0.05		26-Jan-96	SA
WYO-2	Vanadium	0.025	mg/L	J	0.05		24-Jan-96	SA
PGS-2	Vanadium	0.0183	mg/L		0.00043	0.005	22-Sep-97	SA
TA2-SW1-320	Vanadium	0.013	mg/L		0.01		12-Oct-94	SA
TA2-W-19	Vanadium	0.013	mg/L	J	0.05		24-Jan-96	DU
TA2-W-19	Vanadium	0.013	mg/L	J	0.05		24-Jan-96	SA
TA2-W-19	Zinc	320	µg/L		23	91	6-Mar-98	SA
TA2-SW1-320	Zinc	0.54	mg/L		0.02		12-Oct-94	SA
TA2-SW1-320	Zinc	0.53	mg/L		0.02		12-Oct-94	DU

Refer to footnotes at end of table.

Table 4.2.2-1 (Concluded)
Tijeras Arroyo Groundwater Investigation—Metals Analytical Results
(Exceedences Above Background or Federal MCL Only)

B = Analyte detected in an associated blank.
DU = Duplicate.
J = Estimated value, analyte detected below the MDL.
MCL = Maximum contaminant level.
MDL = Method detection limit.
□g/L = microgram(s) per liter.
mg/L = milligram(s) per liter.
RL = Reporting limit.
SA = Sample, aqueous.

Arsenic concentrations exceeded NMED-approved background (14 μg/L) in seven groundwater samples from two wells, PGS-2 and TA2-W-26. The arsenic concentrations never exceeded the EPA MCL of 50 μg/L.

Barium concentrations exceeded NMED-approved background (120 μg/L) in 76 groundwater samples from 7 wells (mostly SGWS wells), but never exceeded the EPA MCL of 2,000 μg/L.

Cadmium concentrations exceeded NMED-approved background (0.47 μg/L) in 18 groundwater samples from 11 wells. Concentrations of cadmium exceeded the EPA MCL of 5 μg/L during one sampling event (September 1999), with a result of 10 μg/L at well TA2-W-25. Cadmium concentrations at TA2-W-25 before and after this sampling event were an order of magnitude below this anomalously high value. The second-highest cadmium concentration was 0.47 μg/L in April 2000.

Chromium concentrations exceeded NMED-approved background (43 μg/L) only once in a groundwater sample collected from well TA2-SW1-320, but did not exceed the EPA MCL of 100 μg/L.

Cobalt concentrations exceeded NMED-approved background (2.5 μg/L) in 11 groundwater samples from nine wells. There is no EPA MCL for cobalt.

Copper concentrations exceeded NMED-approved background (<50 μg/L) in two groundwater samples from well TA2-SW1-320, but never exceeded the EPA Treatment Technique action level of 1,300 μg/L.

Lead concentrations exceeded NMED-approved background (10 μg/L) in two groundwater samples from two wells, PGS-2 and WYO-2, and exceeded the EPA Treatment Technique action level of 15 μg/L for the PGS-2 January 1996 sample.

Nickel concentrations exceeded NMED-approved background (28 μg/L) in five groundwater samples from two wells, PGS-2 and TA2-W-19. There is no EPA MCL for nickel.

Selenium concentrations exceeded NMED-approved background (5 μg/L) in 247 groundwater samples from all wells, except TA1-W-05. Concentrations of selenium exceeded the EPA MCL of 50 μg/L in five samples, all from well TA1-W-03, to a maximum concentration of 74 μg/L.

Silver concentrations exceeded NMED-approved background (<10 μg/L) in two groundwater samples from two wells, PGS-2 and TA1-W-03. There is no EPA MCL for silver.

Thallium concentrations exceeded NMED-approved background and EPA MCL (2 μg/L for both limits) in 13 groundwater samples from 9 wells, mostly SGWS wells. Thallium concentrations had J-qualifiers in all except 1 of the 13 samples.

Vanadium concentrations exceeded NMED-approved background (13 μg/L) in 13 groundwater samples from 5 wells, with 8 of the exceeding concentrations from PGS-2. There is no EPA MCL for vanadium.

Zinc concentrations exceeded NMED-approved background (260 μg/L) in three groundwater samples from two wells, TA2-W-19 and TA2-SW1-320. There is no EPA MCL for zinc.

In summary, concentrations of arsenic, barium, cadmium, chromium, cobalt, copper, lead, nickel, selenium, silver, thallium, vanadium, and zinc exceeded the respective EPA MCLs in groundwater samples from the TAG study area at least once (Table 4.2.2-1).

4.2.2.2 Nitrate

Nitrate analysis has been conducted on TAG samples since 1992 for certain wells. Table 4.2.2-2 lists all the nitrate concentrations detected in TAG samples. Nitrate exceeded the MCL (10 mg/L) in nine wells, and seven of these wells exceeded the MCL only once or twice, which may reflect a laboratory error. Wells TA2-W-SW1-320 and TJA-4 have consistently exceeded the MCL. Concentration trends have been plotted for wells TA2-SW1-320 and TJA-4; other wells with only sporadic hits were not graphed. The concentration trend line for TA2-SW1-320 and TJA-4 (Figures 4.2.2-1 and 4.2.2-2) exhibit increasing concentrations at a rate of 2 to 5 mg/L per year. The nitrate concentrations will continue to be monitored in future sampling events to see if these trends continue.

4.2.2.3 Chloride

Chloride analysis has been conducted on TAG samples since 1993. Annex G lists the historical chloride concentrations detected in TAG groundwater samples. There is no EPA MCL specified for chloride; however, the New Mexico Water Quality Control Commission has a human health standard for chloride of 250 mg/L (NMAC January 2001). Chloride concentrations exceeded this standard only in well TA1-W-03, an SGWS well located on the eastern portion of the study area. The other TAG wells had a wide range of chloride concentrations from less than 2 mg/L in well TA1-W-05 up to 170 mg/L in TA2-NW1-325. Overall, the SGWS wells are consistently higher in chloride content than co-located regional-aquifer wells. The five wells showing the highest chloride concentrations are all SGWS wells. The wells with the higher chloride concentrations are the SGWS wells along the southern edge of TA-I (from TA1-W-07 in the west through TA1-W-06 and over to TA1-W-03 in the east) and at locations northwest and southeast of TA-II (TA2-NW1-325 and TA2-W-27, respectively). For the ten wells with the highest chloride values, the concentrations over time trends have been plotted (Annex G). Although the chloride values are erratic in some of these plots, the majority of the concentration trend lines exhibit decreasing concentrations over time. The chloride concentrations will continue to be monitored in future sampling events to see if these trends continue.

4.2.3 Organic Compounds

4.2.3.1 SVOCs

Only three SVOCs (di-n-octyl phthalate, di-n-butyl phthalate, and bis[2-Ethylhexyl] phthalate) have been detected in groundwater samples over the past nine years. Table 4.2.3-1 lists all of the SVOCs detected in TAG groundwater samples and includes analytes with J and B qualifiers. The three analytes were detected sporadically in eight wells and are all phthalates, which are common laboratory contaminants (EPA February 1988). The quarterly sampling for SVOCs has been discontinued because the lack of consistent detections indicates that groundwater is not contaminated with SVOCs in the TAG study area. Therefore, SVOCs are not a COC for the TAG investigation.

Table 4.2.2-2
Tijeras Arroyo Groundwater Investigation—Nitrate (as N) Concentrations (mg/L) over Time

Sample Location	Zone of Completion	Nov-92	Dec-92	Mar-93	Jun-93	Sep-93	Dec-93	Mar-94	Jun-94	Sep-94	Dec-94	Mar-95
PGS-2	Regional											
TA1-W-01	Regional											
TA1-W-02	Regional											
TA1-W-03	Shallow											
TA1-W-04	Regional											
TA1-W-05	Regional											
TA1-W-06	Shallow											
TA1-W-07	Shallow											
TA2-NW1-325	Shallow			4.1	NS	NS	4.1	3.9	4.3	NS	NS	NS
TA2-NW1-595	Regional				2	NS	NS	NS	NS	NS	NS	NS
TA2-SW1-320	Shallow	9.4	**12.9**	NS	NS	NS	**24**	**22**	**23**	NS	NS	NS
TA2-W-01	Shallow											
TA2-W-19	Shallow											
TA2-W-24	Regional											
TA2-W-25	Regional											
TA2-W-26	Shallow											
TA2-W-27	Shallow											
TJA-2	Shallow											
TJA-3	Regional											
TJA-4	Regional (?)											
TJA-5	Shallow											
WYO-1	Regional											
WYO-2	Shallow											

Refer to footnotes at end of table.

Table 4.2.2-2 (Continued)
Tijeras Arroyo Groundwater Investigation—Nitrate (as N) Concentrations (mg/L) over Time

Sample Location	Zone of Completion	Jun-95	Sep-95	Dec-95	Mar-96	Jun-96	Sep-96	Dec-96	Mar-97	Jun-97	Sep-97	Dec-97
PGS-2	Regional			5.4	NS	NS	7.2	3.4	2.5	2.7	2.4	2.5
TA1-W-01	Regional									NS	NS	1.8
TA1-W-02	Regional											
TA1-W-03	Shallow											
TA1-W-04	Regional											
TA1-W-05	Regional											
TA1-W-06	Shallow											
TA1-W-07	Shallow											
TA2-NW1-325	Shallow	5.1	4.8	4.5	NS	NS	8.4	NS	5.6	4.7	5.0	3.2
TA2-NW1-595	Regional	NS	NS	NS	NS	NS	3.6	NS	2.9	3.4	2.6	2.2
TA2-SW1-320	Shallow	**25**	**26**	**24**	NS	NS	**29**	**26**	**28**	**28**	**23**	**22**
TA2-W-01	Shallow	6.4	6.4	6.1	NS	NS	7.6	3.8	5.4	**11.6**	6.2	4.5
TA2-W-19	Shallow			6.1	6.5	NS	8.2	5.2	5.9	7.3	6.7	6.3
TA2-W-24	Regional											
TA2-W-25	Regional									NS	NS	2
TA2-W-26	Shallow											
TA2-W-27	Shallow											
TJA-2	Shallow			6.5	NS	NS	9.2	6.6	6.7	7.9	6.7	9.0
TJA-3	Regional											
TJA-4	Regional (?)											
TJA-5	Shallow											
WYO-1	Regional			2.6	NS	NS	4.1	3.0	3.5	2.9	2.7	1.5
WYO-2	Shallow			8.4	NS	NS	3.8	NS	2.3	3.0	2.4	1.4

Refer to footnotes at end of table.

Table 4.2.2-2 (Concluded)
Tijeras Arroyo Groundwater Investigation—Nitrate (as N) Concentrations (mg/L) over Time

Sample Location	Zone of Completion	Mar-98	Jun-98	Sep-98	Dec-98	Mar-99	Jun-99	Sep-99	Dec-99	Mar-00	May-00	Jan-01
PGS-2	Regional	1.7	1.9	0.9	0.93	1.2	0.81	0.8	1.7	**12**	NS	1.4
TA1-W-01	Regional	1.1	1.9	2.3	2.0	2.5	2.0	2.2	2.8	1.5	NS	3.9
TA1-W-02	Regional	2.3	2.3	1.8	1.4	1.7	1.6	1.1	1.9	0.98	NS	3.5
TA1-W-03	Shallow	6.5	7.8	6.9	6.6	7.0	4.5	5.9	7.4	8.1	NS	**11**
TA1-W-04	Regional			2.1	4.4	3.1	2.2	2.4	2.8	1.9	NS	3.4
TA1-W-05	Regional			2.5	1.5	3.4	1.0	1.1	1.6	NS	0.9	1.5
TA1-W-06	Shallow	3.0	3.8	3.2	2.8	4.1	2.8	4.1	4	2.1	NS	5.1
TA1-W-07	Shallow			0.9	3.4	3.6	3.2	2.7	3.3	2	NS	4.2
TA2-NW1-325	Shallow	3.4	2.8	3.7	3.8	4.8	2.9	3	5.3	3.6	NS	4
TA2-NW1-595	Regional	3.3	3.7	2.8	2.6	4.3	2.8	2.9	5.5	3.3	NS	5.9
TA2-SW1-320	Shallow	**26**	**26.5**	**21.9**	**20**	**26**	**22**	**27**	**44**	**30**	NS	**36**
TA2-W-01	Shallow	5.9	5.6	5.4	4.8	7.0	5.0	5.3	8.4	**10**	NS	4.7
TA2-W-19	Shallow	5.4	8.3	8.6	7.1	9.1	6.9	8.8	9.9	7.8	NS	**13**
TA2-W-24	Regional	2.4	3.1	3.7	2.8	3.4	2.1	1.9	4.4	2.4	NS	2.1
TA2-W-25	Regional	1.4	3.6	2.5	1.9	2.0	2.2	1.7	3.7	1.5	NS	2.7
TA2-W-26	Shallow	6.6	5.5	6.2	5.0	6.8	4.0	5.6	**10**	NS	2.7	9.3
TA2-W-27	Shallow	3.7	5.4	4.9	4.0	5.2	4.3	3.6	5.3	2.9	NS	3.2
TJA-2	Shallow	7.2	7.5	8.8	7.0	9.2	4.7	7.8	**14**	6.8	NS	**11**
TJA-3	Regional			1.5	3.1	2.0	2.2	2.3	3.5	2.7	NS	3.3
TJA-4	Regional (?)				**20**	**25**	**23**	**25**	**29**	**25**	NS	**33**
TJA-5	Shallow				6.2	7.3	4.1	6.7	7.6	8.1	NS	**12**
WYO-1	Regional	2.2	2.5	2.9	2.8	2.7	2.6	2.3	3.8	NS	2.42	3
WYO-2	Shallow	2.6	2.8	3.3	2.7	2.6	3.0	2.3	4.8	NS	NS	3

Bold values meet or exceed the MCL of 10 mg/L.
MCL = Maximum contaminant level.
mg/L = Milligram(s) per liter.
NS = Existing well not sampled for nitrate analysis.
(?) = Uncertainty exists as to unit of completion.

Figure 4.2.2-1
Nitrate (as N) Concentrations over Time for Monitoring Well TA2-SW1-320

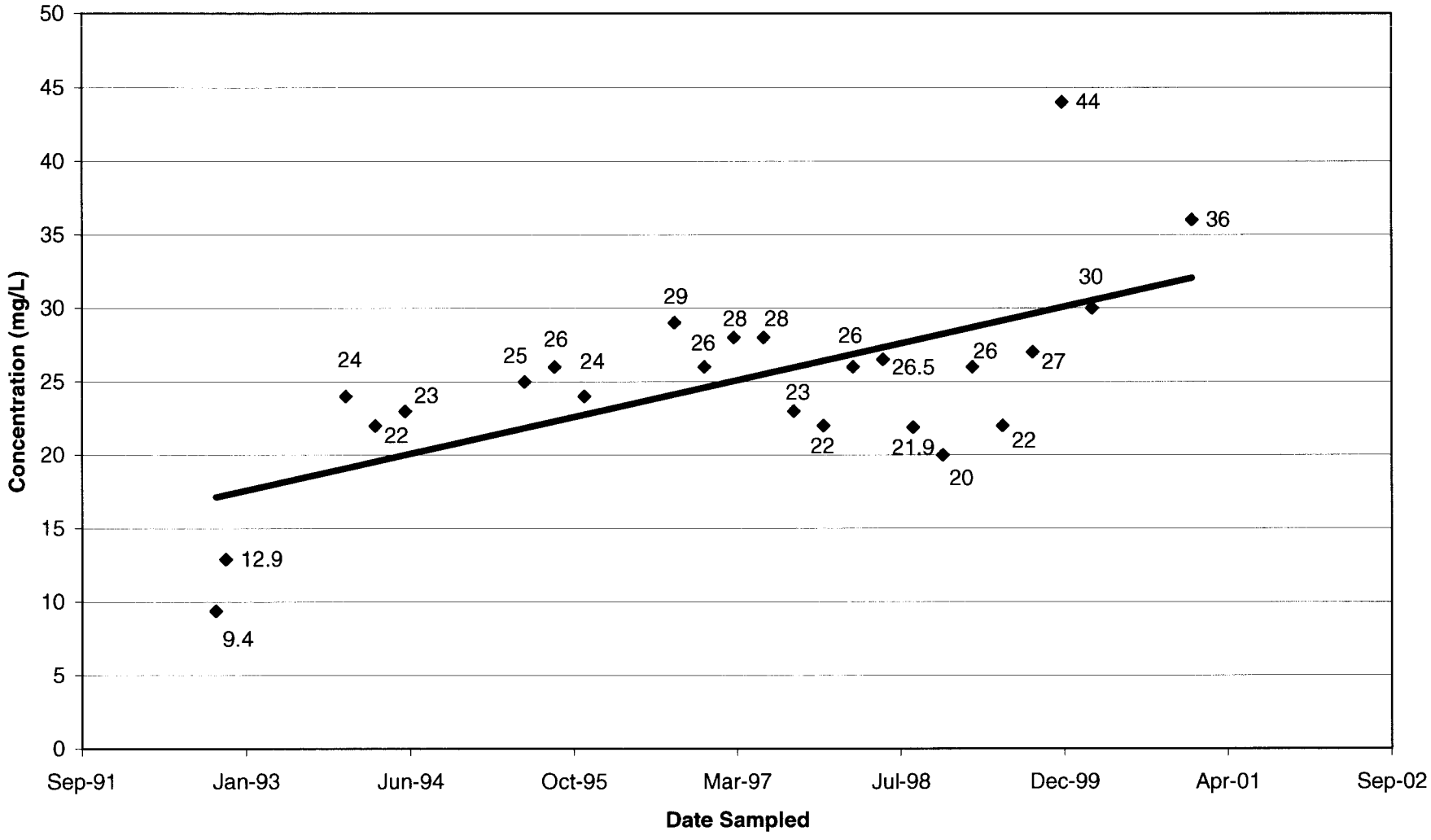


Figure 4.2.2-2
Nitrate (as N) Concentrations over Time for Monitoring Well TJA-4

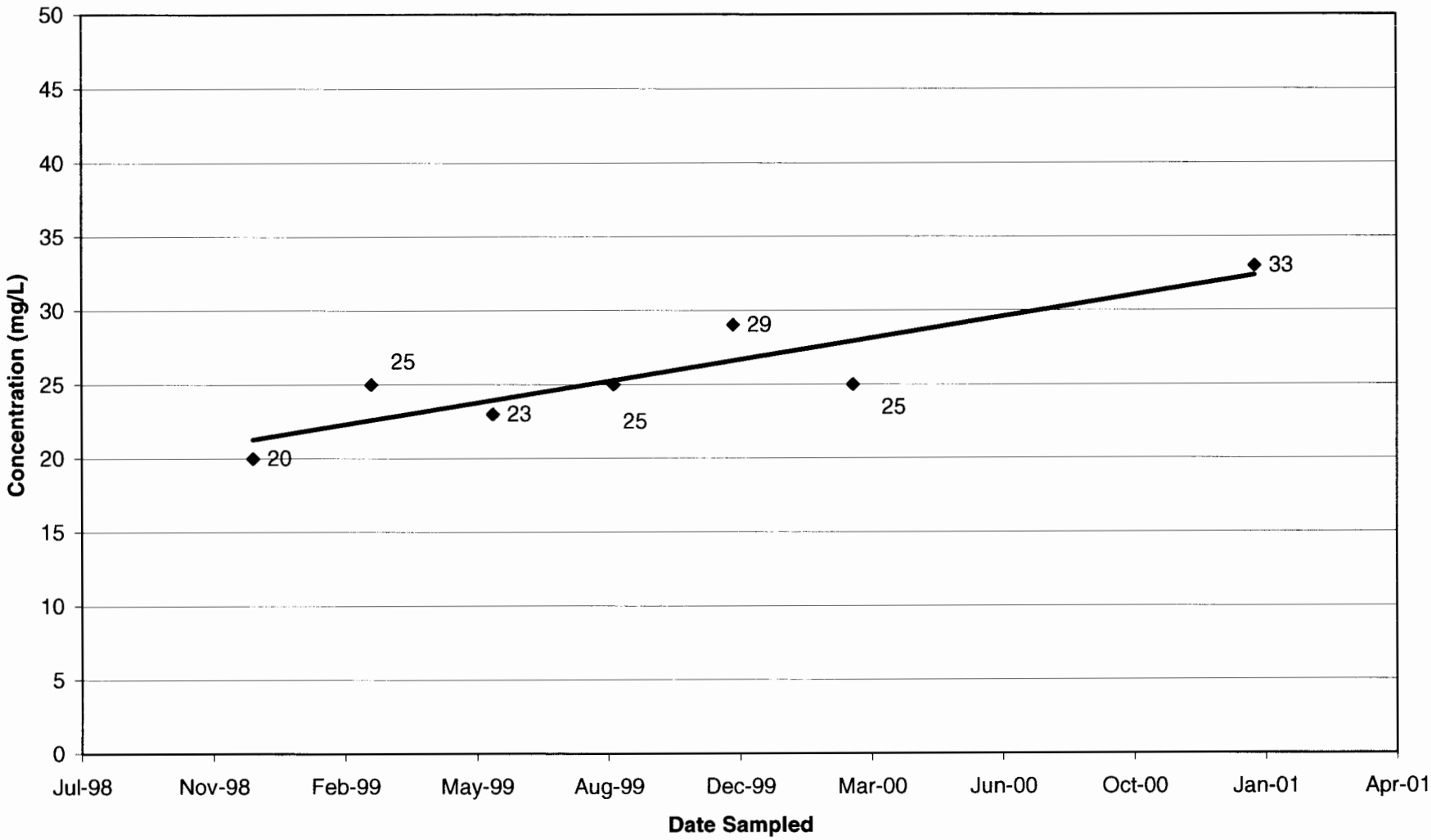


Table 4.2.3-1
Tijeras Arroyo Groundwater Investigation—Summary of Groundwater Sampling SVOC Analytical Results (Detections Only)

Well ID	Analyte	Sample Date	Analytical Method	Result	Laboratory Qualifier	Minimum Detection Limit	Reporting Limit	Units	Sample Type
TA1-W-07	di-n-octyl phthalate	21-Jul-99	EPA 8270	5.6	J,H	4.2	10.2	µg/L	SA
TA2-NW1-325	di-n-butyl phthalate	18-Jul-94	EPA 8270	0.006	J	0.01		µg/L	SA
	bis(2-Ethylhexyl)phthalate	20-Jun-95	EPA 8270	13		10		µg/L	SA
	bis(2-Ethylhexyl)phthalate	25-Jan-96	EPA 8270	7.1	J	10		µg/L	SA
	di-n-butyl phthalate	18-Jul-94	EPA 8270	0.001	J	0.01		mg/L	DU
TA2-W-01	bis(2-Ethylhexyl)phthalate	20-Jun-95	EPA 8270	9.3	J	10		µg/L	SA
TA2-W-19	bis(2-Ethylhexyl)phthalate	29-Sep-97	EPA 8270	180		5	39.6	µg/L	SA
	bis(2-Ethylhexyl)phthalate	16-Sep-98	EPA 8270	5.3	J,B	3.7	9.9	µg/L	SA
TA2-W-25	bis(2-Ethylhexyl)phthalate	12-Dec-97	EPA 8270	6.2	J,H	5	10	µg/L	SA
TJA-2	bis(2-Ethylhexyl)phthalate	24-Jan-96	EPA 8270	4.3	J	10		µg/L	SA
	bis(2-Ethylhexyl)phthalate	16-Dec-97	EPA 8270	18		5	10	µg/L	SA
	bis(2-Ethylhexyl)phthalate	16-Sep-98	EPA 8270	5.5	J,B	3.7	9.9	µg/L	SA
TJA-4	bis(2-Ethylhexyl)phthalate	12-Jul-99	EPA 8270	30		3.7	10	µg/L	DU
WYO-2	bis(2-Ethylhexyl)phthalate	24-Jan-96	EPA 8270	33		10		µg/L	SA
	bis(2-Ethylhexyl)phthalate	01-Oct-97	EPA 8270	45		5	9.9	µg/L	DU

B = Analyte detected in an associated blank.
DU = Duplicate sample.
EPA = U.S. Environmental Protection Agency.
J = Analyte detected below the method detection limit.
H = Holding time exceeded.
ID = Identification.
µg/L = Microgram(s) per liter.
mg/L = Milligram(s) per liter.
SA = Sample, aqueous.
SVOC = Semivolatile organic compound.

4.2.3.2 VOCs

Twenty VOCs have been detected in TAG samples over the past nine years. Table 4.2.3-2 lists all the VOCs ever detected and includes analytes with J and B qualifiers. Most of the VOCs occurred at very low concentrations, and the number of detections is inconsistent from quarter to quarter. The VOCs most often encountered, and therefore considered to be COCs, are TCE, PCE, cis-1,2 DCE, 1,1-DCA, and 1,1-DCE.

Of these five compounds, TCE is the only compound to exceed the MCL and has been detected below, at, and just above detection limits in ten wells (Table 4.2.3-3). Concentration trends have been plotted for six of the ten wells; the other four wells (PGS-2, TA1-W-06, TJA-3, and TJA-5) had only sporadic hits and were not graphed. In the six wells (Figures 4.2.3-1 through 4.2.3-6), the TCE concentrations over time are fairly consistent at any given location. The concentration trend line is level to slightly decreasing for three of the wells (TA2-W-01, TA2-W-19, and TA2-W-26). The trend lines for the remaining three wells (TJA-2, WYO-1, and WYO-2) exhibit increasing concentrations, although the concentrations for the last eight to ten sampling events have leveled off.

For the other four detected VOCs (PCE, cis-1,2 DCE, 1,1-DCA, and 1,1-DCE), Table 4.2.3-2 provides the maximum concentrations, well locations, and sampling dates.

4.2.4 Radionuclides

The historical radionuclide data, from 1993 through 2000, has been compiled in Annex F-4. Gross alpha, gross beta, isotopic uranium (U-238, U-235, and U-234), and tritium were the analytes of interest, but there is no evidence of radioactive contamination in groundwater samples from the TAG study area.

Gross alpha and gross beta results are consistent with historical values found in wells outside the study area that are completed in similar unconsolidated sediments. The uranium analyses showed that all samples were below NMED-approved background levels (Dinwiddie September 1997) and within the MCL concentrations set forth by the EPA. In some instances, the isotopic uranium values were reported as U-233/234. Due to process knowledge of SNL/NM activities, it is assumed that this combined analytical result is predominantly U-234.

All tritium analyses showed results that were less than the minimum detectable activity and below SNL/NM-determined background concentration of <420 picocuries per liter (Tharp February 1999). The few results reported for gamma spectroscopy such as U-235, U-238, Th-232, and Cs-137 indicate that no radioactivity is above background levels.

4.3 Nature and Extent of Contamination

4.3.1 Nitrate

The distribution of average nitrate concentrations for all the sampling events is shown in Figure 4.3.1-1. The average nitrate concentrations in the SGWS ranged from 2.9 to 8.0 mg/L, typically two to three times greater than the concentrations found in the regional aquifer

Table 4.2.3-2
Tijeras Arroyo Groundwater Investigation—Summary of Groundwater Sampling VOC Analytical Results
(Detections Only)

Well ID	Analyte	Sample Date	Analytical Method	Result	Laboratory Qualifier	Minimum Detection Limit	Reporting Limit	Units	Sample Type
PGS-2	2-Hexanone	12-Mar-99	EPA 8260	12	J	10	40	µg/L	SA
	Acetone	26-Jan-96	EPA 8260	4.6	J,B	10		µg/L	SA
	Acetone	16-Dec-97	EPA 8260	20		5	20	µg/L	SA
	Acetone	16-Mar-98	EPA 8260	5.2	J	5	20	µg/L	SA
	Bromoform	09-Jul-98	EPA 8260	1.1	J	0.5	2	µg/L	SA
	Chloroform	26-Jan-96	EPA 8260	0.15	J	5		µg/L	SA
	Dibromochloromethane	09-Jul-98	EPA 8260	0.76	J	0.5	2	µg/L	SA
	Methylene chloride	11-Jun-97	EPA 8260	6.9	J	5	20	µg/L	SA
	Methylene chloride	12-Apr-00	EPA 8260	12	B	0.5	2	µg/L	SA
	Toluene	26-Jan-96	EPA 8260	0.38	J,B	5		µg/L	SA
	Toluene	16-Dec-97	EPA 8260	580		2.5	10	µg/L	SA
	Trichloroethene	26-Jan-96	EPA 8260	1.3	J	5		µg/L	SA
	Trichloroethene	26-Jan-96	EPA 8260	1.4		5		µg/L	SA
	Trichloroethene	26-Jan-96	EPA 8260	3.2		0.5	2	µg/L	SA
	Trichloroethene	16-Dec-96	EPA 8260	1	J	0.5	2	µg/L	SA
	p-, xylene, m-Xylene	09-Jul-98	EPA 8260	1.6	J	1	4	µg/L	SA
TA1-W-01	2-Hexanone	21-Aug-98	EPA 8260	7		3.2	5	µg/L	SA
	2-Hexanone	16-Mar-00	EPA 8260	14	J	10	40	µg/L	SA
	4-methyl-, 2-Pentanone	16-Mar-00	EPA 8260	8.2	J	5	20	µg/L	SA
	Acetone	21-Aug-98	EPA 8260	3.7	J	3.7	5	µg/L	SA
TA1-W-02	1,1-Dichloroethene	27-Jul-99	EPA 8260	1.1	J	0.5	2	µg/L	SA
	Acetone	19-Feb-98	EPA 8260	9.9	J	5	20	µg/L	SA
	Acetone	17-Mar-00	EPA 8260	5.5	J	5	20	µg/L	SA
	Methylene chloride	18-Jun-98	EPA 8260	4.1	B	0.25	1	µg/L	SA
	Tetrachloroethene	09-Mar-98	EPA 8260	2.1		0.5	2	µg/L	SA
TA1-W-03	Acetone	09-Feb-98	EPA 8260	21		5	20	µg/L	SA
	Acetone	09-Feb-98	EPA 8260	25		5	20	µg/L	SA
	Chloroform	14-Sep-99	EPA 8260	0.5	J	0.5	2	µg/L	SA
	Methylene chloride	10-Apr-00	EPA 8260	10	B	0.5	2	µg/L	SA
	Tetrachloroethene	04-Mar-98	EPA 8260	2.7		0.5	2	µg/L	SA
	Toluene	13-Jul-99	EPA 8260	26		0.5	2	µg/L	SA

Refer to footnotes at end of table.

Table 4.2.3-2 (Continued)
Tijeras Arroyo Groundwater Investigation—Summary of Groundwater Sampling VOC Analytical Results
(Detections Only)

Well ID	Analyte	Sample Date	Analytical Method	Result	Laboratory Qualifier	Minimum Detection Limit	Reporting Limit	Units	Sample Type
TA1-W-04	1,1-Dichloroethene	30-Jun-99	EPA 8260	0.89	J	0.5	2	µg/L	SA
	2-Butanone	08-Oct-98	EPA 8260	8	J	5	20	µg/L	SA
	Acetone	23-Sep-98	EPA 8260	31		5	20	µg/L	SA
	Acetone	01-Oct-98	EPA 8260	14	J	5	20	µg/L	SA
	Acetone	08-Oct-98	EPA 8260	48		5	20	µg/L	SA
	Chlorobenzene	08-Oct-98	EPA 8260	0.51	J	0.5	2	µg/L	SA
	Chloromethane	08-Oct-98	EPA 8260	0.78	J	0.5	2	µg/L	SA
	Chloromethane	08-Oct-98	EPA 8260	1.7	J	0.5	2	µg/L	SA
	Methylene chloride	10-Apr-00	EPA 8260	11	B	0.5	2	µg/L	SA
TA1-W-05	2-Butanone	19-Oct-98	EPA 8260	13	J	5	20	µg/L	SA
	4-methyl-, 2-Pentanone	19-Oct-98	EPA 8260	12	J	5	20	µg/L	SA
TA1-W-05	Acetone	19-Oct-98	EPA 8260	68		5	20	µg/L	SA
	Acetone	28-Oct-98	EPA 8260	7.9	J	5	20	µg/L	SA
	Chloromethane	19-Oct-98	EPA 8260	1.5	J	0.5	2	µg/L	SA
	Chloromethane	19-Oct-98	EPA 8260	1.7	J	0.5	2	µg/L	SA
	Trichloroethene	19-Oct-98	EPA 8260	0.58	J	0.5	2	µg/L	SA
TA1-W-06	1,1-Dichloroethane	17-Mar-00	EPA 8260	0.77	J	0.5	2	µg/L	SA
	1,1-Dichloroethene	24-Mar-98	EPA 8260	0.55	J	0.5	2	µg/L	SA
	1,1-Dichloroethene	18-Jun-98	EPA 8260	0.66	J	0.25	1	µg/L	SA
	1,1-Dichloroethene	01-Jul-98	EPA 8260	0.7	J	0.5	2	µg/L	SA
	1,1-Dichloroethene	21-Sep-98	EPA 8260	0.98	J	0.5	2	µg/L	SA
	1,1-Dichloroethene	03-Dec-98	EPA 8260	0.78	J	0.5	2	µg/L	SA
	1,1-Dichloroethene	15-Mar-99	EPA 8260	0.89	J	0.5	2	µg/L	SA
	1,1-Dichloroethene	27-Jul-99	EPA 8260	1.2	J	0.5	2	µg/L	SA
	1,1-Dichloroethene	10-Sep-99	EPA 8260	0.93	J	0.5	2	µg/L	SA
	Acetone	05-Mar-98	EPA 8260	17	J	5	20	µg/L	SA
	Acetone	11-Mar-98	EPA 8260	6	J	5	20	µg/L	SA
	Chloroform	10-Sep-99	EPA 8260	0.51	J	0.5	2	µg/L	SA
	Methylene chloride	18-Jun-98	EPA 8260	5.3	B	0.25	1	µg/L	SA
	Tetrachloroethene	11-Mar-98	EPA 8260	2.4		0.5	2	µg/L	SA
	Tetrachloroethene	24-Mar-98	EPA 8260	0.52	J	0.5	2	µg/L	SA

Refer to footnotes at end of table.

Table 4.2.3-2 (Continued)
Tijeras Arroyo Groundwater Investigation—Summary of Groundwater Sampling VOC Analytical Results
(Detections Only)

Well ID	Analyte	Sample Date	Analytical Method	Result	Laboratory Qualifier	Minimum Detection Limit	Reporting Limit	Units	Sample Type
TA1-W-06	Tetrachloroethene	18-Jun-98	EPA 8260	0.95	J	0.23	1	µg/L	SA
	Trichloroethene	11-Mar-98	EPA 8260	0.82	J	0.5	2	µg/L	SA
	Trichloroethene	18-Jun-98	EPA 8260	0.56	J	0.27	1	µg/L	SA
	Trichloroethene	10-Sep-99	EPA 8260	0.6	J	0.5	2	µg/L	SA
	Trichloroethene	17-Mar-00	EPA 8260	0.52	J	0.5	2	µg/L	SA
TA1-W-07	1,1-Dichloroethene	16-Dec-98	EPA 8260	0.53	J	0.5	2	µg/L	SA
	1,1-Dichloroethene	10-Mar-99	EPA 8260	0.54	J	0.5	2	µg/L	SA
	1,1-Dichloroethene	21-Jul-99	EPA 8260	0.59	J	0.5	2	µg/L	SA
	1,1-Dichloroethene	16-Mar-00	EPA 8260	0.71	J	0.5	2	µg/L	SA
	Acetone	20-Aug-98	EPA 8260	16	J	5	20	µg/L	SA
	Benzene	20-Aug-98	EPA 8260	0.56	J	0.5	2	µg/L	SA
TA2-NW1-325	Acetone	26-Mar-93	EPA 8240	4.8	J,B	10		µg/L	SA
	Acetone	18-Jul-94	EPA 8260	0.004	J,B	0.01		mg/L	SA
	Acetone	25-Jan-96	EPA 8260	12	B	10		µg/L	SA
	Methylene chloride	26-Mar-93	EPA 8240	1	J	5		µg/L	SA
	Methylene chloride	06-Jan-94	EPA 8240	0.001	J	0.005		mg/L	SA
	Methylene chloride	06-Jan-94	EPA 8240	0.001	J	0.005		mg/L	SA
	Methylene chloride	18-Jul-94	EPA 8260	0.006	J,B	0.005		mg/L	SA
	Methylene chloride	13-Oct-94	EPA 8010	0.002	B	0.001		mg/L	SA
	Methylene chloride	25-Jan-96	EPA 8260	0.22	J	5		µg/L	SA
	Methylene chloride	26-Sep-97	EPA 8260	0.5	J	0.5	2	µg/L	SA
	Methylene chloride	08-Dec-97	EPA 8260	5.5		1	5	µg/L	SA
	Methylene chloride	21-Apr-00	EPA 8260	4.2	B	0.5	2	µg/L	SA
	Methylene chloride	11-Jan-01	EPA 8260	0.88	J	0.5	2	µg/L	SA
	Toluene	13-Oct-94	EPA 8020	0.002		0.001		mg/L	SA
	Trichloroethene	27-Sep-95	EPA 8010	0.6		0.5		µg/L	SA
	Trichloroethene	25-Jan-96	EPA 8260	1.2	J	0.5	2	µg/L	SA
	Acetone	18-Jul-94	EPA 8260	0.005	J,B	0.01		mg/L	DU
	Methylene chloride	18-Jul-94	EPA 8260	0.005	B	0.005		mg/L	DU

Refer to footnotes at end of table.

Table 4.2.3-2 (Continued)
Tijeras Arroyo Groundwater Investigation—Summary of Groundwater Sampling VOC Analytical Results
(Detections Only)

Well ID	Analyte	Sample Date	Analytical Method	Result	Laboratory Qualifier	Minimum Detection Limit	Reporting Limit	Units	Sample Type
TA2-NW1-595	Benzene	10-Jun-97	EPA 8260	0.77	J	0.5	2	µg/L	SA
	Methylene chloride	21-Apr-00	EPA 8260	5.2	B	0.5	2	µg/L	SA
	Methylene chloride	11-Jan-01	EPA 8260	0.82	J	0.5	2	µg/L	SA
TA2-SW1-320	1,1-Dichloroethene	20-Jun-95	EPA 8010	2.2		0.5		µg/L	DU
	Acetone	22-Nov-92	EPA 8240	14		10		µg/L	SA
	Acetone	25-Jan-96	EPA 8260	4.9	J,B	10		µg/L	SA
	Methylene chloride	5-Jan-94	EPA 8240	0.001	J	0.005		mg/L	SA
	Methylene chloride	7-Apr-94	EPA 8240	0.001	J,B	0.005		mg/L	SA
	Methylene chloride	12-Oct-94	EPA 8010	0.002	B	0.001		mg/L	SA
	Methylene chloride	12-Oct-94	EPA 8010	0.002	B	0.001		mg/L	DU
	Methylene chloride	12-Apr-00	EPA 8260	6.1	B	0.5	2	µg/L	SA
	Toluene	5-Jan-94	EPA 8240	0.005		0.005		mg/L	SA
	Toluene	12-Oct-94	EPA 8020	0.69		0.5		µg/L	SA
	Toluene	12-Oct-94	EPA 8020	0.002		0.001		mg/L	SA
	Toluene	12-Oct-94	EPA 8020	0.001		0.001		mg/L	DU
	Toluene	25-Jan-96	EPA 8260	0.15	J,B	5		µg/L	SA
	Trichloroethene	20-Jun-95	EPA 8010	1.8		0.5		µg/L	DU
	Trichloroethene	27-Sep-95	EPA 8010	3.9		0.5		µg/L	SA
	Trichloroethene	25-Jan-96	EPA 8260	1.7	J	0.5	2	µg/L	SA
TA2-W-01	1,1-Dichloroethene	18-Sep-98	EPA 8260	3.7		0.5	2	µg/L	SA
	Acetone	20-Jul-94	EPA 8260	0.006	J,B	0.01		mg/L	SA
	Acetone	26-Jan-96	EPA 8260	6.3	J,B	10		µg/L	SA
	Acetone	26-Jan-96	EPA 8260	4.3	J,B	10		µg/L	SA
	Benzene	06-Jun-97	EPA 8260	0.62	J	0.5	2	µg/L	SA
	Methylene chloride	20-Jul-94	EPA 8260	0.007	B	0.005		mg/L	SA
	Methylene chloride	14-Oct-94	EPA 8010	0.003	B	0.001		mg/L	SA
	Methylene chloride	08-Dec-97	EPA 8260	5.6	B	1	5	µg/L	SA
	Methylene chloride	11-Apr-00	EPA 8260	36	B	0.5	2	µg/L	SA
	Toluene	14-Oct-94	EPA 8020	0.001		0.001		mg/L	SA
	Toluene	06-Jun-97	EPA 8260	0.63	J	0.5	2	µg/L	SA
	Trichloroethene	20-Jun-95	EPA 8010	1.6		0.5		µg/L	SA

Refer to footnotes at end of table.

Table 4.2.3-2 (Continued)
Tijeras Arroyo Groundwater Investigation—Summary of Groundwater Sampling VOC Analytical Results
(Detections Only)

Well ID	Analyte	Sample Date	Analytical Method	Result	Laboratory Qualifier	Minimum Detection Limit	Reporting Limit	Units	Sample Type
TA2-W-01 (cont.)	Trichloroethene	27-Sep-95	EPA 8010	1.9		0.5		µg/L	SA
	Trichloroethene	26-Jan-96	EPA 8260	1.9		5		µg/L	SA
	Trichloroethene	26-Jan-96	EPA 8260	1.6	J	5		µg/L	SA
	Trichloroethene	26-Jan-96	EPA 8260	1.4	J	0.5	2	µg/L	SA
	Trichloroethene	26-Jan-96	EPA 8260	1.4		0.5	2	µg/L	SA
	Trichloroethene	26-Aug-96	EPA 8260	1.7	J	0.5	2	µg/L	SA
	Trichloroethene	26-Aug-96	EPA 8260	1.7	J	0.5	2	µg/L	SA
	Trichloroethene	12-Mar-97	EPA 8260	1.3	J	0.5	2	µg/L	SA
	Trichloroethene	06-Jun-97	EPA 8260	1.9	J	0.5	2	µg/L	SA
	Trichloroethene	02-Oct-97	EPA 8260	1.4	J	0.5	2	µg/L	SA
	Trichloroethene	08-Dec-97	EPA 8260	2		1	2	µg/L	SA
	Trichloroethene	08-Dec-97	EPA 8260	1.2	J	0.5	2	µg/L	SA
	Trichloroethene	24-Jun-98	EPA 8260	1.8	J	0.5	2	µg/L	SA
	Trichloroethene	30-Nov-98	EPA 8260	2		0.5	2	µg/L	SA
	Trichloroethene	09-Mar-99	EPA 8260	1.9	J	0.5	2	µg/L	SA
	Trichloroethene	15-Sep-99	EPA 8260	1.1	J	0.5	2	µg/L	SA
	Trichloroethene	02-Dec-99	EPA 8260	1.1	J	0.5	2	µg/L	SA
	Trichloroethene	11-Apr-00	EPA 8260	1.2	J	0.5	2	µg/L	SA
	Trichloroethene	17-Jan-01	EPA 8260	1.6	J	0.5	2	µg/L	SA
	Trichloroethene	27-Sep-95	EPA 8010	1.6		0.5		µg/L	DU
TA2-W-19	1,1-Dichloroethane	24-Jan-96	EPA 8260	2.1		0.5		µg/L	SA
	1,1-Dichloroethane	24-Jan-96	EPA 8260	0.57		0.5		µg/L	SA
	1,1-Dichloroethane	22-Jan-97	EPA 8260	0.64	J	0.5	2	µg/L	SA
	1,1-Dichloroethane	23-Jan-97	EPA 8260	1.2	J	0.5	2	µg/L	SA
	1,1-Dichloroethane	23-Jan-97	EPA 8260	1.2	J	0.5	2	µg/L	SA
	1,1-Dichloroethane	28-Jan-97	EPA 8260	1.4	J	0.5	2	µg/L	SA
	1,1-Dichloroethane	10-Jun-97	EPA 8260	0.64	J	0.5	2	µg/L	SA
	1,1-Dichloroethane	29-Sep-97	EPA 8260	0.81	J	0.5	2	µg/L	SA
	1,1-Dichloroethane	10-Dec-97	EPA 8260	0.79	J	0.5	2	µg/L	SA
	1,1-Dichloroethane	06-Mar-98	EPA 8260	0.7	J	0.5	2	µg/L	SA
	1,1-Dichloroethane	15-Jun-98	EPA 8260	0.7	J	0.5	2	µg/L	SA

Refer to footnotes at end of table.

Table 4.2.3-2 (Continued)
Tijeras Arroyo Groundwater Investigation—Summary of Groundwater Sampling VOC Analytical Results
(Detections Only)

Well ID	Analyte	Sample Date	Analytical Method	Result	Laboratory Qualifier	Minimum Detection Limit	Reporting Limit	Units	Sample Type
TA2-W-19	1,1-Dichloroethane	16-Sep-98	EPA 8260	0.74	J	0.5	2	µg/L	SA
(cont.)	1,1-Dichloroethane	02-Dec-98	EPA 8260	0.82	J	0.5	2	µg/L	SA
	1,1-Dichloroethane	09-Mar-99	EPA 8260	0.95	J	0.5	2	µg/L	SA
	2-Hexanone	09-Mar-99	EPA 8260	20	J	10	40	µg/L	SA
	Acetone	24-Jan-96	EPA 8260	6	J,B	10		µg/L	SA
	Acetone	24-Jan-96	EPA 8260	8	J,B	10		µg/L	SA
	Acetone	11-Mar-97	EPA 8260	5.2	J	5	20	µg/L	SA
	Acetone	11-Mar-97	EPA 8260	5.2	J	5	20	µg/L	SA
	Acetone	02-Dec-98	EPA 8260	7	J	5	20	µg/L	SA
	Chloromethane	16-Sep-98	EPA 8260	1.4	J	0.5	2	µg/L	SA
	Methylene chloride	10-Jun-97	EPA 8260	6.9	J	5	20	µg/L	SA
	Trichloroethene	24-Jan-96	EPA 8260	2.1		0.5		µg/L	SA
	Trichloroethene	24-Jan-96	EPA 8260	2	J	5		µg/L	SA
	Trichloroethene	24-Jan-96	EPA 8260	2		0.5		µg/L	SA
	Trichloroethene	24-Jan-96	EPA 8260	1.9	J	5		µg/L	SA
	Trichloroethene	24-Jan-96	EPA 8260	5.4		0.5	2	µg/L	SA
	Trichloroethene	24-Apr-96	EPA 8010	1.1		0.5		µg/L	SA
	Trichloroethene	28-Aug-96	EPA 8260	1	J	0.5	2	µg/L	SA
	Trichloroethene	28-Aug-96	EPA 8260	1	J	0.5	2	µg/L	SA
	Trichloroethene	22-Jan-97	EPA 8260	2.6		0.5	2	µg/L	SA
	Trichloroethene	23-Jan-97	EPA 8260	4.4		0.5	2	µg/L	SA
	Trichloroethene	23-Jan-97	EPA 8260	5.2		0.5	2	µg/L	SA
	Trichloroethene	28-Jan-97	EPA 8260	6.2		0.5	2	µg/L	SA
	Trichloroethene	11-Mar-97	EPA 8260	1.4	J	0.5	2	µg/L	SA
	Trichloroethene	11-Mar-97	EPA 8260	1.4	J	0.5	2	µg/L	SA
	Trichloroethene	10-Jun-97	EPA 8260	2.7		0.5	2	µg/L	SA
	Trichloroethene	29-Sep-97	EPA 8260	1.9	J	0.5	2	µg/L	SA
	Trichloroethene	10-Dec-97	EPA 8260	2.4		0.5	2	µg/L	SA
	Trichloroethene	06-Mar-98	EPA 8260	2.5		0.5	2	µg/L	SA

Refer to footnotes at end of table.

Table 4.2.3-2 (Continued)
Tijeras Arroyo Groundwater Investigation—Summary of Groundwater Sampling VOC Analytical Results
(Detections Only)

Well ID	Analyte	Sample Date	Analytical Method	Result	Laboratory Qualifier	Minimum Detection Limit	Reporting Limit	Units	Sample Type
TA2-W-19	Trichloroethene	15-Jun-98	EPA 8260	2.7		0.5	2	µg/L	SA
(cont.)	Trichloroethene	16-Sep-98	EPA 8260	2.8		0.5	2	µg/L	SA
	Trichloroethene	02-Dec-98	EPA 8260	3.1		0.5	2	µg/L	SA
	Trichloroethene	09-Mar-99	EPA 8260	3.2		0.5	2	µg/L	SA
	Trichloroethene	24-Sep-99	EPA 8260	1.8	J	0.5	2	µg/L	SA
	Trichloroethene	15-Mar-00	EPA 8260	1.9	J	0.5	2	µg/L	SA
	Trichloroethene	04-Jan-01	EPA 8260	2.3		0.5	2	µg/L	SA
	cis-1,2-Dichloroethene	24-Jan-96	EPA 8260	0.61		0.5		µg/L	SA
	cis-1,2-Dichloroethene	24-Jan-96	EPA 8260	0.57		0.5		µg/L	SA
	cis-1,2-Dichloroethene	22-Jan-97	EPA 8260	0.66	J	0.5	2	µg/L	SA
	cis-1,2-Dichloroethene	23-Jan-97	EPA 8260	1.3	J	0.5	2	µg/L	SA
	cis-1,2-Dichloroethene	23-Jan-97	EPA 8260	1.3	J	0.5	2	µg/L	SA
	cis-1,2-Dichloroethene	28-Jan-97	EPA 8260	1.4	J	0.5	2	µg/L	SA
	cis-1,2-Dichloroethene	10-Jun-97	EPA 8260	0.53	J	0.5	2	µg/L	SA
	cis-1,2-Dichloroethene	06-Mar-98	EPA 8260	0.68	J	0.5	2	µg/L	SA
	cis-1,2-Dichloroethene	15-Jun-98	EPA 8260	0.8	J	0.5	2	µg/L	SA
	cis-1,2-Dichloroethene	16-Sep-98	EPA 8260	0.89	J	0.5	2	µg/L	SA
	cis-1,2-Dichloroethene	02-Dec-98	EPA 8260	0.88	J	0.5	2	µg/L	SA
	cis-1,2-Dichloroethene	09-Mar-99	EPA 8260	0.92	J	0.5	2	µg/L	SA
	cis-1,2-Dichloroethene	24-Sep-99	EPA 8260	0.61	J	0.5	2	µg/L	SA
	cis-1,2-Dichloroethene	15-Mar-00	EPA 8260	0.53	J	0.5	2	µg/L	SA
	1,1-Dichloroethane	22-Jan-97	EPA 8260	0.72	J	0.5	2	µg/L	DU
	1,1-Dichloroethane	15-Jun-98	EPA 8260	0.7	J	0.5	2	µg/L	DU
	1,1-Dichloroethane	16-Sep-98	EPA 8260	0.78	J	0.5	2	µg/L	DU
	1,1-Dichloroethane	02-Dec-98	EPA 8260	0.87	J	0.5	2	µg/L	DU
	Trichloroethene	28-Aug-96	EPA 8260	1	J	0.5	2	µg/L	DU
	Trichloroethene	28-Aug-96	EPA 8260	1.2	J	0.5	2	µg/L	DU
	Trichloroethene	28-Aug-96	EPA 8260	1	J	0.5	2	µg/L	DU
	Trichloroethene	28-Aug-96	EPA 8260	1.2	J	0.5	2	µg/L	DU
	Trichloroethene	22-Jan-97	EPA 8260	2.9		0.5	2	µg/L	DU

Refer to footnotes at end of table.

Table 4.2.3-2 (Continued)
Tijeras Arroyo Groundwater Investigation—Summary of Groundwater Sampling VOC Analytical Results
(Detections Only)

Well ID	Analyte	Sample Date	Analytical Method	Result	Laboratory Qualifier	Minimum Detection Limit	Reporting Limit	Units	Sample Type
TA2-W-19	Trichloroethene	15-Jun-98	EPA 8260	2.8		0.5	2	µg/L	DU
(cont.)	Trichloroethene	16-Sep-98	EPA 8260	2.9		0.5	2	µg/L	DU
	Trichloroethene	02-Dec-98	EPA 8260	3.4		0.5	2	µg/L	DU
	cis-1,2-Dichloroethene	22-Jan-97	EPA 8260	0.7	J	0.5	2	µg/L	DU
	cis-1,2-Dichloroethene	15-Jun-98	EPA 8260	0.8	J	0.5	2	µg/L	DU
	cis-1,2-Dichloroethene	16-Sep-98	EPA 8260	0.88	J	0.5	2	µg/L	DU
	cis-1,2-Dichloroethene	02-Dec-98	EPA 8260	0.9	J	0.5	2	µg/L	DU
TA2-W-24	Methylene chloride	19-Mar-98	EPA 8260	3.1	J,B	1	5	µg/L	SA
	Tetrachloroethene	05-Mar-98	EPA 8260	3		0.5	2	µg/L	SA
	Tetrachloroethene	06-Mar-98	EPA 8260	4		0.5	2	µg/L	SA
	Trichloroethene	05-Mar-98	EPA 8260	0.6	J	0.5	2	µg/L	SA
	Trichloroethene	06-Mar-98	EPA 8260	0.87	J	0.5	2	µg/L	SA
TA2-W-25	2-Hexanone	13-Sep-99	EPA 8260	10	J	10	40	µg/L	SA
	Acetone	23-Sep-98	EPA 8260	6.9	J	5	20	µg/L	SA
	Chloromethane	23-Sep-98	EPA 8260	1.4	J	0.5	2	µg/L	SA
	Chloromethane	14-Dec-98	EPA 8260	0.53	J	0.5	2	µg/L	SA
	Methylene chloride	28-Apr-00	EPA 8260	4	B	0.5	2	µg/L	SA
TA2-W-26	1,1-Dichloroethane	17-Mar-98	EPA 8260	0.96	J	0.5	2	µg/L	SA
	1,1-Dichloroethane	22-Jun-98	EPA 8260	0.79	J	0.5	2	µg/L	SA
	1,1-Dichloroethane	25-Sep-98	EPA 8260	0.79	J	0.5	2	µg/L	SA
	1,1-Dichloroethane	14-Dec-98	EPA 8260	0.89	J	0.4	1	µg/L	SA
	1,1-Dichloroethane	14-Dec-98	EPA 8260	0.86	J	0.5	2	µg/L	SA
	1,1-Dichloroethane	16-Mar-99	EPA 8260	0.86	J	0.5	2	µg/L	SA
	1,1-Dichloroethane	07-Jul-99	EPA 8260	0.84	J	0.5	2	µg/L	SA
	1,1-Dichloroethane	09-Sep-99	EPA 8260	0.95	J	0.4	1	µg/L	SA
	1,1-Dichloroethane	09-Sep-99	EPA 8260	0.87	J	0.5	2	µg/L	SA
	4-methyl-, 2-Pentanone	09-Feb-98	EPA 8260	7.3	J	5	20	µg/L	SA
	Acetone	09-Feb-98	EPA 8260	34		5	20	µg/L	SA

Refer to footnotes at end of table.

Table 4.2.3-2 (Continued)
Tijeras Arroyo Groundwater Investigation—Summary of Groundwater Sampling VOC Analytical Results
(Detections Only)

Well ID	Analyte	Sample Date	Analytical Method	Result	Laboratory Qualifier	Minimum Detection Limit	Reporting Limit	Units	Sample Type
TA2-W-26	Acetone	09-Feb-98	EPA 8260	25		5	20	µg/L	SA
(cont.)	Benzene	09-Feb-98	EPA 8260	1.4	J	0.5	2	µg/L	SA
	Carbon disulfide	14-Dec-98	EPA 8260	0.59	J	0.5	2	µg/L	SA
	Tetrachloroethene	03-Mar-98	EPA 8260	2.3		0.5	2	µg/L	SA
	Tetrachloroethene	17-Mar-98	EPA 8260	1.6	J	0.5	2	µg/L	SA
	Tetrachloroethene	22-Jun-98	EPA 8260	2.4		0.5	2	µg/L	SA
	Tetrachloroethene	25-Sep-98	EPA 8260	1.6	J	0.5	2	µg/L	SA
	Tetrachloroethene	14-Dec-98	EPA 8260	1.8		0.7	1	µg/L	SA
	Tetrachloroethene	14-Dec-98	EPA 8260	2.1		0.5	2	µg/L	SA
	Tetrachloroethene	16-Mar-99	EPA 8260	2		0.5	2	µg/L	SA
	Tetrachloroethene	07-Jul-99	EPA 8260	1.9	J	0.5	2	µg/L	SA
	Tetrachloroethene	09-Sep-99	EPA 8260	2		0.7	1	µg/L	SA
	Tetrachloroethene	09-Sep-99	EPA 8260	2.4		0.5	2	µg/L	SA
	Tetrachloroethene	02-Dec-99	EPA 8260	2.9		0.5	2	µg/L	SA
	Tetrachloroethene	26-May-00	EPA 8260	3.6		0.385	1	µg/L	SA
	Tetrachloroethene	08-Jan-01	EPA 8260	4.6		0.5	2	µg/L	SA
	Tetrachloroethene	08-Jan-01	EPA 8260	4.8		0.5	2	µg/L	SA
	Toluene	09-Feb-98	EPA 8260	4.1		0.5	2	µg/L	SA
	Trichloroethene	03-Mar-98	EPA 8260	0.91	J	0.5	2	µg/L	SA
	Trichloroethene	17-Mar-98	EPA 8260	9.6		0.5	2	µg/L	SA
	Trichloroethene	22-Jun-98	EPA 8260	9		0.5	2	µg/L	SA
	Trichloroethene	25-Sep-98	EPA 8260	7.4		0.5	2	µg/L	SA
	Trichloroethene	14-Dec-98	EPA 8260	8		0.6	1	µg/L	SA
	Trichloroethene	14-Dec-98	EPA 8260	8.6		0.5	2	µg/L	SA
	Trichloroethene	16-Mar-99	EPA 8260	7.4		0.5	2	µg/L	SA
	Trichloroethene	07-Jul-99	EPA 8260	6.8		0.5	2	µg/L	SA
	Trichloroethene	09-Sep-99	EPA 8260	8.4		0.6	1	µg/L	SA
	Trichloroethene	09-Sep-99	EPA 8260	9		0.5	2	µg/L	SA
	Trichloroethene	02-Dec-99	EPA 8260	8.7		0.5	2	µg/L	SA
	Trichloroethene	26-May-00	EPA 8260	9.2		0.15	1	µg/L	SA

Refer to footnotes at end of table.

Table 4.2.3-2 (Continued)
Tijeras Arroyo Groundwater Investigation—Summary of Groundwater Sampling VOC Analytical Results
(Detections Only)

Well ID	Analyte	Sample Date	Analytical Method	Result	Laboratory Qualifier	Minimum Detection Limit	Reporting Limit	Units	Sample Type
TA2-W-26	Trichloroethene	08-Jan-01	EPA 8260	8.5		0.5	2	µg/L	SA
(cont.)	Trichloroethene	08-Jan-01	EPA 8260	8.7		0.5	2	µg/L	SA
	cis-1,2-Dichloroethene	25-Sep-98	EPA 8260	0.51	J	0.5	2	µg/L	SA
	cis-1,2-Dichloroethene	14-Dec-98	EPA 8260	0.73	J	0.5	2	µg/L	SA
	cis-1,2-Dichloroethene	16-Mar-99	EPA 8260	0.65	J	0.5	2	µg/L	SA
	cis-1,2-Dichloroethene	07-Jul-99	EPA 8260	0.6	J	0.5	2	µg/L	SA
	cis-1,2-Dichloroethene	09-Sep-99	EPA 8260	1		0.7	1	µg/L	SA
	cis-1,2-Dichloroethene	09-Sep-99	EPA 8260	1.2	J	0.5	2	µg/L	SA
	cis-1,2-Dichloroethene	02-Dec-99	EPA 8260	0.95	J	0.5	2	µg/L	SA
	cis-1,2-Dichloroethene	26-May-00	EPA 8260	1.08		0.129	1	µg/L	SA
	cis-1,2-Dichloroethene	08-Jan-01	EPA 8260	1.5	J	0.5	2	µg/L	SA
	cis-1,2-Dichloroethene	08-Jan-01	EPA 8260	1.5	J	0.5	2	µg/L	SA
	1,1-Dichloroethane	17-Mar-98	EPA 8260	0.99	J	0.5	2	µg/L	DU
	1,1-Dichloroethane	09-Sep-99	EPA 8260	0.82	J	0.5	2	µg/L	DU
	Tetrachloroethene	17-Mar-98	EPA 8260	1.6	J	0.5	2	µg/L	DU
	Tetrachloroethene	09-Sep-99	EPA 8260	2.4		0.5	2	µg/L	DU
	Trichloroethene	17-Mar-98	EPA 8260	9.6		0.5	2	µg/L	DU
	Trichloroethene	09-Sep-99	EPA 8260	8.8		0.5	2	µg/L	DU
	cis-1,2-Dichloroethene	09-Sep-99	EPA 8260	1.2	J	0.5	2	µg/L	DU
TA2-W-27	Acetone	09-Feb-98	EPA 8260	21		5	20	µg/L	SA
	Benzene	19-Mar-98	EPA 8260	0.86	J	0.5	2	µg/L	SA
	Methylene chloride	19-Mar-98	EPA 8260	2.5	J,B	1	5	µg/L	SA
	Tetrachloroethene	19-Mar-98	EPA 8260	0.85	J	0.5	2	µg/L	SA
	Tetrachloroethene	23-Jun-98	EPA 8260	1.12	J	0.5	2	µg/L	SA
	Tetrachloroethene	24-Sep-98	EPA 8260	0.6	J	0.5	2	µg/L	SA
	Tetrachloroethene	03-Dec-98	EPA 8260	0.61	J	0.5	2	µg/L	SA
	Tetrachloroethene	08-Jul-99	EPA 8260	0.52	J	0.5	2	µg/L	SA

Refer to footnotes at end of table.

Table 4.2.3-2 (Continued)
Tijeras Arroyo Groundwater Investigation—Summary of Groundwater Sampling VOC Analytical Results
(Detections Only)

Well ID	Analyte	Sample Date	Analytical Method	Result	Laboratory Qualifier	Minimum Detection Limit	Reporting Limit	Units	Sample Type
TA2-W-27	Tetrachloroethene	14-Mar-00	EPA 8260	0.79	J	0.5	2	µg/L	SA
(cont.)	Tetrachloroethene	03-Jan-01	EPA 8260	0.76	J	0.5	2	µg/L	SA
TJA-2	1,1-Dichloroethane	24-Jan-96	EPA 8260	0.44	J	0.5		µg/L	SA
	1,1-Dichloroethane	28-Aug-96	EPA 8260	0.52	J	0.5	2	µg/L	SA
	1,1-Dichloroethane	28-Aug-96	EPA 8260	0.52	J	0.5	2	µg/L	SA
	1,1-Dichloroethane	10-Mar-98	EPA 8260	0.62	J	0.5	2	µg/L	SA
	1,1-Dichloroethane	24-Jun-98	EPA 8260	0.59	J	0.5	2	µg/L	SA
	1,1-Dichloroethane	16-Sep-98	EPA 8260	0.59	J	0.5	2	µg/L	SA
	1,1-Dichloroethane	02-Dec-98	EPA 8260	0.68	J	0.5	2	µg/L	SA
	1,1-Dichloroethane	04-Mar-99	EPA 8260	0.61	J	0.5	2	µg/L	SA
	1,1-Dichloroethane	16-Jun-99	EPA 8260	0.61	J	0.5	2	µg/L	SA
	1,1-Dichloroethane	13-Sep-99	EPA 8260	0.52	J	0.5	2	µg/L	SA
	Acetone	24-Jan-96	EPA 8260	8.3	J,B	10		µg/L	SA
	Acetone	11-Mar-97	EPA 8260	5.8	J	5	20	µg/L	SA
	Acetone	11-Mar-97	EPA 8260	5.8	J	5	20	µg/L	SA
	Acetone	04-Mar-99	EPA 8260	7.8	J	5	20	µg/L	SA
	Chlorobenzene	16-Jun-99	EPA 8260	0.53	J	0.5	2	µg/L	SA
	Chloromethane	16-Sep-98	EPA 8260	0.56	J	0.5	2	µg/L	SA
	Methylene chloride	16-Jun-99	EPA 8260	0.65	J	0.5	2	µg/L	SA
	Toluene	24-Jan-96	EPA 8260	0.22	J,B	0.5		µg/L	SA
	Toluene	16-Dec-97	EPA 8260	480		2.5	10	µg/L	SA
	Trichloroethene	24-Jan-96	EPA 8260	3.7		0.5	2	µg/L	SA
	Trichloroethene	24-Jan-96	EPA 8260	1.9		0.5		µg/L	SA
	Trichloroethene	24-Jan-96	EPA 8260	1.7	J	5		µg/L	SA
	Trichloroethene	28-Aug-96	EPA 8260	1.4	J	0.5	2	µg/L	SA
	Trichloroethene	28-Aug-96	EPA 8260	1.4	J	0.5	2	µg/L	SA
	Trichloroethene	11-Mar-97	EPA 8260	1.8	J	0.5	2	µg/L	SA
	Trichloroethene	11-Mar-97	EPA 8260	1.8	J	0.5	2	µg/L	SA
	Trichloroethene	12-Jun-97	EPA 8260	3.15		1		µg/L	SA
	Trichloroethene	12-Jun-97	EPA 8260	1.7	J	0.5	2	µg/L	SA
	Trichloroethene	29-Sep-97	EPA 8260	1.6	J	0.5	2	µg/L	SA

Refer to footnotes at end of table.

Table 4.2.3-2 (Continued)
Tijeras Arroyo Groundwater Investigation—Summary of Groundwater Sampling VOC Analytical Results
(Detections Only)

Well ID	Analyte	Sample Date	Analytical Method	Result	Laboratory Qualifier	Minimum Detection Limit	Reporting Limit	Units	Sample Type
TJA-2	Trichloroethene	16-Dec-97	EPA 8260	0.66	J	0.5	2	µg/L	SA
(cont.)	Trichloroethene	10-Mar-98	EPA 8260	2.5		0.5	2	µg/L	SA
	Trichloroethene	24-Jun-98	EPA 8260	2.7		0.5	2	µg/L	SA
	Trichloroethene	16-Sep-98	EPA 8260	2.4		0.5	2	µg/L	SA
	Trichloroethene	02-Dec-98	EPA 8260	2.7		0.5	2	µg/L	SA
	Trichloroethene	04-Mar-99	EPA 8260	2.3		0.5	2	µg/L	SA
	Trichloroethene	16-Jun-99	EPA 8260	2.3		0.5	2	µg/L	SA
	Trichloroethene	13-Sep-99	EPA 8260	2.3		0.5	2	µg/L	SA
	Trichloroethene	30-Nov-99	EPA 8260	2.5		0.5	2	µg/L	SA
	Trichloroethene	15-Mar-00	EPA 8260	3.2		0.5	2	µg/L	SA
	Trichloroethene	04-Jan-01	EPA 8260	2.8		0.5	2	µg/L	SA
	cis-1,2-Dichloroethene	24-Jan-96	EPA 8260	0.54		0.5		µg/L	SA
	cis-1,2-Dichloroethene	10-Mar-98	EPA 8260	0.8	J	0.5	2	µg/L	SA
	cis-1,2-Dichloroethene	24-Jun-98	EPA 8260	0.72	J	0.5	2	µg/L	SA
	cis-1,2-Dichloroethene	16-Sep-98	EPA 8260	0.7	J	0.5	2	µg/L	SA
	cis-1,2-Dichloroethene	02-Dec-98	EPA 8260	0.78	J	0.5	2	µg/L	SA
	cis-1,2-Dichloroethene	04-Mar-99	EPA 8260	0.68	J	0.5	2	µg/L	SA
	cis-1,2-Dichloroethene	13-Sep-99	EPA 8260	0.64	J	0.5	2	µg/L	SA
	cis-1,2-Dichloroethene	15-Mar-00	EPA 8260	0.69	J	0.5	2	µg/L	SA
TJA-3	2-Butanone	10-Sep-98	EPA 8260	10	J	5	20	µg/L	SA
	2-Butanone	08-Jan-01	EPA 8260	42		5	20	µg/L	SA
	4-methyl-, 2-Pentanone	10-Sep-98	EPA 8260	14	J	5	20	µg/L	SA
	Acetone	25-Aug-98	EPA 8260	6.5	J	5	20	µg/L	SA
	Acetone	01-Sep-98	EPA 8260	11	J	5	20	µg/L	SA
	Acetone	10-Sep-98	EPA 8260	43		5	20	µg/L	SA
	Benzene	10-Sep-98	EPA 8260	1	J	0.5	2	µg/L	SA
	Ethyl benzene	08-Jan-01	EPA 8260	0.63	J	0.5	2	µg/L	SA
	Methylene chloride	11-Apr-00	EPA 8260	0.61	J	0.5	2	µg/L	SA

Refer to footnotes at end of table.

Table 4.2.3-2 (Continued)
Tijeras Arroyo Groundwater Investigation—Summary of Groundwater Sampling VOC Analytical Results
(Detections Only)

Well ID	Analyte	Sample Date	Analytical Method	Result	Laboratory Qualifier	Minimum Detection Limit	Reporting Limit	Units	Sample Type
TJA-3	Methylene chloride	08-Jan-01	EPA 8260	1.2	J	0.5	2	µg/L	SA
(cont.)	Toluene	01-Sep-98	EPA 8260	0.52	J	0.5	2	µg/L	SA
	Toluene	10-Sep-98	EPA 8260	1.6	J	0.5	2	µg/L	SA
	Trichloroethene	08-Jan-01	EPA 8260	0.51	J	0.5	2	µg/L	SA
TJA-4	2-Butanone	04-Mar-99	EPA 8260	5	J	5	20	µg/L	SA
	Acetone	03-Aug-98	EPA 8260	10	J	5	20	µg/L	SA
	Acetone	07-Aug-98	EPA 8260	5.5	J	5	20	µg/L	SA
	Acetone	07-Aug-98	EPA 8260	12	J	5	20	µg/L	SA
	Acetone	04-Mar-99	EPA 8260	13	J	5	20	µg/L	SA
	Benzene	07-Aug-98	EPA 8260	2.9		0.5	2	µg/L	SA
	Chloromethane	15-Dec-98	EPA 8260	1.2	J	0.5	2	µg/L	SA
	Toluene	30-Jul-98	EPA 8260	0.61	J	0.5	2	µg/L	SA
	2-Butanone	04-Mar-99	EPA 8260	5.3	J	5	20	µg/L	DU
	Acetone	04-Mar-99	EPA 8260	13	J	5	20	µg/L	DU
TJA-5	2-Butanone	11-Aug-98	EPA 8260	5.5	J	5	20	µg/L	SA
	4-methyl-, 2-Pentanone	11-Aug-98	EPA 8260	7.5	J	5	20	µg/L	SA
	Acetone	11-Aug-98	EPA 8260	24		5	20	µg/L	SA
	Benzene	11-Aug-98	EPA 8260	3.5		0.5	2	µg/L	SA
	Chlorobenzene	11-Aug-98	EPA 8260	0.89	J	0.5	2	µg/L	SA
	Methylene chloride	28-Apr-00	EPA 8260	6.1	B	0.5	2	µg/L	SA
	Trichloroethene	28-Apr-00	EPA 8260	0.65	J	0.5	2	µg/L	SA
	Trichloroethene	02-Jan-01	EPA 8260	1.5	J	0.5	2	µg/L	SA
	Acetone	28-Jun-99	EPA 8260	9.3	J	5	20	µg/L	DU
	Methylene chloride	28-Apr-00	EPA 8260	6.5	B	0.5	2	µg/L	DU
	Trichloroethene	28-Apr-00	EPA 8260	0.74	J	0.5	2	µg/L	DU
WYO-1	1,1,2,2-Tetrachloroethane	05-Mar-98	EPA 8260	3.3		0.3	1	µg/L	SA
	1,1,2,2-Tetrachloroethane	05-Mar-98	EPA 8260	3.8		0.3	1	µg/L	SA
	1,1-Dichloroethane	24-Jan-96	EPA 8260	0.99		0.5		µg/L	SA
	1,1-Dichloroethane	24-Jan-96	EPA 8260	1.1	J	5		µg/L	SA
	1,1-Dichloroethane	26-Aug-96	EPA 8260	1.4	J	0.5	2	µg/L	SA

Refer to footnotes at end of table.

Table 4.2.3-2 (Continued)
Tijeras Arroyo Groundwater Investigation—Summary of Groundwater Sampling VOC Analytical Results
(Detections Only)

Well ID	Analyte	Sample Date	Analytical Method	Result	Laboratory Qualifier	Minimum Detection Limit	Reporting Limit	Units	Sample Type
WYO-1	1,1-Dichloroethane	21-Jan-97	EPA 8260	1.4	J	0.5	2	µg/L	SA
(cont.)	1,1-Dichloroethane	22-Jan-97	EPA 8260	1.5	J	0.5	2	µg/L	SA
	1,1-Dichloroethane	23-Jan-97	EPA 8260	1.2	J	0.5	2	µg/L	SA
	1,1-Dichloroethane	23-Jan-97	EPA 8260	1.3	J	0.5	2	µg/L	SA
	1,1-Dichloroethane	10-Mar-97	EPA 8260	1.4		0.5		µg/L	SA
	1,1-Dichloroethane	10-Mar-97	EPA 8260	1.1	J	0.5	2	µg/L	SA
	1,1-Dichloroethane	10-Mar-97	EPA 8260	1.1	J	0.5	2	µg/L	SA
	1,1-Dichloroethane	05-Jun-97	EPA 8260	2.06		1		µg/L	SA
	1,1-Dichloroethane	05-Jun-97	EPA 8260	1.1	J	0.5	2	µg/L	SA
	1,1-Dichloroethane	01-Oct-97	EPA 8260	0.9	J	0.5	2	µg/L	SA
	1,1-Dichloroethane	09-Dec-97	EPA 8260	1.1	J	0.5	2	µg/L	SA
	1,1-Dichloroethane	09-Dec-97	EPA 8260	1.3	J	0.5	2	µg/L	SA
	1,1-Dichloroethane	05-Mar-98	EPA 8260	1.5		0.2	1	µg/L	SA
	1,1-Dichloroethane	05-Mar-98	EPA 8260	1.6		0.2	1	µg/L	SA
	1,1-Dichloroethane	05-Mar-98	EPA 8260	1.2	H	0.02	1	µg/L	SA
	1,1-Dichloroethane	05-Mar-98	EPA 8260	1.4		0.02	1	µg/L	SA
	1,1-Dichloroethane	05-Mar-98	EPA 8260	1.3	J	0.5	2	µg/L	SA
	1,1-Dichloroethane	05-Mar-98	EPA 8260	1.3	J	0.5	2	µg/L	SA
	1,1-Dichloroethane	05-Mar-98	EPA 8260	1.2	J	0.5	2	µg/L	SA
	1,1-Dichloroethane	10-Jun-98	EPA 8260	1.1	J	0.5	2	µg/L	SA
	1,1-Dichloroethane	14-Sep-98	EPA 8260	1.1	J	0.5	2	µg/L	SA
	1,1-Dichloroethane	01-Dec-98	EPA 8260	1.2	J	0.5	2	µg/L	SA
	1,1-Dichloroethane	05-Mar-99	EPA 8260	1.1	J	0.5	2	µg/L	SA
	1,1-Dichloroethane	14-Jul-99	EPA 8260	1	J	0.5	2	µg/L	SA
	1,1-Dichloroethane	16-Sep-99	EPA 8260	0.97	J	0.4	1	µg/L	SA
	1,1-Dichloroethane	16-Sep-99	EPA 8260	0.95	J	0.5	2	µg/L	SA
	1,1-Dichloroethene	05-Mar-98	EPA 8260	0.32	J	0.19	1	µg/L	SA
	1,1-Dichloroethene	05-Mar-98	EPA 8260	0.36	J	0.19	1	µg/L	SA

Refer to footnotes at end of table.

Table 4.2.3-2 (Continued)
Tijeras Arroyo Groundwater Investigation—Summary of Groundwater Sampling VOC Analytical Results
(Detections Only)

Well ID	Analyte	Sample Date	Analytical Method	Result	Laboratory Qualifier	Minimum Detection Limit	Reporting Limit	Units	Sample Type
WYO-1	1,1-Dichloroethene	14-Sep-98	EPA 8260	0.53	J	0.5	2	µg/L	SA
(cont.)	1,2-Dichloroethene	05-Mar-98	EPA 8260	2.5		0.13	1	µg/L	SA
	1,2-Dichloroethene	05-Mar-98	EPA 8260	2.5		0.13	1	µg/L	SA
	2-Butanone	05-Mar-99	EPA 8260	5.9	J	5	20	µg/L	SA
	Acetone	05-Mar-98	EPA 8260	3.8	J,B	0.76	5	µg/L	SA
	Acetone	05-Mar-99	EPA 8260	8.1	J	5	20	µg/L	SA
	Chloroform	05-Mar-98	EPA 8260	0.24	J	0.17	1	µg/L	SA
	Methylene chloride	10-Mar-97	EPA 8260	2.3	J,B	1		µg/L	SA
	Methylene chloride	05-Mar-98	EPA 8260	0.65	J,B	0.07	1	µg/L	SA
	Methylene chloride	05-Mar-98	EPA 8260	3.8	H,B	0.07	1	µg/L	SA
	Methylene chloride	16-Sep-99	EPA 8260	2.1	J,B	1.2	5	µg/L	SA
	Tetrachloroethene	05-Mar-98	EPA 8260	0.22	J	0.18	1	µg/L	SA
	Toluene	24-Jan-96	EPA 8260	1	B	0.5		µg/L	SA
	Toluene	24-Jan-96	EPA 8260	1.2	J	5		µg/L	SA
	Trichloroethene	24-Jan-96	EPA 8260	4		0.5		µg/L	SA
	Trichloroethene	24-Jan-96	EPA 8260	4	J	5		µg/L	SA
	Trichloroethene	26-Aug-96	EPA 8260	5.6		0.5	2	µg/L	SA
	Trichloroethene	21-Jan-97	EPA 8260	7.2		0.5	2	µg/L	SA
	Trichloroethene	22-Jan-97	EPA 8260	8		0.5	2	µg/L	SA
	Trichloroethene	23-Jan-97	EPA 8260	6.6		0.5	2	µg/L	SA
	Trichloroethene	23-Jan-97	EPA 8260	8.3		0.5	2	µg/L	SA
	Trichloroethene	27-Jan-97	EPA 8260	3.6		0.5	2	µg/L	SA
	Trichloroethene	10-Mar-97	EPA 8260	6.5		0.5		µg/L	SA
	Trichloroethene	10-Mar-97	EPA 8260	5		0.5	2	µg/L	SA
	Trichloroethene	10-Mar-97	EPA 8260	5		0.5	2	µg/L	SA
	Trichloroethene	05-Jun-97	EPA 8260	8.64		1		µg/L	SA
	Trichloroethene	05-Jun-97	EPA 8260	5.6		0.5	2	µg/L	SA
	Trichloroethene	01-Oct-97	EPA 8260	2.9		0.5	2	µg/L	SA
	Trichloroethene	09-Dec-97	EPA 8260	5.1		0.5	2	µg/L	SA
	Trichloroethene	09-Dec-97	EPA 8260	5.4		0.5	2	µg/L	SA

Refer to footnotes at end of table.

Table 4.2.3-2 (Continued)
Tijeras Arroyo Groundwater Investigation—Summary of Groundwater Sampling VOC Analytical Results
(Detections Only)

Well ID	Analyte	Sample Date	Analytical Method	Result	Laboratory Qualifier	Minimum Detection Limit	Reporting Limit	Units	Sample Type
WYO-1	Trichloroethene	05-Mar-98	EPA 8260	7.5		0.4	1	µg/L	SA
(cont.)	Trichloroethene	05-Mar-98	EPA 8260	7.7		0.4	1	µg/L	SA
	Trichloroethene	05-Mar-98	EPA 8260	6.3	H	0.03	1	µg/L	SA
	Trichloroethene	05-Mar-98	EPA 8260	7.9		0.03	1	µg/L	SA
	Trichloroethene	05-Mar-98	EPA 8260	7		0.5	2	µg/L	SA
	Trichloroethene	05-Mar-98	EPA 8260	7.2		0.5	2	µg/L	SA
	Trichloroethene	05-Mar-98	EPA 8260	6.8		0.5	2	µg/L	SA
	Trichloroethene	10-Jun-98	EPA 8260	6.3		0.5	2	µg/L	SA
	Trichloroethene	14-Sep-98	EPA 8260	6.8		0.5	2	µg/L	SA
	Trichloroethene	01-Dec-98	EPA 8260	6.1		0.5	2	µg/L	SA
	Trichloroethene	05-Mar-99	EPA 8260	6.1		0.5	2	µg/L	SA
	Trichloroethene	14-Jul-99	EPA 8260	4.8		0.5	2	µg/L	SA
	Trichloroethene	16-Sep-99	EPA 8260	5.1		0.6	1	µg/L	SA
	Trichloroethene	16-Sep-99	EPA 8260	5.6		0.5	2	µg/L	SA
	Trichloroethene	01-Dec-99	EPA 8260	5.9		0.5	2	µg/L	SA
	Trichloroethene	01-Jun-00	EPA 8260	5.68		0.15	1	µg/L	SA
	Trichloroethene	12-Jan-01	EPA 8260	6		0.5	2	µg/L	SA
	cis-1,2-Dichloroethene	24-Jan-96	EPA 8260	2		0.5		µg/L	SA
	cis-1,2-Dichloroethene	24-Jan-96	EPA 8260	1.8	J	5		µg/L	SA
	cis-1,2-Dichloroethene	26-Aug-96	EPA 8260	2.2		0.5	2	µg/L	SA
	cis-1,2-Dichloroethene	21-Jan-97	EPA 8260	2.4		0.5	2	µg/L	SA
	cis-1,2-Dichloroethene	22-Jan-97	EPA 8260	2.5		0.5	2	µg/L	SA
	cis-1,2-Dichloroethene	23-Jan-97	EPA 8260	2		0.5	2	µg/L	SA
	cis-1,2-Dichloroethene	23-Jan-97	EPA 8260	2.2		0.5	2	µg/L	SA
	cis-1,2-Dichloroethene	27-Jan-97	EPA 8260	1	J	0.5	2	µg/L	SA
	cis-1,2-Dichloroethene	10-Mar-97	EPA 8260	1.4	J	0.5	2	µg/L	SA
	cis-1,2-Dichloroethene	10-Mar-97	EPA 8260	1.4	J	0.5	2	µg/L	SA
	cis-1,2-Dichloroethene	05-Jun-97	EPA 8260	3.24		1		µg/L	SA
	cis-1,2-Dichloroethene	05-Jun-97	EPA 8260	1.9	J	0.5	2	µg/L	SA
	cis-1,2-Dichloroethene	01-Oct-97	EPA 8260	0.97	J	0.5	2	µg/L	SA
	cis-1,2-Dichloroethene	09-Dec-97	EPA 8260	1.3	J	0.5	2	µg/L	SA

Refer to footnotes at end of table.

Table 4.2.3-2 (Continued)
Tijeras Arroyo Groundwater Investigation—Summary of Groundwater Sampling VOC Analytical Results
(Detections Only)

Well ID	Analyte	Sample Date	Analytical Method	Result	Laboratory Qualifier	Minimum Detection Limit	Reporting Limit	Units	Sample Type
WYO-1	cis-1,2-Dichloroethene	09-Dec-97	EPA 8260	1.4	J	0.5	2	µg/L	SA
(cont.)	cis-1,2-Dichloroethene	05-Mar-98	EPA 8260	1.8	H	0.03	1	µg/L	SA
	cis-1,2-Dichloroethene	05-Mar-98	EPA 8260	2.2		0.5	2	µg/L	SA
	cis-1,2-Dichloroethene	05-Mar-98	EPA 8260	2.3		0.5	2	µg/L	SA
	cis-1,2-Dichloroethene	05-Mar-98	EPA 8260	2.1		0.5	2	µg/L	SA
	cis-1,2-Dichloroethene	10-Jun-98	EPA 8260	2.1		0.5	2	µg/L	SA
	cis-1,2-Dichloroethene	14-Sep-98	EPA 8260	2.1		0.5	2	µg/L	SA
	cis-1,2-Dichloroethene	01-Dec-98	EPA 8260	2		0.5	2	µg/L	SA
	cis-1,2-Dichloroethene	05-Mar-99	EPA 8260	2.2		0.5	2	µg/L	SA
	cis-1,2-Dichloroethene	14-Jul-99	EPA 8260	1.4	J	0.5	2	µg/L	SA
	cis-1,2-Dichloroethene	16-Sep-99	EPA 8260	1.7		0.7	1	µg/L	SA
	cis-1,2-Dichloroethene	16-Sep-99	EPA 8260	2.1		0.5	2	µg/L	SA
	cis-1,2-Dichloroethene	01-Dec-99	EPA 8260	1.9	J	0.5	2	µg/L	SA
	cis-1,2-Dichloroethene	01-Jun-00	EPA 8260	1.46		0.129	1	µg/L	SA
	cis-1,2-Dichloroethene	12-Jan-01	EPA 8260	1.8	J	0.5	2	µg/L	SA
	1,1-Dichloroethane	22-Jan-97	EPA 8260	1.4	J	0.5	2	µg/L	DU
	1,1-Dichloroethane	10-Mar-97	EPA 8260	1	J	0.5	2	µg/L	DU
	1,1-Dichloroethane	10-Mar-97	EPA 8260	1	J	0.5	2	µg/L	DU
	1,1-Dichloroethane	05-Jun-97	EPA 8260	1.69	J	1		µg/L	DU
	1,1-Dichloroethane	16-Sep-99	EPA 8260	1	J	0.5	2	µg/L	DU
	Trichloroethene	22-Jan-97	EPA 8260	7.2		0.5	2	µg/L	DU
	Trichloroethene	10-Mar-97	EPA 8260	5.2		0.5	2	µg/L	DU
	Trichloroethene	10-Mar-97	EPA 8260	5.2		0.5	2	µg/L	DU
	Trichloroethene	05-Jun-97	EPA 8260	8.42		1		µg/L	DU
	Trichloroethene	16-Sep-99	EPA 8260	6.3		0.5	2	µg/L	DU
	cis-1,2-Dichloroethene	22-Jan-97	EPA 8260	2.2		0.5	2	µg/L	DU
	cis-1,2-Dichloroethene	10-Mar-97	EPA 8260	1.6	J	0.5	2	µg/L	DU
	cis-1,2-Dichloroethene	10-Mar-97	EPA 8260	1.6	J	0.5	2	µg/L	DU
	cis-1,2-Dichloroethene	05-Jun-97	EPA 8260	2.94		1		µg/L	DU
	cis-1,2-Dichloroethene	16-Sep-99	EPA 8260	2.2		0.5	2	µg/L	DU

Refer to footnotes at end of table.

Table 4.2.3-2 (Continued)
Tijeras Arroyo Groundwater Investigation—Summary of Groundwater Sampling VOC Analytical Results
(Detections Only)

Well ID	Analyte	Sample Date	Analytical Method	Result	Laboratory Qualifier	Minimum Detection Limit	Reporting Limit	Units	Sample Type
WYO-2	1,1-Dichloroethane	24-Jan-96	EPA 8260	0.76		0.5		µg/L	SA
	1,1-Dichloroethane	26-Aug-96	EPA 8260	0.87	J	0.5	2	µg/L	SA
	1,1-Dichloroethane	10-Mar-97	EPA 8260	1.5		0.5		µg/L	SA
	1,1-Dichloroethane	10-Mar-97	EPA 8260	1.2	J	0.5	2	µg/L	SA
	1,1-Dichloroethane	10-Mar-97	EPA 8260	1.2	J	0.5	2	µg/L	SA
	1,1-Dichloroethane	05-Jun-97	EPA 8260	1.2	J	0.5	2	µg/L	SA
	1,1-Dichloroethane	01-Oct-97	EPA 8260	1.4	J	0.5	2	µg/L	SA
	1,1-Dichloroethane	09-Dec-97	EPA 8260	1.1	J	0.5	2	µg/L	SA
	1,1-Dichloroethane	06-Mar-98	EPA 8260	1.2	J	0.5	2	µg/L	SA
	1,1-Dichloroethane	10-Jun-98	EPA 8260	1.1	J	0.5	2	µg/L	SA
	1,1-Dichloroethane	14-Sep-98	EPA 8260	1.1	J	0.5	2	µg/L	SA
	1,1-Dichloroethane	01-Dec-98	EPA 8260	1.2	J	0.5	2	µg/L	SA
	1,1-Dichloroethane	05-Mar-99	EPA 8260	1.2	J	0.5	2	µg/L	SA
	1,1-Dichloroethane	19-Jul-99	EPA 8260	0.95	J	0.5	2	µg/L	SA
	1,1-Dichloroethane	16-Sep-99	EPA 8260	0.98	J	0.5	2	µg/L	SA
	1,1-Dichloroethane	01-Dec-99	EPA 8260	0.99	J	0.4	1	µg/L	SA
	1,1-Dichloroethene	16-Sep-99	EPA 8260	0.71	J	0.5	2	µg/L	SA
	Acetone	24-Jan-96	EPA 8260	4.6	J,B	10		µg/L	SA
	Acetone	24-Jan-96	EPA 8260	5.5	J,B	10		µg/L	SA
	Bromomethane	01-Dec-99	EPA 8260	2.6	B	0.4	1	µg/L	SA
	Toluene	24-Jan-96	EPA 8260	0.25	J,B	0.5		µg/L	SA
	Toluene	24-Jan-96	EPA 8260	1.3	J	5		µg/L	SA
	Trichloroethene	24-Jan-96	EPA 8260	3.7		0.5		µg/L	SA
	Trichloroethene	24-Jan-96	EPA 8260	3.5	J	5		µg/L	SA
	Trichloroethene	24-Jan-96	EPA 8260	6.7		0.5	2	µg/L	SA
	Trichloroethene	26-Aug-96	EPA 8260	3.7		0.5	2	µg/L	SA
	Trichloroethene	10-Mar-97	EPA 8260	7.5		0.5		µg/L	SA
	Trichloroethene	10-Mar-97	EPA 8260	6.1		0.5	2	µg/L	SA
	Trichloroethene	10-Mar-97	EPA 8260	6.1		0.5	2	µg/L	SA
	Trichloroethene	05-Jun-97	EPA 8260	6.6		0.5	2	µg/L	SA
	Trichloroethene	01-Oct-97	EPA 8260	5.6		0.5	2	µg/L	SA

Refer to footnotes at end of table.

Table 4.2.3-2 (Continued)
Tijeras Arroyo Groundwater Investigation—Summary of Groundwater Sampling VOC Analytical Results
(Detections Only)

Well ID	Analyte	Sample Date	Analytical Method	Result	Laboratory Qualifier	Minimum Detection Limit	Reporting Limit	Units	Sample Type
WYO-2	Trichloroethene	09-Dec-97	EPA 8260	5.9		0.5	2	µg/L	SA
(cont.)	Trichloroethene	06-Mar-98	EPA 8260	6.4		0.5	2	µg/L	SA
	Trichloroethene	10-Jun-98	EPA 8260	7		0.5	2	µg/L	SA
	Trichloroethene	14-Sep-98	EPA 8260	6.3		0.5	2	µg/L	SA
	Trichloroethene	01-Dec-98	EPA 8260	7.5		0.5	2	µg/L	SA
	Trichloroethene	05-Mar-99	EPA 8260	7.2		0.5	2	µg/L	SA
	Trichloroethene	19-Jul-99	EPA 8260	5.2		0.5	2	µg/L	SA
	Trichloroethene	16-Sep-99	EPA 8260	6.9		0.5	2	µg/L	SA
	Trichloroethene	01-Dec-99	EPA 8260	6.6		0.6	1	µg/L	SA
	Trichloroethene	01-Dec-99	EPA 8260	6.9		0.5	2	µg/L	SA
	Trichloroethene	16-Jan-01	EPA 8260	5.9		0.5	2	µg/L	SA
	Trichloroethene	16-Jan-01	EPA 8260	6.5		0.5	2	µg/L	SA
	cis-1,2-Dichloroethene	24-Jan-96	EPA 8260	1.6		0.5		µg/L	SA
	cis-1,2-Dichloroethene	24-Jan-96	EPA 8260	1.4	J	5		µg/L	SA
	cis-1,2-Dichloroethene	24-Jan-96	EPA 8260	0.64	J	0.5	2	µg/L	SA
	cis-1,2-Dichloroethene	26-Aug-96	EPA 8260	1.6	J	0.5	2	µg/L	SA
	cis-1,2-Dichloroethene	10-Mar-97	EPA 8260	1.7	J	0.5	2	µg/L	SA
	cis-1,2-Dichloroethene	10-Mar-97	EPA 8260	1.7	J	0.5	2	µg/L	SA
	cis-1,2-Dichloroethene	05-Jun-97	EPA 8260	2	J	0.5	2	µg/L	SA
	cis-1,2-Dichloroethene	01-Oct-97	EPA 8260	1.6	J	0.5	2	µg/L	SA
	cis-1,2-Dichloroethene	09-Dec-97	EPA 8260	1.4	J	0.5	2	µg/L	SA
	cis-1,2-Dichloroethene	06-Mar-98	EPA 8260	2		0.5	2	µg/L	SA
	cis-1,2-Dichloroethene	10-Jun-98	EPA 8260	2.1		0.5	2	µg/L	SA
	cis-1,2-Dichloroethene	14-Sep-98	EPA 8260	2.1		0.5	2	µg/L	SA
	cis-1,2-Dichloroethene	01-Dec-98	EPA 8260	2.2		0.5	2	µg/L	SA
	cis-1,2-Dichloroethene	05-Mar-99	EPA 8260	2.3		0.5	2	µg/L	SA
	cis-1,2-Dichloroethene	19-Jul-99	EPA 8260	1.4	J	0.5	2	µg/L	SA
	cis-1,2-Dichloroethene	16-Sep-99	EPA 8260	2.1		0.5	2	µg/L	SA
	cis-1,2-Dichloroethene	01-Dec-99	EPA 8260	2		0.7	1	µg/L	SA
	cis-1,2-Dichloroethene	01-Dec-99	EPA 8260	2		0.5	2	µg/L	SA

Refer to footnotes at end of table.

Table 4.2.3-2 (Concluded)
Tijeras Arroyo Groundwater Investigation—Summary of Groundwater Sampling VOC Analytical Results
(Detections Only)

Well ID	Analyte	Sample Date	Analytical Method	Result	Laboratory Qualifier	Minimum Detection Limit	Reporting Limit	Units	Sample Type
WYO-2	cis-1,2-Dichloroethene	16-Jan-01	EPA 8260	1.7	J	0.5	2	µg/L	SA
(cont.)	cis-1,2-Dichloroethene	16-Jan-01	EPA 8260	1.9	J	0.5	2	µg/L	SA
	1,1-Dichloroethane	10-Mar-97	EPA 8260	1.2	J	0.5	2	µg/L	DU
	1,1-Dichloroethane	10-Mar-97	EPA 8260	1.2	J	0.5	2	µg/L	DU
	1,1-Dichloroethane	01-Oct-97	EPA 8260	1.2	J	1	2	µg/L	DU
	Trichloroethene	10-Mar-97	EPA 8260	6.3		0.5	2	µg/L	DU
	Trichloroethene	10-Mar-97	EPA 8260	6.3		0.5	2	µg/L	DU
	Trichloroethene	01-Oct-97	EPA 8260	7.4		1	2	µg/L	DU
	Trichloroethene	01-Dec-99	EPA 8260	6.6		0.5	2	µg/L	DU
	cis-1,2-Dichloroethene	10-Mar-97	EPA 8260	1.8	J	0.5	2	µg/L	DU
	cis-1,2-Dichloroethene	10-Mar-97	EPA 8260	1.8	J	0.5	2	µg/L	DU
	cis-1,2-Dichloroethene	01-Oct-97	EPA 8260	2.1		1	2	µg/L	DU
	cis-1,2-Dichloroethene	01-Dec-99	EPA 8260	1.9	J	0.5	2	µg/L	DU

B = Analyte detected in an associated blank.
DU = Duplicate sample.
EPA = U.S. Environmental Protection Agency.
H = Holding time exceeded.
ID = Identification.
J = Analyte detected below the method detection limit.
µg/L = Microgram(s) per liter.
mg/L = Milligram(s) per liter.
SA = Sample, aqueous.
VOC = Volatile organic compound.

Table 4.2.3-3
Tijeras Arroyo Groundwater Investigation—TCE Concentrations over Time

Well ID	Date[a]	TCE (µg/L)	Qualifier/Comments
PGS-2 (Regional Aquifer)	Jan-96	2	J; average of duplicates
	Apr-96	0.5	U
	Aug-96	0.5	U
	Dec-96	1	J
	Mar-97	0.5	U
	Jun-97	0.5	U
	Sep-97	0.5	U
	Dec-97	0.5	U
	Mar-98	0.5	U
	Jun-98	0.5	U
	Sep-98	0.5	U
	Dec-98	0.5	U
	Mar-99	0.5	U
	Jun-99	0.5	U
	Sep-99	0.5	U
	Dec-99	0.5	U
	Mar-00	0.5	U
	Jan-01	0.5	U
TA1-W-06 (SGWS)	Mar-98	0.82	J
	Jun-98	0.56	J
	Sep-98	0.5	U
	Dec-98	0.5	U
	Mar-99	0.5	U
	Jun-99	0.5	U
	Sep-99	0.6	J
	Dec-99	0.5	U
	Mar-00	0.52	J
	Jan-01	0.5	U
TA2-W-01 (SGWS)	Jun-95	1.6	average of duplicates
	Sep-95	1.9	
	Jan-96	1.7	J; average of duplicates
	Apr-96	1.4	J
	Aug-96	1.7	J; average of duplicates
	Dec-96	0.5	U
	Mar-97	1.3	J
	Jun-97	1.9	J
	Sep-97	1.4	J
	Dec-97	1.6	J; average of duplicates
	Mar-98	0.5	U
	Jun-98	0.5	U
	Sep-98	0.5	U
	Dec-98	2	
	Mar-99	1.9	J
	Jun-99	0.5	U

Refer to footnotes at end of table.

Table 4.2.3-3 (Continued)
Tijeras Arroyo Groundwater Investigation—TCE Concentrations over Time

Well ID	Date[a]	TCE (µg/L)	Qualifier/Comments
TA2-W-01 (cont.)	Sep-99	1.1	J
	Dec-99	1.1	J
	Mar-00	1.2	J
	Jan-01	1.6	J
TA2-W-19 (SGWS)	Jan-96	2.7	J; average of duplicates
	Apr-96	1.1	J
	Aug-96	1.1	J; average of duplicates
	Dec-96	4.3	J; average of duplicates
	Mar-97	1.4	J; average of duplicates
	Jun-97	2.7	
	Sep-97	1.9	J
	Dec-97	2.4	
	Mar-98	2.5	
	Jun-98	2.7	average of duplicates
	Sep-98	2.8	average of duplicates
	Dec-98	3.3	average of duplicates
	Mar-99	3.2	
	Jun-99	0.5	U
	Sep-99	1.8	J
	Dec-99	0.5	U
	Mar-00	1.9	J
	Jan-01	2.3	
TA2-W-26 (SGWS)	Mar-98	**9.6**	
	Jun-98	**9.0**	
	Sep-98	**7.4**	
	Dec-98	**8.3**	average of duplicates
	Mar-99	**7.4**	
	Jun-99	**6.8**	
	Sep-99	**8.7**	
	Dec-99	**8.7**	
	May-00	**9.2**	
	Jan-01	**7.9**	average of duplicates
TJA-2 (SGWS)	Jan-96	2.4	average of duplicates
	Apr-96	0.5	U
	Aug-96	1.4	average of duplicates
	Dec-96	0.5	U
	Mar-97	1.8	J; average of duplicates
	Jun-97	2.4	J; average of duplicates
	Sep-97	1.6	J
	Dec-97	0.66	J
	Mar-98	2.5	
	Jun-98	2.7	
	Sep-98	2.4	

Refer to footnotes at end of table.

Table 4.2.3-3 (Continued)
Tijeras Arroyo Groundwater Investigation—TCE Concentrations over Time

Well ID	Date[a]	TCE (µg/L)	Qualifier/Comments
TJA-2 (cont.)	Dec-98	2.7	
	Mar-99	2.3	
	Jun-99	2.3	
	Sep-99	2.3	
	Dec-99	2.5	
	Mar-00	3.2	
	Jan-01	2.8	
TJA-3 (Regional)	Dec-98	0.5	U
	Mar-99	0.5	U
	Jun-99	0.5	U
	Sep-99	0.5	U
	Dec-99	0.5	U
	Mar-00	0.5	U
	Jan-01	0.51	J
TJA-5 (SGWS)	Dec-98	0.5	U
	Mar-99	0.5	U
	Jun-99	0.5	U
	Sep-99	0.5	U
	Dec-99	0.5	U
	May-00	0.7	J; average of duplicates
	Jan-01	1.5	J
WYO-1 (Regional completion with annular connection to SGWS)	Jan-96	4	J; average of duplicates
	Apr-96	3	
	Aug-96	**5.6**	
	Dec-96	4.3	
	Mar-97	**5**	
	Jun-97	**7.1**	average of duplicates
	Sep-97	2.9	
	Dec-97	**5.3**	average of duplicates
	Mar-98	**7.2**	average of duplicates
	Jun-98	**6.3**	
	Sep-98	**6.8**	
	Dec-98	**6.1**	
	Mar-99	**6.1**	
	Jun-99	4.8	
	Sep-99	**5.4**	average of duplicates
	Dec-99	**5.9**	
	May-00	**5.68**	
	Jan-01	**6**	
WYO-2 (SGWS completion with annual connection to regional aquifer)	Jan-96	4.6	average of duplicates
	Apr-96	4	
	Aug-96	3.7	
	Dec-96	4.8	
	Mar-97	**6.5**	average of duplicates

Refer to footnotes at end of table.

Table 4.2.3-3 (Concluded)
Tijeras Arroyo Groundwater Investigation—TCE Concentrations over Time

Well ID	Date[a]	TCE (µg/L)	Qualifier/Comments
WYO-2 (cont.)	Jun-97	**6.6**	
	Sep-97	**5.6**	
	Dec-97	**5.9**	
	Mar-98	**6.4**	
	Jun-98	**7**	
	Sep-98	**6.3**	
	Dec-98	**7.5**	
	Mar-99	**7.2**	
	Jun-99	**5.2**	
	Sep-99	**6.9**	
	Dec-99	**6.8**	average of duplicates
	Jan-01	**6**	average of duplicates

Bold text indicates the value meets or exceeds the EPA TCE MCL of 5 µg/L.
Only wells with detectable concentrations of TCE are included in this table.
[a]For ease of viewing, the dates given are based upon quarterly sampling events and not necessarily actual sample dates.
EPA = U.S. Environmental Protection Agency.
ID = Identification.
J = The result is greater than or equal to the MDL but less than the PQL.
MCL = Maximum contaminant level.
MDL = Method detection limit.
µg/L = Microgram(s) per liter.
PQL = Practical quantitation limit.
SGWS= Shallow groundwater system.
TCE = Trichloroethene (trichloroethylene).
U = Designates a non-detect; see original data for MDLs.

Figure 4.2.3-1
TCE Concentrations over Time for Monitoring Well TA2-W-01

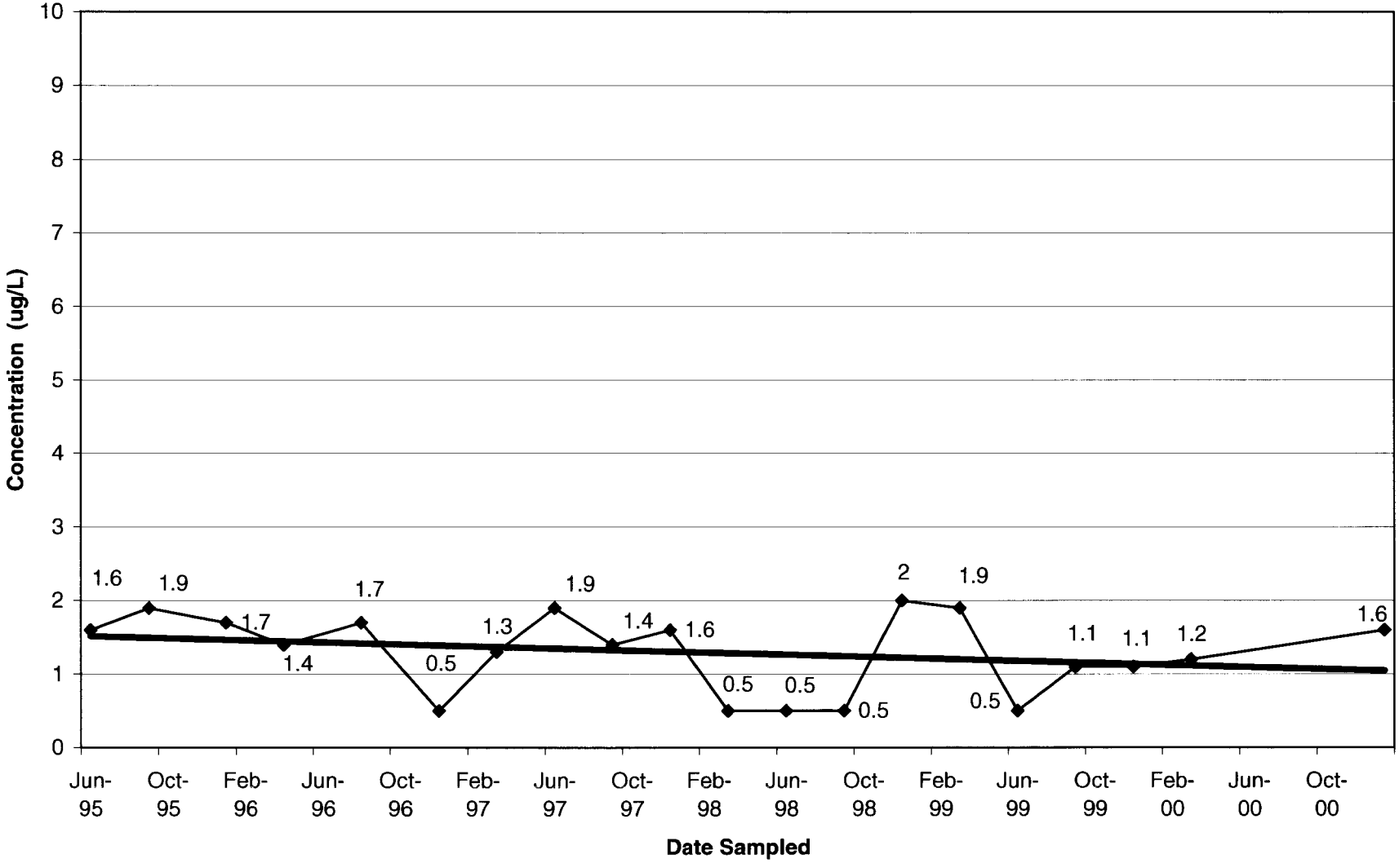


Figure 4.2.3-2
TCE Concentrations over Time for Monitoring Well TA2-W-19

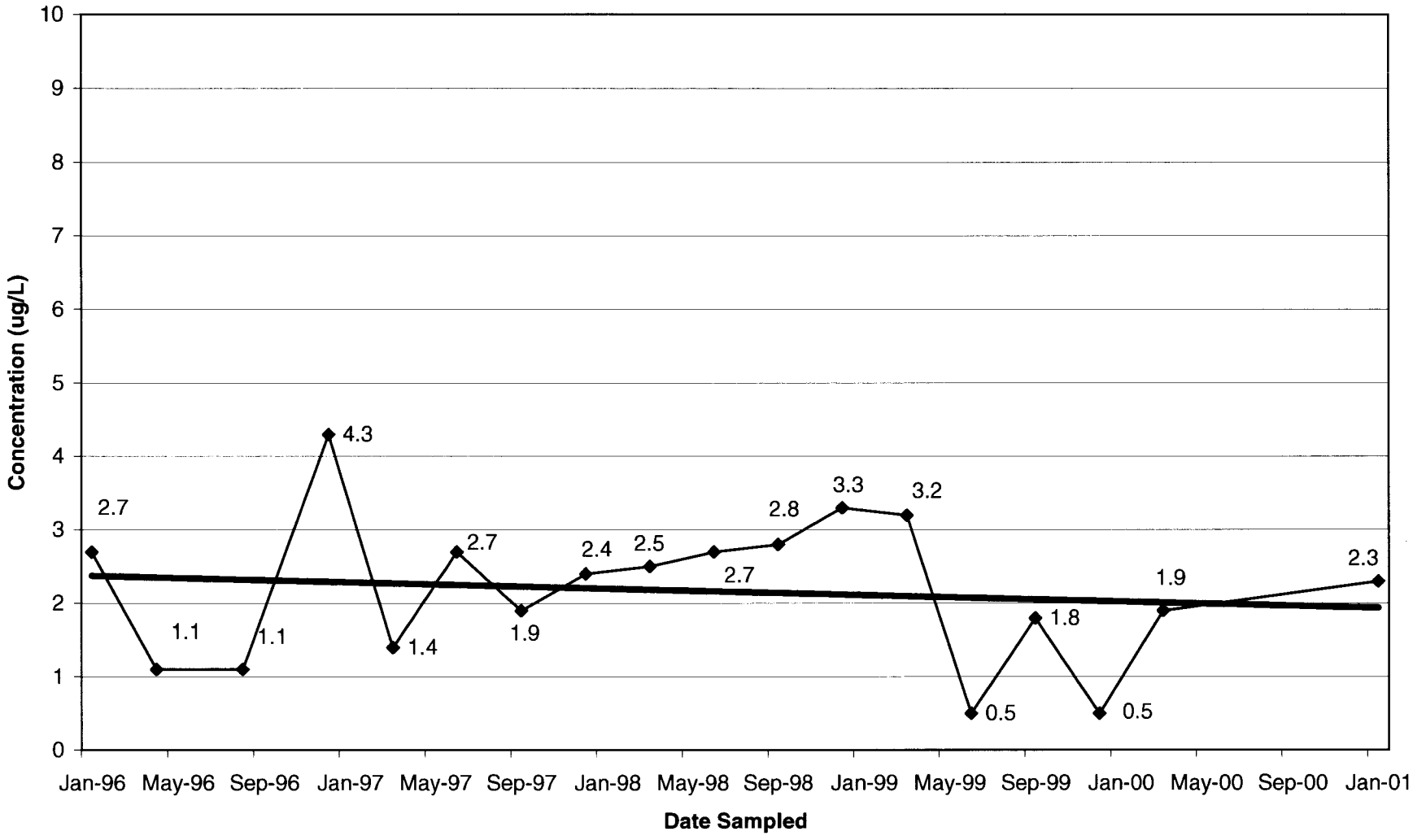


Figure 4.2.3-3
TCE Concentration over Time for Monitoring Well TA2-W-26

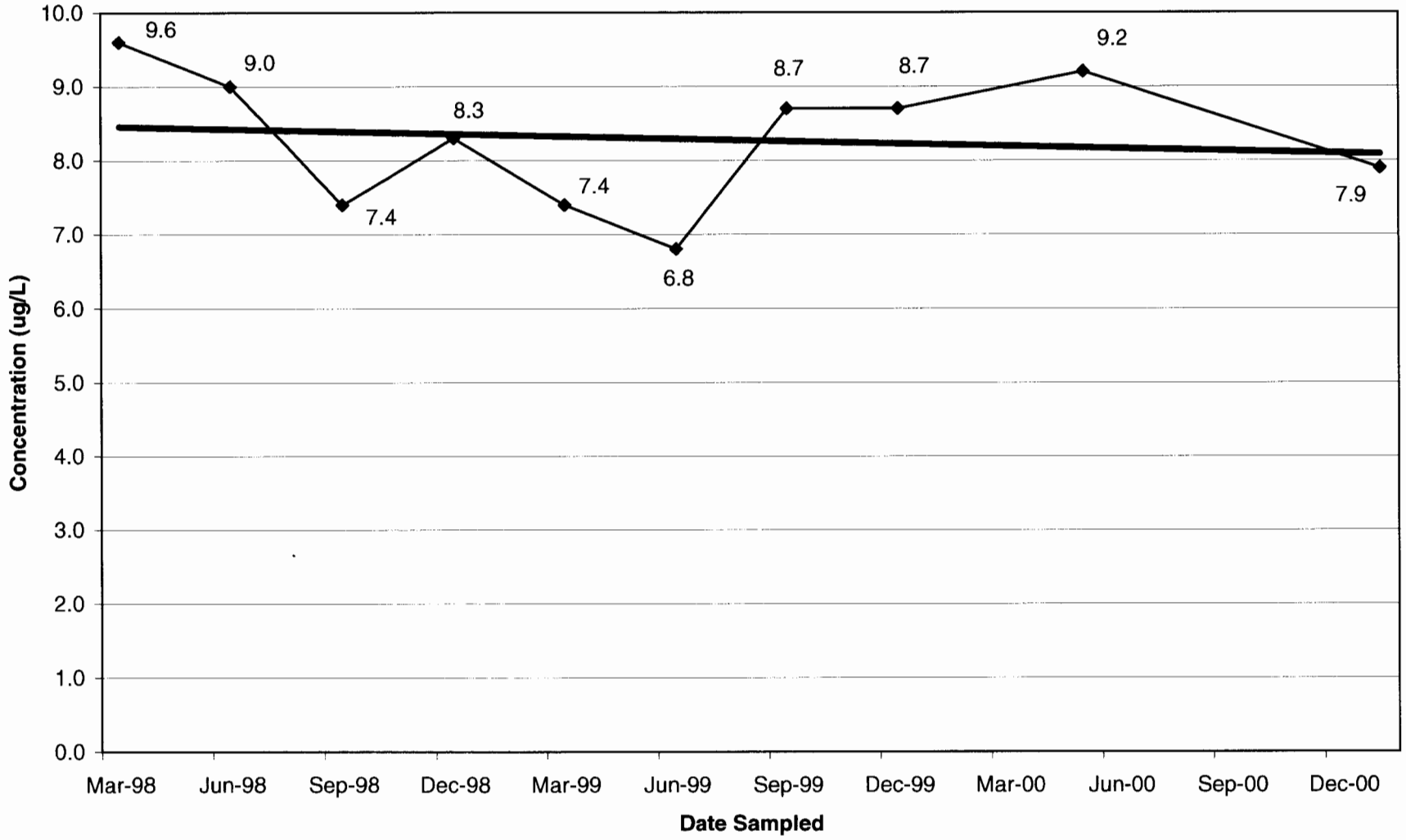


Figure 4.2.3-4
TCE Concentrations over Time for Monitoring Well TJA-2

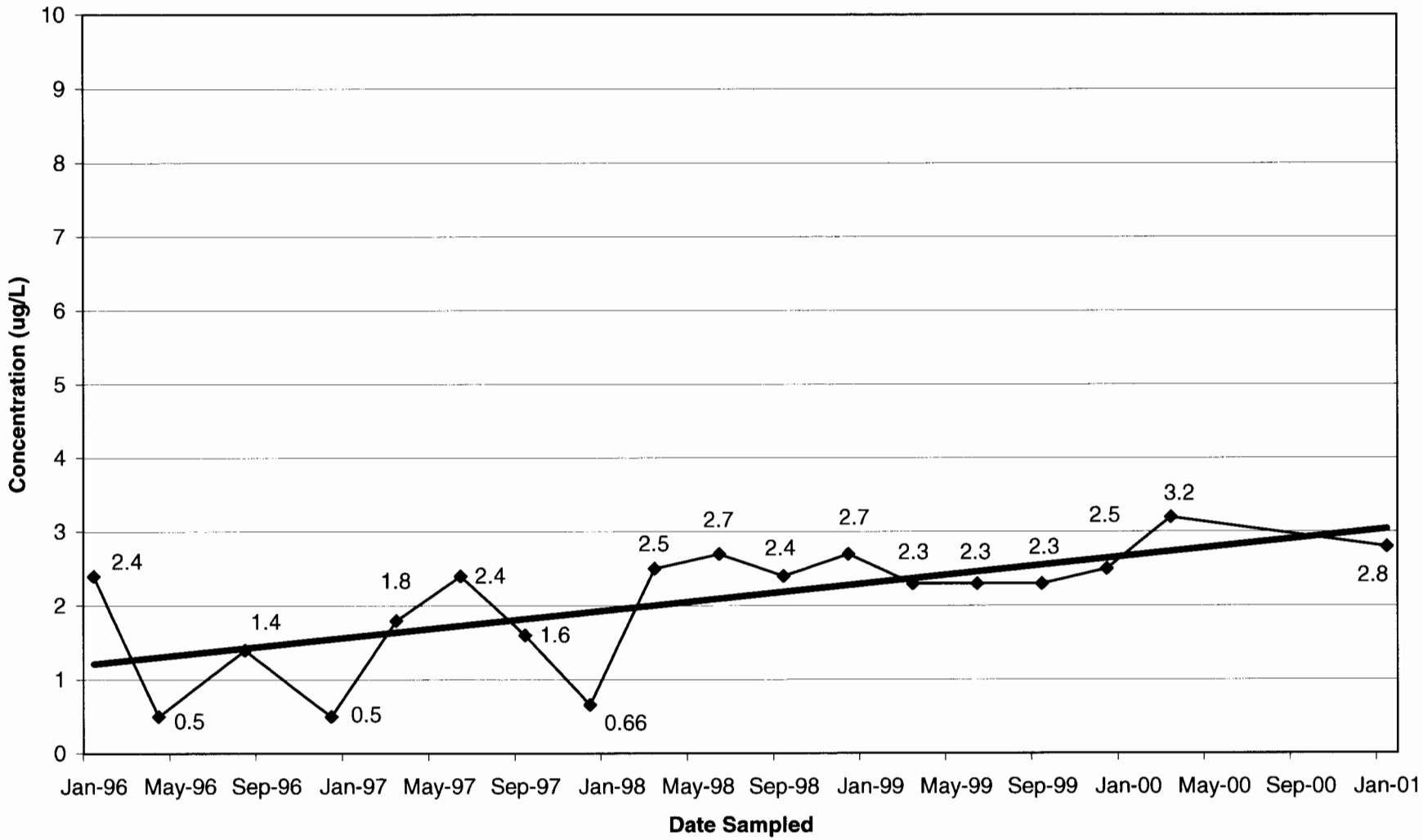


Figure 4.2.3-5
TCE Concentrations over Time for Monitoring Well WYO-1

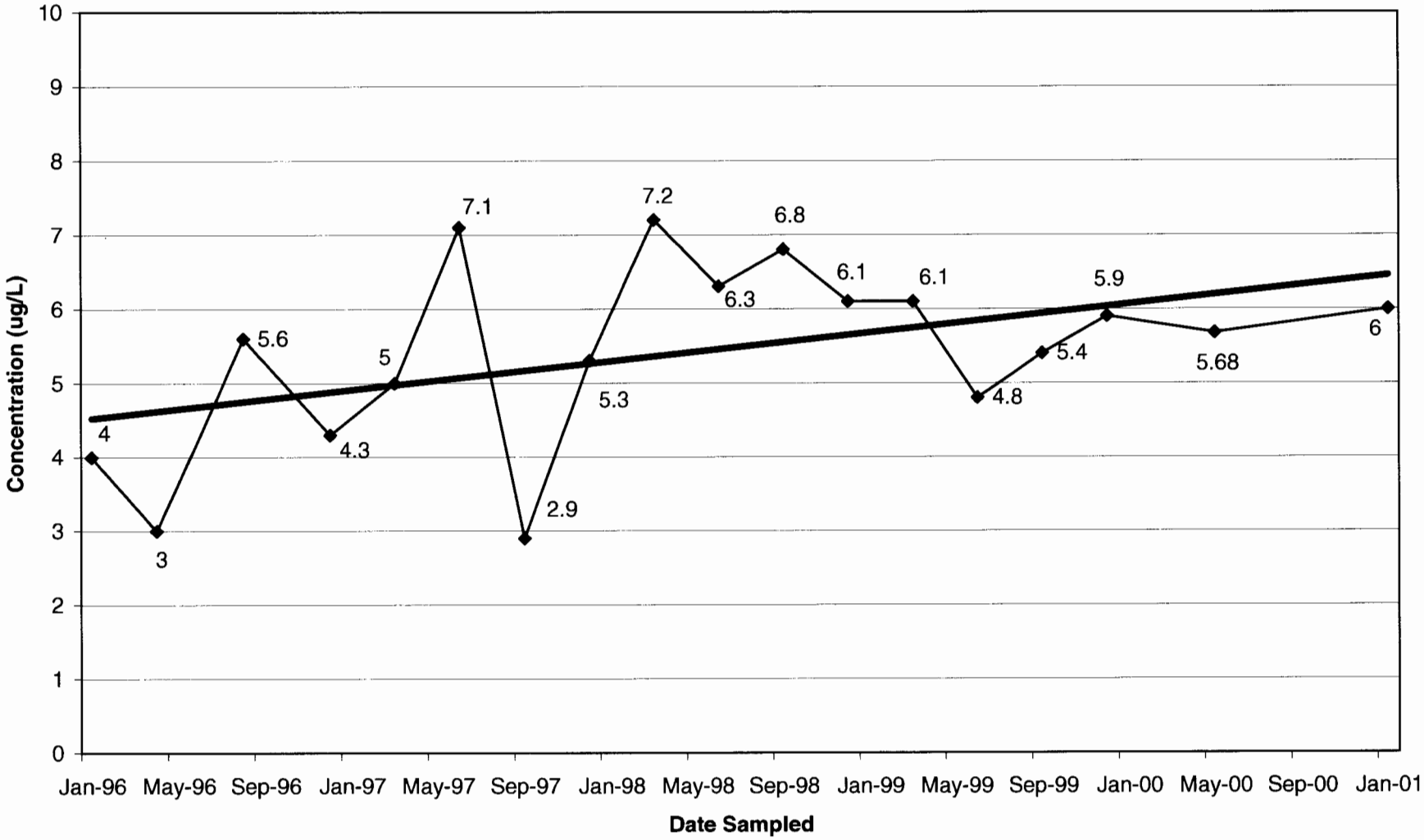
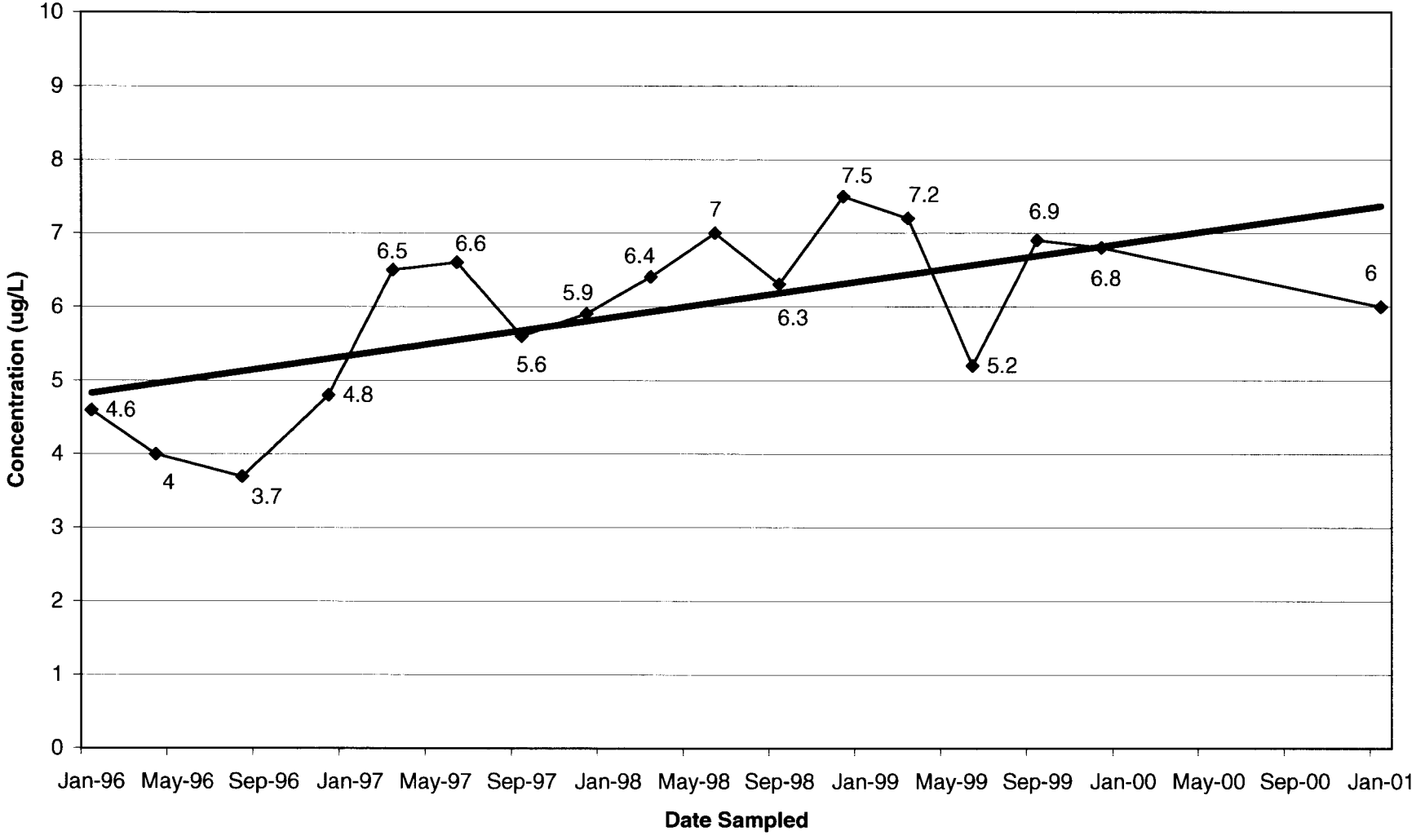
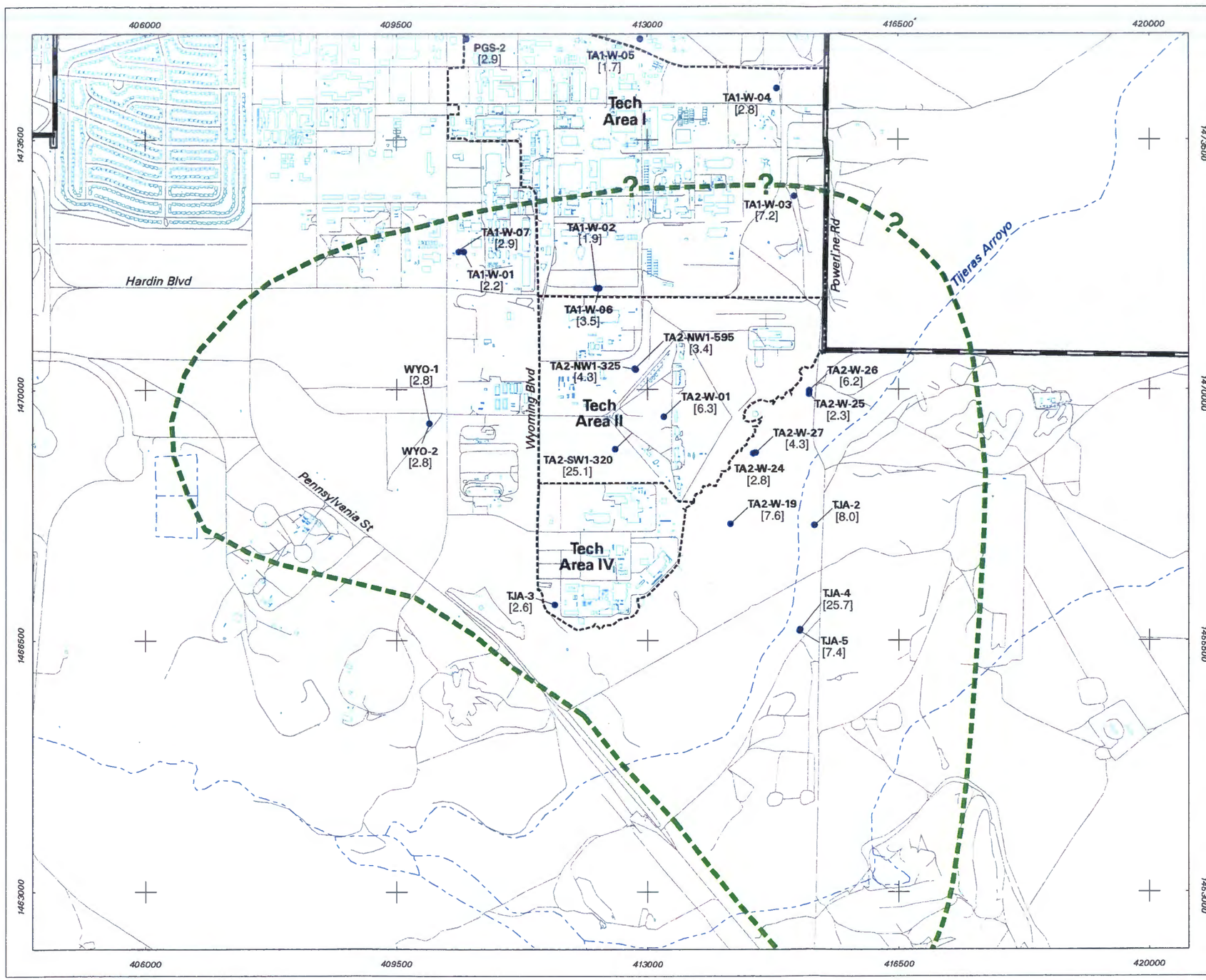


Figure 4.2.3-6
TCE Concentrations over Time for Monitoring Well WYO-2



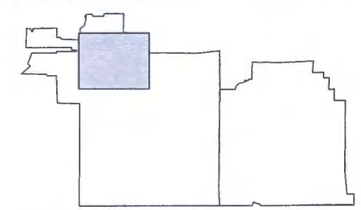


Legend

- Monitoring Well
- Extent of the Shallow Groundwater System, (Queried Where Uncertain)
- Roadway
- Building
- Surface Drainage
- Tech Area Boundary
- KAFB Boundary
- [6.2] Average Nitrate (as N) Concentration in mg/L

0 1500 3000
Scale in Feet

0 360 720
Scale in Meters



Sandia National Laboratories, New Mexico
Environmental Geographic Information System

Figure 4.3.1-1
Average Nitrate Concentrations (mg/L) for Tijeras Arroyo Groundwater Investigation Monitoring Wells (May 2001)

Transverse Mercator Projection, New Mexico State Plane Coordinate System, Central Zone, 1927 North American Horizontal Datum, 1929 North American Vertical Datum

	1:18000	MAPID=030019
Unclassified		SNL EGIS ORG. 6135
ddrizor	dr030019.aml	04/02/02

with values ranging from 1.7 to 3.4 mg/L. For comparison of the regional aquifer to the SGWS, nitrate concentrations in the two wells exhibiting nitrate contamination (TJA-4 and TA2-NW1-325, discussed below) were not used in calculating average concentrations. The lateral distribution of nitrate in the regional aquifer wells shows no discernable pattern. However, the lateral distribution of nitrate in the SGWS groundwater shows lower concentrations to the northwest, in the upgradient direction. This suggests that nitrate contamination in the SGWS is spatially related to TA-II and Tijeras Arroyo.

Nitrate exceeded the MCL (10 mg/L) in nine wells, with seven of these wells exceeding the MCL only once or twice, which may reflect a laboratory error. Wells TA2-SW1-320 and TJA-4 have consistently exceeded the MCL and the concentration trend lines exhibit increasing concentrations at a rate of 2 to 5 mg/L per year. The nitrate in well TA2-SW1-320 is directly attributable to the high volume TA-II Building 901 Septic System in the vicinity (SWMU 165, Building 901 Septic System—discussed in Section 2.2) that discharged TA-II septic and waste water.

The source of nitrate contamination at TJA-4 is unclear. This well is an intermediate zone completion with undetermined flow direction. Although no gradient information is available, it is assumed that the intermediate zone mimics the SGWS because the same fine-grained sediments holding up the SGWS are the perching mechanism (a similarly dipping package of parallel strata) for the intermediate zone. With this assumption, there are no nearby, upgradient SWMUs that can be identified as the source of the nitrate. The nearby KAFB landfill LF-08 is crossgradient or downgradient of TJA-4 and, therefore, is not a suspected source of nitrate contamination. It should be noted that the companion SGWS well (TJA-5) with nitrate concentrations typically in the 6 to 8 mg/L range, does not exhibit concentrations similar to TJA-4. Nitrate from the golf course pond and/or turf fertilization may be impacting groundwater near TJA-4 and TJA-5 via a presently unrecognized flow path.

The 17 most likely potential nitrate-release sites in the vicinity of the TAG study area are:

- SWMU 48, Building 904 Septic System (TA-II waste water)
- SWMU 136, Building 907 Septic System (TA-II septic water)
- SWMU 159, Building 935 Septic System (TA-II septic water)
- SWMU 165, Building 901 Septic System (TA-II personnel shower and septic water)
- SWMU 166, Building 919 Septic System (TA-II waste water)
- SWMU 167, Building 940 Septic System (TA-II septic water)
- SWMU 187, TA-I Sanitary Sewer System (with waste-water cross-connects)
- KAFB Landfill LF-02
- KAFB Landfill LF-08
- KAFB Landfill LF-44

- KAFB Landfill LF-268
- KAFB Sewage Lagoons (WP-26)
- KAFB Golf Course Main Pond (WP-26)
- COA Eubank Landfill—Northeast Fill Area
- COA Eubank Landfill—Southwest Fill Area
- COA Sanitary-Sewer Line Rupture
- COA leaking sanitary-sewer lines
- COA Montessa Park/Tree Farm

Currently, KAFB is addressing nitrate contamination in the vicinity of the TAG study area as part of a nitrate-abatement investigation (Montgomery Watson August 2000). Based upon NMED requirements, KAFB is conducting an extensive investigation, including numerous well installations, rigorous groundwater sampling suites, and routine reporting. The nitrate abatement program includes sampling three SNL/NM wells (TA1-W-02, TA2-SW1-320, and TJA-2) and installing SGWS wells to the west of WYO-1/WYO-2. The results from KAFB investigations will be incorporated in future SNL/NM reports.

4.3.2 Chlorinated Solvents

Based upon a review of site information and investigation results (discussed in Chapter 2.0), the list of SWMUs that may have contributed TCE to TAG study area groundwater has been narrowed down to 19 viable sites, including:

- SWMU 46, Old Acid Waste Line Outfall (waste-water outfall for SWMU 226)
- SWMU 48, Building 904 Septic System (TA-II waste water)
- SWMU 96, Storm Drain System (extending across much of TA-I)
- SWMU 135, Building 907 Septic System (TA-II septic water)
- SWMU 136, Building 907 Septic System (TA-II waste water)
- SWMU 159, Building 935 Septic System (TA-II septic water)
- SWMU 165, Building 901 Septic System (TA-II personnel shower and septic water)
- SWMU 166, Building 919 Septic System (TA-II waste water)
- SWMU 167, Building 940 Septic System (TA-II septic water)
- SWMU 187, TA-I Sanitary Sewer System (with waste-water cross-connects)

- SWMU 226, Old Acid Waste Line (TA-I waste water)
- SWMU 227, Building 904 Outfall (waste water from TA-II via SWMU 48)
- SWMU 229, Storm Drain System Outfall (TA-II waste water via SWMU 48)
- KAFB Landfill (LF-02)
- KAFB Landfill (LF-08)
- KAFB Sewage Lagoons (WP-26)
- KAFB Golf Course Pond (WP-26)
- COA Eubank Landfill—Northeast Fill Area
- COA Eubank Landfill—Southwest Fill Area.

The horizontal distribution of TCE in groundwater is sporadic. The highest concentrations found to date are at well TA2-W-26 in the eastern portion of the study area. With intervening wells, such as TA2-W-27, consistently yielding no detectable TCE concentrations, it is difficult to project a plume from TA2-W-26 over to the wells in and around TA-II (TA2-W-01 and TA2-W-19) and further west to WYO-1 and WYO-2. The sporadic distribution of TCE may reflect multiple small sources of TCE.

The distribution of the other detected chlorinated solvents coincides comparatively well with the TCE distribution. Only rarely are 1,1-DCA; 1,1-DCE; and cis-1,2-DCE found in any wells that do not also contain TCE. PCE is usually found only in TA2-W-26 and rarely in TA2-W-27 (as sub-µg/L J-values).

4.3.3 Metals

Although concentrations of 13 metals (arsenic, barium, cadmium, chromium, cobalt, copper, lead, nickel, selenium, silver, thallium, vanadium, and zinc) exceeded the NMED-approved background concentrations (Dinwiddie September 1997) in a variety of groundwater samples from the TAG study area, only three metals (cadmium, selenium, and thallium) exceeded the respective EPA MCLs (Table 4.2.2-1).

The cadmium exceedence was limited to the September 1999 sampling event in well TA2-W-25. As discussed above and seen in Table 4.2.2-1, cadmium concentrations at TA2-W-25 before and after this sampling event were an order of magnitude below this anomalously high value, with the second-highest detected concentration of 0.47 µg/L found in April 2000. Therefore, the September 1999 cadmium concentration found at TA2-W-25 is considered a statistical outlier and does not represent a true geochemical nature of groundwater at this well. Cadmium concentrations at this location will continue to be monitored during future sampling events.

The most obvious metal contaminant in the TAG study area is the selenium found in nearly all of the monitoring wells (Table 4.3.3-1). The extremely large percentage of exceedences above background suggest that the NMED-approved background concentration may not be applicable

Table 4.3.3-1
Tijeras Arroyo Groundwater Investigation—Selenium Concentrations (µg/L) over Time

Well Location	Amount Detected	Laboratory Qualifier	Sample Date
PGS-2	19		26-Jan-96
	ND	U	26-Jan-96
	ND	U	28-Aug-96
	ND	U	28-Aug-96
	9.9		11-Jun-97
	5.52		22-Sep-97
	12		22-Sep-97
	11		16-Dec-97
	2.7	J	16-Mar-98
	7.3		8-Jul-98
	3.8	J	22-Sep-98
	4.9	J	8-Dec-98
	2.6	J	12-Mar-99
	6	J	30-Jun-99
	3.9	J,B	23-Sep-99
	5.2	J	3-Dec-99
	4.8	J	12-Apr-00
	3.6	J	15-Jan-01
TA1-W-01	1.56	J	15-Dec-97
	4.6	J,B	15-Dec-97
	4	J	12-Mar-98
	3.7	J	7-Jul-98
	ND	U	21-Aug-98
	5.6	J	17-Sep-98
	3.4	J	8-Dec-98
	3.4	J	10-Mar-99
	5	J,B	22-Jul-99
	4.1	J,B	16-Sep-99
	4.6	J	9-Dec-99
	3.1	J	16-Mar-00
	4.5	J	10-Jan-01
TA1-W-02	4.2	J	24-Mar-98
	2	J	18-Jun-98
	3	J	1-Jul-98
	5.8	J	21-Sep-98
	3.8	J	3-Dec-98
	1.9	J	15-Mar-99
	4.7	J,B	27-Jul-99
	4.5	J,B	10-Sep-99
	6.5	J	22-Nov-99

Refer to footnotes at end of table.

Table 4.3.3-1 (Continued)
Tijeras Arroyo Groundwater Investigation—Selenium Concentrations (µg/L) over Time

Well Location	Amount Detected	Laboratory Qualifier	Sample Date
TA1-W-02 (cont.)	3.7	J	17-Mar-00
	2.4	J,B	9-Jan-01
TA1-W-03	**54**		11-Mar-98
	49		1-Jul-98
	35		17-Sep-98
	59		17-Sep-98
	27		10-Mar-99
	4.8	J,B	13-Jul-99
	54	B	14-Sep-99
	58		24-Nov-99
	74		10-Apr-00
	40	B	5-Jan-01
TA1-W-04	3.7	J	14-Dec-98
	2.6	J	17-Mar-99
	5	J	30-Jun-99
	3.3	J,B	22-Sep-99
	3.2	J	8-Dec-99
	6.9		10-Apr-00
	3.7	J	15-Jan-01
TA1-W-05	3.8	J	16-Dec-98
	2.6	J	19-Mar-99
	3.7	J	17-Jun-99
	3.4	J,B	22-Sep-99
	4.2	J	7-Dec-99
	ND	U	29-May-00
	4.7	J	16-Jan-01
TA1-W-06	13		24-Mar-98
	9.11		18-Jun-98
	12		1-Jul-98
	22		21-Sep-98
	16		3-Dec-98
	6.8		15-Mar-99
	19	B	27-Jul-99
	15	B	10-Sep-99
	20		22-Nov-99
	7.73		22-Nov-99
	20		22-Nov-99
	14		17-Mar-00
	9.9	B	9-Jan-01

Refer to footnotes at end of table.

Table 4.3.3-1 (Continued)
Tijeras Arroyo Groundwater Investigation—Selenium Concentrations (µg/L) over Time

Well Location	Amount Detected	Laboratory Qualifier	Sample Date
TA1-W-07	19		16-Dec-98
	9.16		10-Mar-99
	9.7		10-Mar-99
	24	B	21-Jul-99
	16	B	16-Sep-99
	17		6-Dec-99
	19		16-Mar-00
	21		10-Jan-01
TA2-NW1-325	6.6	J	26-Mar-93
	5		6-Jan-94
	7		11-Apr-94
	8		11-Apr-94
	6		18-Jul-94
	6		18-Jul-94
	5		13-Oct-94
	ND	U	20-Jun-95
	9.4		27-Sep-95
	5.6		25-Jan-96
	ND	U	25-Jan-96
	ND	U	27-Aug-96
	ND	U	27-Aug-96
	11		9-Jun-97
	13		26-Sep-97
	18		8-Dec-97
	11		9-Mar-98
	13		6-Jul-98
	19		15-Sep-98
	13		30-Nov-98
	15		8-Mar-99
	16		15-Jun-99
	14	B	15-Sep-99
	18		17-Nov-99
	13		21-Apr-00
	16		11-Jan-01
TA2-NW1-595	ND	U	27-Aug-96
	ND	U	27-Aug-96
	8.7		10-Jun-97
	9.1		30-Sep-97
	9.5		30-Sep-97
	11	B	15-Dec-97

Refer to footnotes at end of table.

Table 4.3.3-1 (Continued)
Tijeras Arroyo Groundwater Investigation—Selenium Concentrations (µg/L) over Time

Well Location	Amount Detected	Laboratory Qualifier	Sample Date
TA2-NW1-595 (cont.)	10		9-Mar-98
	8		6-Jul-98
	15		15-Sep-98
	11		30-Nov-98
	13		8-Mar-99
	12		15-Jun-99
	9.8	B	15-Sep-99
	16		18-Nov-99
	11		21-Apr-00
	12		11-Jan-01
TA2-SW1-320	ND	U	17-Dec-92
	ND	U	17-Dec-92
	3		5-Jan-94
	4		7-Apr-94
	3		15-Jul-94
	ND	U	12-Oct-94
	ND	U	12-Oct-94
	ND	U	12-Oct-94
	ND	U	20-Jun-95
	ND	U	20-Jun-95
	ND	U	27-Sep-95
	ND	U	25-Jan-96
	ND	U	25-Jan-96
	ND	U	27-Aug-96
	ND	U	27-Aug-96
	5.1	J	9-Jun-97
	6	J	6-Mar-98
	7.1		6-Jul-98
	7.7		10-Sep-98
	6.3	J	30-Nov-98
	9.2	B	20-Jul-99
	6	J,B	13-Sep-99
	9.6		19-Nov-99
	11		12-Apr-00
	7.5		12-Jan-01
TA2-W-01	3		20-Jul-94
	5		14-Oct-94
	ND	U	20-Jun-95
	5.5		27-Sep-95
	6.9		27-Sep-95

Refer to footnotes at end of table.

Table 4.3.3-1 (Continued)
Tijeras Arroyo Groundwater Investigation—Selenium Concentrations (µg/L) over Time

Well Location	Amount Detected	Laboratory Qualifier	Sample Date
TA2-W-01 (cont.)	3.9	J	26-Jan-96
	ND	U	26-Jan-96
	ND	U	26-Aug-96
	ND	U	26-Aug-96
	9.7		6-Jun-97
	11		2-Oct-97
	14	B	8-Dec-97
	14		13-Mar-98
	12		24-Jun-98
	19		18-Sep-98
	11		30-Nov-98
	13		9-Mar-99
	20	B	28-Jul-99
	12	B	15-Sep-99
	13		2-Dec-99
	3.7	J	11-Apr-00
	16		17-Jan-01
TA2-W-19	5		24-Jan-96
	5.2		24-Jan-96
	ND	U	24-Jan-96
	ND	U	28-Aug-96
	ND	U	28-Aug-96
	ND	U	28-Aug-96
	ND	U	28-Aug-96
	8.9		10-Jun-97
	7.4		29-Sep-97
	11	B	10-Dec-97
	6.9		6-Mar-98
	8.6		8-Jul-98
	9.7		16-Sep-98
	9.5		16-Sep-98
	8.8		2-Dec-98
	8.3		2-Dec-98
	10		9-Mar-99
	15		16-Jun-99
	7.1	B	24-Sep-99
	10		30-Nov-99
	9.3		15-Mar-00
	5.7	J,B	4-Jan-01
TA2-W-24	3.49	J	19-Mar-98
	9.8		19-Mar-98

Refer to footnotes at end of table.

Table 4.3.3-1 (Continued)
Tijeras Arroyo Groundwater Investigation—Selenium Concentrations (µg/L) over Time

Well Location	Amount Detected	Laboratory Qualifier	Sample Date
TA2-W-24 (cont.)	5.8	J	23-Jun-98
	3.1	J	24-Sep-98
	2.4	J	3-Dec-98
	1.8	J	11-Mar-99
	4.4	J	29-Jun-99
	3.1	J,B	9-Sep-99
	5.1	J	23-Nov-99
	ND	U	14-Mar-00
	ND	U	3-Jan-01
TA2-W-25	1.44	J	12-Dec-97
	3.9	J,B	12-Dec-97
	3.8	J	10-Mar-98
	4.6	J	22-Jun-98
	4.9	J	23-Sep-98
	3.4	J	14-Dec-98
	1.7	J	16-Mar-99
	4.9	J	29-Jun-99
	5.2	J,B	13-Sep-99
	4.6	J	24-Nov-99
	4.6	J	28-Apr-00
	2.92	J	28-Apr-00
	2.3	J,B	5-Jan-01
TA2-W-26	7.4		17-Mar-98
	19		17-Mar-98
	12		22-Jun-98
	10		25-Sep-98
	5.1		14-Dec-98
	11		14-Dec-98
	4.6	J	16-Mar-99
	10		7-Jul-99
	9.2	B	9-Sep-99
	5.43		9-Sep-99
	8.3	B	9-Sep-99
	9.6		2-Dec-99
	3.97	J	26-May-00
	5.9	J,B	8-Jan-01
	4.7	J,B	8-Jan-01
TA2-W-27	12		19-Mar-98
	8.7		19-Mar-98
	19		23-Jun-98
	20		24-Sep-98

Refer to footnotes at end of table.

Table 4.3.3-1 (Continued)
Tijeras Arroyo Groundwater Investigation—Selenium Concentrations (µg/L) over Time

Well Location	Amount Detected	Laboratory Qualifier	Sample Date
TA2-W-27 (cont.)	17		3-Dec-98
	10		11-Mar-99
	26		8-Jul-99
	20	B	9-Sep-99
	26		23-Nov-99
	21		14-Mar-00
	13	B	3-Jan-01
TJA-2	ND	U	24-Jan-96
	5.2		24-Jan-96
	3.07	J	12-Jun-97
	7.3		12-Jun-97
	7.2		29-Sep-97
	12		16-Dec-97
	7.5		10-Mar-98
	11		24-Jun-98
	12		16-Sep-98
	7.6		2-Dec-98
	7.8		4-Mar-99
	10		16-Jun-99
	6.4	J,B	13-Sep-99
	15		30-Nov-99
	9.5		15-Mar-00
	5.6	J,B	4-Jan-01
TJA-3	ND	U	15-Dec-98
	4.1	J	15-Dec-98
	5.3	J	8-Mar-99
	5	J	16-Jun-99
	2.6	J,B	20-Sep-99
	5.7	J	29-Nov-99
	13		11-Apr-00
	2.7	J,B	8-Jan-01
TJA-4	6.2	J	15-Dec-98
	4.6	J	4-Mar-99
	ND	U	4-Mar-99
	4.9	J	4-Mar-99
	8.1	B	12-Jul-99
	7.3	B	12-Jul-99
	5.6	J,B	20-Sep-99
	6.6	J	29-Nov-99
	6.2	J	20-Apr-00
	4.2	J,B	2-Jan-01

Refer to footnotes at end of table.

Table 4.3.3-1 (Continued)
Tijeras Arroyo Groundwater Investigation—Selenium Concentrations (µg/L) over Time

Well Location	Amount Detected	Laboratory Qualifier	Sample Date
TJA-5	5.6	J	15-Dec-98
	5.3	J	4-Mar-99
	5.9	J	4-Mar-99
	7		28-Jun-99
	8.2		28-Jun-99
	8.8	B	14-Sep-99
	6.9		29-Nov-99
	6.7	J	28-Apr-00
	6.5	J	28-Apr-00
	5.2	J,B	2-Jan-01
WYO-1	5.2		25-Jan-96
	ND	U	26-Aug-96
	6.04		5-Jun-97
	5.77		5-Jun-97
	9.1		5-Jun-97
	10		1-Oct-97
	14	B	9-Dec-97
	15	B	9-Dec-97
	8.1		5-Mar-98
	10		10-Jun-98
	12		28-Aug-98
	13		28-Aug-98
	13		28-Aug-98
	9.9		28-Aug-98
	15		14-Sep-98
	4.7	J	1-Dec-98
	10		5-Mar-99
	19	B	14-Jul-99
	10	B	16-Sep-99
	5.69		16-Sep-99
	10	B	16-Sep-99
	11		1-Dec-99
	5.91		1-Jun-00
	10		12-Jan-01
WYO-2	ND	U	24-Jan-96
	ND	U	24-Jan-96
	ND	U	26-Aug-96
	9.5		5-Jun-97
	5.18		1-Oct-97
	6.78		1-Oct-97
	11		1-Oct-97

Refer to footnotes at end of table.

Table 4.3.3-1 (Concluded)
Tijeras Arroyo Groundwater Investigation—Selenium Concentrations (µg/L) over Time

Well Location	Amount Detected	Laboratory Qualifier	Sample Date
WYO-2 (cont.)	13	B	9-Dec-97
	7.4		6-Mar-98
	11		10-Jun-98
	16		14-Sep-98
	3.4	J	1-Dec-98
	9.6		5-Mar-99
	19	B	19-Jul-99
	9.7	B	16-Sep-99
	10		1-Dec-99
	4.66	J	1-Dec-99
	8.3		1-Dec-99
	13		16-Jan-01
	13		16-Jan-01

Note: **Bold** text indicates the value meets or exceeds the EPA selenium MCL of 50 µg/L.
B = Analyte detected in an associated blank.
EPA = U.S. Environmental Protection Agency.
J = Analyte detected below the method detection limit.
MCL = Maximum contaminant level.
µg/L = Microgram(s) per liter.
ND = Analyte not detected.
U = Analyte not detected.

for the TAG study area. However, the concentrations of selenium consistently above the EPA MCL found in TA1-W-03 probably does represent actual contamination. Determining a source for the selenium at this location is problematic; there are no apparent upgradient sources.

TA1-W-03 selenium concentrations consistently exceeded the MCLs, and the concentration versus time trend line shows that concentrations are highly scattered, where the trend line appears to be level (Figure 4.3.3-1). Selenium did not exceed the MCL in any other monitoring wells, but selenium concentrations over time were plotted for three other wells that exceeded the NMED/HWB approved maximum background value (Figures 4.3.3-2 through 4.3.3-4). The trend in these three wells ranges from level to slightly increasing selenium concentrations over time. Even with increasing trend lines, none of the other wells are likely to exceed the EPA MCL in the near future.

The 13 thallium exceedences in the SGWS wells are perplexing. However, with the analytical method used in the past, the majority of the thallium concentrations were estimated quantities below the detection limits (with J-qualifiers). In order to get a more accurate determination of thallium concentrations, future analytical methods will require lower detection limits.

Figure 4.3.3-1
Selenium Concentrations over Time for Monitoring Well TA1-W-03

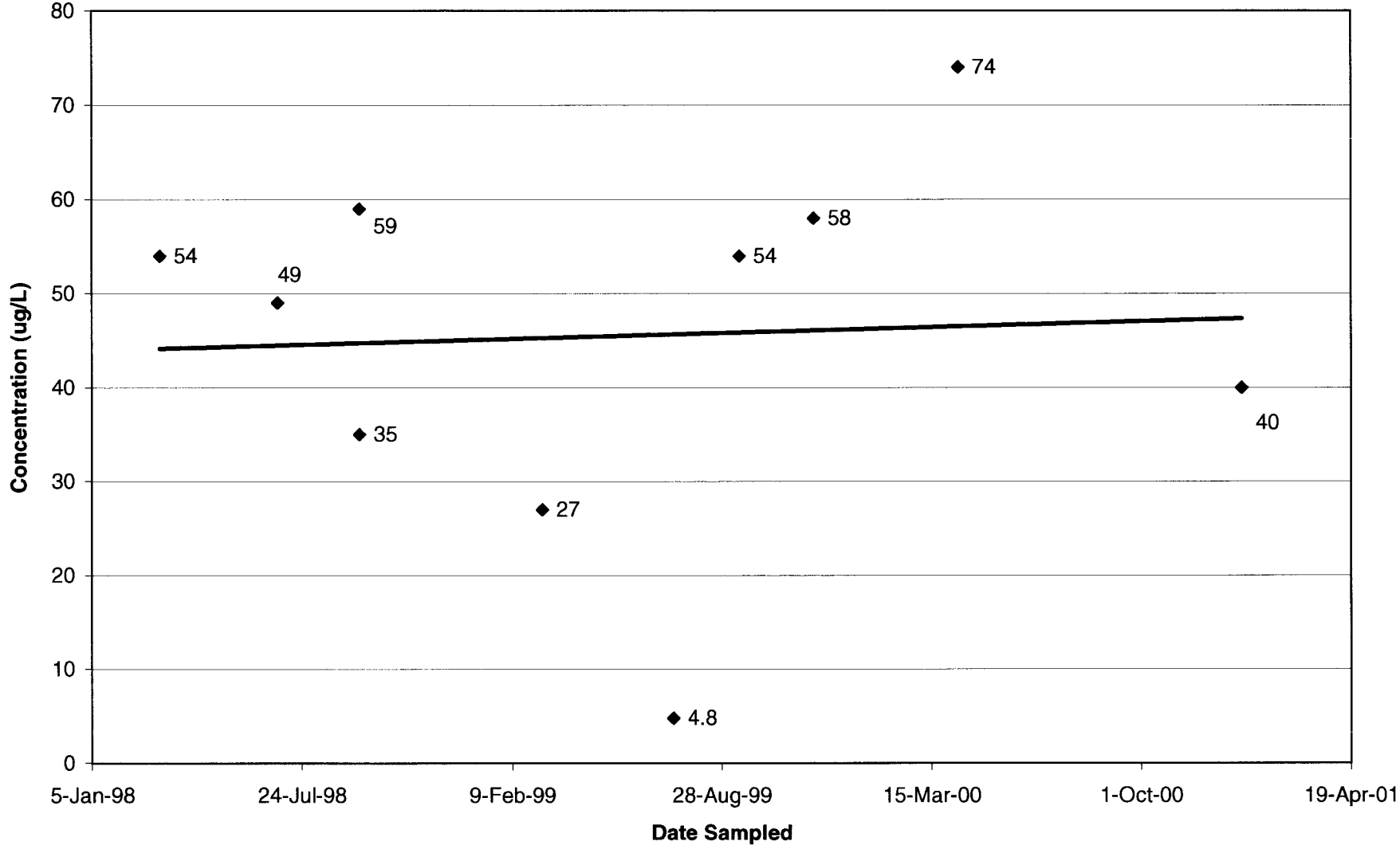


Figure 4.3.3-2
Selenium Concentrations over Time for Monitoring Well TA1-W-06

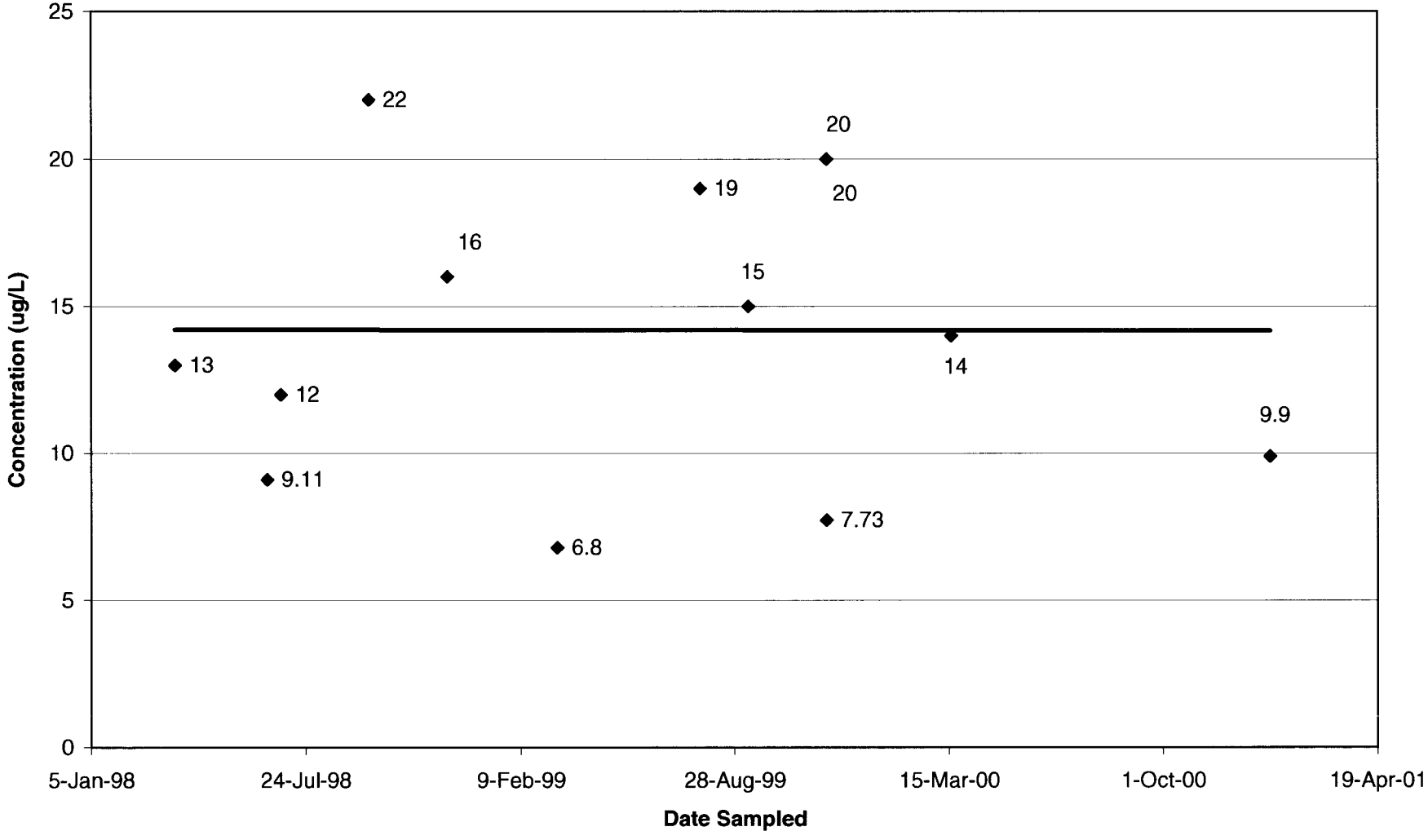


Figure 4.3.3-3
Selenium Concentrations over Time for Monitoring Well TA1-W-07

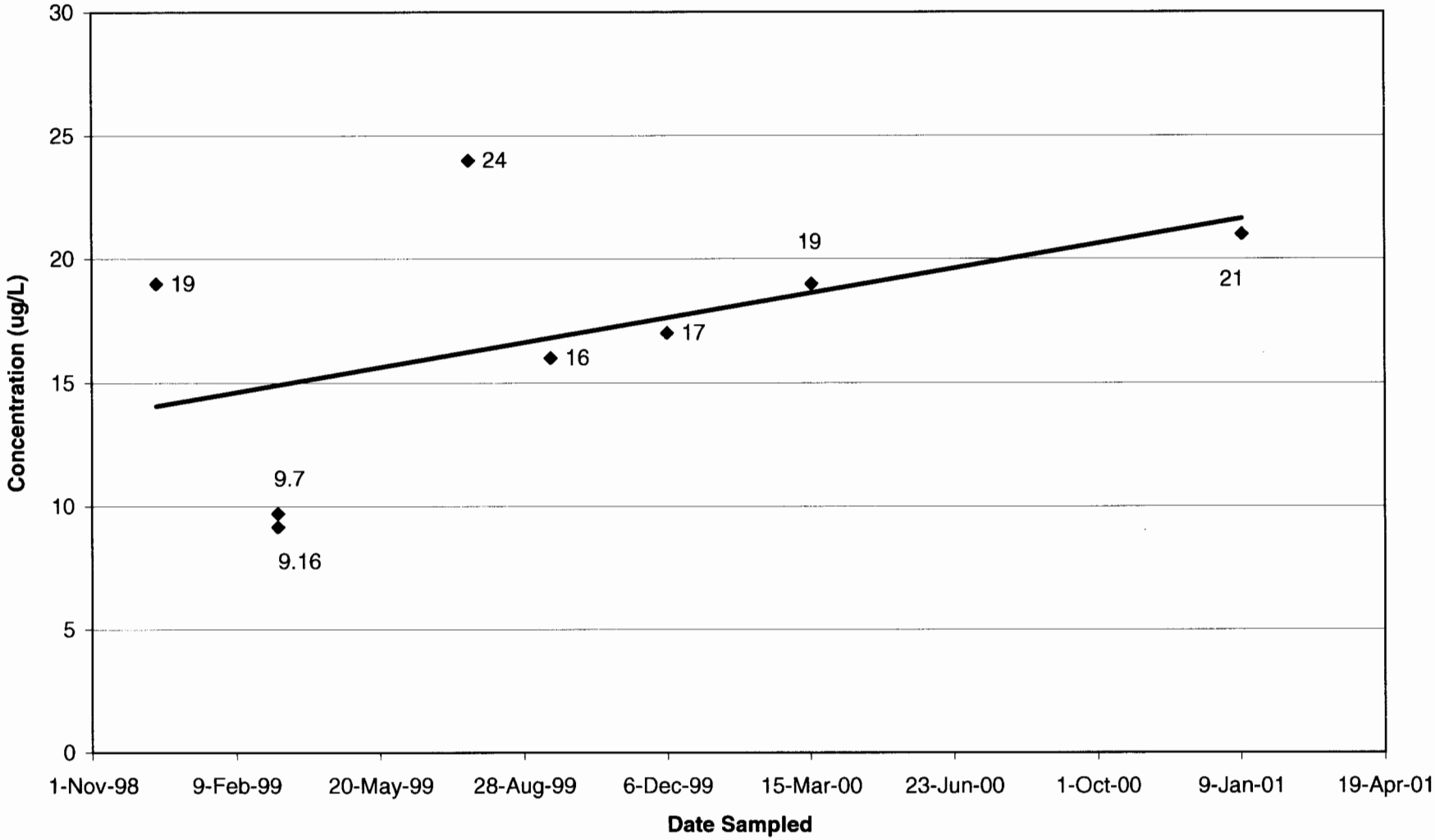
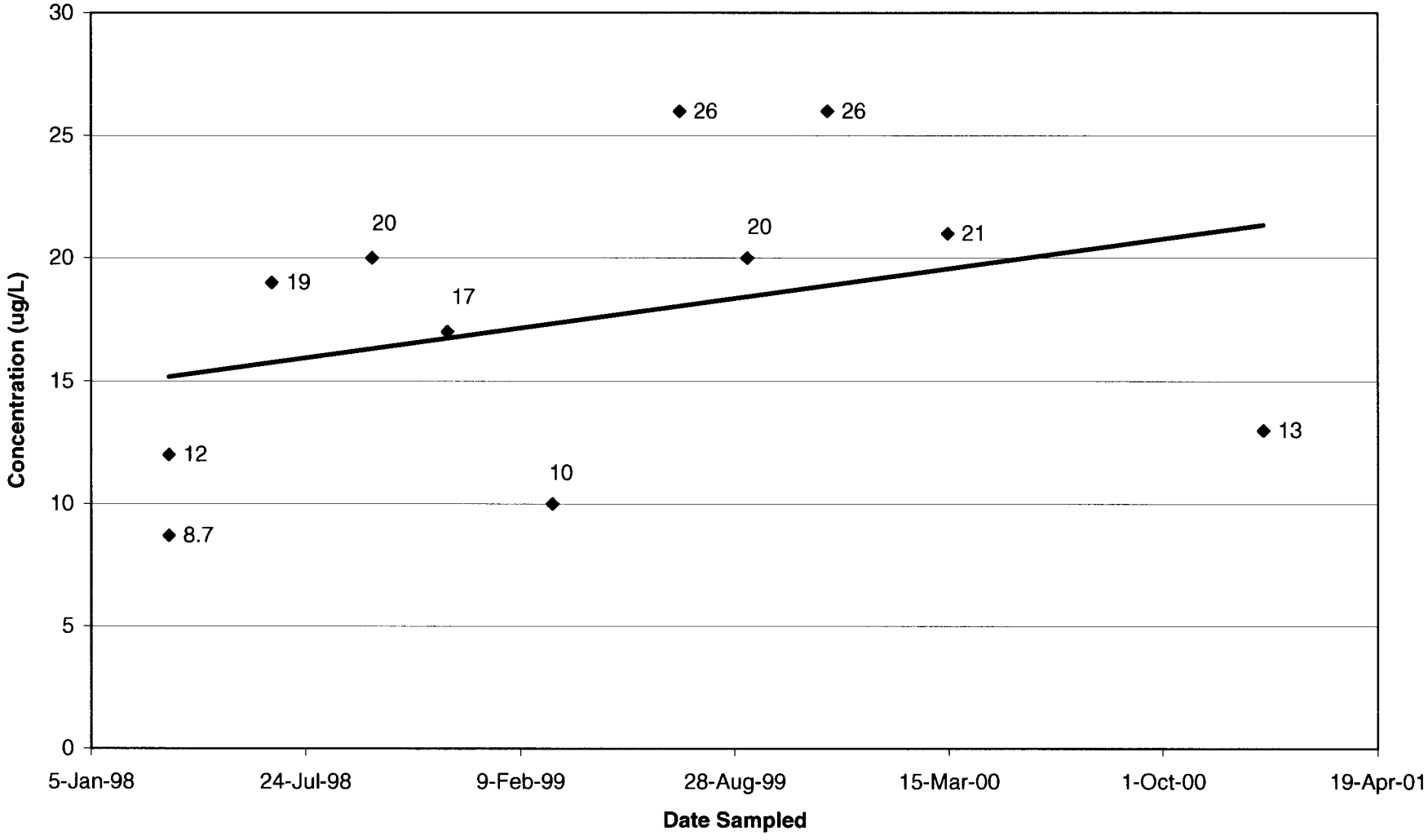


Figure 4.3.3-4
Selenium Concentrations over Time for Monitoring Well TA2-W-27



5.0 SUMMARY AND RECOMMENDATIONS

This section summarizes the environmental work and findings to date, and recommends future investigations for the TAG study area.

5.1 Summary of Work Accomplished

A wide variety of environmental studies have been conducted by SNL/NM for the TAG study area.

- The research work for the SWMUs has consisted of compiling process knowledge by interviewing current and former SNL/NM employees, as well as reviewing historical documents, such as memoranda, aerial photographs, and engineering drawings.
- A substantial amount of process knowledge has been acquired for the SWMUs. For example, the COCs are well known for each SWMU, and engineering drawings have been acquired for nearly every building. Process knowledge for 43 SWMUs in the study area revealed that 40 SWMUs required site characterization.
- Soil sampling has been conducted at all 40 SWMUs. Soil-vapor sampling has been conducted at 20 of the SWMUs.
- A FIP has been accepted by NMED/HWB for the proposed sampling at the six DSS.
- Analytical results are available for all of the SWMUs that required sampling. Based upon these analytical results, NMED has accepted NFA proposals for 18 of the 40 characterized SWMUs. Risk assessments are being, or will be, prepared for the remaining 22 SWMUs.
- Across the TAG study area, SNL/NM has installed a network of 30 monitoring wells that consists of 25 groundwater and five soil-vapor wells. KAFB and the COA have installed another 25 groundwater monitoring wells in the vicinity.
- Hydrogeologic investigations, such as transducer studies, aquifer tests, colloidal borescope, water analyses, and computer modeling have been conducted.
- Groundwater analyses have been performed for VOCs, SVOCs, metals, and nitrate. Trend analysis and geochemical interpretation have been prepared.
- Geologic field mapping and other investigations, such as borehole-geophysical, seismic, and aeromagnetic surveys, have been conducted.
- A conceptual model has been prepared that depicts the hydrogeologic setting of the TAG study area.

5.2 Summary of Data Findings

Environmental studies in the TAG study area have determined SWMU locations, the hydrogeologic setting, the distribution of TCE and nitrate in groundwater, the occurrence of other COCs in soil, and the principal release sites. TCE and nitrate are the primary COCs affecting groundwater in the TAG study area. No ongoing pollution is occurring at the SWMUs. For example, the TA-II septic systems have been taken out of service. No dumping or disposal of toxic materials is allowed at the sites.

Forty-three SWMUs and six DSS are located in the TAG study area which includes TA-I, TA-II, TA-IV, and the TJAOU. The KAFB IRP and the COA Environmental Health Department manage approximately 41 sites in the vicinity. Most of the characterization work has been completed at SNL/NM. At the majority of the SWMUs, only minor amounts of hazardous and/or radioactive materials were released. Therefore, most SWMUs have not required remediation. However, a minor amount of additional soil sampling is planned for 22 SWMUs in response to NMED NOD/RSI comments concerning various NFA proposals. The planned sampling will further evaluate the shallow distributions of COCs in soil, and will typically involve the collection of soil samples at depths of less than 10 ft. The additional soil sampling is confirmatory in nature and is not expected to produce analytical results that would require a re-interpretation of the TAG conceptual model or the installation of additional monitoring wells. Likewise, additional sampling is expected to confirm that the DSS are not significant sources of TCE or nitrate.

The hydrogeologic setting for the TAG study area is well understood because a significant number of monitoring wells have been installed. Groundwater occurs in both the SGWS and the regional aquifer. However, the SGWS has a limited lateral extent that covers approximately 3.5 square miles of north-central KAFB. The SGWS may extend northward across the KAFB boundary. In the TAG study area, the depth to groundwater for the SGWS ranges from 270 to 340 ft bgs. The uppermost saturated zone in the SGWS varies from approximately 10- to 30-ft thick, depending on well location. Borehole geophysical surveys indicate that a few relatively damp intervals are present below the uppermost saturated zone, but borehole-yield testing has revealed that most of these deeper intervals are too thin to yield sufficient volumes of water suitable for the construction of monitoring wells. The SGWS is not used for water supply.

The direction of groundwater flow in the SGWS is to the southeast. Groundwater flows through low-yield alluvial fan sediments with an average hydraulic gradient of approximately 0.008 ft/ft. Groundwater elevations in the SGWS are decreasing in the northwest part of the study area, but are increasing in the southeast part. The aqueous geochemistry of the SGWS and the regional aquifer are unique. The geochemical signatures of the SGWS vary between well locations and tend to exhibit higher concentrations of calcium, sulfate, and chloride than the regional aquifer. The SGWS is recharged by both artificial (leaking water-supply/sewer lines and the former sewage lagoons), and natural sources (Tijeras Arroyo and possibly ancestral Tijeras Creek). Principal hydrogeologic controls upon the SGWS are 1) the stratigraphic dip of the alluvial fan sediments; 2) stratigraphic variations (such as braided paleochannels); and 3) multiple recharge locations in the northwest part of the TAG study area.

Multiple overlapping lenses of low conductivity, mostly unsaturated sediments, serve as a perching horizon beneath the SGWS. Beneath the central TAG study area, a layer of approximately 180 to 280 ft of these unsaturated sediments separate the SGWS from the regional aquifer. The regional aquifer is more laterally extensive than the SGWS, extending across the TAG study area as well as the Albuquerque basin. Across the TAG study area, the depth to the regional aquifer ranges from approximately 430 to 570 ft bgs. The regional aquifer

is composed of both the ARG fluvial facies and alluvial fan facies. Groundwater in the regional aquifer flows to the northwest in a nearly opposite direction to that of the SGWS. The hydraulic gradient in the regional aquifer averages approximately 0.009 ft/ft across the study area, but is steeper near the KAFB and COA water-supply wells. The regional aquifer is recharged by natural sources including mountain-front flow, current day Tijeras Arroyo, and the SGWS. Groundwater elevations are generally decreasing in the northwest part of the study area, but are increasing in the southeast part. Seasonal pumping variations cause sporadic water-level fluctuations near the water-supply wells. The principal hydrogeologic control upon groundwater flow direction in the regional aquifer is the combined drawdown effect of the KAFB, COA, and VA water-supply wells.

The occurrence of TCE in groundwater is principally restricted to the SGWS. To date, the maximum concentration of TCE in the SGWS has been 9.6 μg/L. Only six of the twelve SGWS-monitoring wells have yielded detectable concentrations of TCE. TCE concentrations in the SGWS are higher than concentrations in the regional aquifer. The historical trend of TCE concentrations in the SGWS is essentially stable.

In the TAG study area, TCE is suspected of reaching groundwater by being disposed of in dilute concentrations along with significant quantities of waste water at SNL/NM. Thirteen SWMUs are potential sources of groundwater contamination involving TCE. Another four sites managed by KAFB, one site managed by the COA, and an uncontrolled landfill also may have impacted groundwater with TCE.

The sporadic distribution of low TCE concentrations (<10 μg/L) in the SGWS is indicative of discrete TCE occurrences, not widespread contamination. The distribution is most likely due to a few scattered TCE-release sites compounded by the heterogeneity of the alluvial fan deposits that comprise the unsaturated and saturated intervals. The TCE distribution also probably reflects both the lateral and vertical spreading of TCE soil-vapor through a 250 to 300 ft thick vadose zone. TCE releases have been correlated to historical activities associated with TA-I, TA-II, and KAFB. TCE is suspected of reaching groundwater by being disposed of in dilute concentrations along with significant quantities of septic and waste water. Based upon current understanding, two SWMUs are assigned a "high" concern level for being TCE-release sites that may have impacted groundwater. These two SWMUs are SWMU 46 (the SNL/NM Acid Waste Line Outfall) and SWMU 165 (the Building 901 Septic System). The KAFB Sewage Lagoons also are assigned a "high" concern level. The three sites appear to be the most likely sources of groundwater contamination involving TCE. Ongoing investigations by SNL/NM, KAFB, and the COA should improve our understanding of the TCE-release sites.

The occurrence of TCE in the regional aquifer has no discernible pattern and is more intermittent than the distribution in the SGWS. Excluding the annular-compromised WYO-1, only 2 (PGS-2 and TJA-3) of the 13 regional-aquifer monitoring wells have yielded detectable concentrations of TCE. To date, the maximum TCE concentration for the regional aquifer has been 2 μg/L, which is below the Federal MCL of 5 μg/L. Dispersion of TCE through the SGWS and the perching zone has apparently resulted in TCE concentrations at a particular regional-aquifer well not being directly attributable to a specific TCE-release site.

At SNL/NM, nitrate may have reached groundwater due to the disposal of septic water at six TA-II septic-system leachfields (SWMUs 48, 136, 159, 165, 166, and 167), leakage from the TA-I Sanitary Sewer System (SWMU 187), and possibly the inadvertent discharge of septic water along with waste water at SWMU 46. As part of the IRP Nitrate Abatement Program, three primary potential sources of nitrate contamination have been identified at KAFB

(Montgomery Watson August 2000). These sites are the KAFB Sewage Lagoons, the KAFB Golf Course Main Pond, and the COA Sanitary-Sewer Line Rupture. Four KAFB landfills and various COA sites (Eubank Landfill, 1994 Sanitary Sewer Line Rupture, leaking sanitary-sewer lines, and Montessa Park/Tree Nursery) may also be sources of nitrate.

Elevated levels of nitrate have been detected in SGWS groundwater samples. The maximum nitrate concentration to date is 44 mg/L, which is above the Federal MCL of 10 mg/L. No elevated nitrate levels have been detected in the regional aquifer. Nitrate is suspected of reaching SGWS groundwater as degradation products associated with the disposal of septic water or landfill debris. Based upon current understanding, two SWMUs are assigned a "high" concern level for being nitrate-release sites that may have impacted groundwater. These two SWMUs are SWMU 165 (the Building 901 Septic System in TA-II), and SWMU 187 (the TA-I Sanitary Sewer System). The KAFB Sewage Lagoons and the KAFB Golf Course Main Pond also are assigned a "high" concern level. These four sites appear to be the most likely sources of groundwater contamination involving nitrate. Ongoing investigations by SNL/NM, KAFB, and the COA should improve our understanding of the nitrate-release sites.

Elevated levels of selenium have been detected in groundwater samples collected from a single SGWS well near the eastern margin of the study area. The maximum concentration of selenium to date is 74 μg/L, which is above the Federal MCL of 50 μg/L. However, the selenium may result from the natural weathering of limestone clastics. Elevated selenium has not been detected in the regional aquifer. Selenium is not a COC for any of the SWMUs.

5.3 Recommendations for Further Study

SNL/NM is recommending the following work as part of its environmental studies.

- Continue collection of groundwater samples at all TAG groundwater monitoring wells. Based upon analytical results, the sampling frequency will be re-evaluated for each monitoring well. After at least four quarters of sampling have been conducted at a particular well, the sampling frequency will be reduced to annual for analytes that are not COCs.

- At a minimum, the analytes for groundwater sampling will consist of VOCs and nitrate. Other analytes will be eliminated after four quarters of non-detections are reported.

- Collect four quarters of soil-vapor samples at the soil-vapor monitoring wells. The analytes will consist of VOCs.

- Continue periodic measurements of groundwater elevations in all TAG monitoring wells.

- Continue computer-modeling efforts (including the SGWS-FEMWATER, the MODFLOW/MODPATH regional-aquifer particle tracking, and the SNORM geochemical model) as needed.

- Maintain contact with the KAFB IRP personnel with respect to the results of their TCE and nitrate-abatement studies.

- As available, obtain groundwater results from both KAFB and the COA. The results will be integrated into future SNL/NM reports.
- Perform aquifer tests at TAG monitoring wells as needed. Depending on the yield at a particular well, the aquifer tests might consist of either pump tests or slug tests.
- The monitoring-well pair WYO-1/WYO-2 should be abandoned and replaced.
- A SGWS-monitoring well should be installed on the northern edge of the TAG study area near TA1-W-05.
- Future TAG investigation results should be reported in the GPP's Annual Groundwater Monitoring Report.
- Evaluate historical aerial photographs to determine when the two fill areas at the Eubank Landfill were operated and what types of waste were disposed of there.

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ANNEX A
Shallow Groundwater System Investigation Tijeras Arroyo and Vicinity
(Van Hart June 2001)

Shallow Groundwater System Investigation

Tijeras Arroyo and Vicinity

Environmental Restoration Project
Department 6133

Sandia National Laboratories
New Mexico

June 2001

Shallow Groundwater System Investigation
Tijeras Arroyo and Vicinity

Executive Summary

The area of investigation spans the Tijeras Arroyo and includes Sandia National Laboratories' Technical Areas 1 (TA-I), 2 (TA-II), and 4 (TA-IV), and includes the adjacent regions of Kirtland Air Force Base to the west and southwest and the City of Albuquerque to the northeast. A shallow, perched groundwater system here is the focus of this investigation.

Twenty five new monitor wells have been installed during the four years since the last geological investigation of the area was made (Fritts and Van Hart, 1997). The mandate of the project was to integrate the new well data into the existing knowledge base and to modify the conceptual groundwater flow model if warranted.

The stratigraphy of the area of investigation principally involves the alluvial-fan lithofacies of the Upper Santa Fe Group deposited on the piedmont of Manzano Base and the southernmost Sandia Mountains. A correlation grid was constructed consisting of five geophysical-log cross sections. The grid demonstrates that the boundary between the predominantly coarse-grained alluvial-fan sediments above and the predominantly fine-grained alluvial-fan sediments below is a datum that can be correlated with moderate to high confidence across the area. A structure map constructed on this datum shows a gently-south-plunging syncline with an axis along the western parts of TA-I and TA-IV. This syncline is referred to in this report as the *Sandia North syncline*.

The perched groundwater system resides entirely within the fine-grained alluvial-fan lithofacies, i.e., below the datum of the structure map. The regional groundwater system across most of the area lies within the same fine-grained lithofacies. However, in the western part of the area the regional system passes into the lithofacies of the more conductive Ancestral Rio Grande fluvial deposits. Regional structure mapping on the top of the Ancestral Rio Grande "A" shows dip to the east toward the axis of the Sandia North syncline.

The regional groundwater regime flows down to the northwest, and the perched system flows in the opposite direction, down to the southeast. The flow direction in the perched system appears to be mainly independent of the structural configuration of the sediments. If the assumption is made that hydraulic conductivities are much higher parallel to bedding planes vs. normal, and that bedding-plane structure should therefore exert an influence on flow within the perched system, this lack of conformity is puzzling. The explanation may lie in a complex architecture of the perched system that is beyond our ability to resolve with the existing data.

The top of the perched system is about 260 ft above the regional in the northwestern part of the area and about 160 ft above the regional in the southeastern part. Beyond the 160-ft-difference line to the southeast the two systems lose their individual identity due to lithofacies change and merge into one. The zone of merging is characterized by downward flow to the regional aquifer.

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Shallow Groundwater System Investigation
Tijeras Arroyo and Vicinity

1.0 Introduction

This project was done as per the request of Acting Manager Sue Collins of ER Department 6133. Work began on April 9, 2001. The mandate was to integrate the 25 new monitor wells installed since the last geologic study of this area was performed four years ago (Fritts and Van Hart, March 1997), and to reinterpret the groundwater model if necessary. Changes would then be made available for incorporation into a computer groundwater flow model being generated for this area by Balleau Groundwater, Inc., of Albuquerque.

The existence of a shallow groundwater system several hundred feet above the regional became suspected in 1990 when KAFB installed four monitor wells at the north end of the Tijeras Arroyo Golf Club (KAFB 0602, 0608, 0609, and 0610). Shallow groundwater was encountered near Sandia National Laboratory's (SNL) Technical Area II (TA-II) in 1992 and 1993 (TA2-SW1-320 and TA2-NW1-325, respectively). The latter well triggered a comprehensive program to delineate and characterize the shallow system.

The area of investigation spans the eastern portion of Tijeras Arroyo. It covers SNL Technical Areas I, II, and IV, KAFB areas to the west, southwest, southeast, and east, and the City of Albuquerque's Eubank Landfill to the northeast (*Figure 1-1*). Twinned wells – i.e., one completed in the regional groundwater system and a second in the perched system nearby – constitute a single control point, and eight such pairs have been installed to date. A total of 39 control points are available for analysis (*Table 1-1*).

2.0 Geophysical-Log Correlation

A geophysical-log correlation net was constructed to document the correlations and the structural configuration (*Figure 2-1*). Unfortunately, the log format is not standardized: different logs contain different suites of curves and presentations, and considerable care must be exercised to correlate curves of the same type.

The correlation net consists of five cross sections (*Figures 2-2* through *2-9)*. Four sections (*Figures 2-3* through *2-8*) contain too many logs to fit conveniently on a single piece of paper and were therefore split in two. Some of the sections contain redundant portions in order to best show the correlations and structure in a chosen direction.

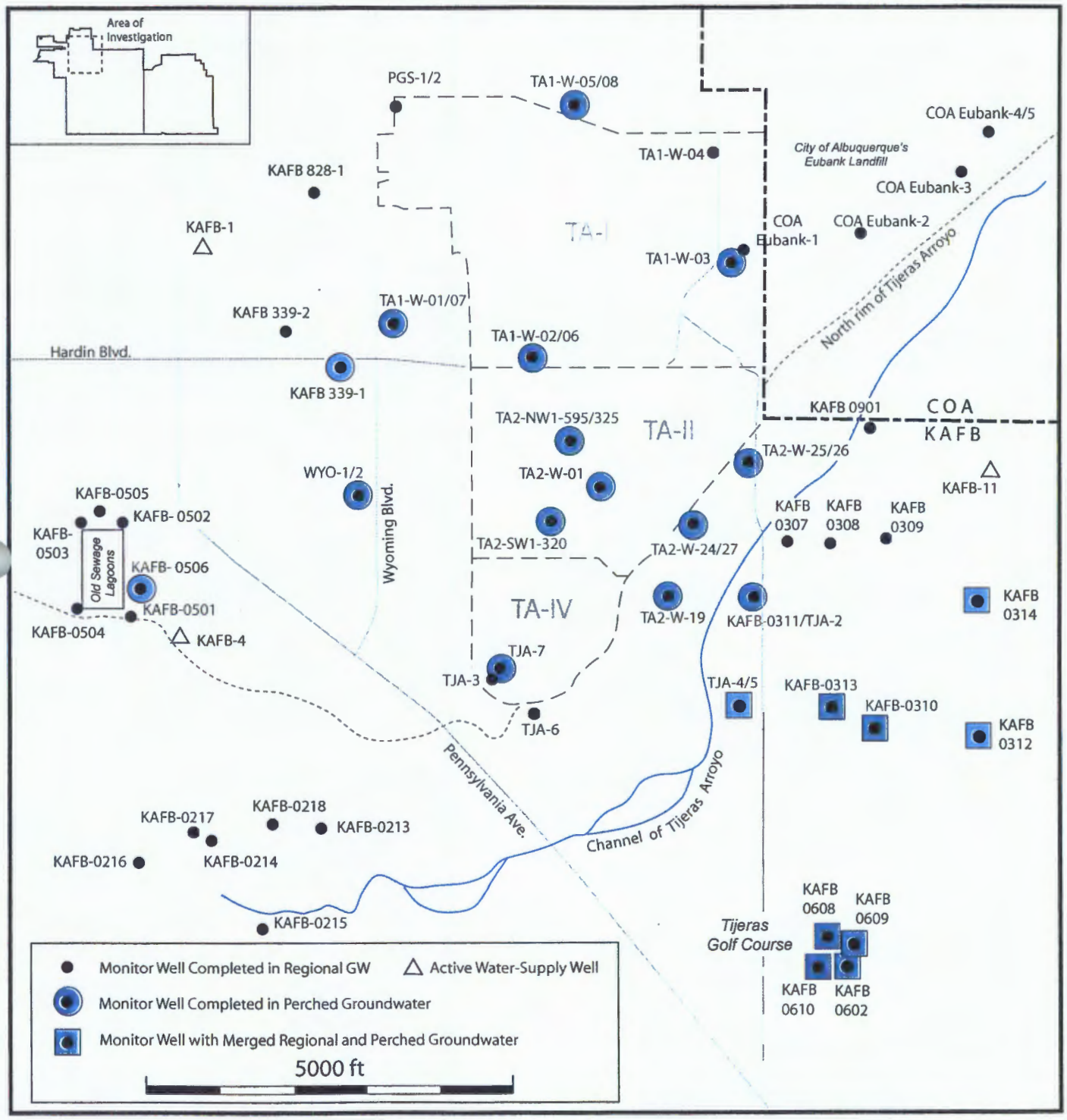


Figure 1-1. Location and Base Map of Tijeras Arroyo Area

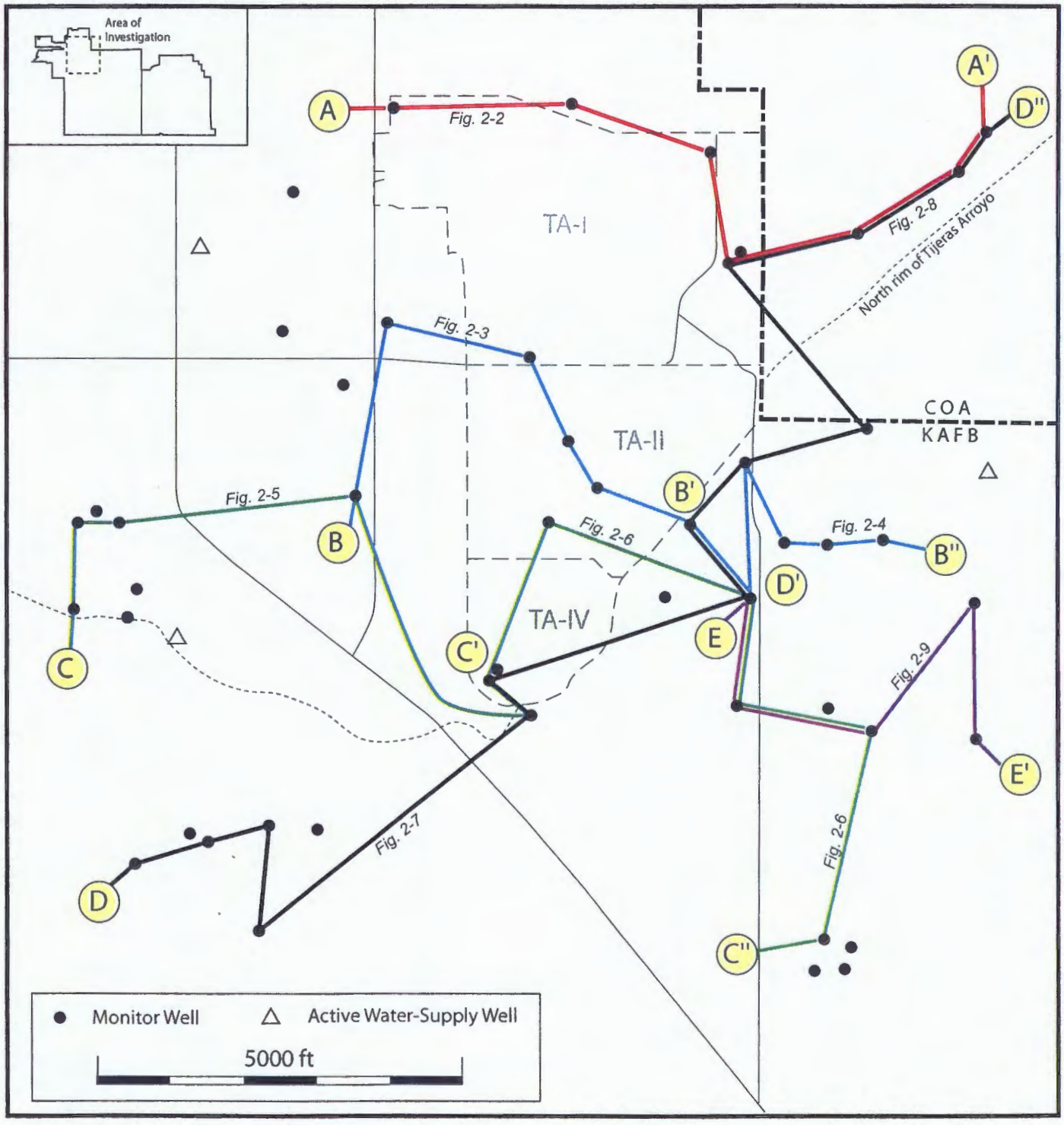
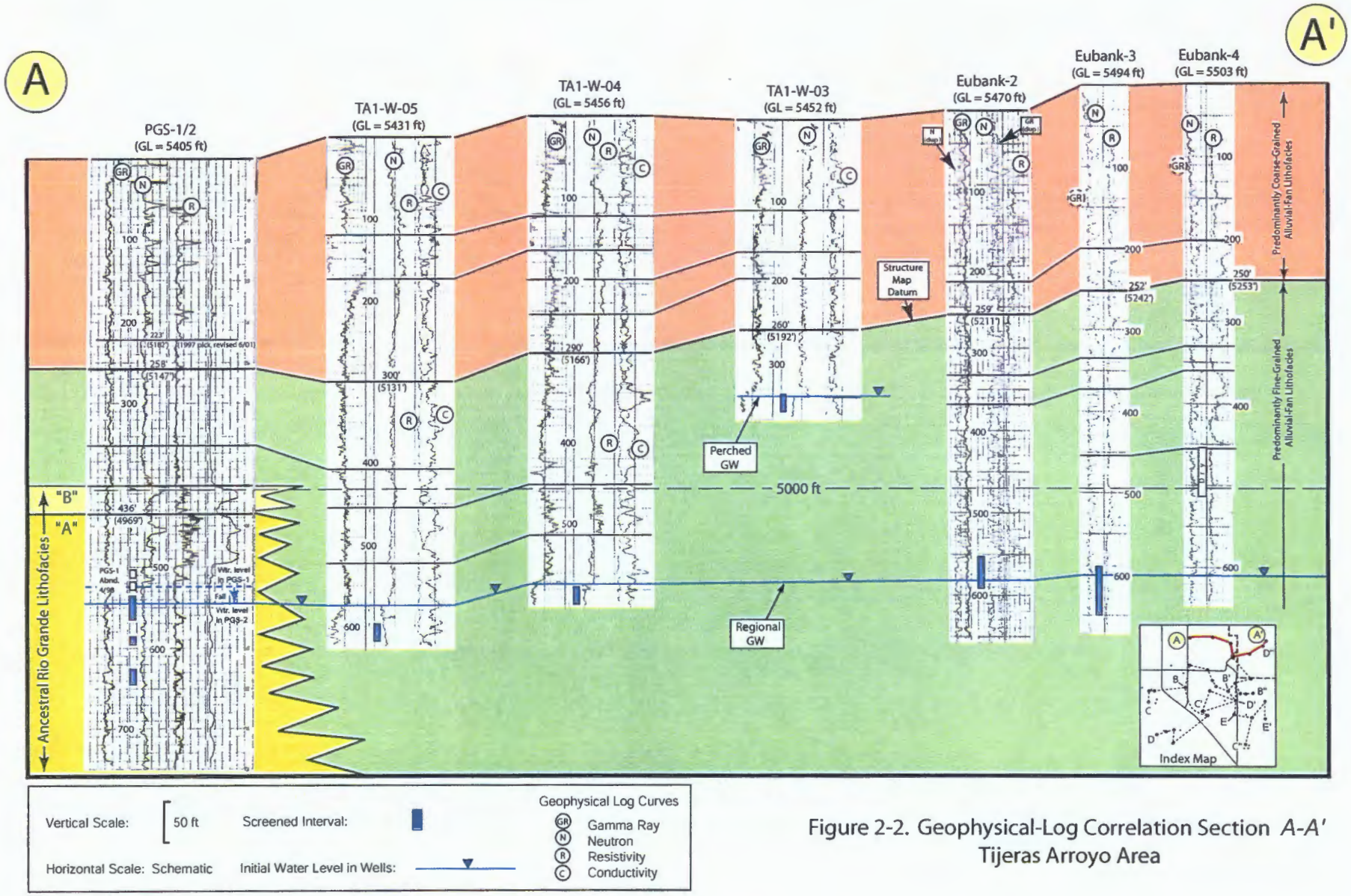


Figure 2-1. Cross Section Index Map, Tijeras Arroyo Area



Vertical Scale: 50 ft

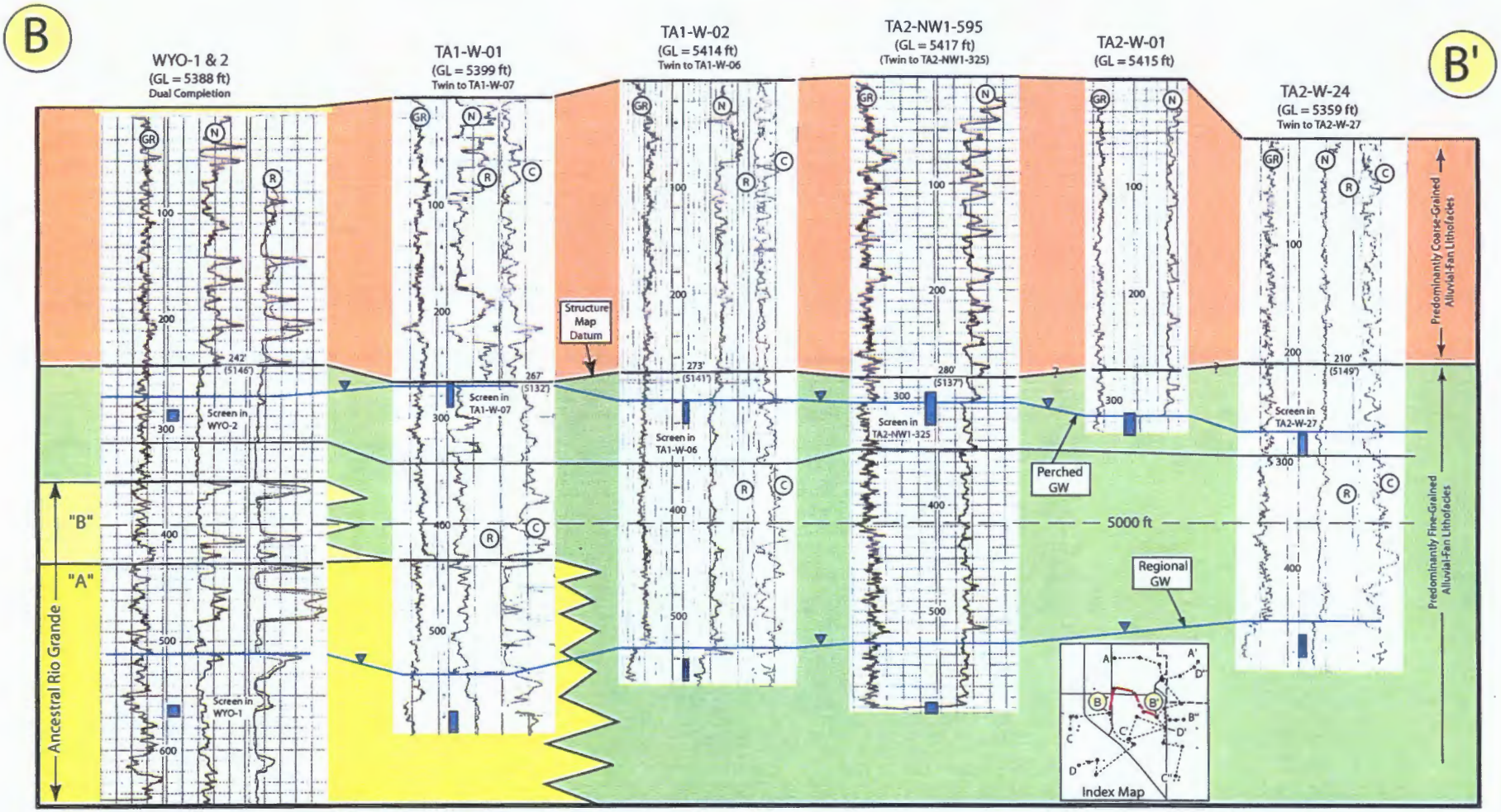
Horizontal Scale: Schematic

Screened Interval:

Initial Water Level in Wells:

Geophysical Log Curves
- GR Gamma Ray
- N Neutron
- R Resistivity
- C Conductivity

Figure 2-2. Geophysical-Log Correlation Section *A-A'*
Tijeras Arroyo Area



Vertical Scale: 50 ft

Horizontal Scale: Schematic

Screened Interval:

Initial Water Level in Wells:

Geophysical Log Curves
- GR Gamma Ray
- N Neutron
- R Resistivity
- C Conductivity

Figure 2-3. Geophysical-Log Correlation Section *B-B'*
Tijeras Arroyo Area

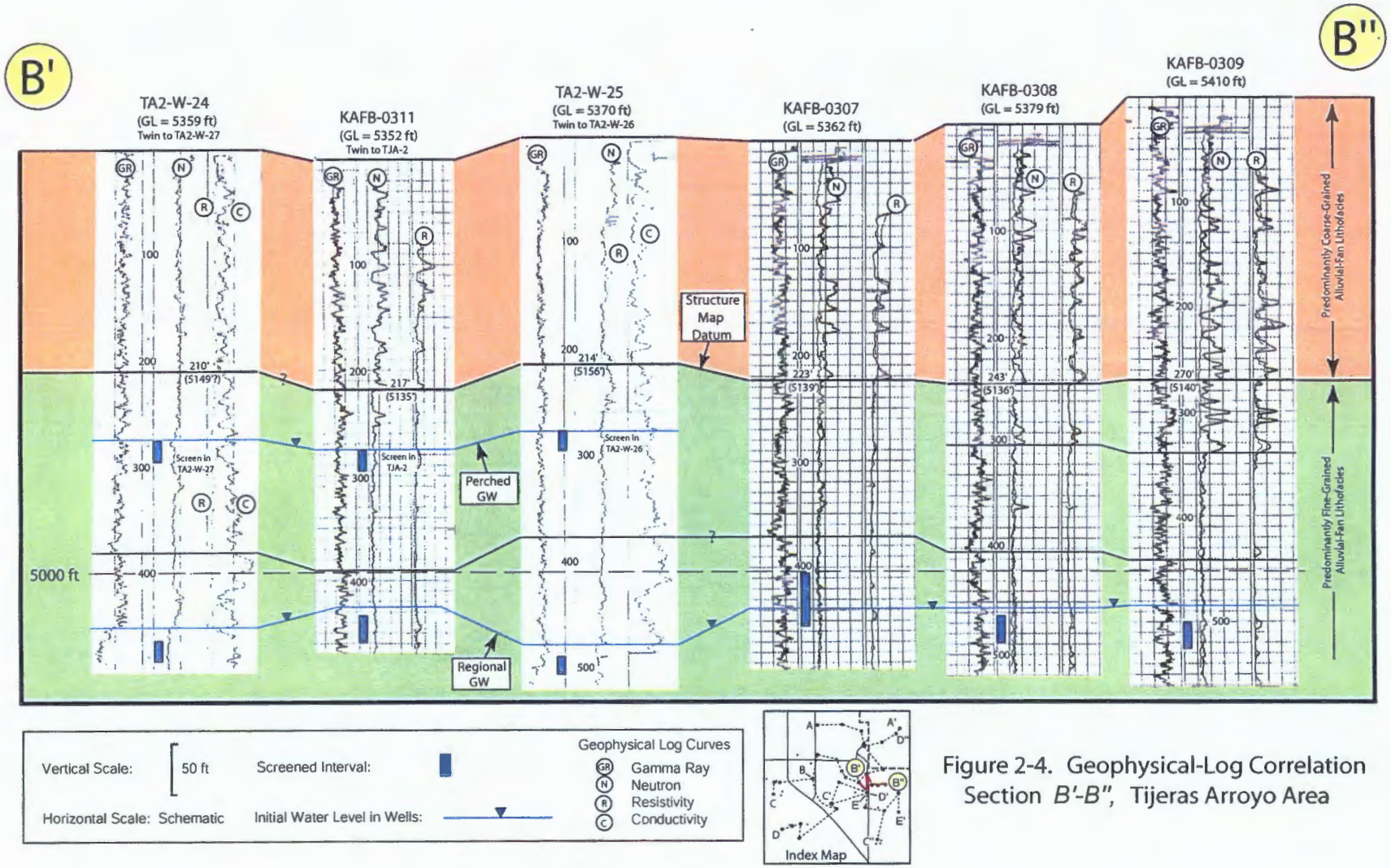


Figure 2-4. Geophysical-Log Correlation Section *B'-B''*, Tijeras Arroyo Area

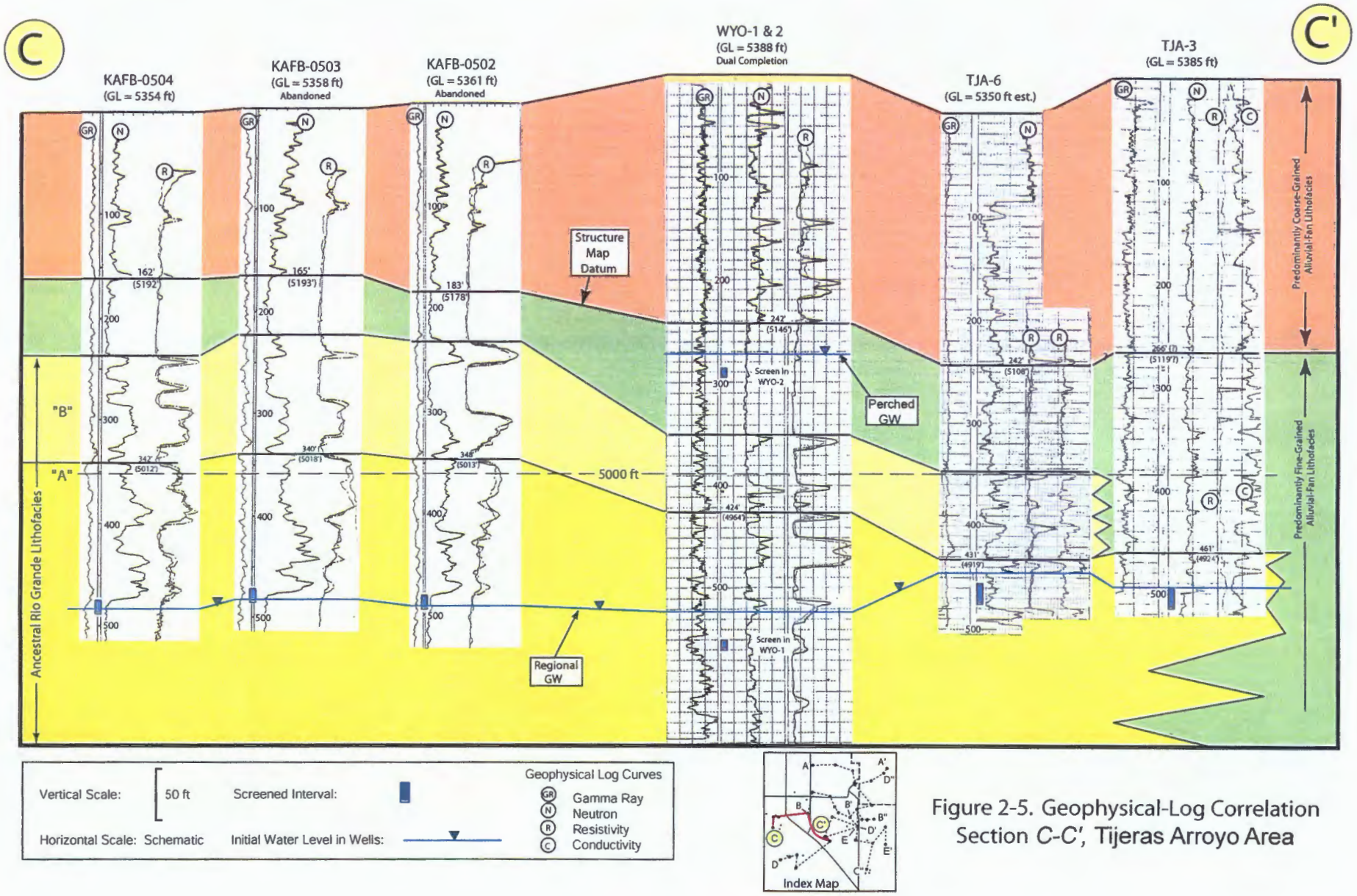


Figure 2-5. Geophysical-Log Correlation Section *C-C'*, Tijeras Arroyo Area

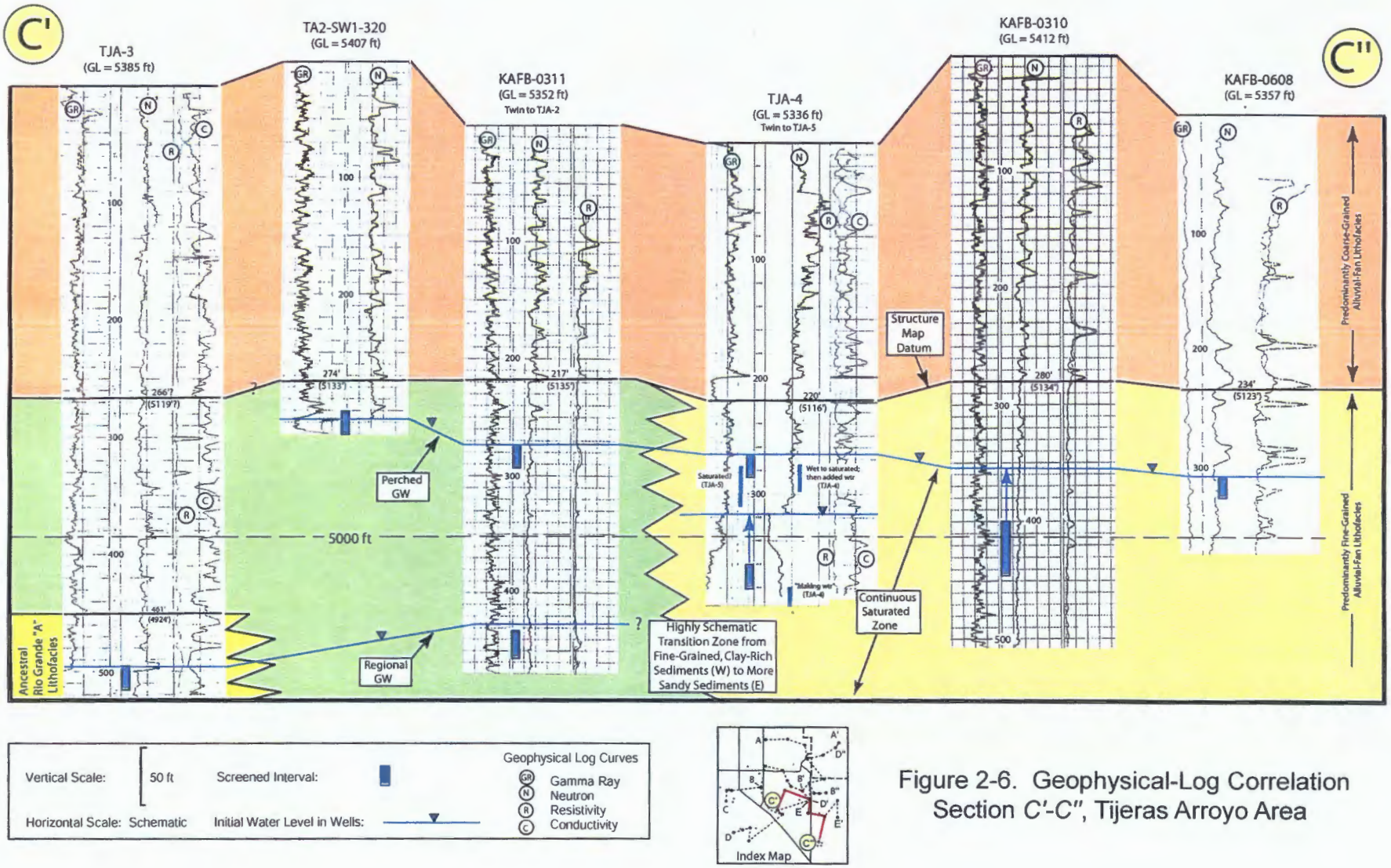


Figure 2-6. Geophysical-Log Correlation Section *C'-C''*, Tijeras Arroyo Area

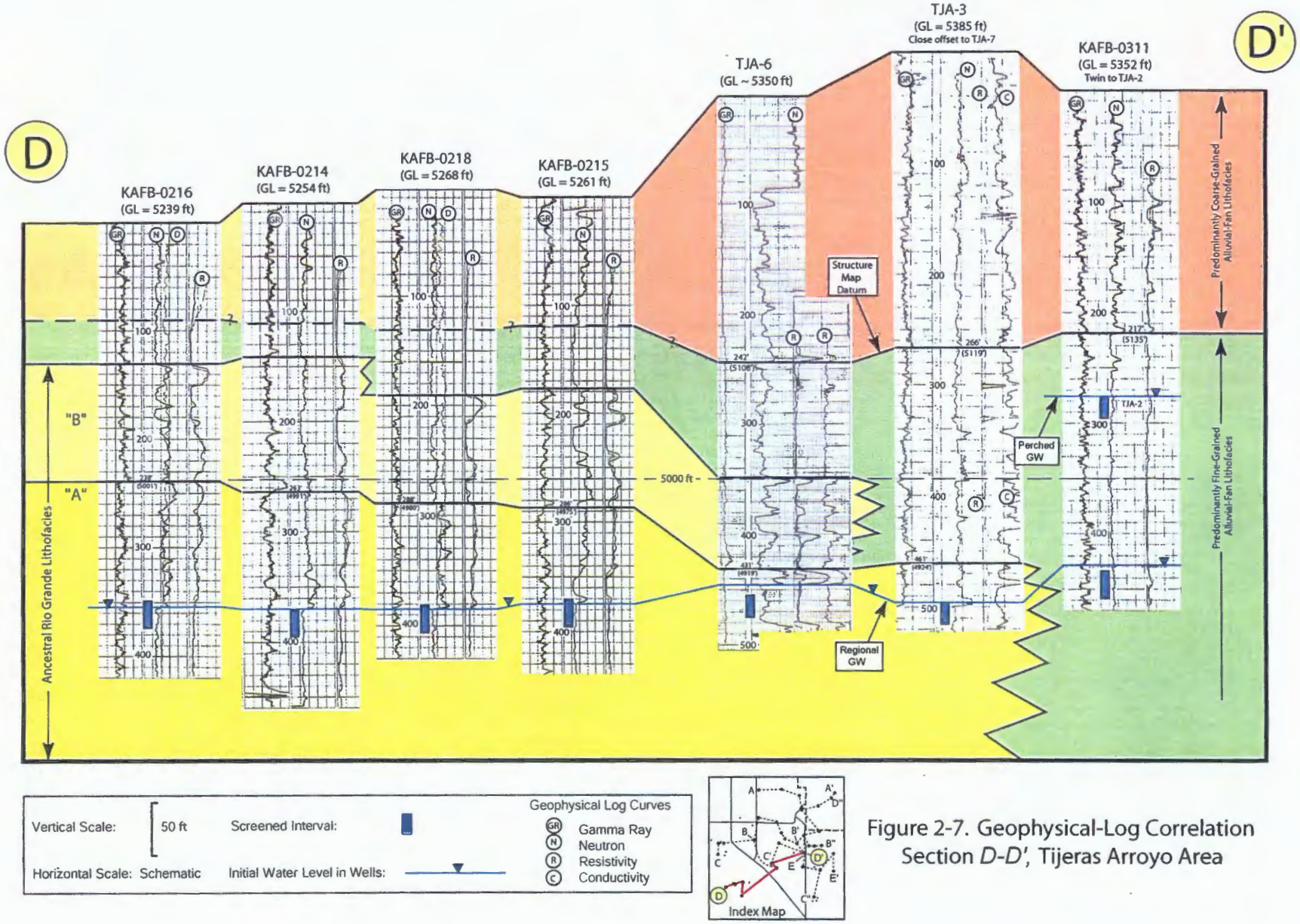
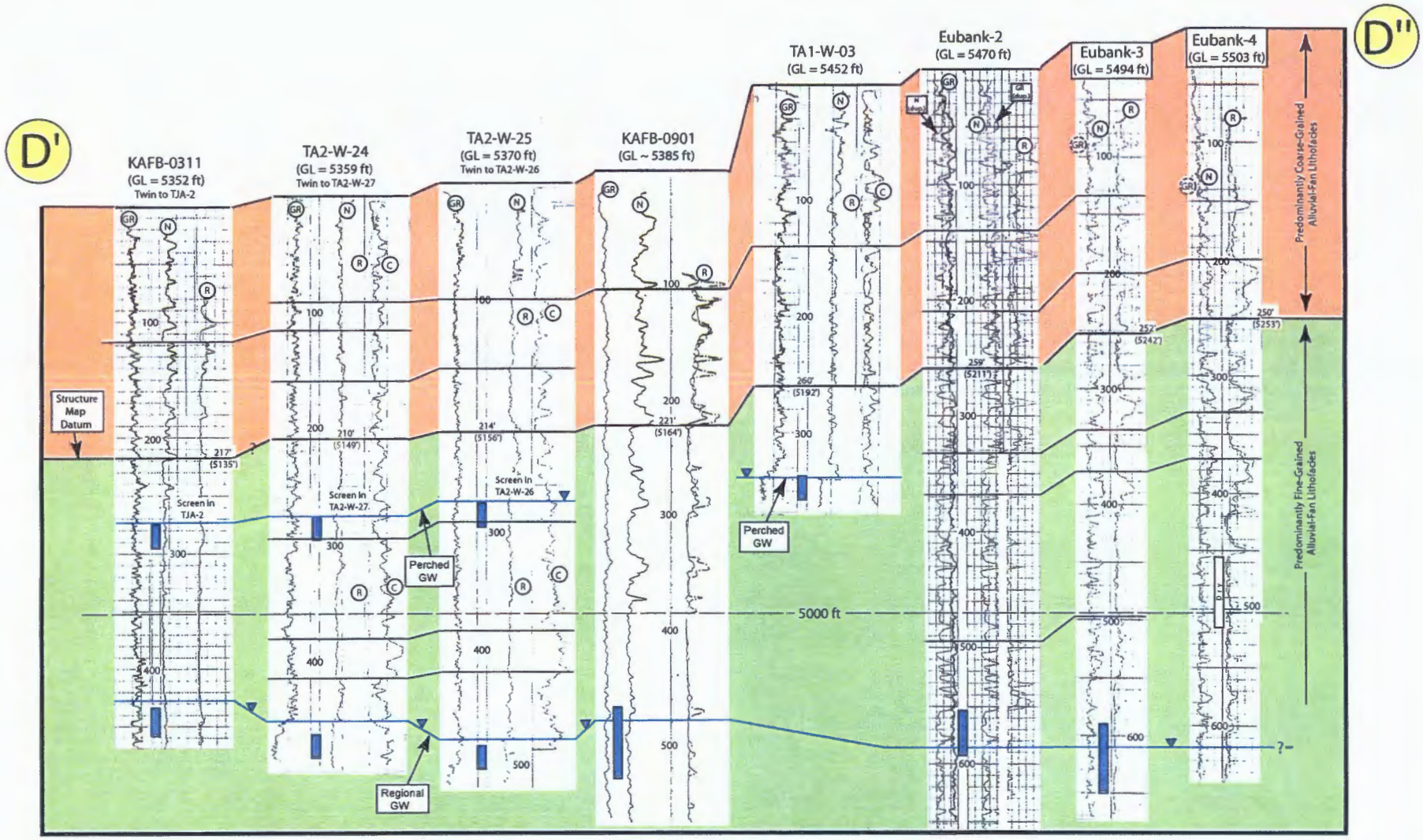


Figure 2-7. Geophysical-Log Correlation Section *D-D'*, Tijeras Arroyo Area



Vertical Scale: 50 ft

Horizontal Scale: Schematic

Screened Interval:

Initial Water Level in Wells:

Geophysical Log Curves
- GR Gamma Ray
- N Neutron
- R Resistivity
- C Conductivity

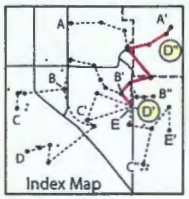


Figure 2-8. Geophysical-Log Correlation Section *D'-D"*, Tijeras Arroyo Area

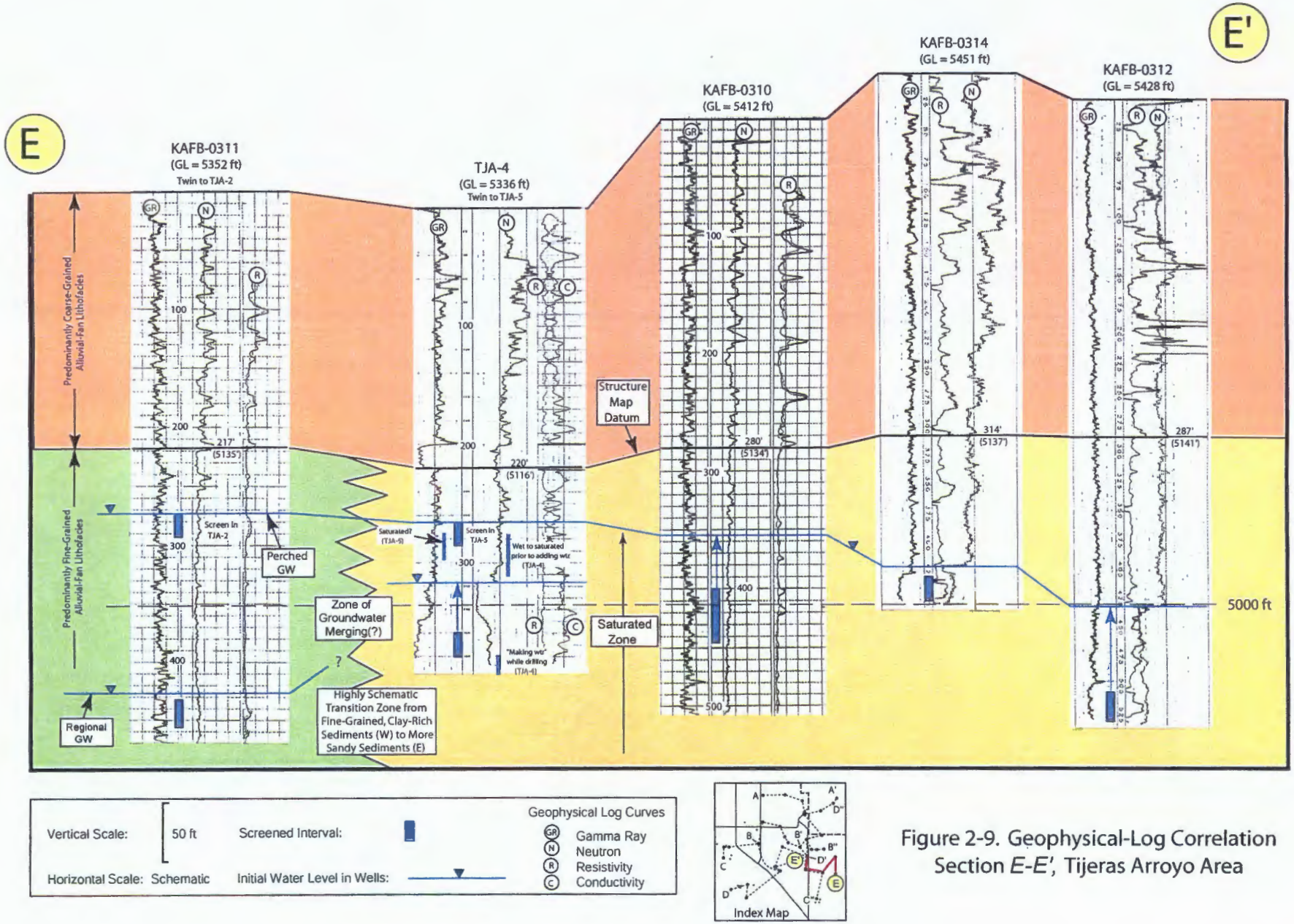


Figure 2-9. Geophysical-Log Correlation Section *E-E'*, Tijeras Arroyo Area

Table 1-1. Monitor Well Database, Tijeras Arroyo and Vicinity

Year Installed	Well Name (Twin Well)	Groundwater System			Logged? (Twin)	Cross Sections
		Regional	Perched	Merged		
1989	KAFB-0501	X			Y	--
	KAFB-0502	X			Y	C-C'
	KAFB-0503	X			Y	C-C'
1990	KAFB-0504	X			Y	C-C'
	KAFB-0602			X	Y	--
	KAFB-0608			X	Y	C'-C"
	KAFB-0609			X	Y	--
	KAFB-0610			X	Y	--
	KAFB-0901	X			Y	D'-D"
1991	KAFB-0307	X			Y	B'-B"
	KAFB-0308	X			Y	B'-B"
	KAFB-0309	X			Y	B'-B"
	KAFB-0310			X	Y	C'-C"
	KAFB-0214	X			Y	D-D'
	KAFB-0215	X			Y	D-D'
1992	KAFB-0216	X			Y	D-D'
	KAFB-0217	X			Y	--
	KAFB-0218	X			Y	D-D'
	KAFB-0311	X			Y	B'-B" C'-C" D-D' D'-D" E-E'
	TA2-SW1-320		X		Y	C'-C"
1993	TA2-NW1-595	X			Y	B-B'
	(TA2-NW1-325)		X		(Y)	--
1994	PGS-1	X			Y	A-A'
	TA2-W-01		X		Y	B-B'
	(TJA-2)		X		(Y)	--
1995	PGS-2	X			*N*	--
	TA2-W-19		X		*N*	--
	WYO-1/2	X	X		Y	B-B' C-C'
1996	COA Eubank-2	X			Y	A-A' D'-D"
	COA Eubank-4	X			Y	A-A' D'-D"
1997	COA Eubank-3	X			Y	A-A' D'-D"
	TA1-W-01	X			Y	B-B'
	TA2-W-25	X			Y	B'-B" D'-D"

Continued on next page

Table 1-1 (Cont.). Monitor Well Database, Tijeras Arroyo and Vicinity

Date Installed	Well Name (Twin Well)	Groundwater System			Logged?	Cross Sections
		Regional	Perched	Merged		
1998	TA1-W-02	X			Y	B-B'
	TA1-W-03		X		Y	A-A' D'-D"
	TA1-W-04	X			Y	A-A'
	TA1-W-05	X			Y	A-A'
	(TA1-W-06)		X		*N*	B-B'
	(TA1-W-07)		X		*N*	B-B'
	TA2-W-24	X			Y	B-B' B'-B" D'-D"
	(TA2-W-26)		X		*N*	B'-B" D'-D"
	(TA2-W-27)		X		*N*	B'-B" D'-D"
	TJA-3	X			Y	C-C' C'-C"
	TJA-4			X	Y	C'-C" D-D' E-E'
	(TJA-5)			X	*N*	C'-C" E-E'
	KAFB-0312			X	Y *	E-E'
	KAFB-0313			X	Y *	--
	KAFB-0314			X	Y *	E-E'
	KAFB-0505	X			Y *	--
	KAFB-0506		X		Y *	--
	KAFB 339-1		X		Y?	--
1999	KAFB 339-2	X			Y	--
2000	KAFB 828-1	X			Y	--
2001	TJA-6	X			Y	C-C' D-D'
	(TJA-7)		X		*N*	--
	KAFB-0507	X			Y *	--
	Total	33	14	10	39 Control Points	

* Geophysical logs run but not yet acquired

3.0 Structure

Fritts and Van Hart (1997) found that the Santa Fe Group sediments are configured into a gently-south-plunging syncline. The datum employed for the structure map is a marker that approximately separates predominantly coarse-grained alluvial-fan sediments above from predominantly fine-grained alluvial-fan sediments below. The datum was correlated into the new wells wherever possible via the cross-section net. A structure map was then constructed on this datum (*Figure 3-1*). The new well data support and refine the synclinal interpretation of Fritts and Van Hart (1997).

As shown on the cross sections, correlation lines from well to well within the Santa Fe Group are generally parallel, indicating that the "structure" is not caused by sedimentary wedging or offlap phenomena. Therefore the syncline should be considered as a true fold.

4.0 Significance of Grain-Size Change near Structure-Map Datum

The vertical change from predominantly coarse-grained to fine-grained alluvial-fan piedmont sediments has wide regional significance. Pazzaglia et al. (1999) explain the origin of the

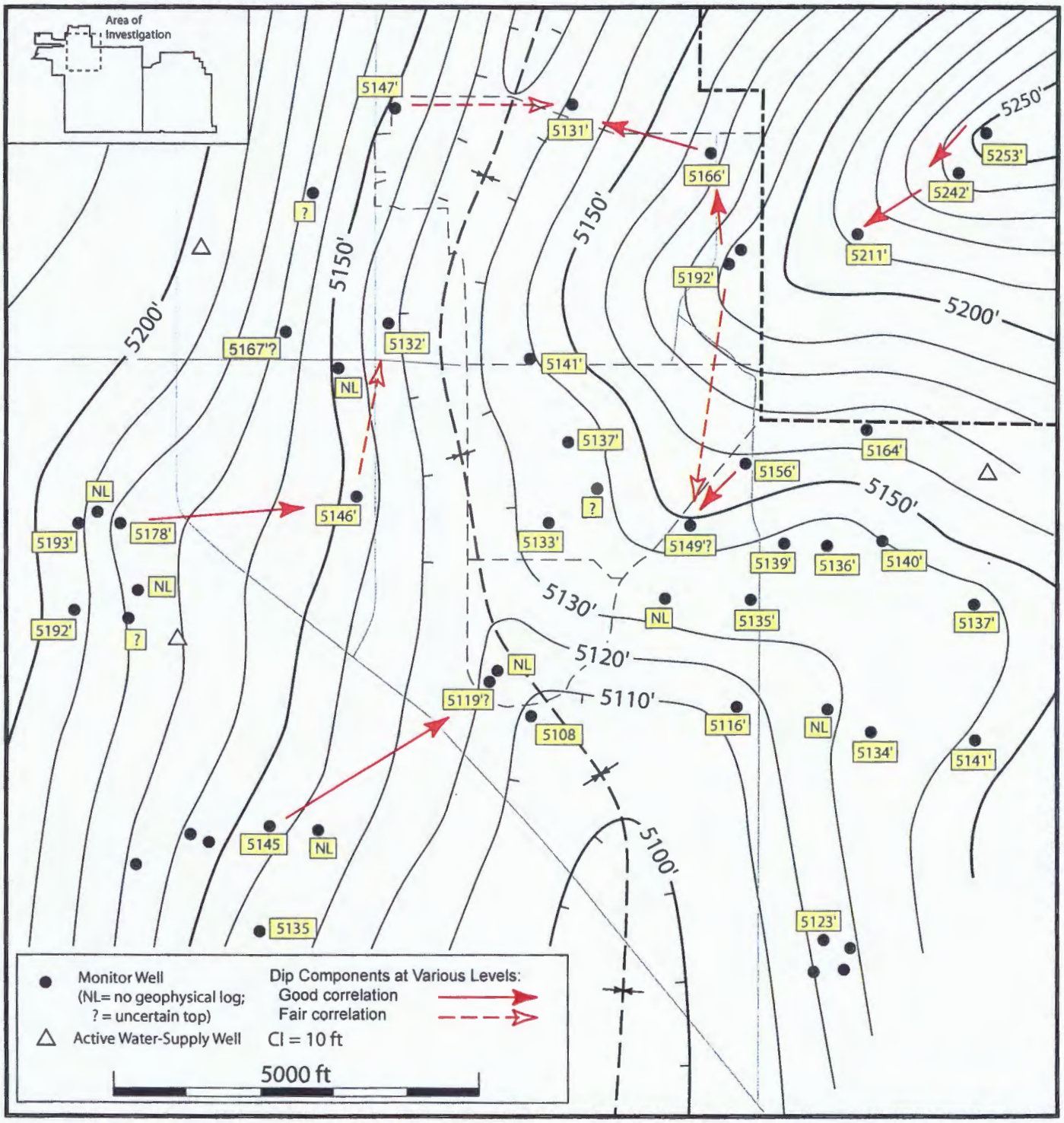


Figure 3-1. Structure Map on Datum near Top of Fine-Grained Alluvial-Fan Lithofacies

piedmont on the west flank of the Sandia Mountains, and their ideas are relevant to the piedmont in the area of investigation. The Sandia piedmont owes its origin to both tectonic and climatic events. Pazzaglia et al. (1999) propose that the first critical event occurred about 800 thousand years ago (Ka) at the onset of the middle Pleistocene. That point marks the onset of large-scale continental glaciation in North America and the beginning of large-amplitude, 100-Ka glacial-interglacial cycles. Prior to that time the mountain slopes experienced a greater degree of chemical weathering than today. The hillslopes were subjected to extensive, deep corestone weathering and were blanketed by a significant thickness of soil. The highly-weathered, fine-grained material remained on the slopes and supported perennial streams draining the heights. The streams had a constant base level and sculpted a low-relief pediment west of the fault-bound escarpments.

After about 800 Ka the 100 Ka glacial-interglacial climate cycles and monsoonal rains limited deep weathering and favored stripping of the soil cover. As soil was removed the mode of water runoff changed from subsurface to overland flow. The increased sediment supply and the increasingly ephemeral drainage caused alluvial fans to be deposited on the piedmont. As the soil was stripped down to the corestone roots the pre-middle Pleistocene weathering profile was exposed. Sediment supply became coarser as corestone debris and even corestones themselves were deposited on the piedmont. As Pazzaglia et al. (1999) eloquently state, the upward-coarsening of the alluvial-fan deposits represents the unroofing of the pre-Middle Pleistocene weathering profile during the past 800 Ka

5.0 Groundwater Systems

5.1 Regional System

Over most of the area of investigation the regional groundwater system is contained within the fine-grained alluvial-fan lithofacies. On the western margin of the area the regional groundwater enters the fluvial sediments of the Ancestral Rio Grande "A" (*Figure 5-1*). A map of the potentiometric surface of the regional system (*Figure 5-1*) indicates that the surface dips gently to the northwest.

5.2 Perched System

The perched system is completely contained within the fine-grained alluvial-fan lithofacies. The known extent of the perched system is shown by *Figure 5-2*. Flow is to the southeast, opposite to that of the regional system. Fritts and Van Hart (1997) hypothesized that groundwater flow in the perched system was governed at least in part by a "floor" of gently-folded, low hydraulic-conductivity sediments. It follows that the shallow groundwater flow should show a correlation to the structure map of the fine-grained alluvial-fan sediments. However, the isopotential contours suggest that the flow is semi-independent of the structural configuration of the fine-grained sediments (compare *Figures 3-1* and *5-2*). It may be that the perched groundwater flow is highly complicated and characterized by a degree of splitting and merging of flow paths beyond our ability to resolve with the existing data. Therefore the southeast flow regime shown by *Figure 5-2* may be a composite snapshot that averages complex recharge and flow paths through the vadose and perched saturated zones, respectively.

The rate of convergence of the perched and regional groundwater is shown by an isopach map of the vertical distance between the tops of the two systems (*Figure 5-3*). The distance decreases from a maximum of 260 ft in the northwest to 160 ft in the southeast. *Figures 5-1*

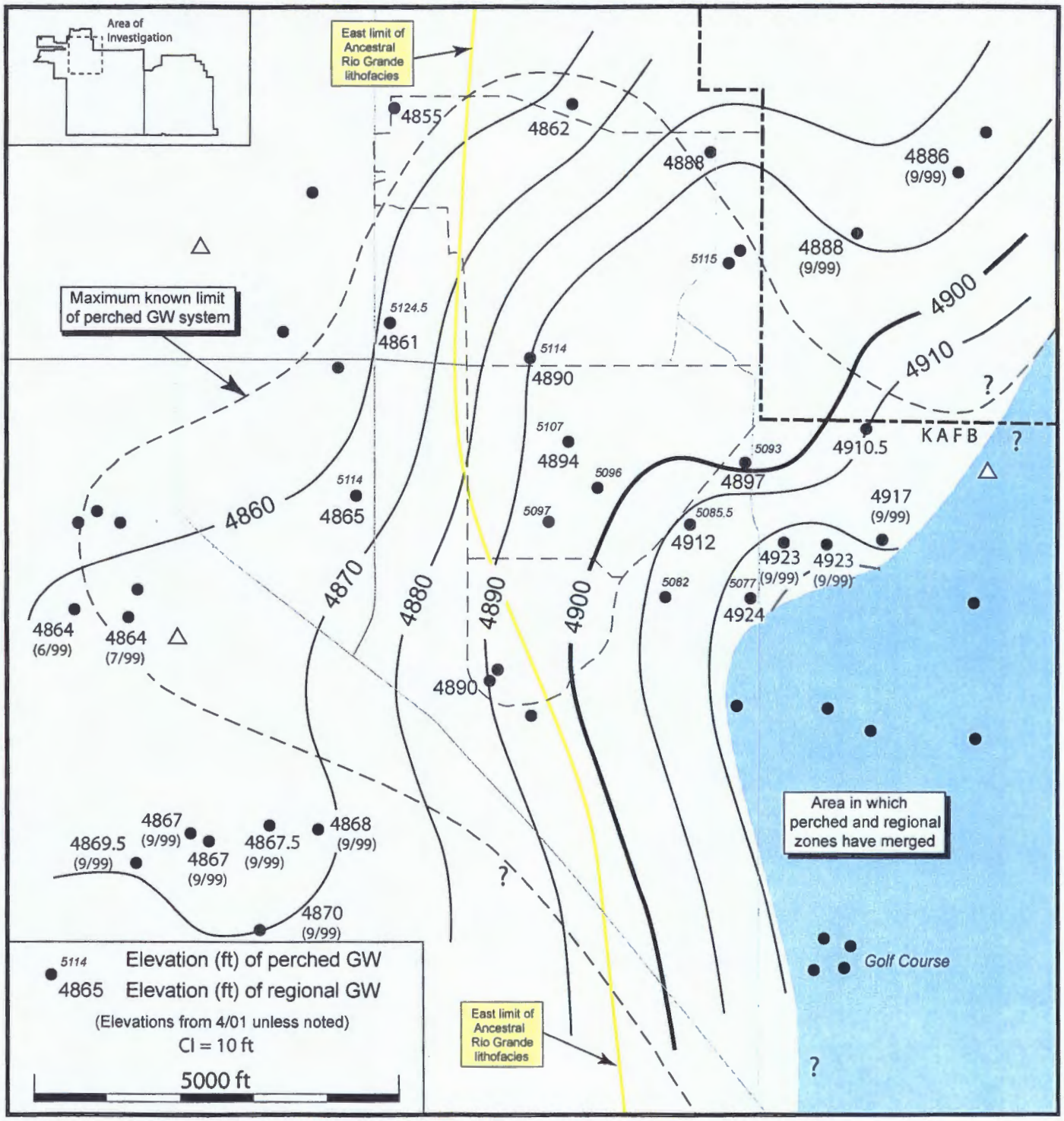


Figure 5-1. Elevation Map of Regional Groundwater, Tijeras Arroyo Area

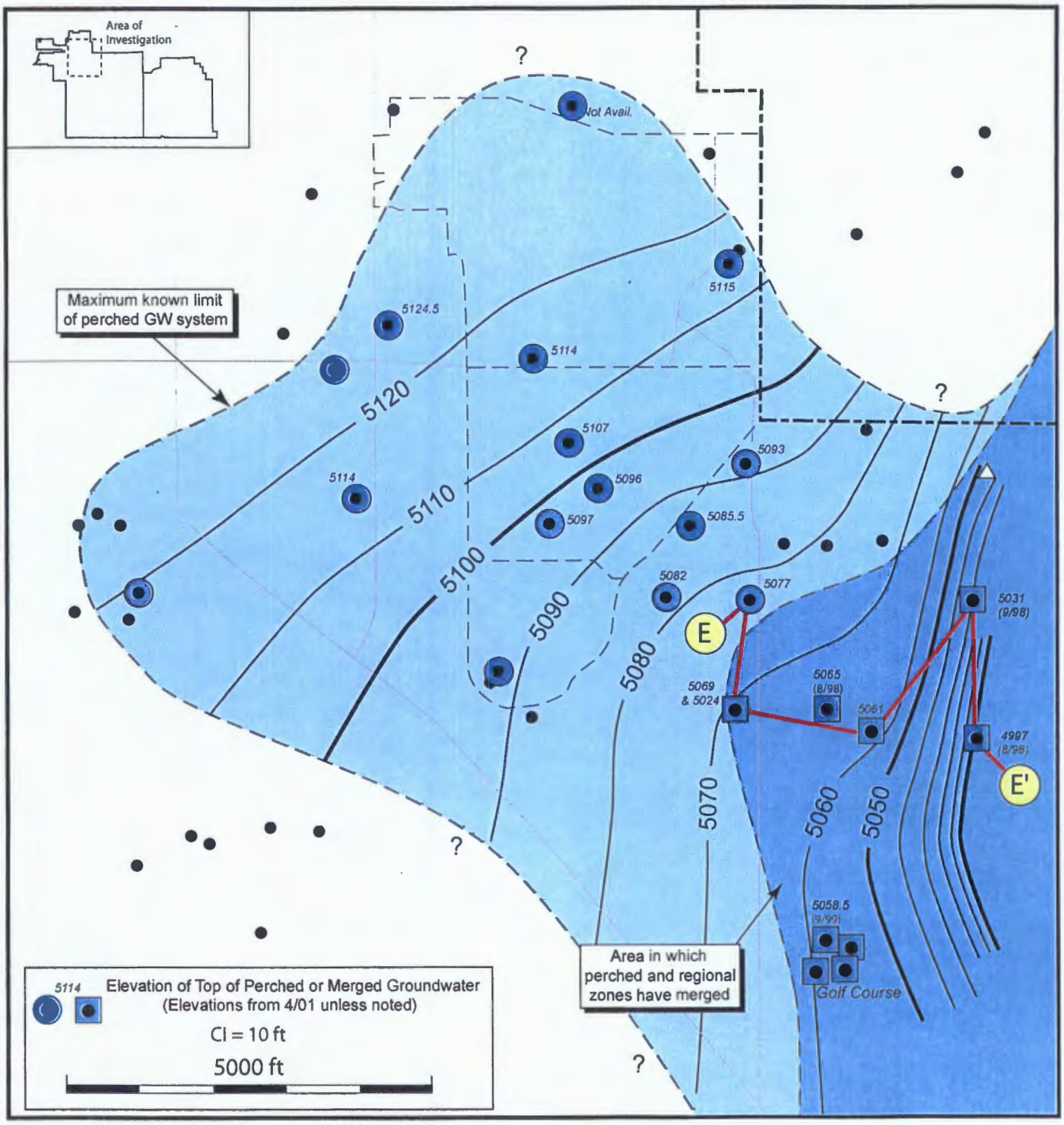


Figure 5-2. Elevation Map of Perched and Merged Groundwater, Tijeras Arroyo Area

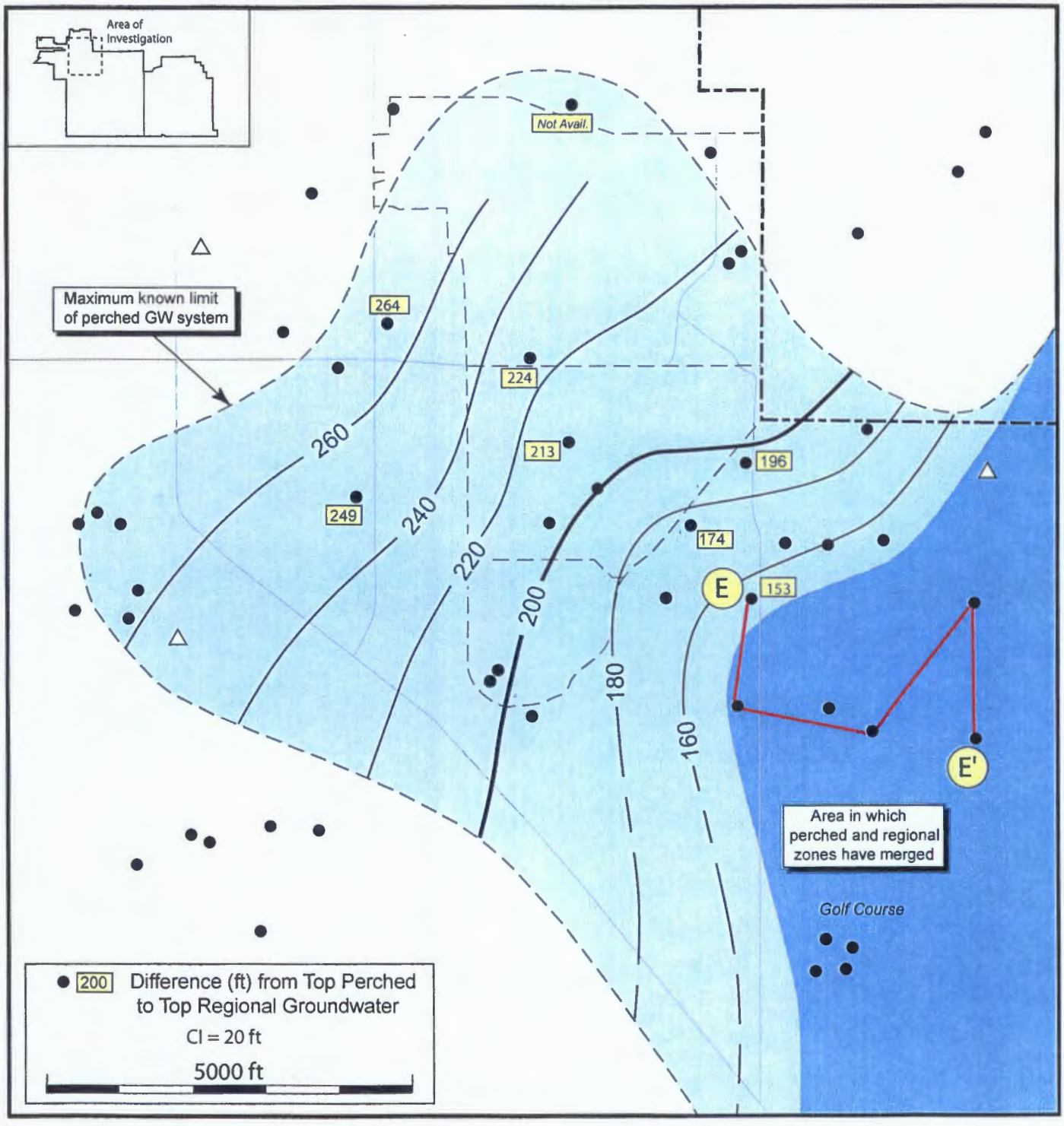


Figure 5-3. Isopach Map of Vertical Distance between Perched and Regional Groundwater, Tijeras Arroyo Area

through *5-3* show an area in darker blue to the east. The perched and regional systems are interpreted to have merged in this area, and the shape of the interpreted western limit of this area was guided by the isopach map.

6.0 Conceptual Model of Groundwater Flow

The interpreted conceptual model of the groundwater flow in the area of investigation is sketched in *Figure 6-1*. Groundwater in the regional system flows downgradient to the northwest from recharge areas in the eastern highlands. Near Manzano Base the saturated sediments are more permeable than those to the west.

In the area centering on TA-I and TA-II anthropogenic recharge from human activities on the surface and by leaking pipes in the subsurface has infiltrated downward and partly into a fine-grained, low-permeability alluvial-fan sequence to form a perched system. The combination of a component of south formation dip, higher horizontal conductivities in the fine-grained sediments, and likely complex flow paths guide perched groundwater flow to the southeast.

The two groundwater systems merge in a zone to the southeast where the aquitard properties of the fine-grained unit pinches out into more permeable sediments girdling the eastern uplands. The steep gradient suggested by the two wells near the fault (KAFB-0312 and 0314) may be expressing a downward gradient and downward flow expected in a zone of merging (*Figure 2-9*).

7.0 Summary and Conclusions

The purpose of this project was to incorporate the 25 new monitor wells drilled in the area during the past four years, and to modify the conceptual groundwater flow model if warranted. Work began on April 9, 2001.

A correlation grid was constructed consisting of five cross sections. A correlative marker approximately separating the predominantly coarse-grained alluvial-fan sediments above from the predominantly fine-grained alluvial-fan sediments below was selected as a map datum. Both the perched and regional aquifers occur below that datum in the fine-grained sediments. A structure map on the datum reveals that the sediments are configured into the gently-south-plunging Sandia North syncline, with the axis passing through the western portions of TA-I and TA-IV. This interpretation is consistent with regional structural data to the west and south.

The regional groundwater flows to the northwest and the perched system flows in the opposite, southeasterly direction. In the northwestern part of the area the top of the perched system is about 260 ft above the regional. This distance decreases to the southeast to a minimum recorded of about 160 ft. Southeast of that point the two systems appear to merge into one. As the perched groundwater, flowing to the southeast along complex flow paths within the fine-grained alluvial-fan sediments, encounters more permeable sediments to the southeast the lower aquitards pinches out. There the perched water cascades downward in the more permeable sediments to merge with the regional system flowing in the opposite, northwest direction.

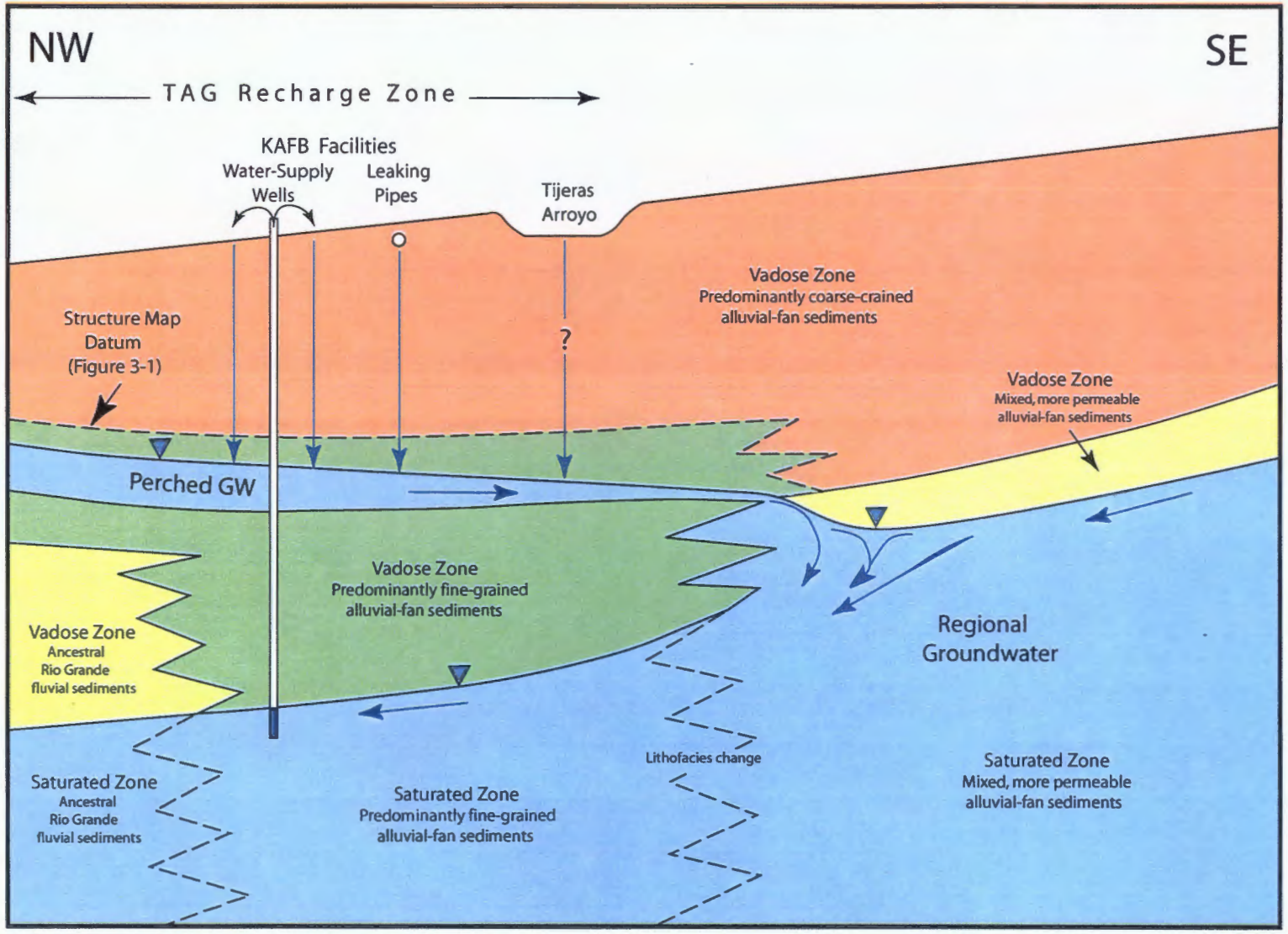


Figure 6-1. Sketch of Groundwater Flow Model, Tijeras Arroyo Area
(Saturated zone in blue)

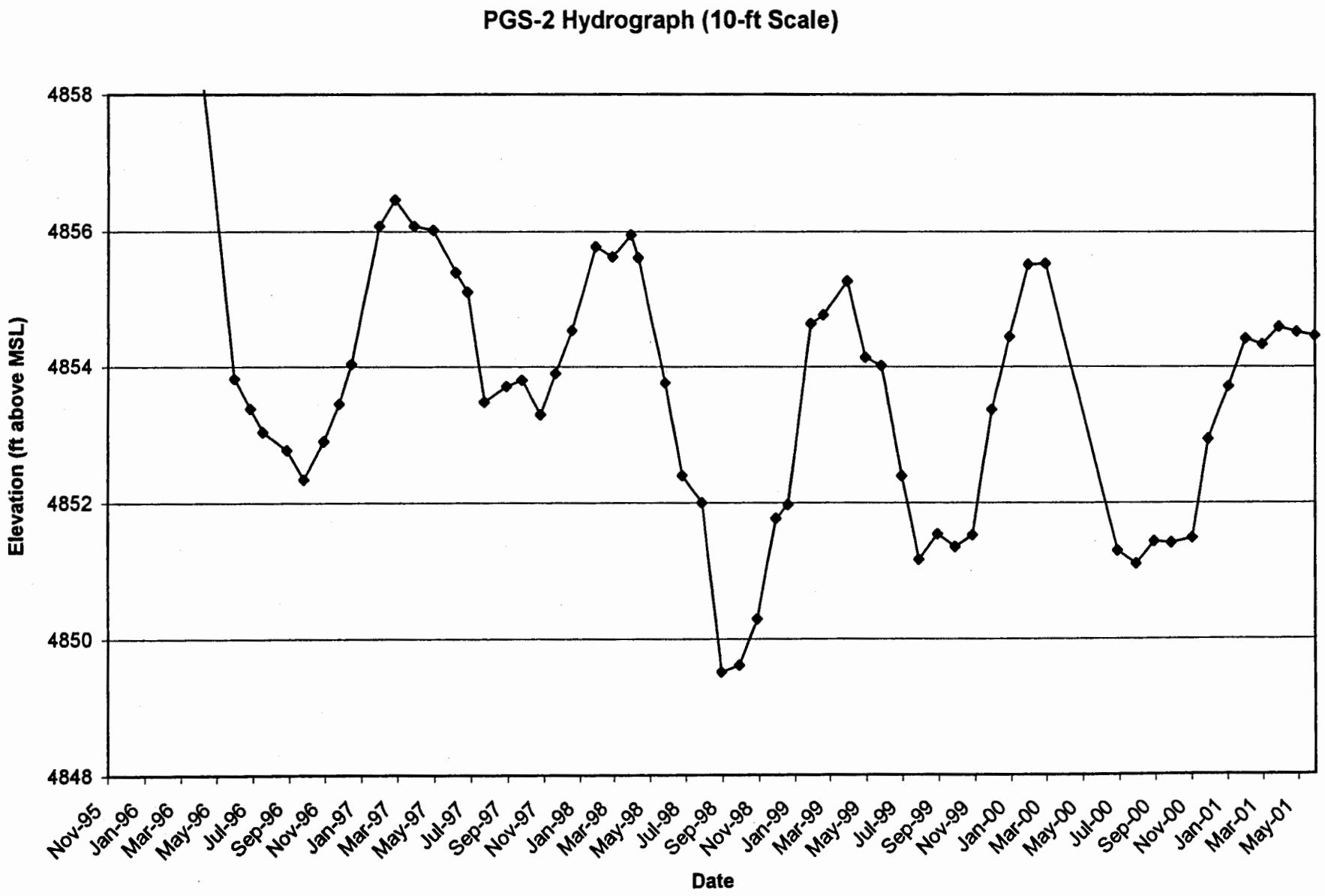
8.0 References Cited

Balleau Groundwater, Inc., 2001, A preliminary three-dimensional variably saturated model of a perched aquuifer at Sandia National Laboratories, New Mexico, February, 2001.

Fritts, J.F., and Van Hart, D., 1997. Sandia North Geologic Investigation Project Report, prepared for Sandia National Laboratories Environmental Restoration Project by GRAM, Inc.

Pazzaglia, F.J., Woodward, L.A., Lucas, S.G., Anderson, O.J., Wegmann, K.W., & Estep, J.W., 1999. Phanerozoic geologic evolution of the Albuquerque area, in *New Mexico Geological Society 50th Annual Field Conference, Albuquerque Geology*, p. 97-114.

ANNEX B
Tijeras Arroyo Groundwater Investigation—Monitor Well Hydrographs


PGS-2 Hydrograph (10-ft Scale)
Elevation (ft above MSL)
4858
4856
4854
4852
4850
4848
Nov-95
Jan-96
Mar-96
May-96
Jul-96
Sep-96
Nov-96
Jan-97
Mar-97
May-97
Jul-97
Sep-97
Nov-97
Jan-98
Mar-98
May-98
Jul-98
Sep-98
Nov-98
Jan-99
Mar-99
May-99
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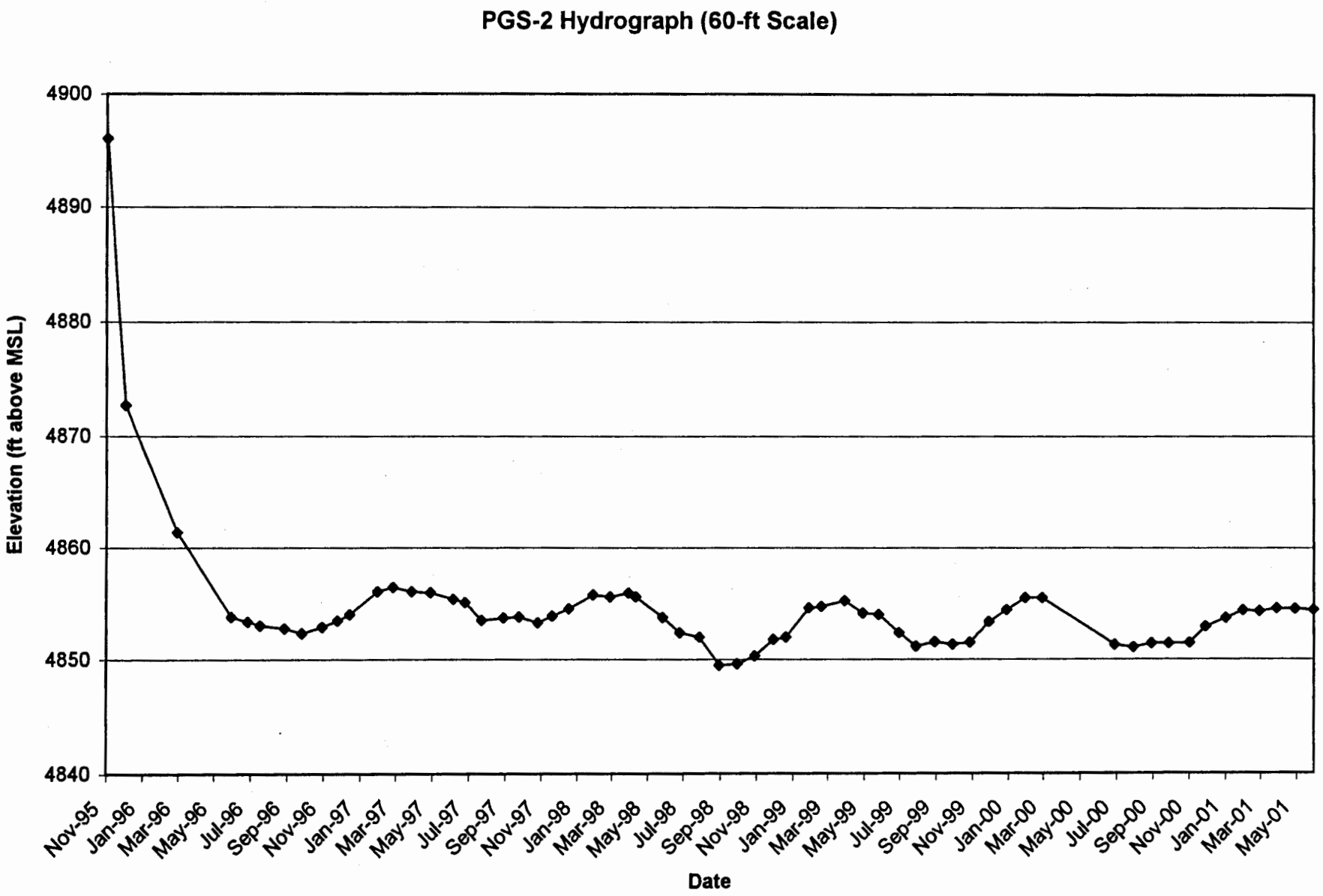
Jan-01
Mar-01
May-01
Date


PGS-2 Hydrograph (60-ft Scale)
Elevation (ft above MSL)
4900
4890
4880
4870
4860
4850
4840
Nov-95
Jan-96
Mar-96
May-96
Jul-96
Sep-96
Nov-96
Jan-97
Mar-97
May-97
Jul-97
Sep-97
Nov-97
Jan-98
Mar-98
May-98
Jul-98
Sep-98
Nov-98
Jan-99
Mar-99
May-99
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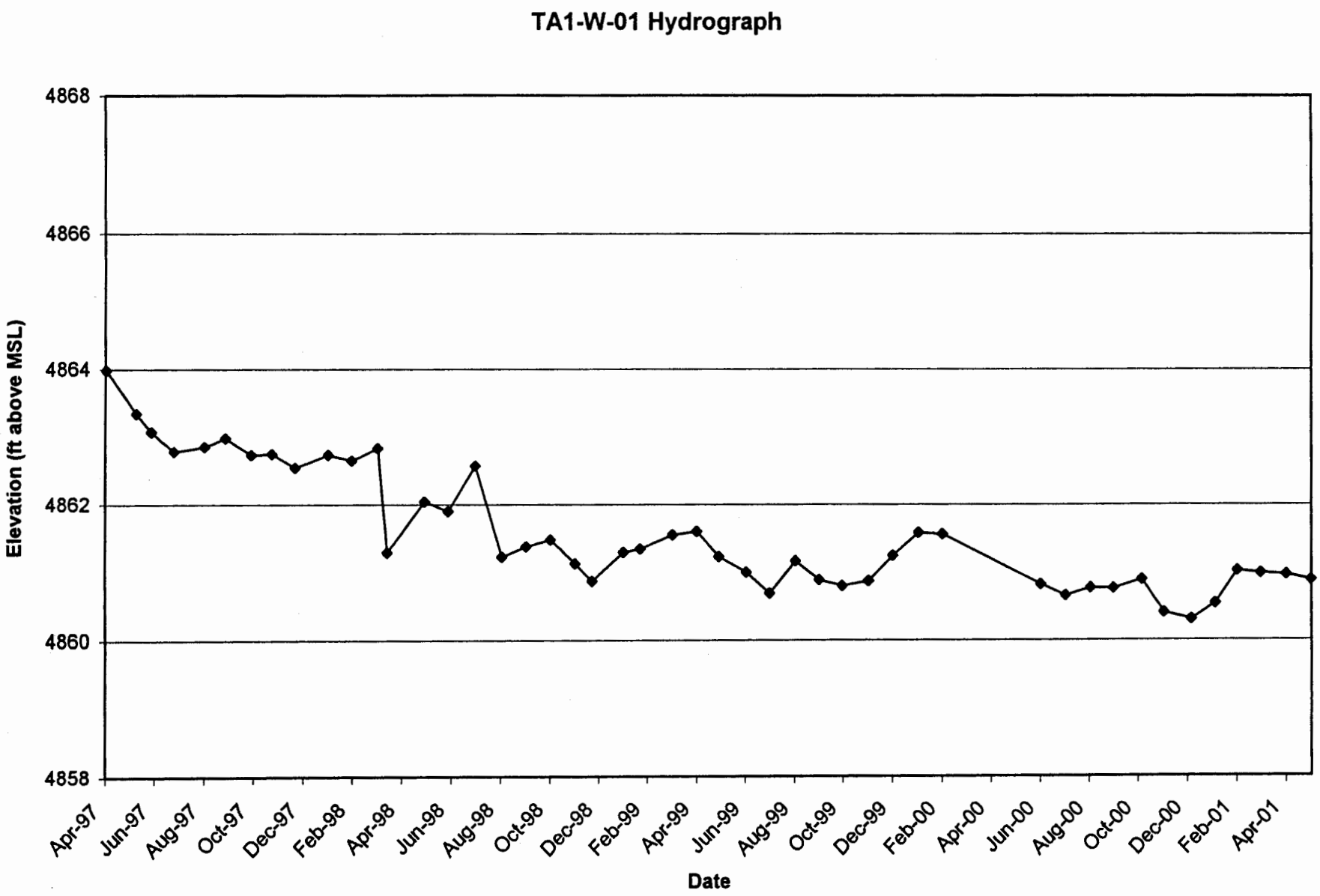
Jan-01
Mar-01
May-01
Date


TA1-W-01 Hydrograph
Elevation (ft above MSL)
4868
4866
4864
4862
4860
4858
Apr-97
Jun-97
Aug-97
Oct-97
Dec-97
Feb-98
Apr-98
Jun-98
Aug-98
Oct-98
Dec-98
Feb-99
Apr-99
Jun-99
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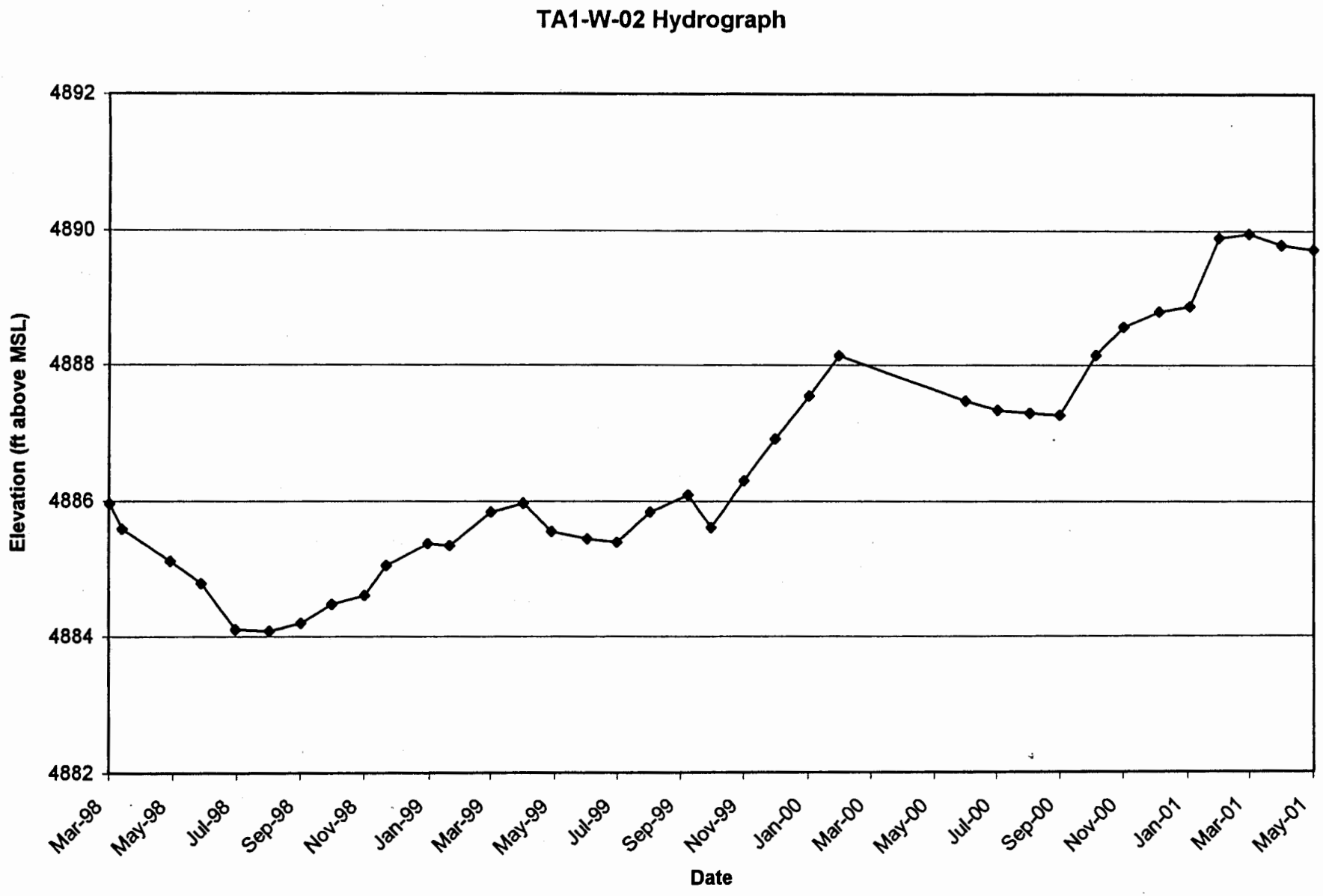
Dec-00
Feb-01
Apr-01
Date


TA1-W-02 Hydrograph
Elevation (ft above MSL)
4892
4890
4888
4886
4884
4882
Mar-98
May-98
Jul-98
Sep-98
Nov-98
Jan-99
Mar-99
May-99
Jul-99
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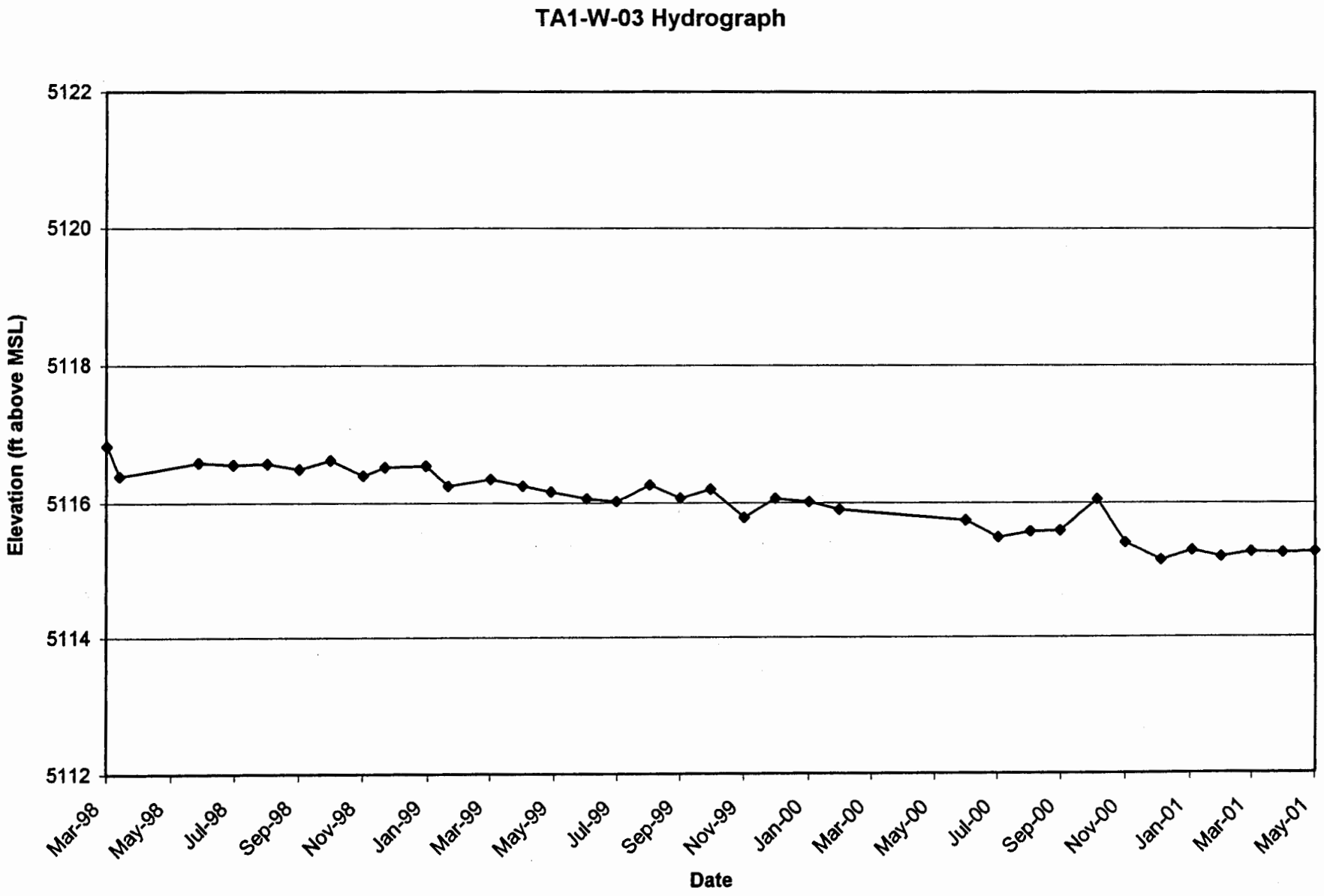
Jan-01
Mar-01
May-01
Date


TA1-W-03 Hydrograph
5122
5120
5118
5116
5114
5112
Elevation (ft above MSL)
Mar-98
May-98
Jul-98
Sep-98
Nov-98
Jan-99
Mar-99
May-99
Jul-99
Sep-99
Nov-99
Jan-00
Mar-00
May-00
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Sep-00
Nov-00
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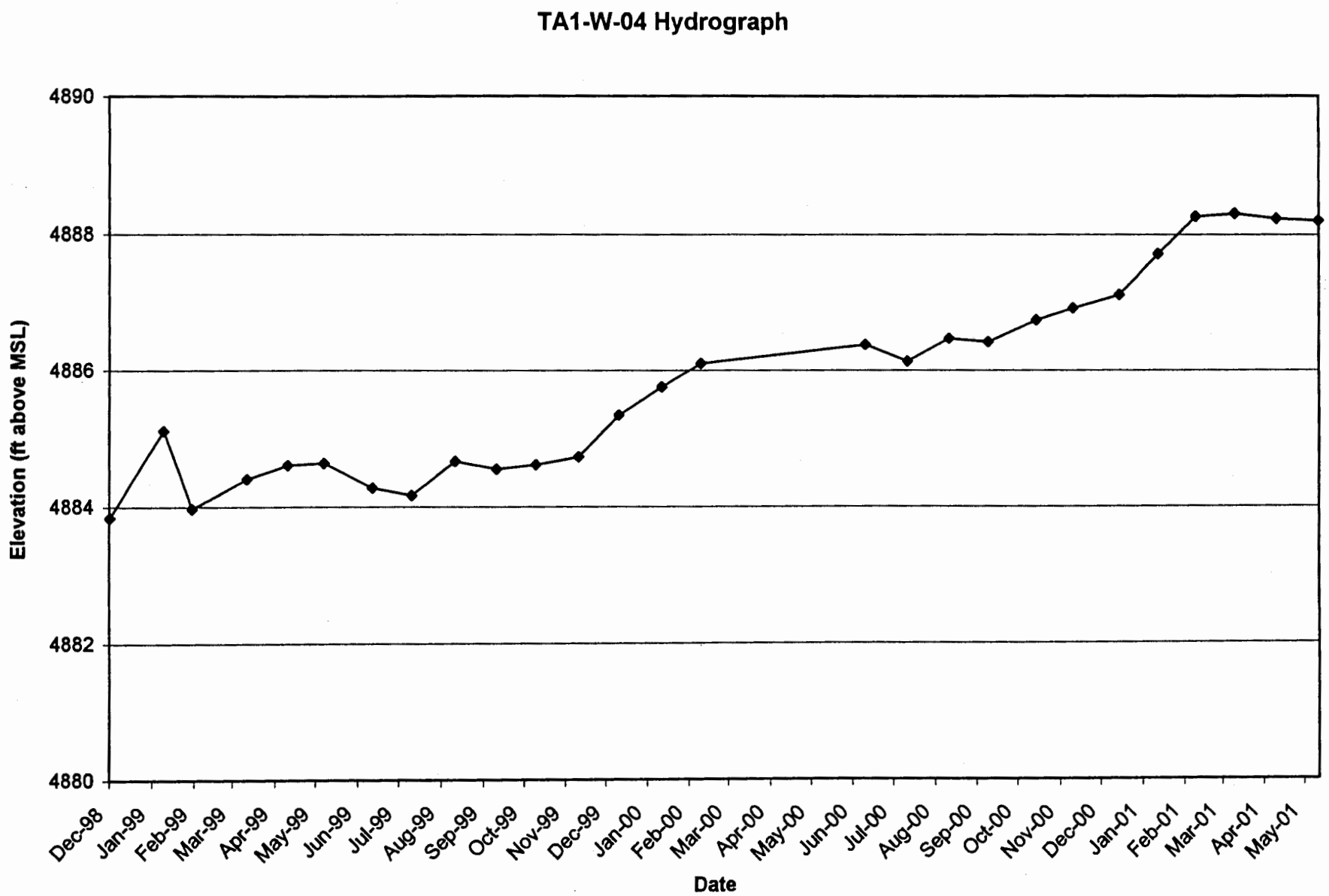
Mar-01
May-01
Date


TA1-W-04 Hydrograph
Elevation (ft above MSL)
4890
4888
4886
4884
4882
4880
Dec-98
Jan-99
Feb-99
Mar-99
Apr-99
May-99
Jun-99
Jul-99
Aug-99
Sep-99
Oct-99
Nov-99
Dec-99
Jan-00
Feb-00
Mar-00
Apr-00
May-00
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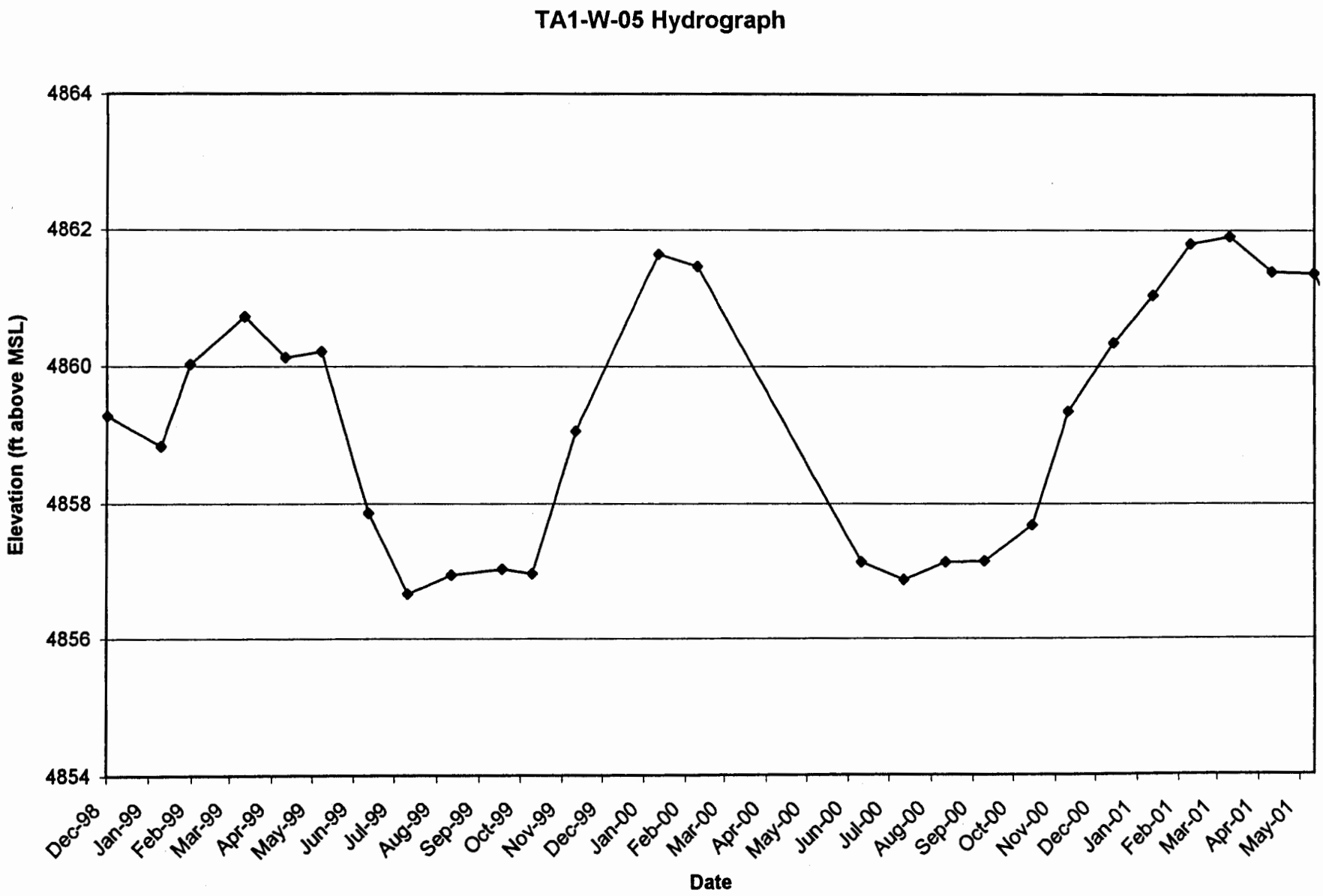
May-01
Date


TA1-W-05 Hydrograph
Elevation (ft above MSL)
4864
4862
4860
4858
4856
4854
Dec-98
Jan-99
Feb-99
Mar-99
Apr-99
May-99
Jun-99
Jul-99
Aug-99
Sep-99
Oct-99
Nov-99
Dec-99
Jan-00
Feb-00
Mar-00
Apr-00
May-00
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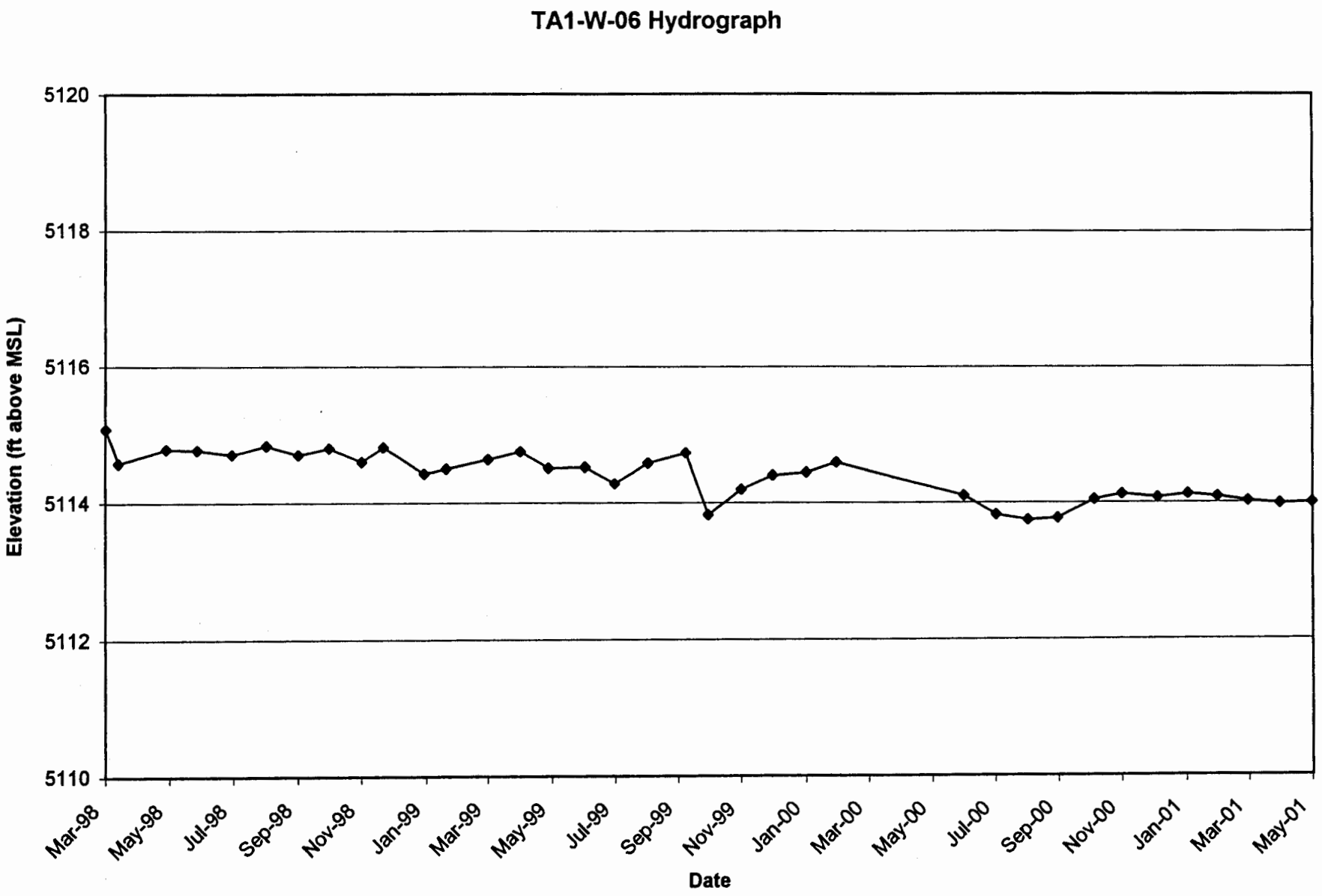
May-01
Date


TA1-W-06 Hydrograph
Elevation (ft above MSL)
5120
5118
5116
5114
5112
5110
Mar-98
May-98
Jul-98
Sep-98
Nov-98
Jan-99
Mar-99
May-99
Jul-99
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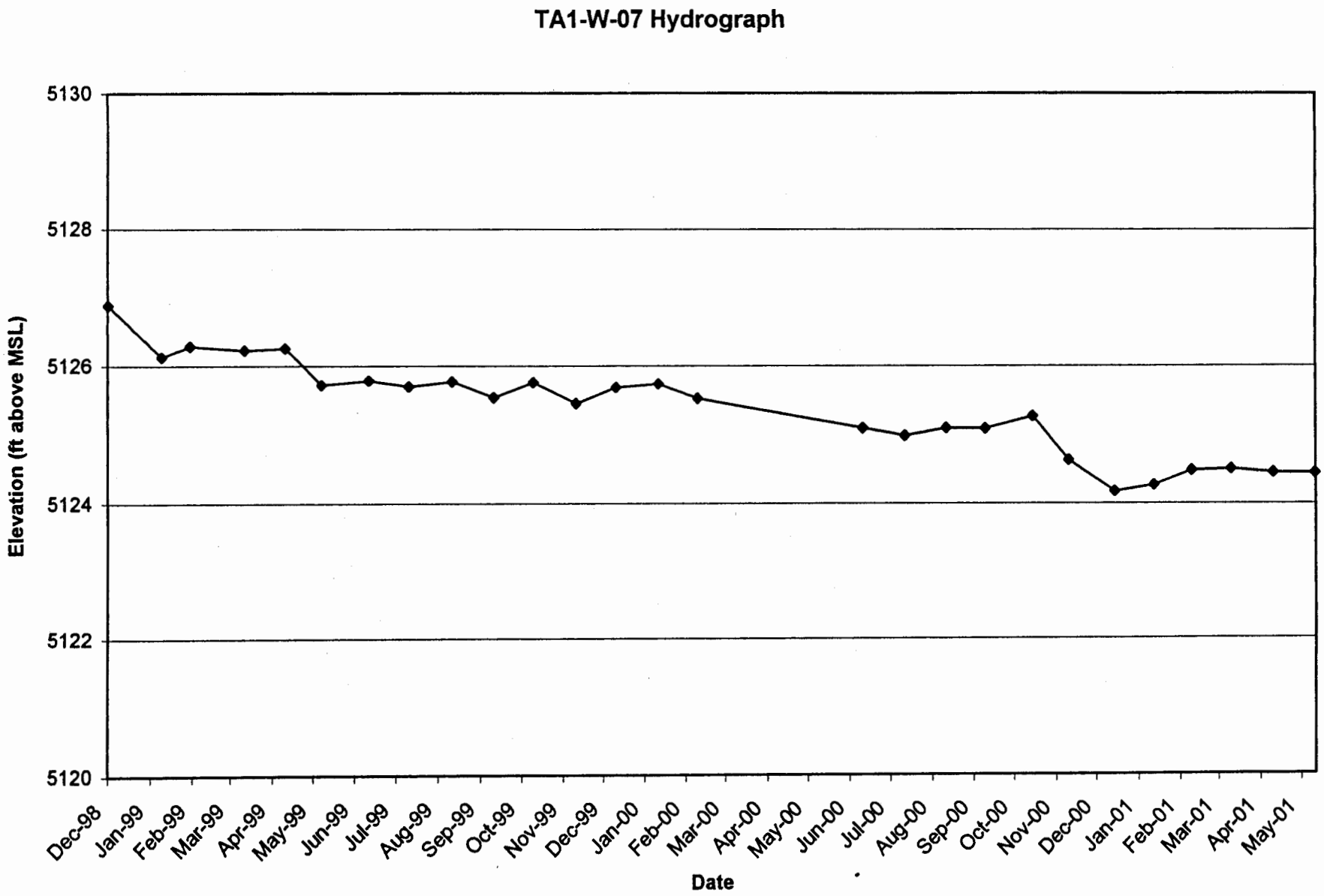
Jan-01
Mar-01
May-01
Date


TA1-W-07 Hydrograph
Elevation (ft above MSL)
5130
5128
5126
5124
5122
5120
Dec-98
Jan-99
Feb-99
Mar-99
Apr-99
May-99
Jun-99
Jul-99
Aug-99
Sep-99
Oct-99
Nov-99
Dec-99
Jan-00
Feb-00
Mar-00
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May-00
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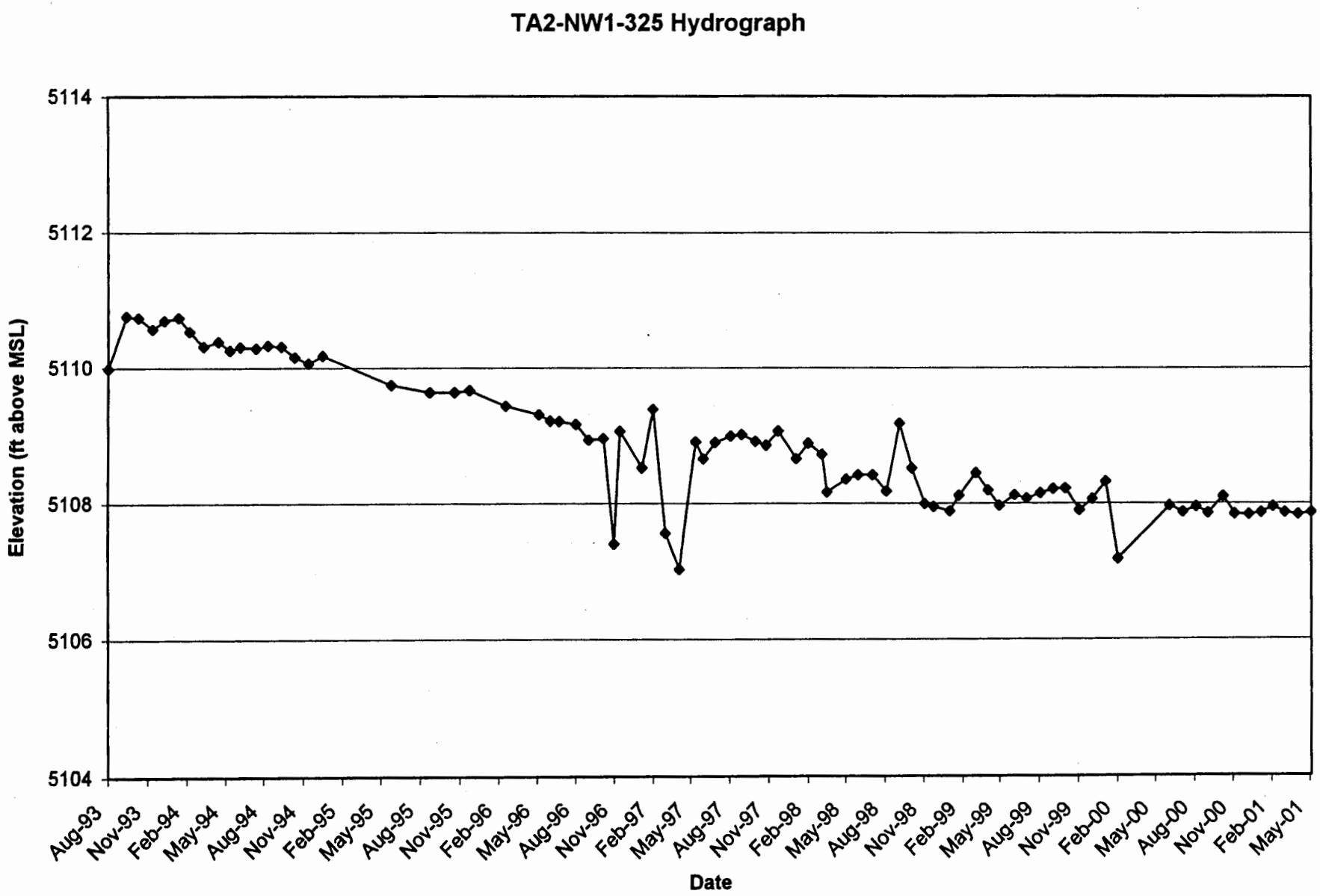
Apr-01
May-01
Date


TA2-NW1-325 Hydrograph
Elevation (ft above MSL)
5114
5112
5110
5108
5106
5104
Aug-93
Nov-93
Feb-94
May-94
Aug-94
Nov-94
Feb-95
May-95
Aug-95
Nov-95
Feb-96
May-96
Aug-96
Nov-96
Feb-97
May-97
Aug-97
Nov-97
Feb-98
May-98
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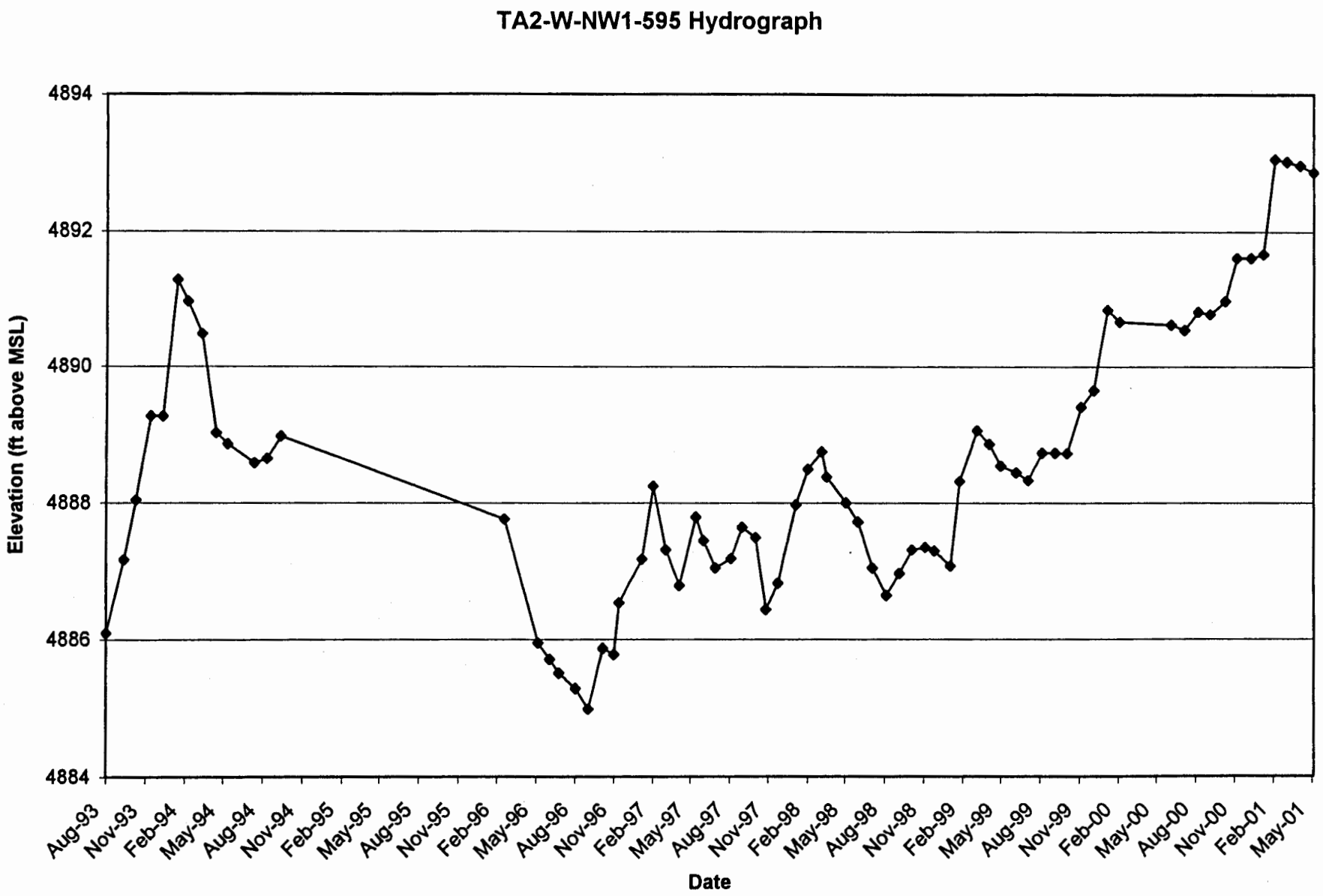
May-01
Date


TA2-W-NW1-595 Hydrograph
Elevation (ft above MSL)
4894
4892
4890
4888
4886
4884
Aug-93
Nov-93
Feb-94
May-94
Aug-94
Nov-94
Feb-95
May-95
Aug-95
Nov-95
Feb-96
May-96
Aug-96
Nov-96
Feb-97
May-97
Aug-97
Nov-97
Feb-98
May-98
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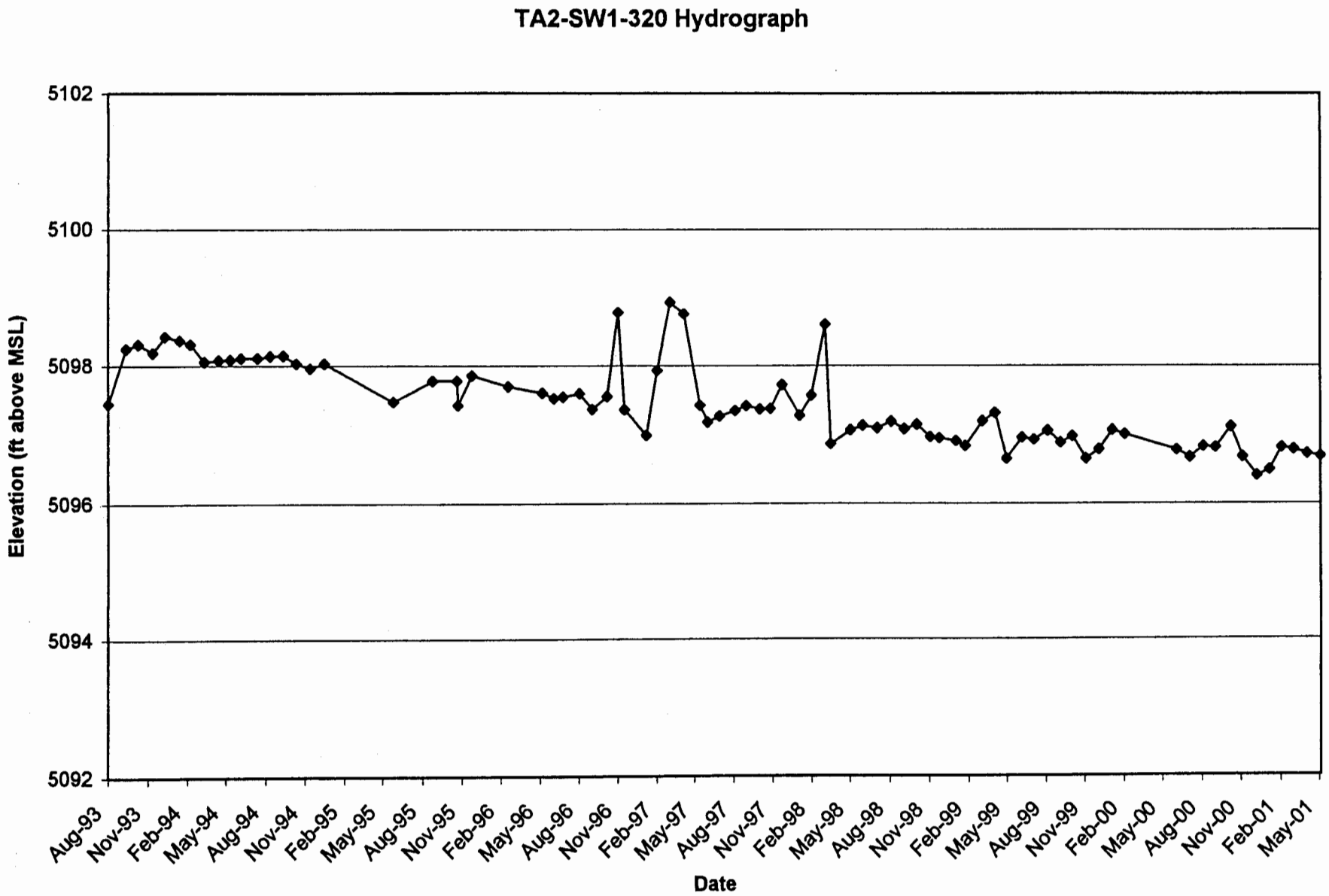
May-01
Date


TA2-SW1-320 Hydrograph
Elevation (ft above MSL)
5102
5100
5098
5096
5094
5092
Aug-93
Nov-93
Feb-94
May-94
Aug-94
Nov-94
Feb-95
May-95
Aug-95
Nov-95
Feb-96
May-96
Aug-96
Nov-96
Feb-97
May-97
Aug-97
Nov-97
Feb-98
May-98
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Nov-00
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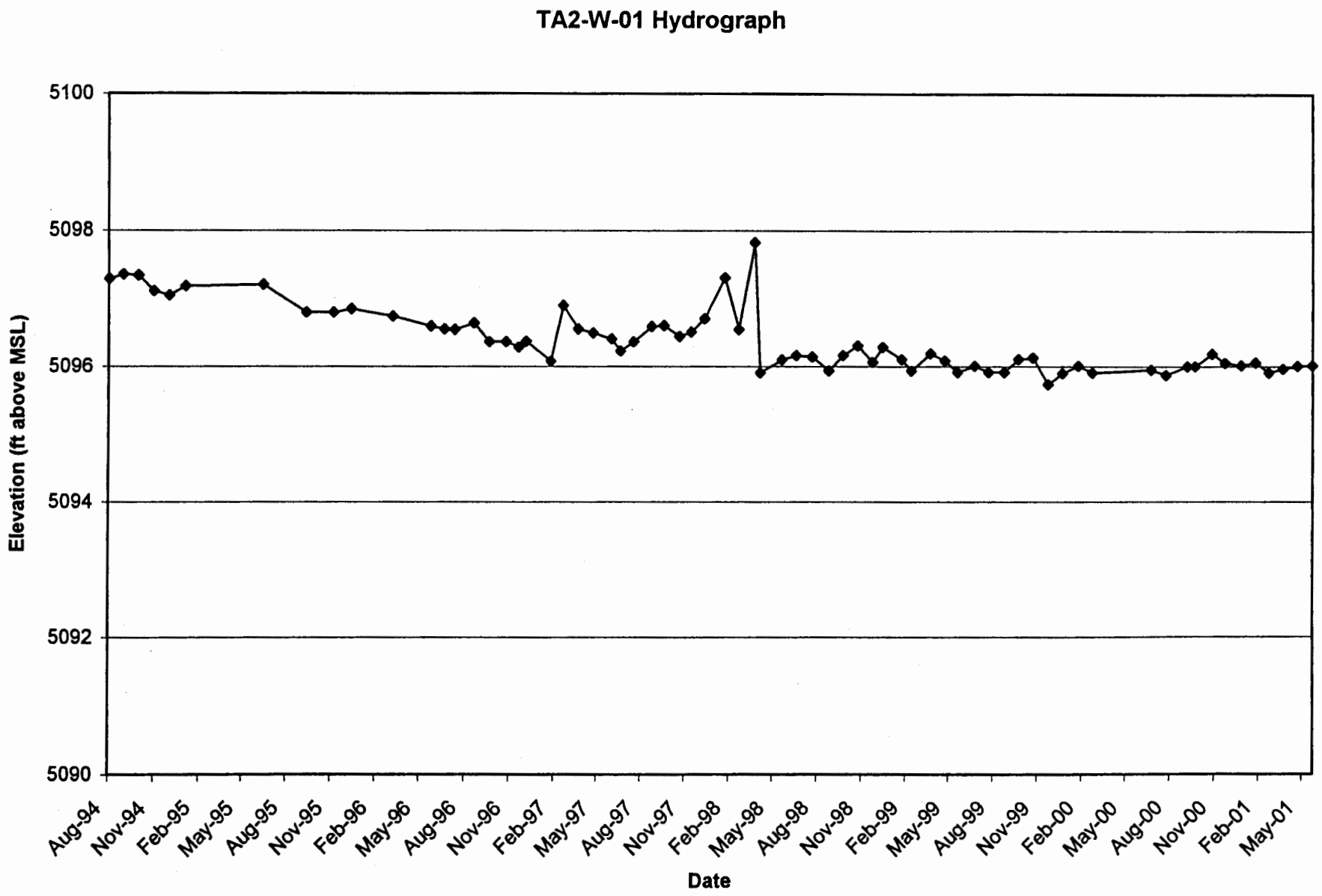
May-01
Date


TA2-W-01 Hydrograph
Elevation (ft above MSL)
5100
5098
5096
5094
5092
5090
Aug-94
Nov-94
Feb-95
May-95
Aug-95
Nov-95
Feb-96
May-96
Aug-96
Nov-96
Feb-97
May-97
Aug-97
Nov-97
Feb-98
May-98
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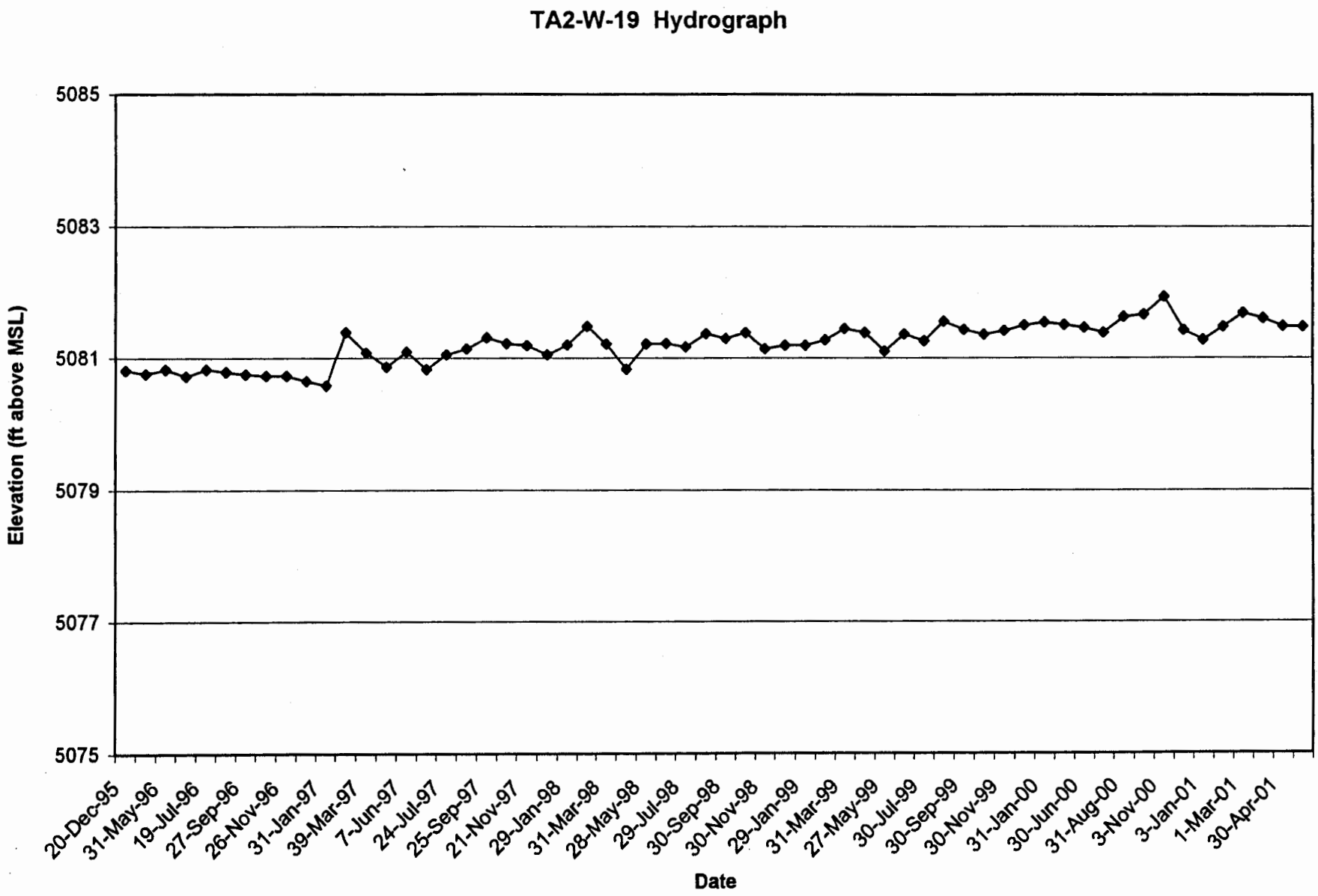
Nov-00
Feb-01
May-01
Date


TA2-W-19 Hydrograph
Elevation (ft above MSL)
5085
5083
5081
5079
5077
5075
20-Dec-95
31-May-96
19-Jul-96
27-Sep-96
26-Nov-96
31-Jan-97
39-Mar-97
7-Jun-97
24-Jul-97
25-Sep-97
21-Nov-97
29-Jan-98
31-Mar-98
28-May-98
29-Jul-98
30-Sep-98
30-Nov-98
29-Jan-99
31-Mar-99
27-May-99
30-Jul-99
30-Sep-99
30-Nov-99
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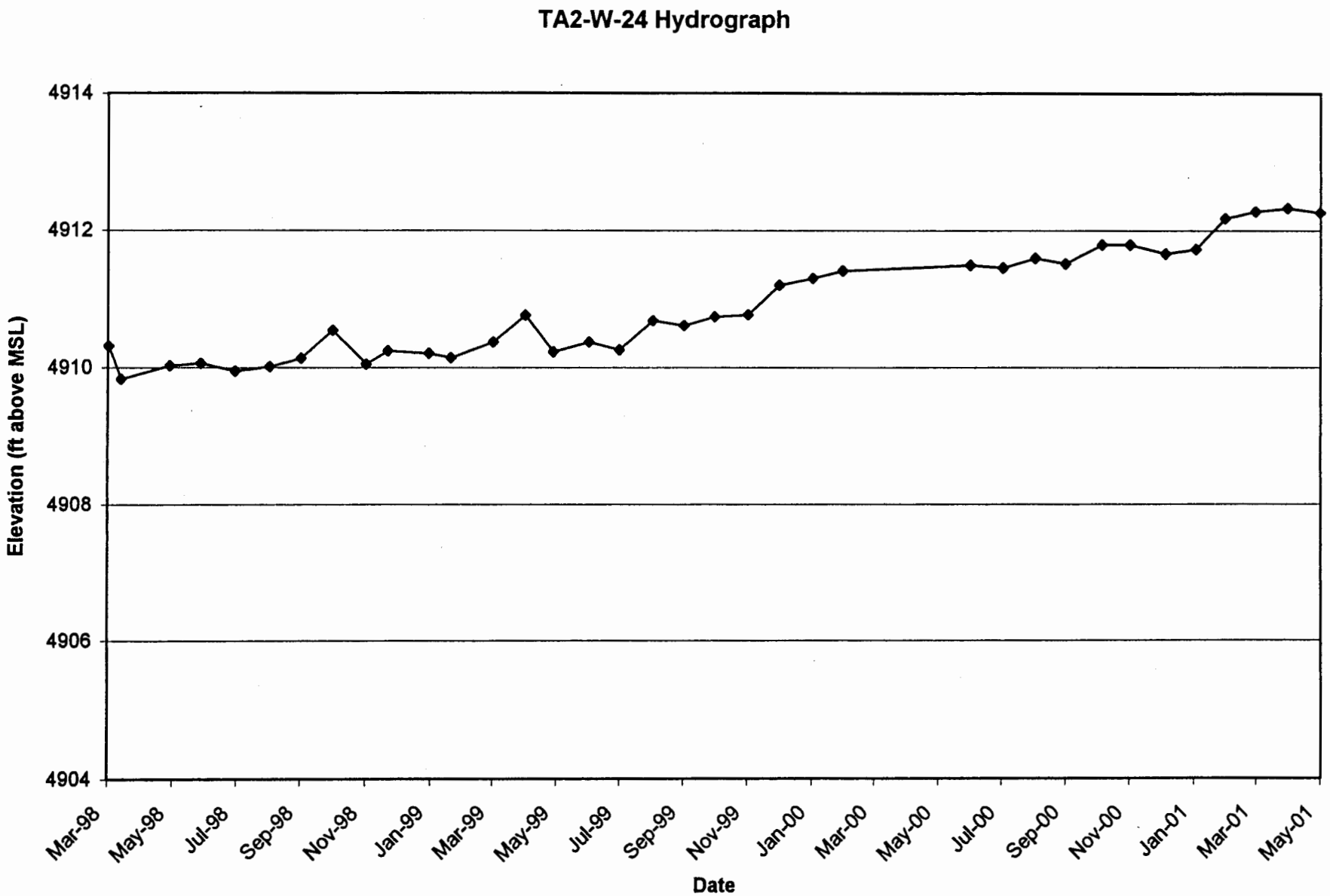
31-Aug-00
3-Nov-00
3-Jan-01
1-Mar-01
30-Apr-01
Date


TA2-W-24 Hydrograph
4914
4912
4910
4908
4906
4904
Elevation (ft above MSL)
Mar-98
May-98
Jul-98
Sep-98
Nov-98
Jan-99
Mar-99
May-99
Jul-99
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Jan-00
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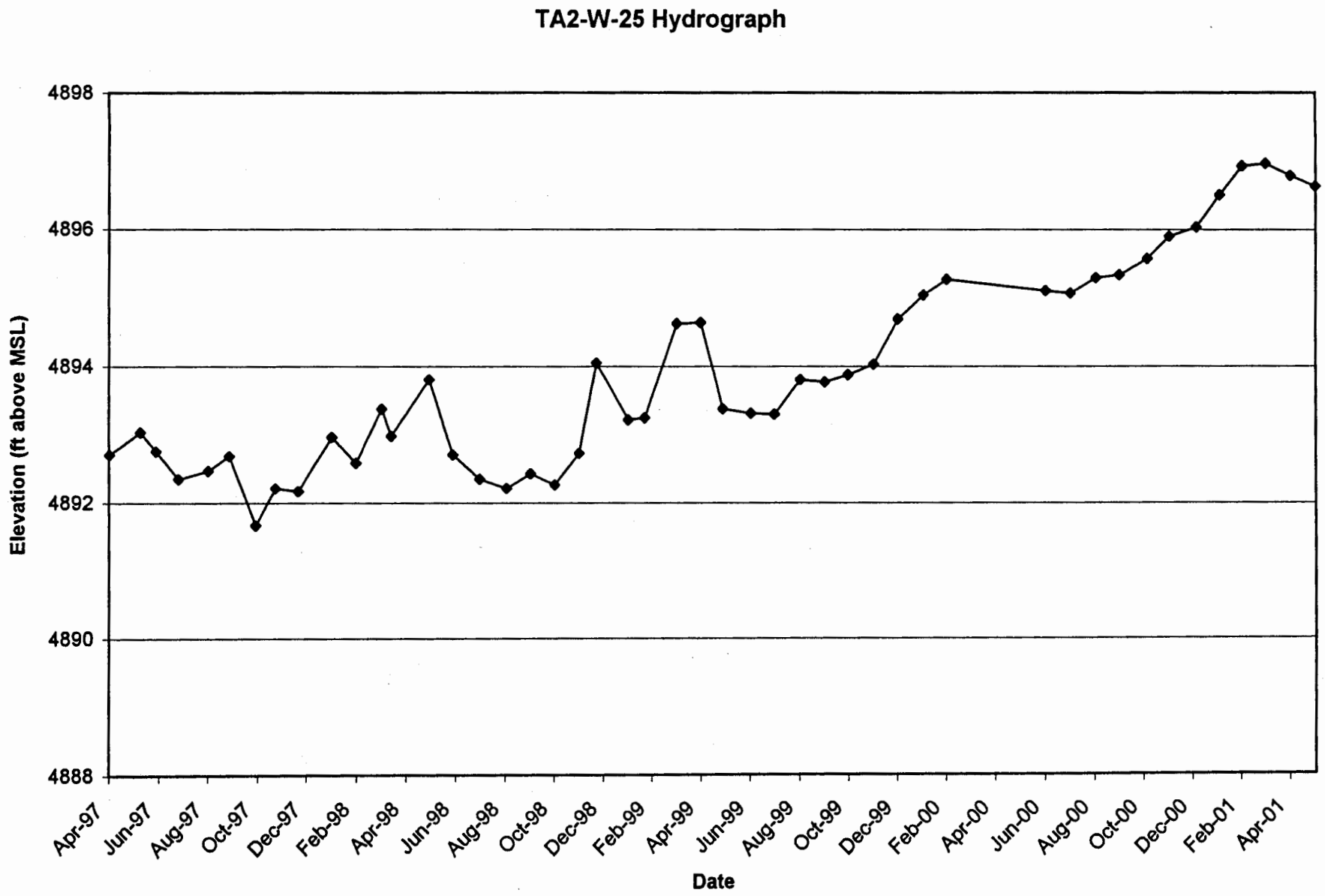
Jan-01
Mar-01
May-01
Date


TA2-W-25 Hydrograph
Elevation (ft above MSL)
4898
4896
4894
4892
4890
4888
Apr-97
Jun-97
Aug-97
Oct-97
Dec-97
Feb-98
Apr-98
Jun-98
Aug-98
Oct-98
Dec-98
Feb-99
Apr-99
Jun-99
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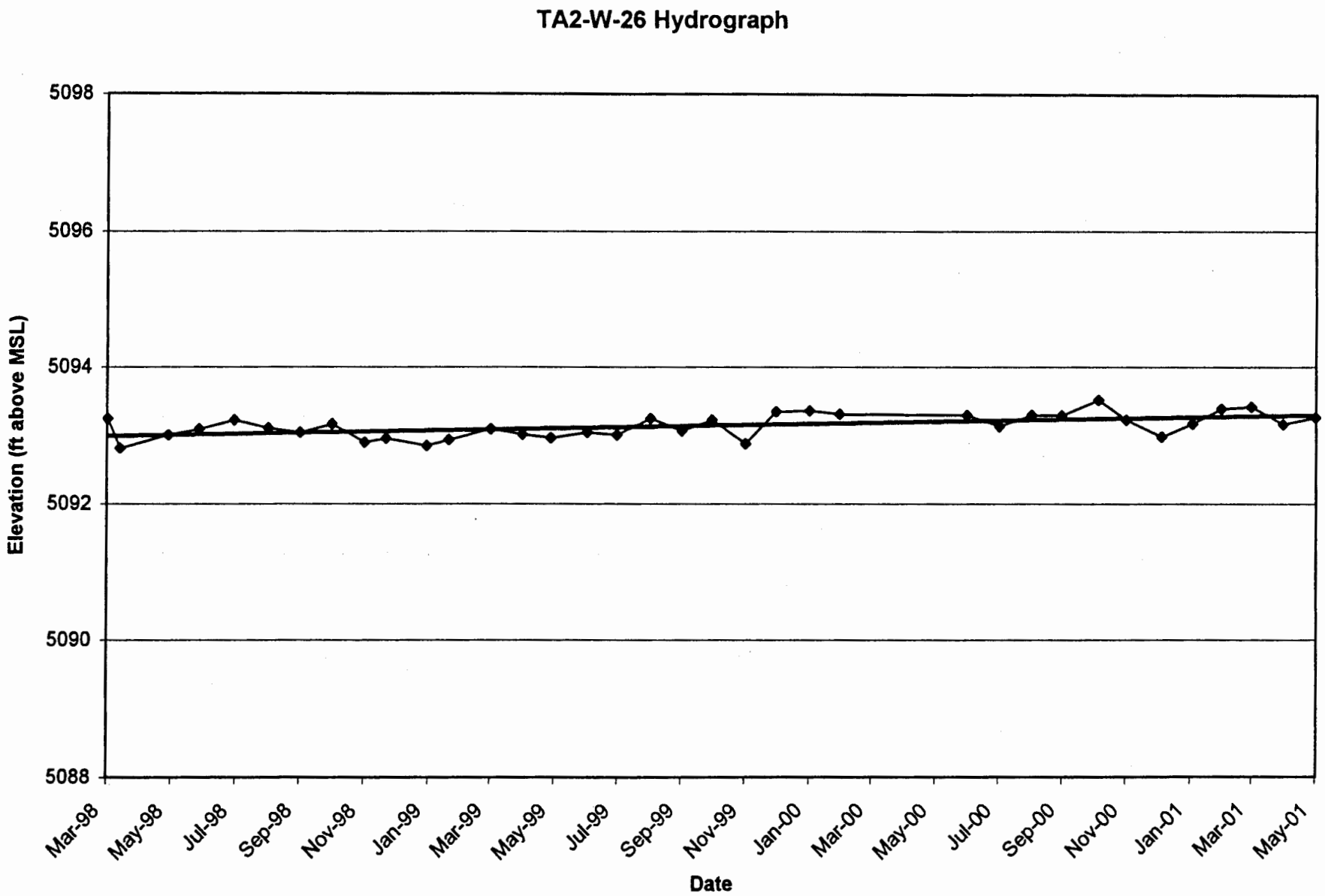
Dec-00
Feb-01
Apr-01
Date


TA2-W-26 Hydrograph
5098
5096
5094
5092
5090
5088
Elevation (ft above MSL)
Mar-98
May-98
Jul-98
Sep-98
Nov-98
Jan-99
Mar-99
May-99
Jul-99
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Nov-99
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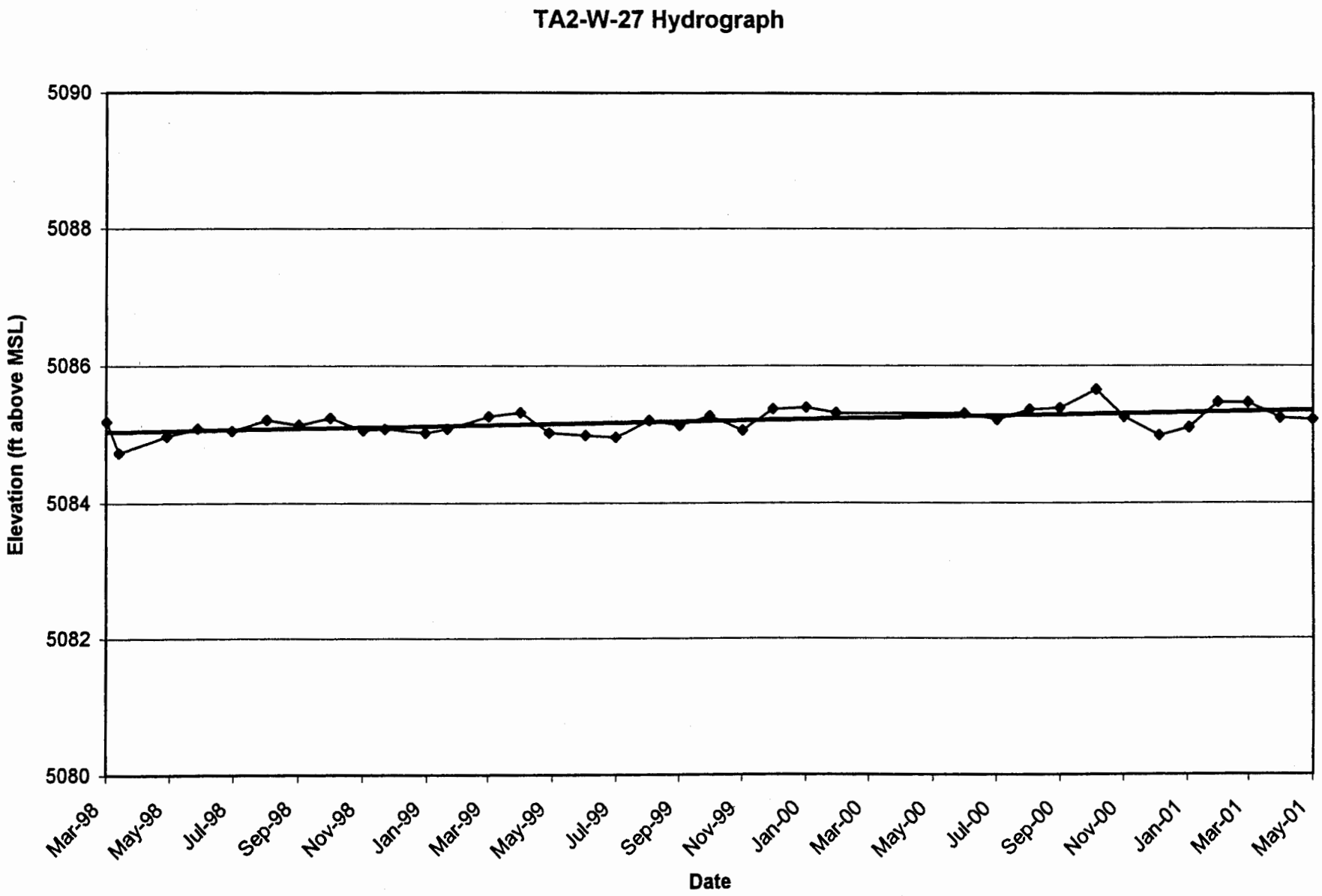
Jan-01
Mar-01
May-01
Date


TA2-W-27 Hydrograph
5090
5088
5086
5084
5082
5080
Elevation (ft above MSL)
Mar-98
May-98
Jul-98
Sep-98
Nov-98
Jan-99
Mar-99
May-99
Jul-99
Sep-99
Nov-99
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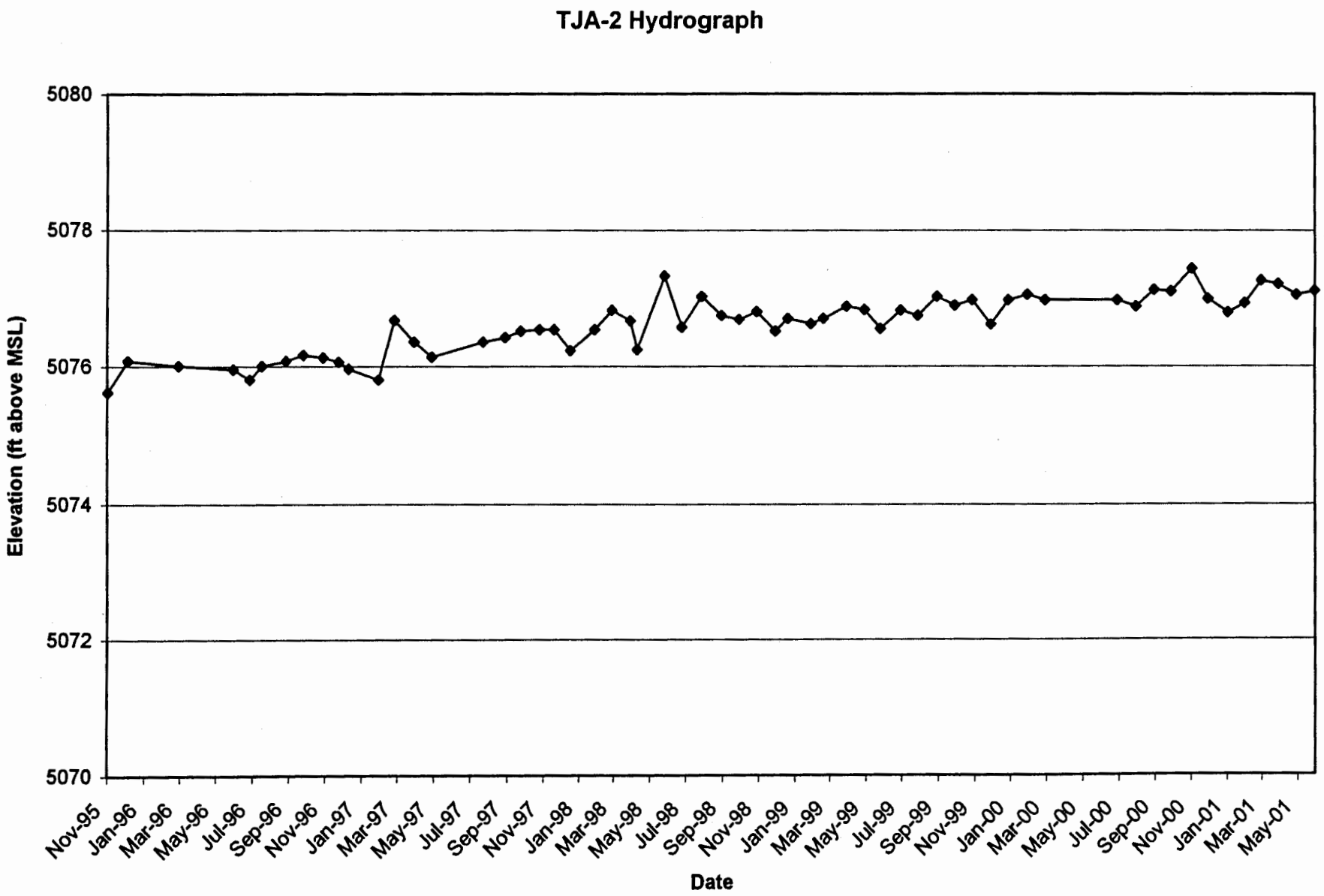
Jan-01
Mar-01
May-01
Date


TJA-2 Hydrograph
Elevation (ft above MSL)
5080
5078
5076
5074
5072
5070
Nov-95
Jan-96
Mar-96
May-96
Jul-96
Sep-96
Nov-96
Jan-97
Mar-97
May-97
Jul-97
Sep-97
Nov-97
Jan-98
Mar-98
May-98
Jul-98
Sep-98
Nov-98
Jan-99
Mar-99
May-99
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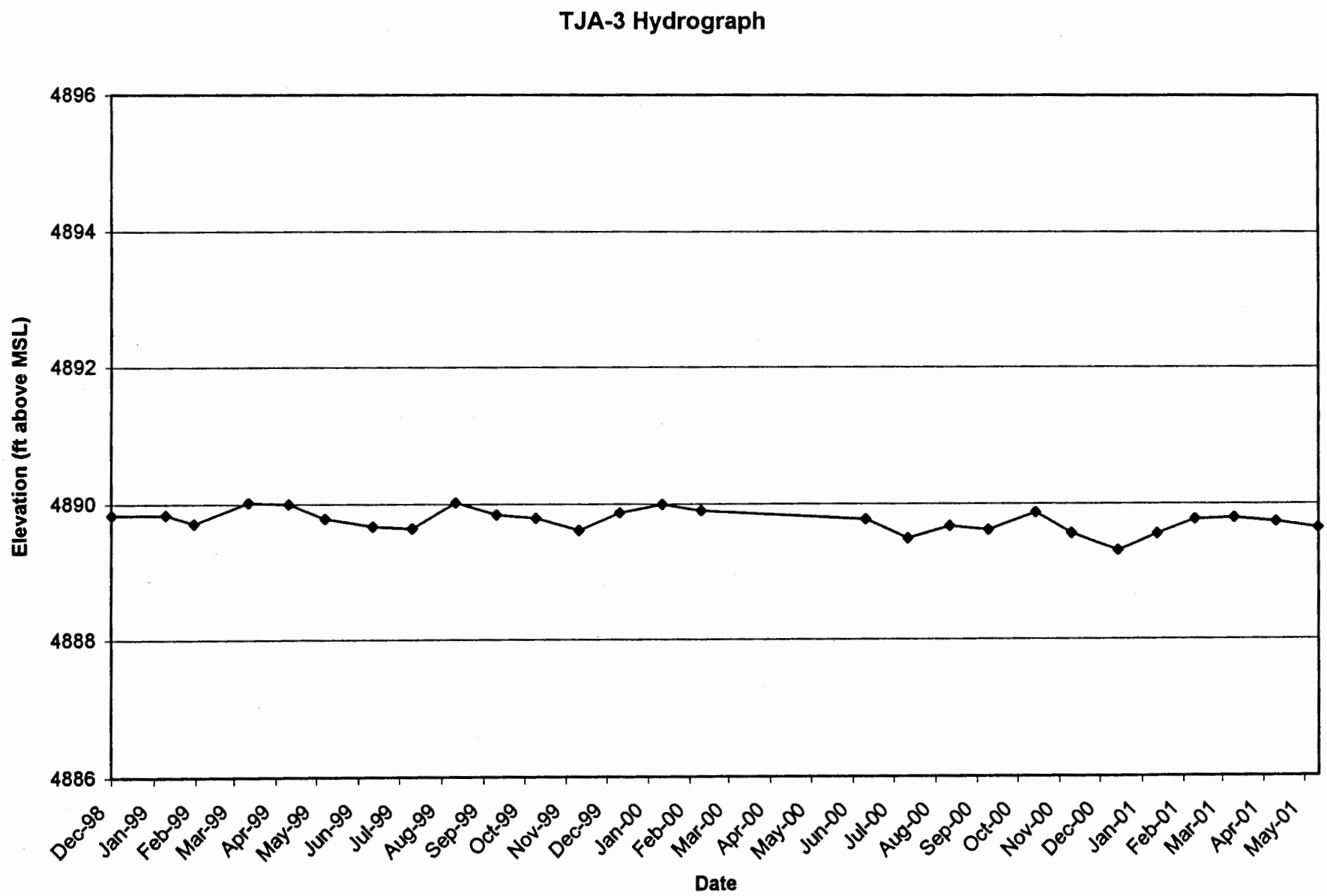
Jan-01
Mar-01
May-01
Date


TJA-3 Hydrograph
Elevation (ft above MSL)
4896
4894
4892
4890
4888
4886
Dec-98
Jan-99
Feb-99
Mar-99
Apr-99
May-99
Jun-99
Jul-99
Aug-99
Sep-99
Oct-99
Nov-99
Dec-99
Jan-00
Feb-00
Mar-00
Apr-00
May-00
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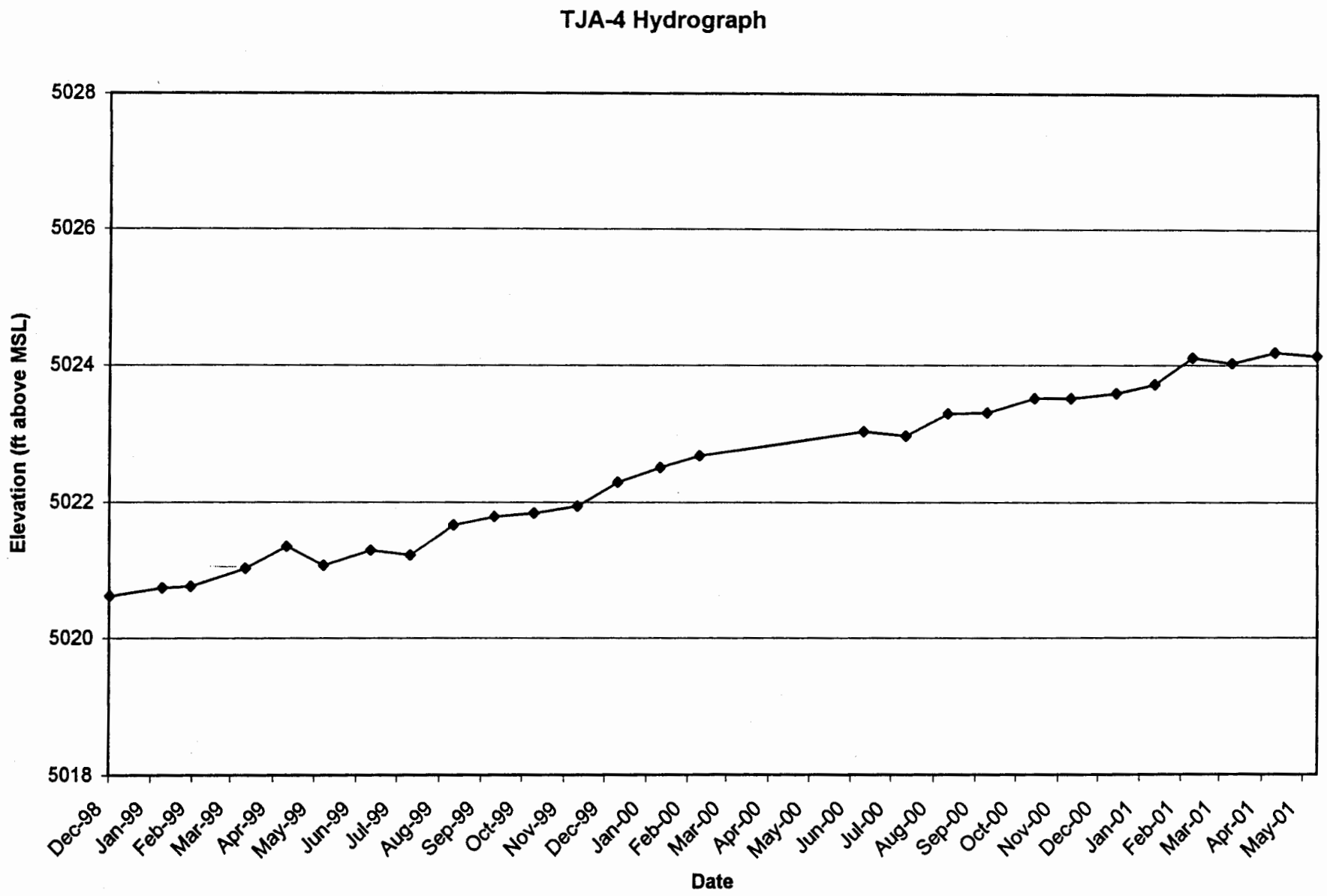
Mar-01
Apr-01
May-01
Date


TJA-4 Hydrograph
Elevation (ft above MSL)
5028
5026
5024
5022
5020
5018
Dec-98
Jan-99
Feb-99
Mar-99
Apr-99
May-99
Jun-99
Jul-99
Aug-99
Sep-99
Oct-99
Nov-99
Dec-99
Jan-00
Feb-00
Mar-00
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May-00
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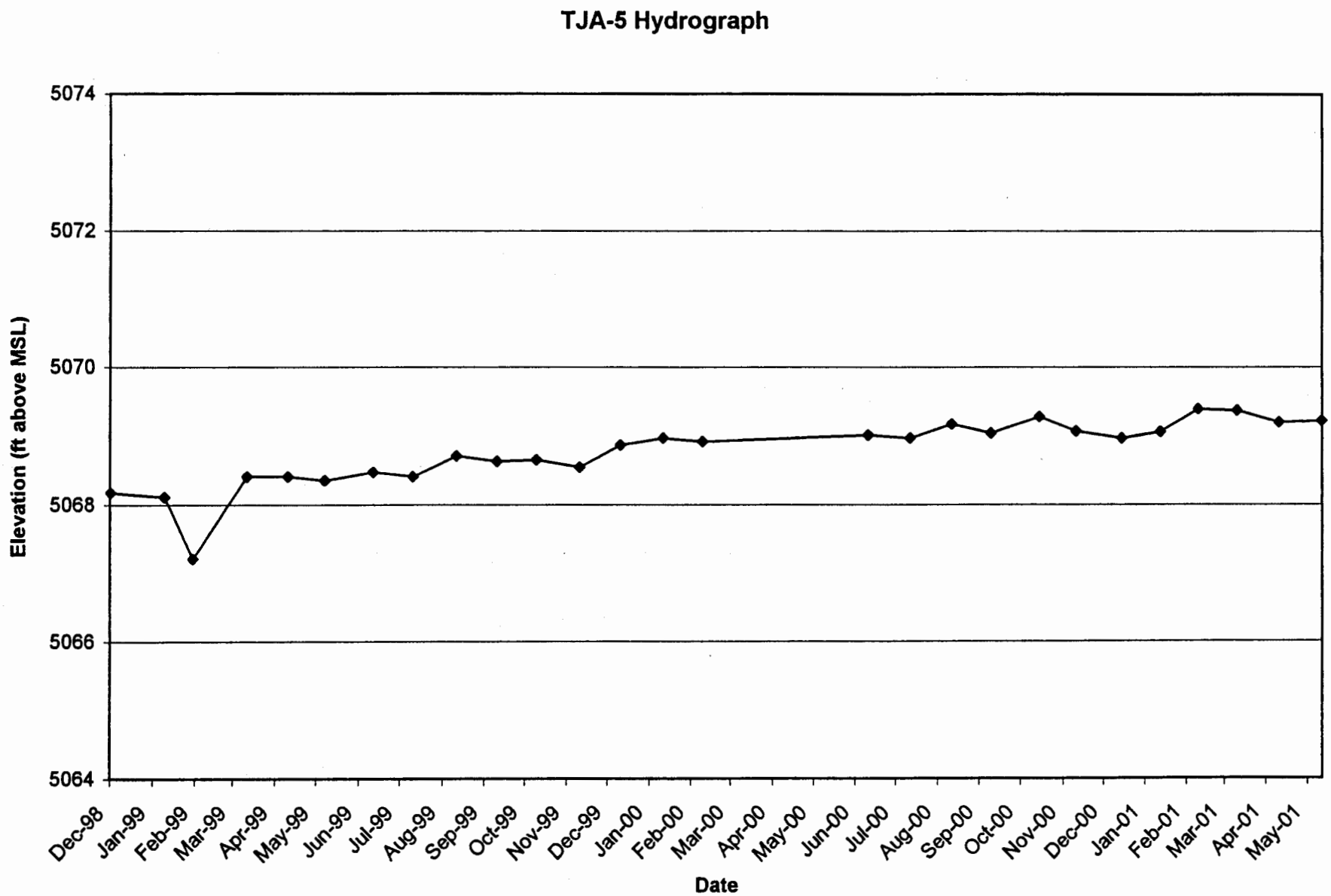
Mar-01
Apr-01
May-01
Date


TJA-5 Hydrograph
5074
5072
5070
5068
5066
5064
Elevation (ft above MSL)
Dec-98
Jan-99
Feb-99
Mar-99
Apr-99
May-99
Jun-99
Jul-99
Aug-99
Sep-99
Oct-99
Nov-99
Dec-99
Jan-00
Feb-00
Mar-00
Apr-00
May-00
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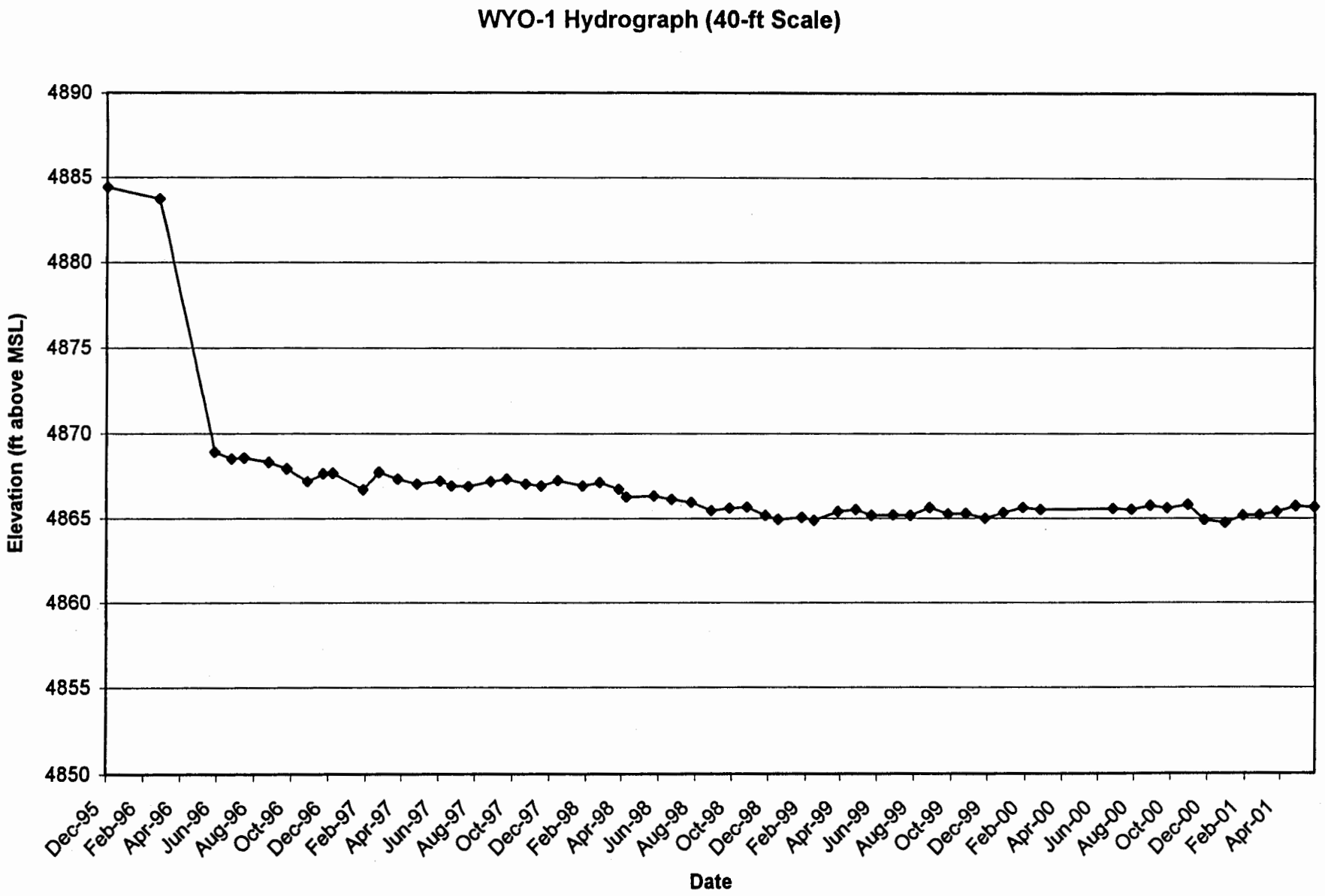
Mar-01
Apr-01
May-01
Date


WYO-1 Hydrograph (40-ft Scale)
Elevation (ft above MSL)
4890
4885
4880
4875
4870
4865
4860
4855
4850
Dec-95
Feb-96
Apr-96
Jun-96
Aug-96
Oct-96
Dec-96
Feb-97
Apr-97
Jun-97
Aug-97
Oct-97
Dec-97
Feb-98
Apr-98
Jun-98
Aug-98
Oct-98
Dec-98
Feb-99
Apr-99
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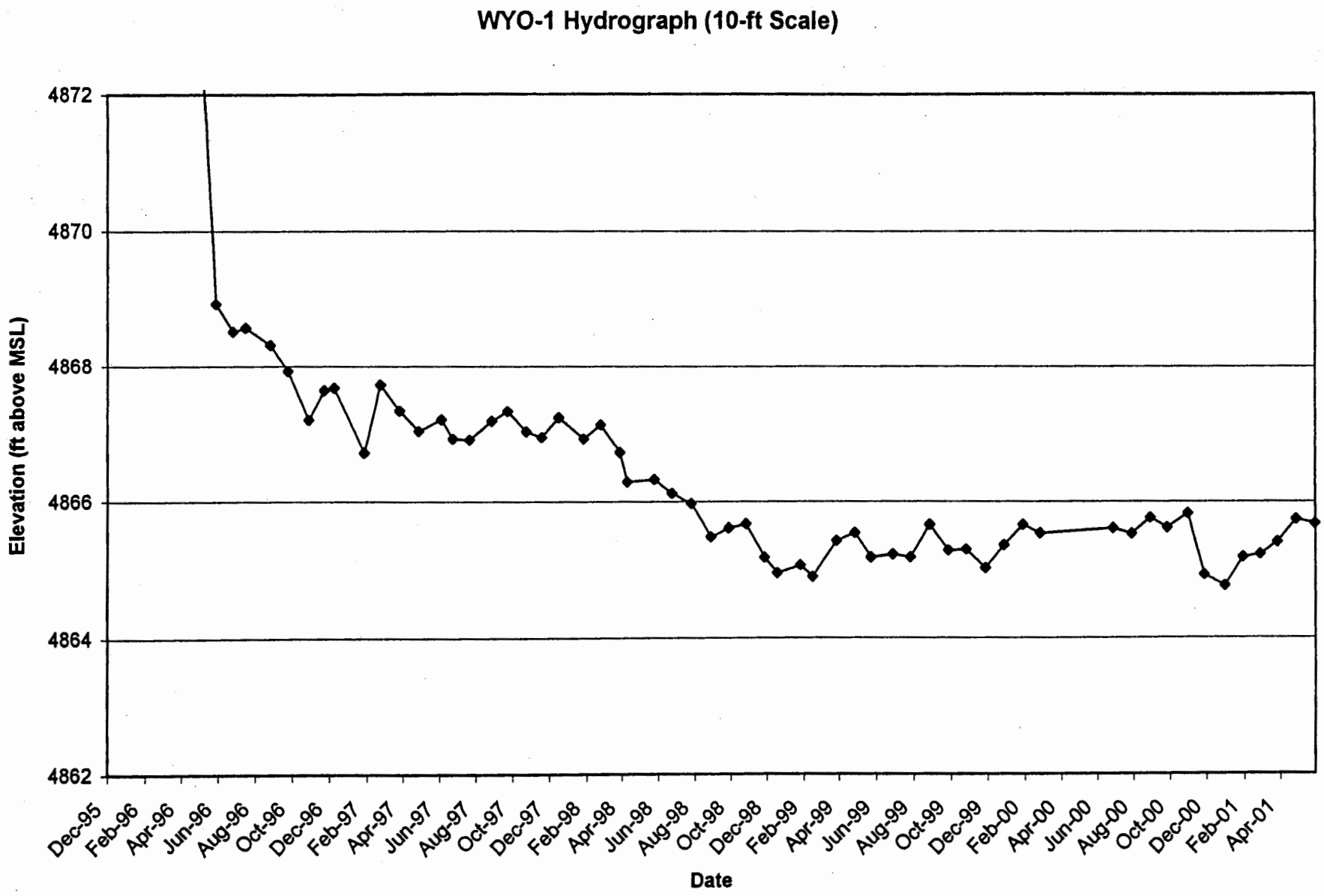
Dec-00
Feb-01
Apr-01
Date


WYO-1 Hydrograph (10-ft Scale)
Elevation (ft above MSL)
4872
4870
4868
4866
4864
4862
Dec-95
Feb-96
Apr-96
Jun-96
Aug-96
Oct-96
Dec-96
Feb-97
Apr-97
Jun-97
Aug-97
Oct-97
Dec-97
Feb-98
Apr-98
Jun-98
Aug-98
Oct-98
Dec-98
Feb-99
Apr-99
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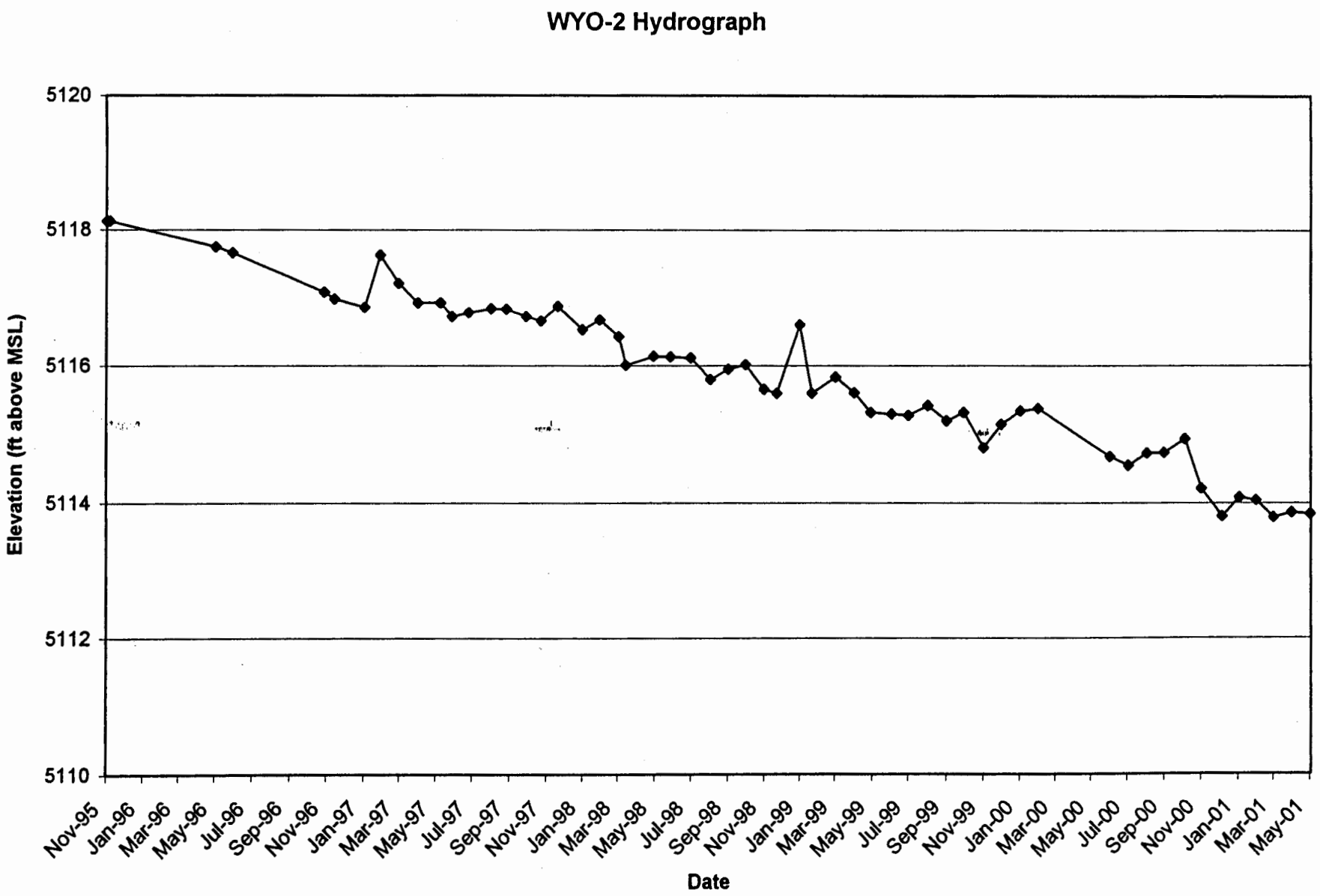
Dec-00
Feb-01
Apr-01
Date


WYO-2 Hydrograph
Elevation (ft above MSL)
5120
5118
5116
5114
5112
5110
Nov-95
Jan-96
Mar-96
May-96
Jul-96
Sep-96
Nov-96
Jan-97
Mar-97
May-97
Jul-97
Sep-97
Nov-97
Jan-98
Mar-98
May-98
Jul-98
Sep-98
Nov-98
Jan-99
Mar-99
May-99
Jul-99
Sep-99
Nov-99
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May-00
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Jan-01
Mar-01
May-01
Date

ANNEX C
Colloidal Borescope Investigation of the Sandia North Site
(AquaVISION July 1999)

Colloidal Borescope Investigation of the Sandia North Site
Albuquerque, New Mexico

Work performed under MDM Inc.
Contract # 12-0939B

July 21, 1999

Conducted by
AquaVISION
375 33 ½ Road
Palisade, CO 81526

AquaVISION
Groundwater Experts

INTRODUCTION

This report presents the results of the colloidal borescope investigation conducted by AquaVISION, May 25th through June 6th, 1999 at the Sandia National Laboratory in Albuquerque, New Mexico. The purpose of this investigation is to measure groundwater flow rates and directions in the perched aquifer underlying the Sandia North site.

The geology underlying the site consisted of interbedded alluvial gravels, sands and silts. There is a perched groundwater zone above the regional aquifer at an approximate depth of 300 feet below the land surface. The perched aquifer consisted of one or more saturated zones. Groundwater flow directions based on potentiometric surface maps indicate a general south to southeast flow direction. In the southern portion of the study area, groundwater flow is in a southeastern direction toward the Sandia Mountains. The groundwater recharge area that occurs along the mountain front, the topography that slope westward to the Rio Grande River, and the regional groundwater flow system that flows in a southern direction, suggest a more southern or western flow direction than indicated by the potentiometric surface.

Potentiometric surface maps are a commonly accepted hydrologic method for determining groundwater flow directions. However, under certain circumstances, potentiometric maps may provide misleading information. For instance, in aquifers comprised of several permeable zones, the degree of hydraulic interconnection between these permeable units may not be easily defined. Wells in the perched zone at Sandia North may or may not be completed in interconnecting hydraulic zones. Resulting potentiometric maps based on water-level data from separate hydraulic units may be misleading. Consequently, the colloidal borescope offers the opportunity to measure direct flow velocities at individual wells without relying on potentiometric maps to determine groundwater flow directions. Eighteen monitoring wells were tested at the site. Several zones were tested in each well until a reliable flow zone was encountered as indicated by steady horizontal flow for a

period exceeding two hours. Groundwater flow directions and rates were measured on a continuous basis during these two hour measurement intervals.

This report discusses the use of the colloidal borescope for locating groundwater flow zones and the results of the groundwater flow measurements in the perched aquifer at Sandia North performed under the direction of MDM Service Corporation and Foster Wheeler Environmental Corporation.

INSTRUMENT DESCRIPTION AND OPERATION

The colloidal borescope consists of a CCD (charged-couple device) camera, a flux-gate compass, an optical magnification lens, an illumination source, and stainless steel housing. The device is approximately 89 cm long and has a diameter of 44 mm, thus facilitating insertion into a 5-cm-diameter monitoring well. Upon insertion into a well, an electronic image magnified 140X is transmitted to the surface, where it is viewed and analyzed. The flux-gate compass is used to align the borescope in the well. As particles in the groundwater pass beneath the lens, the back lighting source illuminates the particles similar to a conventional microscope with a lighted stage. A video frame grabber digitizes individual video frames at intervals selected by the operator. A software package developed by AquaVISION compares the two digitized video frames, matches particles from the two images, and assigns pixel addresses to the particles. Using this information, the software program computes and records the average particle size, number of particles, speed, and direction. A Pentium based computer is capable of analyzing flow measurements every four seconds resulting in a large database after only a few minutes of observations. Since standard VHS video uses 30 frames per second, a particle that moves 1 mm across the field of view could be captured in subsequent frames 1/30 of a second apart. This would result in an upper measurement velocity range of 3 cm/s. For low flow conditions, the delay between frames can be set for large time periods resulting in a lower velocity range for stagnant flow conditions.

Flow velocities measured by the colloidal borescope were verified using a laminar flow chamber developed at the Desert Research Institute in Boulder City, Nevada. At a flow velocity in the laminar flow chamber of 0.10 cm/s, and verified by a tracer test, the colloidal borescope measured a comparable velocity value of 0.11 cm/s (Kearl, 1997).

Only zones that display consistent horizontal laminar flow in a steady direction over a substantial time period (greater than 2 h) should be considered. Swirling flow zones may be the result of adjacent low-permeable sediments, positive skin effects, vertical flow gradients, or nearby preferential flow zones that dominate flow in the observed zone. Measurements in swirling flow zones should be disregarded. However, if steady directional flow is observed, typical of a preferential flow zone, then reliable measurements are possible.

For the colloidal borescope to be an effective tool in characterizing groundwater flow velocity, it is necessary to differentiate and quantify aquifer heterogeneity, filter packs, and well skins influence on flow in a well bore. This is a difficult task because the hydraulic conductivity of the filter pack and surrounding formation may be unknown and/or the skin effects not easily quantified. However, following some basic assumptions and general guidelines, it is possible to select reliable data and estimate a range of groundwater velocities.

At field sites, observed well bore flow velocities exceed predicted velocities, even values that are adjusted based on α (conversion factor for predicting seepage velocity from well bore velocity) values. If theoretical work and laboratory results indicate that the borescope provides reliable flow measurements within a specified range, then this evidence would suggest that velocities in the well bore represent the maximum flow velocities in an aquifer. It would further suggest that the maximum velocity and not the average linear velocity over the entire screen length dominates flow in the well bore under ambient flow conditions. In no instances have velocity measurements using the colloidal borescope been less that values predicted by independent hydraulic information. Swirling, nondirectional flow zones may be representative of lower-permeable material within the permeable section of the aquifer or positive skin affects due to poor well construction

practice, but the flow velocity has been magnified by the transfer of momentum from the adjacent, higher-flow zones.

Based on the work presented in Kearl (1997), colloidal borescope measurements in the field should be reduced by a factor of 1 to 4 to calculate seepage velocity in the adjacent porous medium. For field comparison measurements presented in this paper, the borescope measurements represent the flow velocities in the preferential flow zones compared with average flow velocity measurement obtained by conventional methods. Consequently, the velocity values given in these figures should be reduced by a maximum factor of 4 to obtain the seepage velocity in the adjacent porous medium. It should be re-emphasized that the colloidal borescope measures the maximum velocity values in preferential flow zones in a heterogeneous aquifer.

The colloidal borescope has been used to develop the micropurge sampling methodology (Kearl et al., 1994) and to characterize flow in heterogeneous aquifer (Kearl and Roemer, 1998). In addition, the instrument has been used at numerous sites across the United States to evaluate groundwater flow conditions and the effectiveness of remediation treatment systems.

RESULTS OF FIELD MEASUREMENTS

Colloidal borescope observations were conducted on the following eighteen monitoring wells:

- TA1-W-06
- TA1-W-07
- WYO-2
- TA2-W-01
- TA2—SW1-320
- TA2-NW1-325
- TA1-W-03

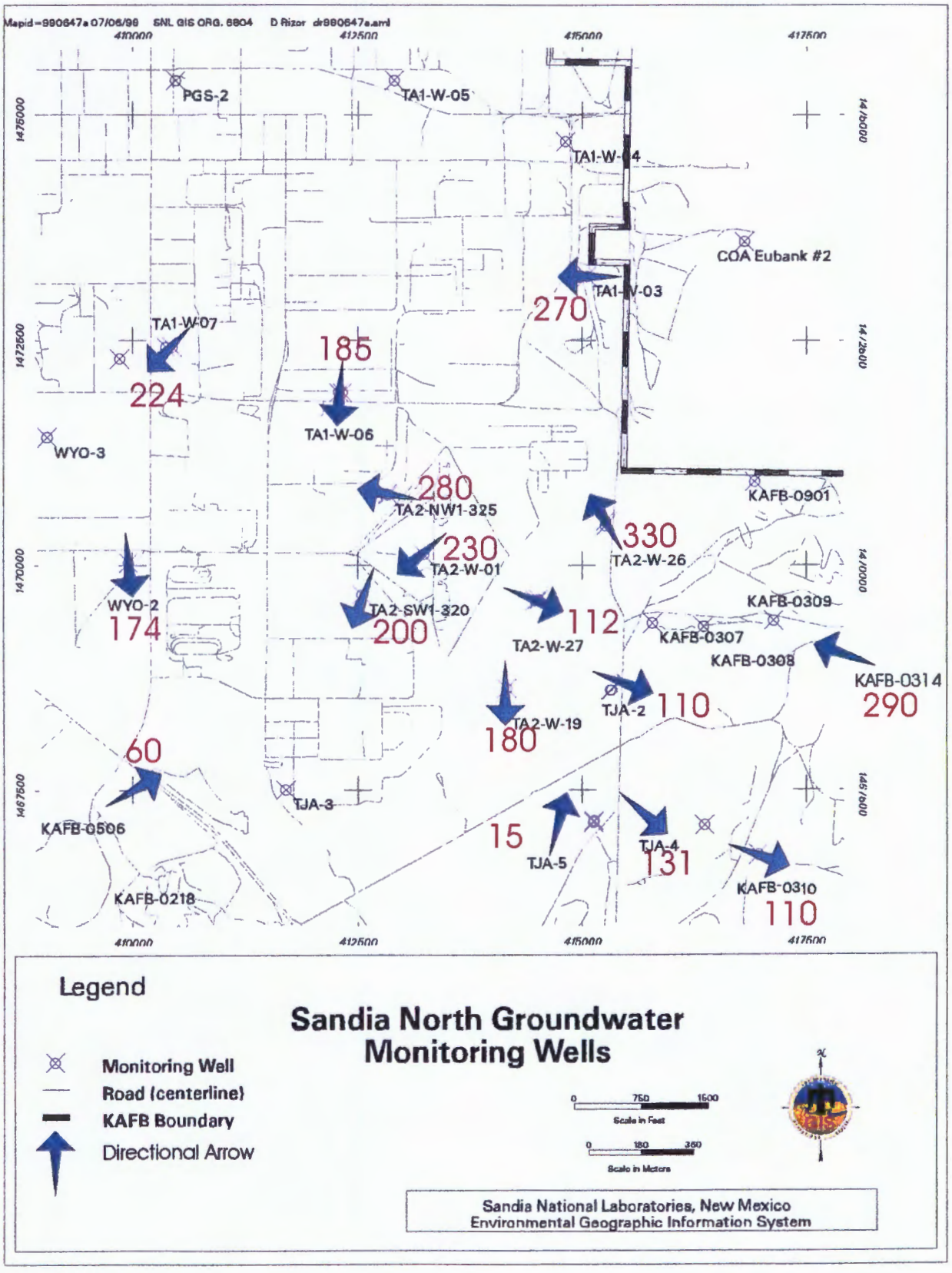
- TA2-W-26
- TA2-W-27
- TJA-2
- TJA-5
- TJA-4
- TA2-W-19
- KAFB-0310
- KAFB-0313
- KAFB-0314
- KAFB-0506
- KAFB-3391

COLLOIDAL BORESCOPE MEASUREMENTS

Results of the colloidal borescope directional measurements are illustrated in Figure 1. The arrows represent the average flow direction for selected test intervals where reliable horizontal flow was observed. The following section of the report discusses test results from the colloidal borescope measurements in the individual monitor wells. Actual velocity data from selected test intervals are presented in Appendix A.

Well TA1-W-06

Two reliable groundwater flow zones were measured in monitoring well TA1-W-06 at depths of 310.0 and 313.0 ft below ground level (BGL). The upper flow zone showed a moderate amount of cyclic variability with groundwater flow directions ranging from southeast to southwest. The average flow direction was approximately due south. Flow in the lower zone showed a southern flow direction that exhibited only minor variability. Flow velocities corrected for the influence of the well bore averaged 0.054 cm/s at an azimuth of 185 degrees from true north.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410000
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1467500
PGS-2
TA1-W-05
TA1-W-04
COA Eubank #2
TA1-W-03
270
TA1-W-07
185
224
TA1-W-06
WYO-3
280
TA2-NW1-325
KAFB-0901
330
TA2-W-26
230
TA2-W-01
WYO-2
174
TA2-SW1-320
200
112
TA2-W-27
KAFB-0309
KAFB-0307
KAFB-0308
KAFB-0314
290
TJA-2
110
TA2-W-19
180
60
TJA-3
KAFB-0506
15
TJA-5
TJA-4
131
KAFB-0310
110
KAFB-0218
Legend
Monitoring Well
Road (centerline)
KAFB Boundary
Directional Arrow
Sandia North Groundwater
Monitoring Wells
0 750 1500
Scale in Feet
0 180 360
Scale in Meters
Sandia National Laboratories, New Mexico
Environmental Geographic Information System

Well TA1-W-07

Two zones were tested in well TA1-W-07 with a reliable flow zone encountered at a depth of 282.0 ft below top of steel casing (BTOSC). Flow was in a south-southwest direction with a corrected flow rate of 0.038 cm/s. There were very few particles present in this zone, consistent with the coarse grain, low organic content of the aquifer.

Well WYO-2

Five intervals were tested in Well WYO-2 before a reliable zone was encountered at a depth of 229.0 ft BTOSC. Numerous particles were present in this zone that allowed nearly 3000 flow measurements during a three-hour test. Flow was in a southern direction at a velocity of 0.011 cm/s. There were only minor variations in the flow direction.

Well TA2-W-01

Eight zones were tested in well TA2-W-01 with a reliable flow zone detected at a depth of 322.0 ft BTOSC. Flow in this zone was in a southwest direction with minor directional variations. The corrected groundwater flow velocity was a steady 0.023 cm/s. There were a significant number of particles present in this well that allowed over 3500 particle matches during the two-hour test.

Well TA2-SW1-320

The test zone at 316.0 ft BTOSC yielded a reliable flow zone that was periodically disturbed by small pressure waves at approximately 12 minute intervals. Flow direction in this well was in a south-southwest direction with flow corrected groundwater flow velocity of 0.040 cm/s. The effects of the pressure waves that disturbed the steady

directional flow only lasted a minute or two, with steady flow quickly being re-established. The cause of these pressure waves is unclear. Possible site activities or seismic activity could be responsible.

Well TA2—NW1-325

A reliable groundwater flow zone was measured at a depth of 323.0 ft BTOSC in well TA2-NW1-325. The groundwater flow direction in the well is due west at a corrected flow rate 0.046 cm/s.

Well TA1-W-03

Ten zones were tested in well TA1-W-03 with only a marginal flow zone encountered at a depth of 341 ft. BTOSC. There is a large amount of variability at this depth as exhibited by the data graph in Appendix A. Both direction and flow rates vary considerably over the duration of the test. Groundwater flow direction is in a general westward direction, however, the reliability is marginal. Corrected flow rates average 0.060 cm/s. It appears that this well is in limited hydraulic connection with the surrounding aquifer.

Well TA2-W-26

Ten zones were tested in well TA2-W-26 with a reliable flow zone encountered at a depth of 296.0 ft BTOSC. Groundwater flow at this interval was in a northwest direction at an average rate of 0.045 cm/s. There was a moderate amount of variability in the flow direction.

Well TA2-W-27

Fourteen zones were tested in well TA2-W-27 along the entire length of the well screen. A large vertical component dominated the observed groundwater flow in the well at all of the test zones. This well is located adjacent to the northern edge of the arroyo. The large vertical component suggests that vertical movement is occurring in the perched zone in the vicinity of well TA2-W-27.

Two reliable flow zones were located in well TA2-W-27 that yielded flow in a southeast and south-southeast direction. The more consistent zone was at a depth of 297.0 ft BTOSC and exhibited a corrected groundwater flow velocity of 0.046 cm/s.

TJA-2

Three reliable flow zones were tested in well TJA-2. All three zones yielded consistent a southeast flow direction at an average corrected groundwater velocity of 0.038 cm/s.

TJA-5

Several zones tested in well TJA-5 yielded an unexpected northern groundwater flow direction. The results of measurements conducted at a depth of 289.0 ft BTOSC showed a consistent groundwater flow direction approximately N15E directly towards well TJA-4 at a corrected groundwater flow velocity 0.048 cm/s. There is a large downward vertical gradient based on water-level measurements between wells TJA-5 and TJA-4. This northern flow direction in well TJA-5 may indicate that the TJA-4 well completion is leaking or there is a natural "hole" in the upper perched aquifer in the vicinity of well TJA-4. This latter scenario may explain the existence of the deeper perched zones where well TJA-4 is screened.

TJA-4

This well is completed in a deeper perched zone than the majority of wells tested at Sandia. The groundwater flow is in a southeast direction with a minor amount of variability. The corrected groundwater flow velocity for the flow zone tested at 375.0 ft BTOSC is 0.034 cm/s.

Well TA2-W-19

Eight zones were tested in well TA2-W-19 with a reliable zone encountered at a depth of 271.0 ft BTOSC. The groundwater flow direction at this depth was approximately due south with a moderate amount of variability. The directional variability is believed to be due to high gusty winds that caused pressure fluctuations in the well casing. These pressure fluctuations, however, did not impact the actual flow directions other than increase the direction and rate variability. The corrected groundwater flow velocity for the test interval is 0.0027 cm/s.

Well KAFB-0310

Eight zones were tested in well KAFB-0310 that is completed in the lower portion of the perched aquifer similar to well TJA-4. There was a large amount of debris in the well, however, a reliable flow zone was observed at a depth of 413.0 ft BTOSC. The groundwater flow direction was east-southeast, similar to well TJA-4. The corrected groundwater flow velocity of 0.119 cm/s was the highest measured velocity in the wells tested during this investigation.

Well KAFB-0313

Four test zones in this well showed a general western groundwater flow direction. The test interval at a depth of 353.0 ft BTOSC showed a consistent west-southwest flow direction at a corrected groundwater flow velocity of 0.042 cm/s.

Well KAFB-0314

Eight zones were tested in well KAFB-0314 with a reliable flow zone encountered at a depth of 432.0 ft BTOSC. Groundwater flow is in a west-northwest direction at a corrected groundwater velocity of 0.048 cm/s.

Well KAFB-0506

This well is located on the eastern edge of the WP-26 sewage lagoon. Groundwater flow in this well is east-northeast or away from the lagoon. This flow direction suggests that leakage from the lagoons has mounded in the perched zone and is the hydraulic force for the groundwater flow direction observed in well KAFB-0506. The corrected groundwater flow velocity is 0.028 cm/s.

Well KAFB-3391

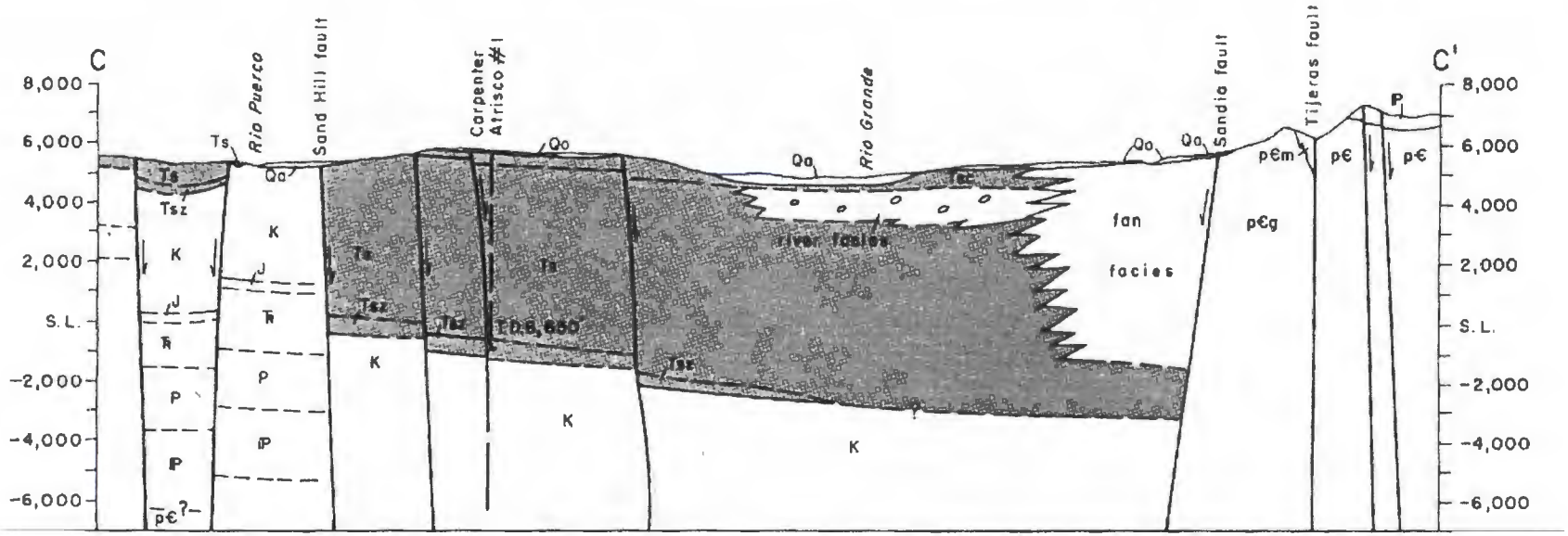
Sixteen zones were tested in well KAFB-3391 at one-foot intervals over the majority of the twenty feet of well screen. No distinct flow zones were detected in this well. Flow was typically swirling at low velocities. According to site personnel, this well was completed in a low permeable unit that is typical for the site. Colloidal borescope observations indicate that the well is not in good hydraulic communication with the surrounding porous media, suggesting that the well is completed in low permeable

material that is restricting hydraulic communication. Consequently, reliable measurements of groundwater flow rate and direction were not obtained in this well.

DISCUSSION AND CONCLUSIONS

The hydrogeology of the perched aquifer underlying Sandia North is complex in lithology, structure, and hydraulic properties. Results of the colloidal borescope investigation reflect these complexities. As previously noted, the colloidal borescope provides a point measurement of groundwater in a preferential flow zone in the immediate vicinity of the test well. Consequently, variability in the site hydrogeology will be reflected in the colloidal borescope measurements which is evident from the test results. Several prominent flow directions were measured during the field study. These various flow directions need to be compared with the existing information and the site hydrology in order to obtain a comprehensive understanding of groundwater flow conditions at the site.

Kelly (1977) presents a geologic cross section of the Sandia North site as illustrated in Figure 2. The geology is comprised of the Santa Fe Formation interbedded with alluvial fan deposits emanating from the Sandia Mountains and alluvial deposits associated with the historic Rio Grande River. In addition to the depositional complexity, faulting has occurred in the area further increasing the complexity of the hydrogeology. Kelly and Northrop (1975) point out that the upper beds of the Santa Fe Formation in the Tijeras Arroyo dip eastward towards the Sandia Mountains at 0.5 to 1.5 degrees due to basin faulting associated with subsidence. Downward rotation of the basin fault block or graben toward the more strongly uplifted eastern side of the alluvial deposits has resulted in significant accumulations of alluvial fan deposits along the Sandia uplift. This downward rotation toward the more strongly uplifted eastern side may have accompanied much of the basin subsidence creating what has been termed a vortex monocline (Kelly and Northrop, 1975). The net result is eastward dipping sediments in the Sandia North area that exert an influence on groundwater flow, particularly on the perched system.



From: Memoir 33; New Mexico Institute of Mining & Technology, 1977.

The final influence on groundwater flow in the perched system is the location of recharge areas. For the perched system, recharge is believed to occur along the mountain front faults. In addition, there is a large unlined sewage lagoon that is also believed to contributed water to the perched zone. Leaking underground water lines may also be a possible source of recharge to the perched system. The source and quantity of recharge further complicates groundwater flow in the perched system.

The majority of the test wells yielded reliable flow zones with groundwater flow velocities that ranged from 0.011 to 0.119 cm/s. Once again, these flow velocities represent preferential flow zones in the aquifer and are usually as much as an order of magnitude higher than groundwater velocities based on conventional methodologies that average groundwater flow for the entire aquifer.

Results of the Sandia North colloidal borescope investigation of the perched groundwater system yielded three distinct groups of wells that showed similar characteristics. The majority of wells show a southern groundwater flow direction that ranges from southwest to southeast. In the area north of the arroyo, groundwater flow directions were from south to west-southwest for the wells tested using the colloidal borescope. Several wells (TA2-W-27, TJA-2, KAFB-0310, and TJA-4) located at the southeastern portion of the study site showed a southeastern flow direction consistent with the basin faulting and the potentiometric surface.

Several wells showed a strong western flow component that did not agree with the potentiometric surface. With the exception of well TA2-NW1-325, these wells (TA1-W-03, TA2-W-26, and KAFB-0314) were general located along the western margin of the study site. The western flow directions based on colloidal borescope measurements are consistent with the surface topography, the depositional environment, and the recharge/discharge areas that suggest a western flow direction. The presence of this western flow component suggests the possibility that these wells are completed in the

alluvial fan deposits discussed in Kelly (1977). If these wells are completed in the alluvial fan deposits, then it is reasonable to assume that groundwater flow will be controlled by recharge along the mountain front resulting in a strong westward groundwater flow component.

There appears to be a distinct difference in flow characteristics for the wells located north of the Tijeras Arroyo compared with wells south of the arroyo. The wells north of the arroyo generally show southern to western flow directions compared to the wells south of the arroyo that show a stronger eastern flow component. This difference suggests that basin fault blocks that dip eastward are exerting a larger hydrologic influence south of the arroyo. Wells KAFB-0313 and KAFB-0314, located south of the arroyo, do not follow this trend and exhibit a strong westward flow component. Wells KAFB-0310 and KAFB-0313 are located in the same general area but are completed at significantly different depths. Well KAFB-0310 is completed in a perched zone nearly 100 ft. below KAFB-0313. The different hydrologic units encountered by these wells may explain the difference in groundwater flow directions. Well TJA-4, believed to be completed in the same unit as KAFB-0310, shows a similar southeastern flow direction. The variance in groundwater flow directions in wells south of the arroyo may be explained by a combination of lithologic and structural influences.

Two tests wells showed anomalous behavior compared to the other wells tested. Well KAFB-0506 is located on the eastern side of the abandoned sewage lagoons and yielded a groundwater flow direction to the east-northeast. This flow direction suggests that the lagoon has leaked resulting in a groundwater mound that is moving radially from beneath the lagoon. The other anomalous well, TJA-5, exhibited groundwater flow in north-northeast direction, directly toward the nearby well TJA-4. This flow direction suggests that a vertical conduit from the upper perched zone to the lower perched zone exists north of well TJA-5. Whether the well casing of well TJA-4 is leaking or there is a natural vertical pathway between the two perched zones is unclear. The large vertical component

of groundwater flow observed using the colloidal borescope in well TJA-5 and the large downward hydraulic potential based on the water level differences between these two wells supports a vertical pathway in this area. Based our understanding, the lower perched zone present in the area of TJA-4 and TJA-5 is not present north of this area.

In summary, 17 of the 18 wells tested yielded reliable flow zones. Although the flow in these zones was dominantly horizontal, most of the flow observed using the colloidal borescope contained a significant vertical component suggesting some downward movement of groundwater from the perched zone. Most of the groundwater flow was in a southern direction with several wells exhibiting a strong western flow component. The variability in groundwater flow directions is believed to be due to variations in lithology due to a highly heterogeneous system, structural control resulting from basin faulting, and the location of recharge/discharge areas.

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Kearl, P.M. 1997. Observations of particle movement in a monitoring well using the colloidal borescope. Journal of Hydrology, 200, 323-344.

Kearl, P.M. and K. Roemer. 1998. Evaluation of groundwater flow directions in a heterogeneous aquifer using the colloidal borescope. Advances in Environmental Research, 2 (1), 12-23.

Kelly, V. C. 1977. Geology of the Albuquerque Basin. New Mexico. New Mexico Bureau of Mines and Mineral Resources, Memoir 33, Socorro.

Kelly, V. C., and S. A. Northrop. 1975. Geology of Sandia Mountains and Vicinity, New Mexico. New Mexico Bureau of Mines and Mineral Resources, Memoir 29, Socorro.

Appendix A: Groundwater flow velocity graphs for selected test intervals.

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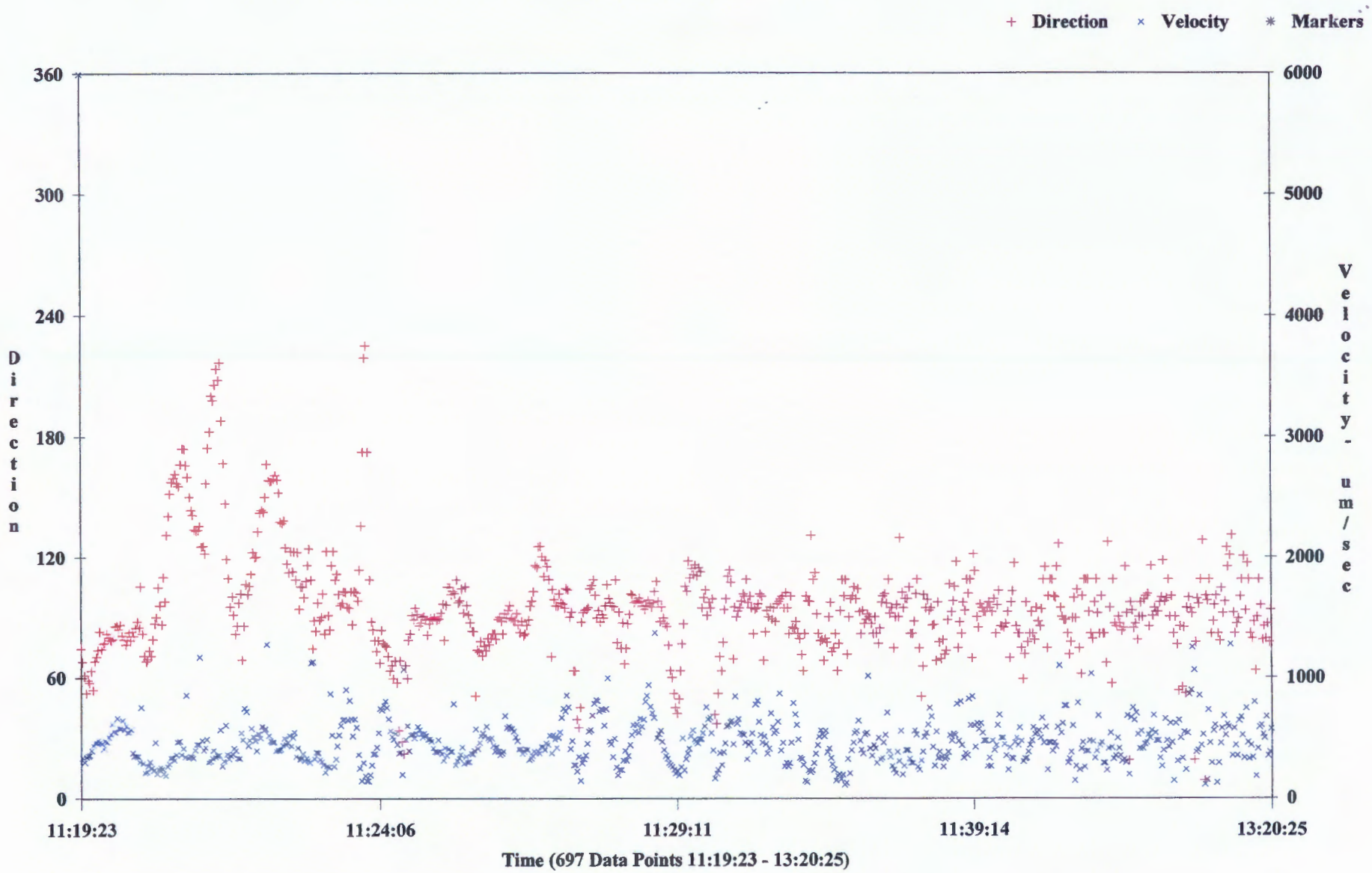

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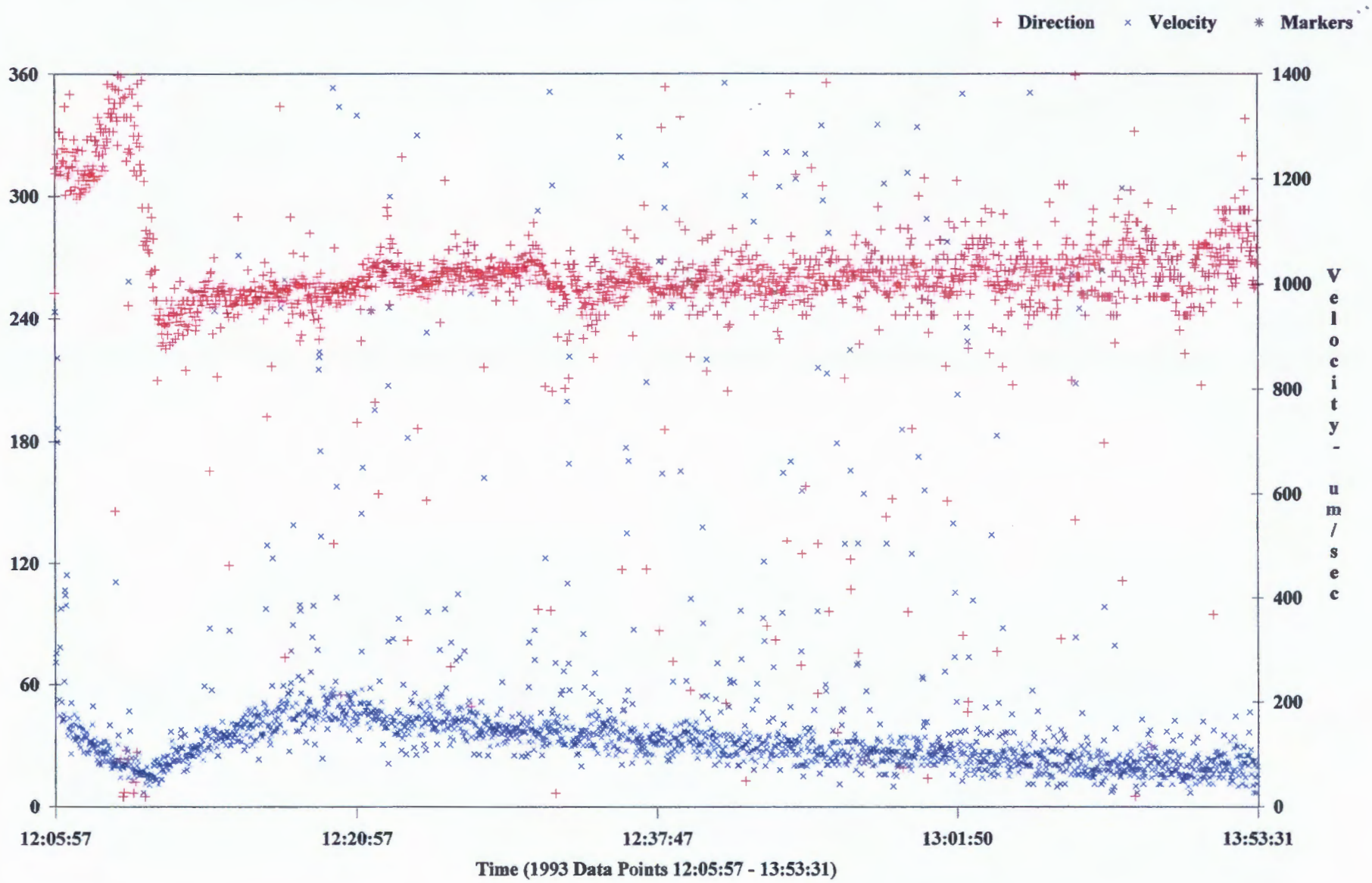

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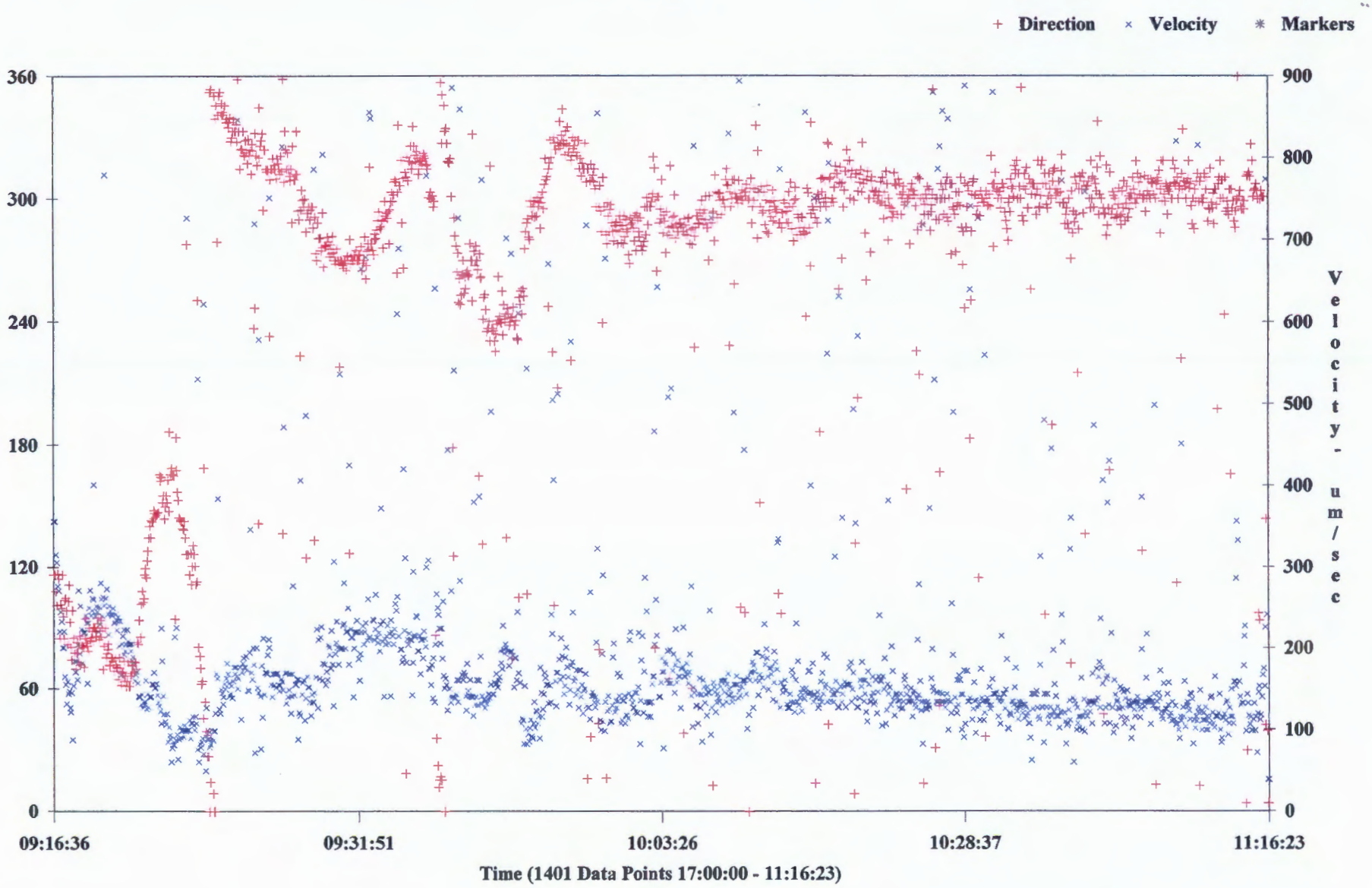

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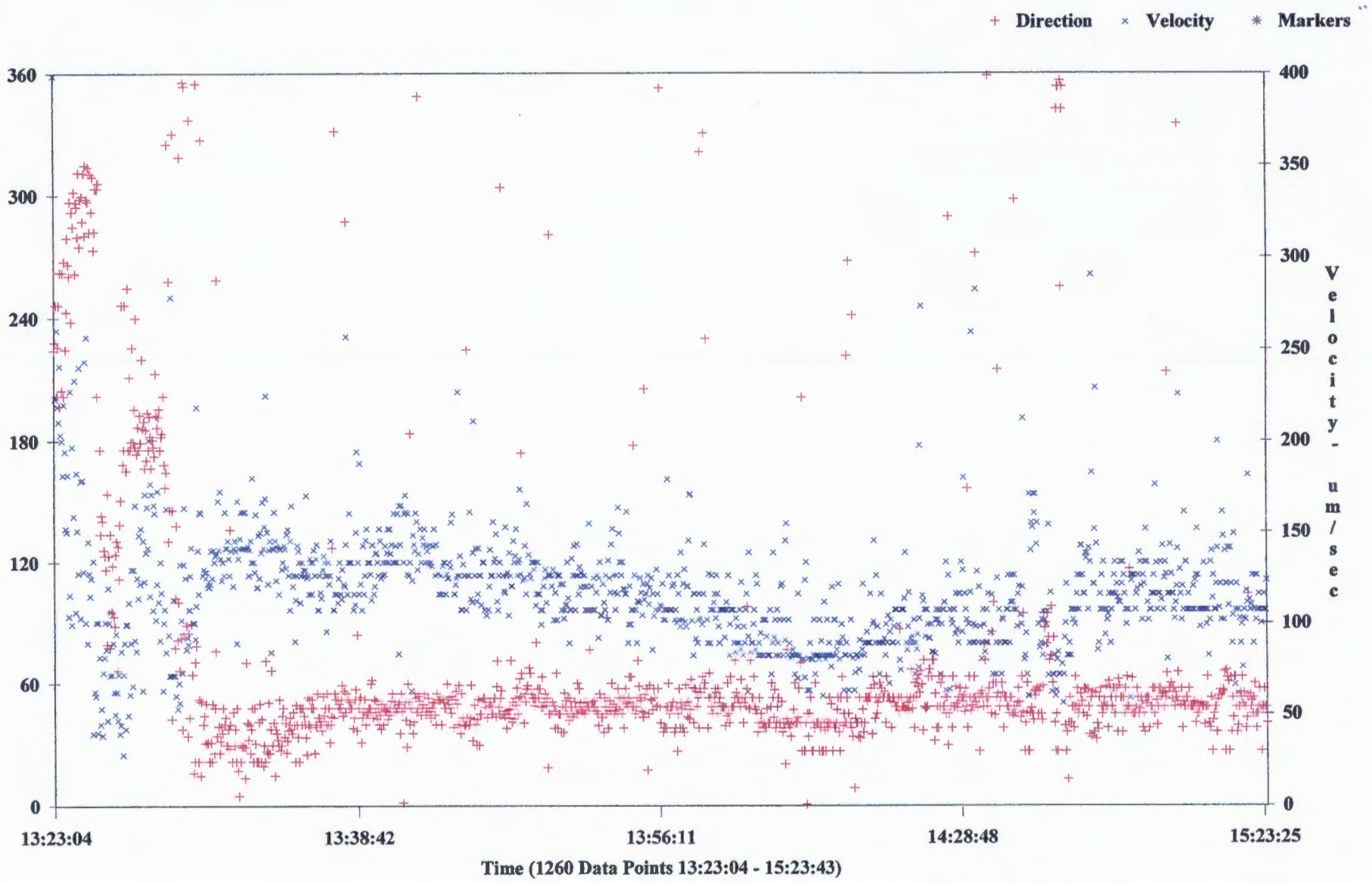

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T A1-W-07-2
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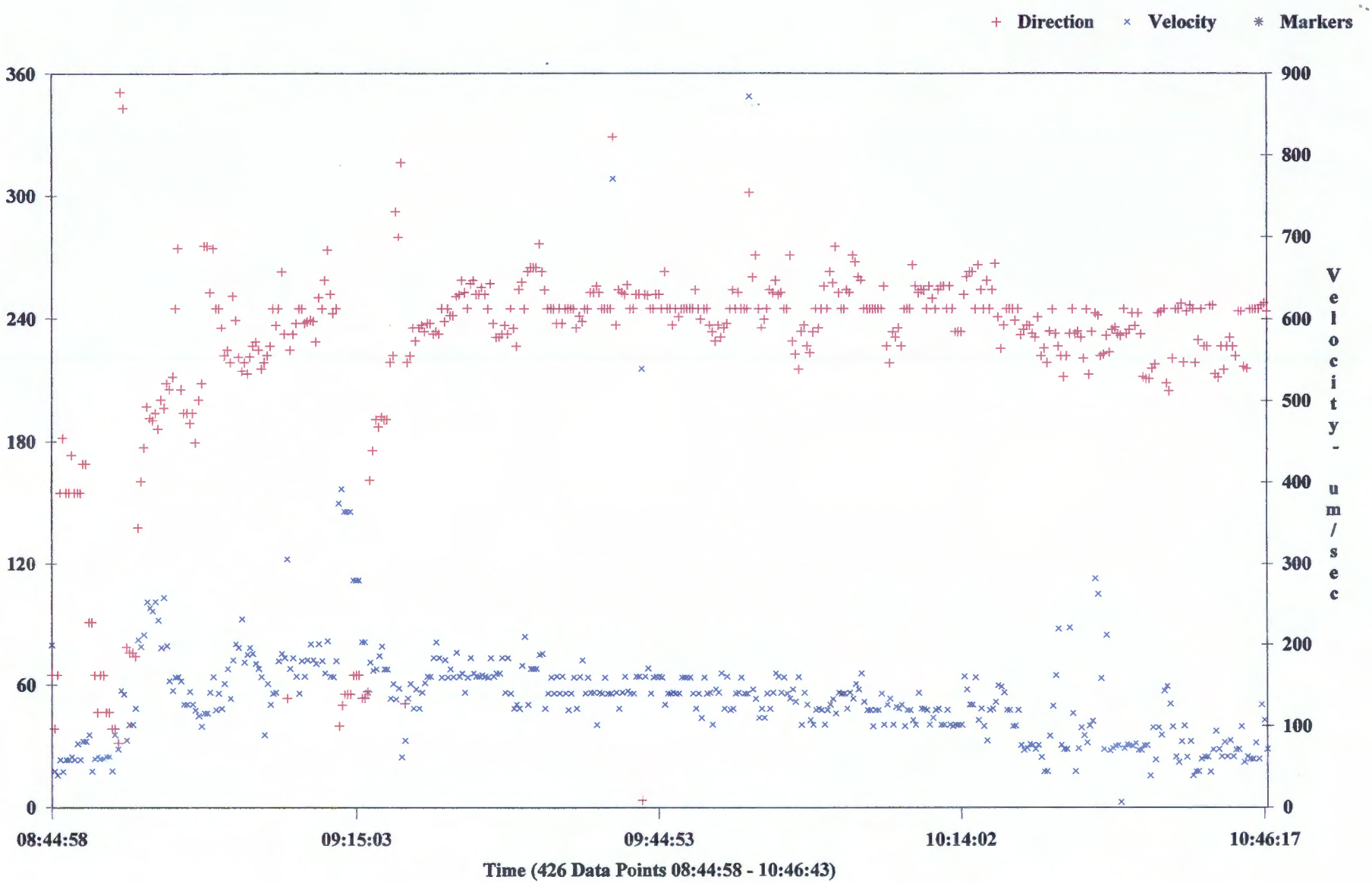

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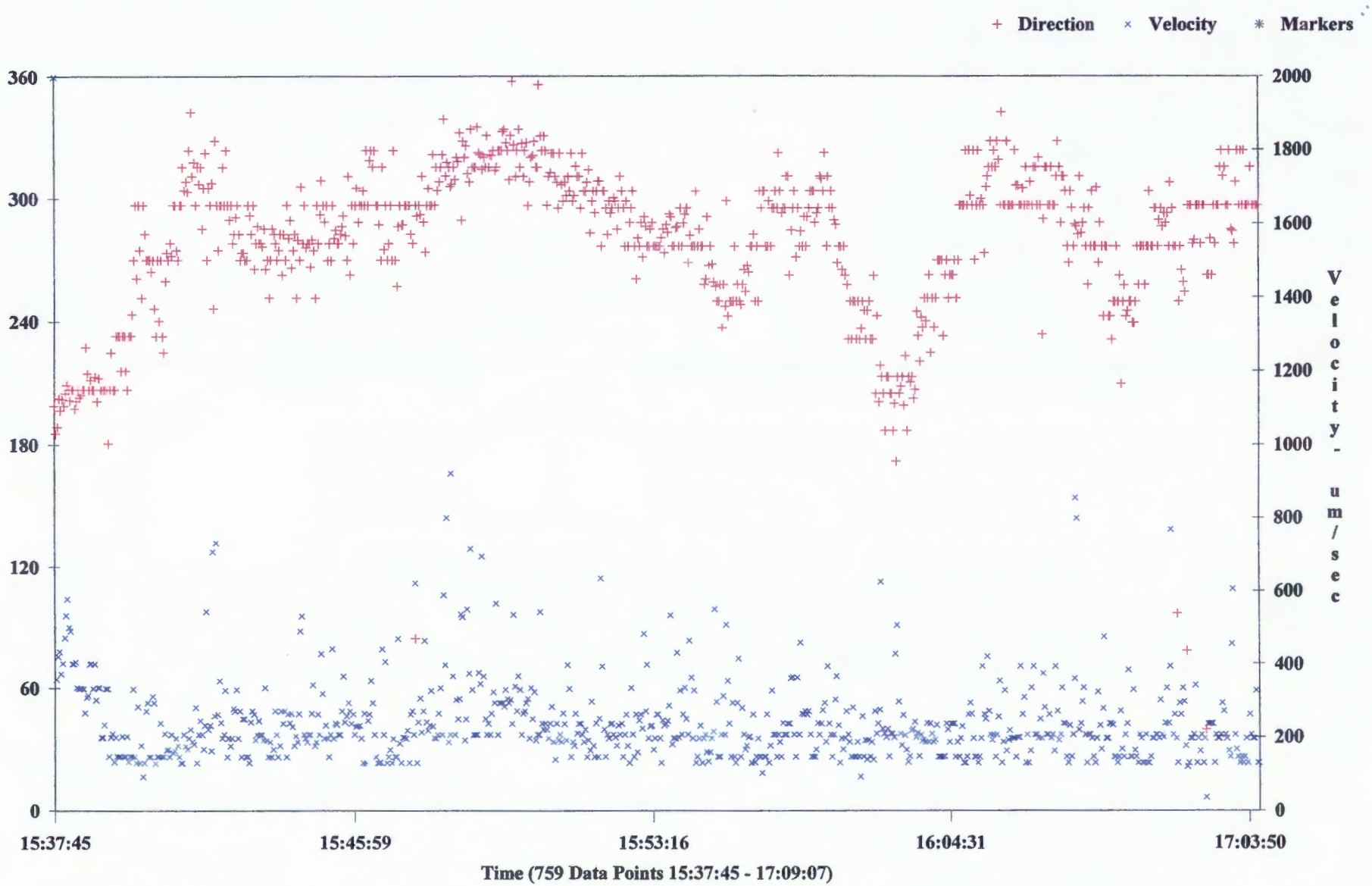

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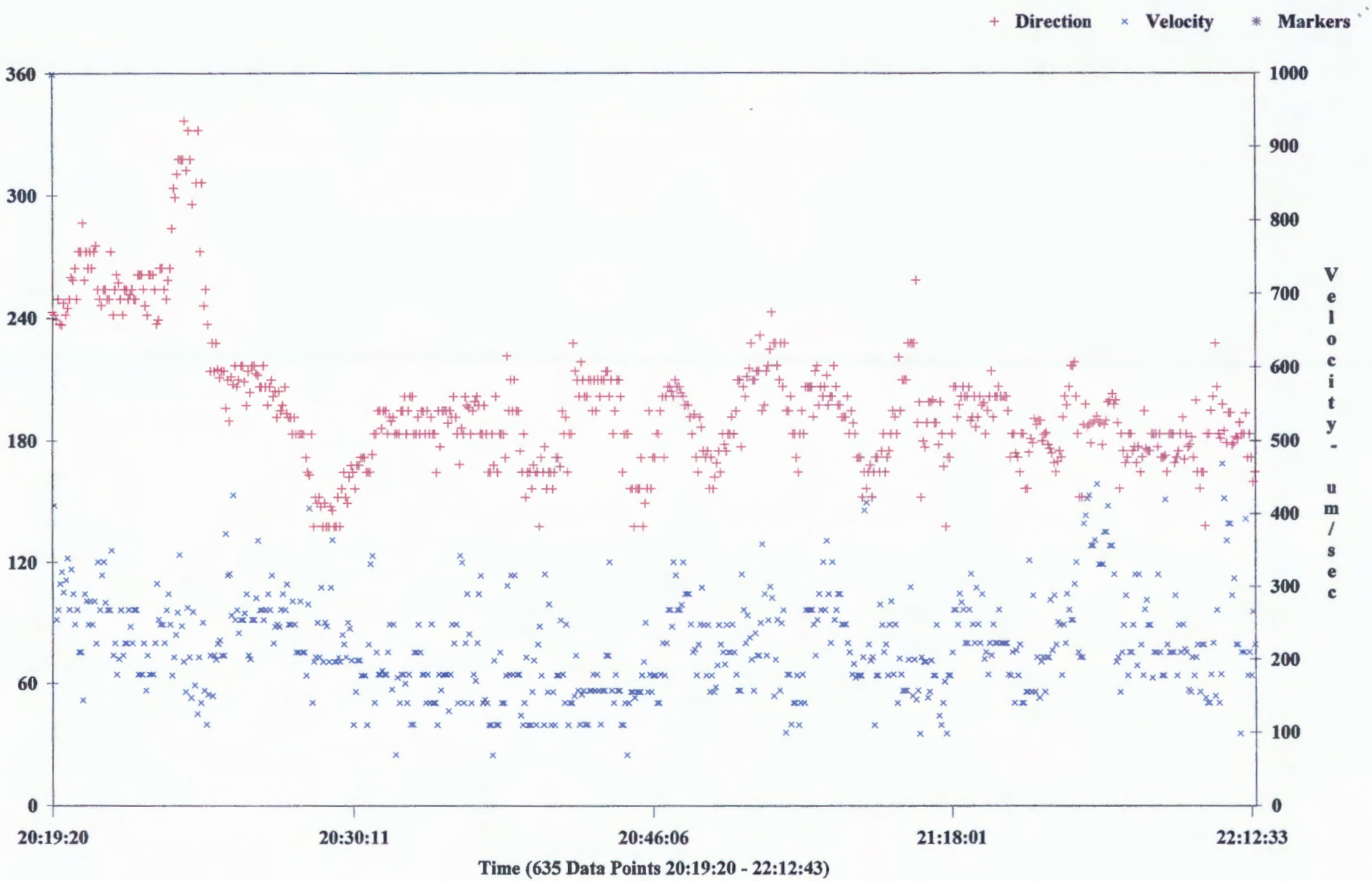

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TA2-W-01-8
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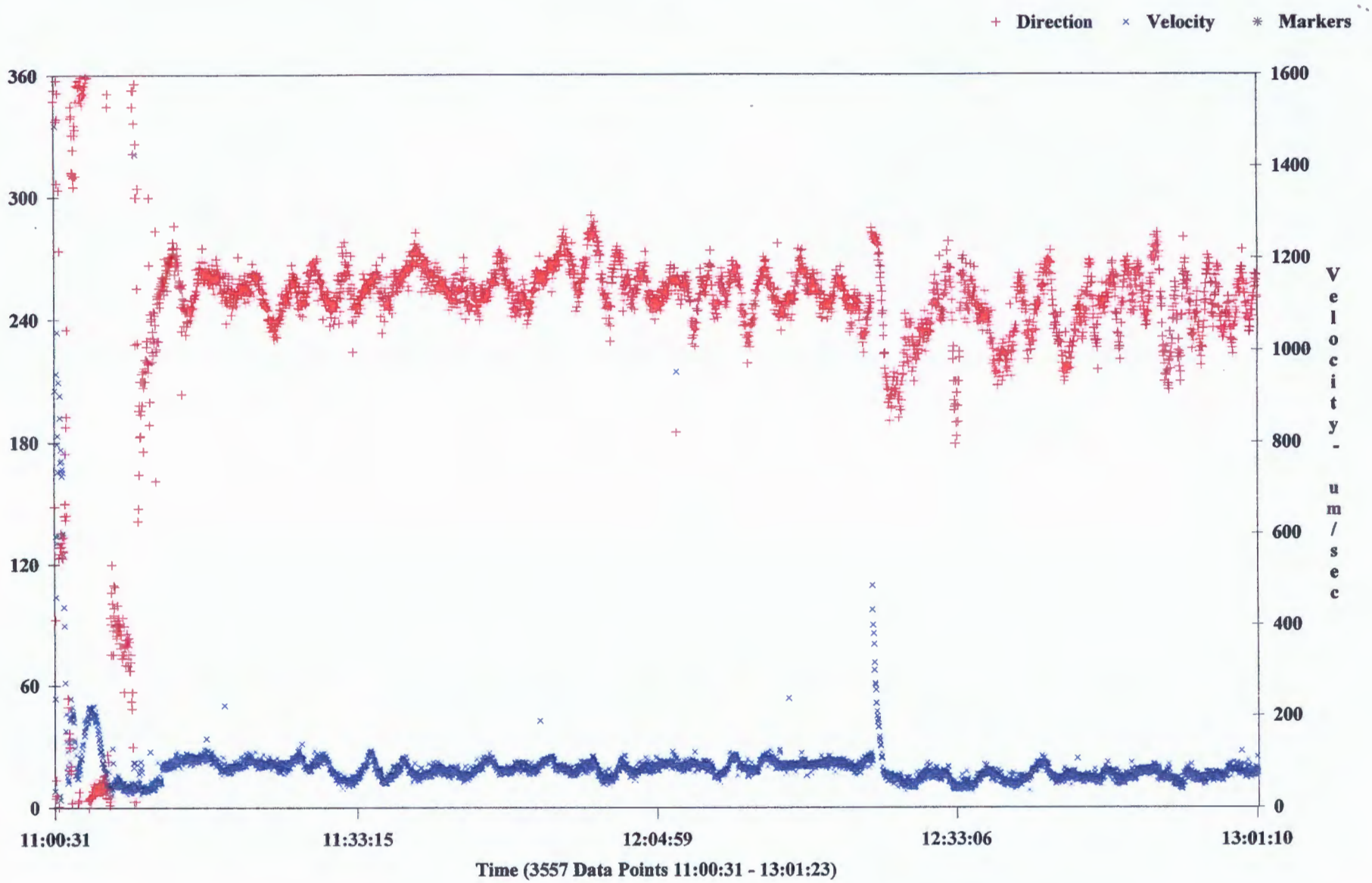

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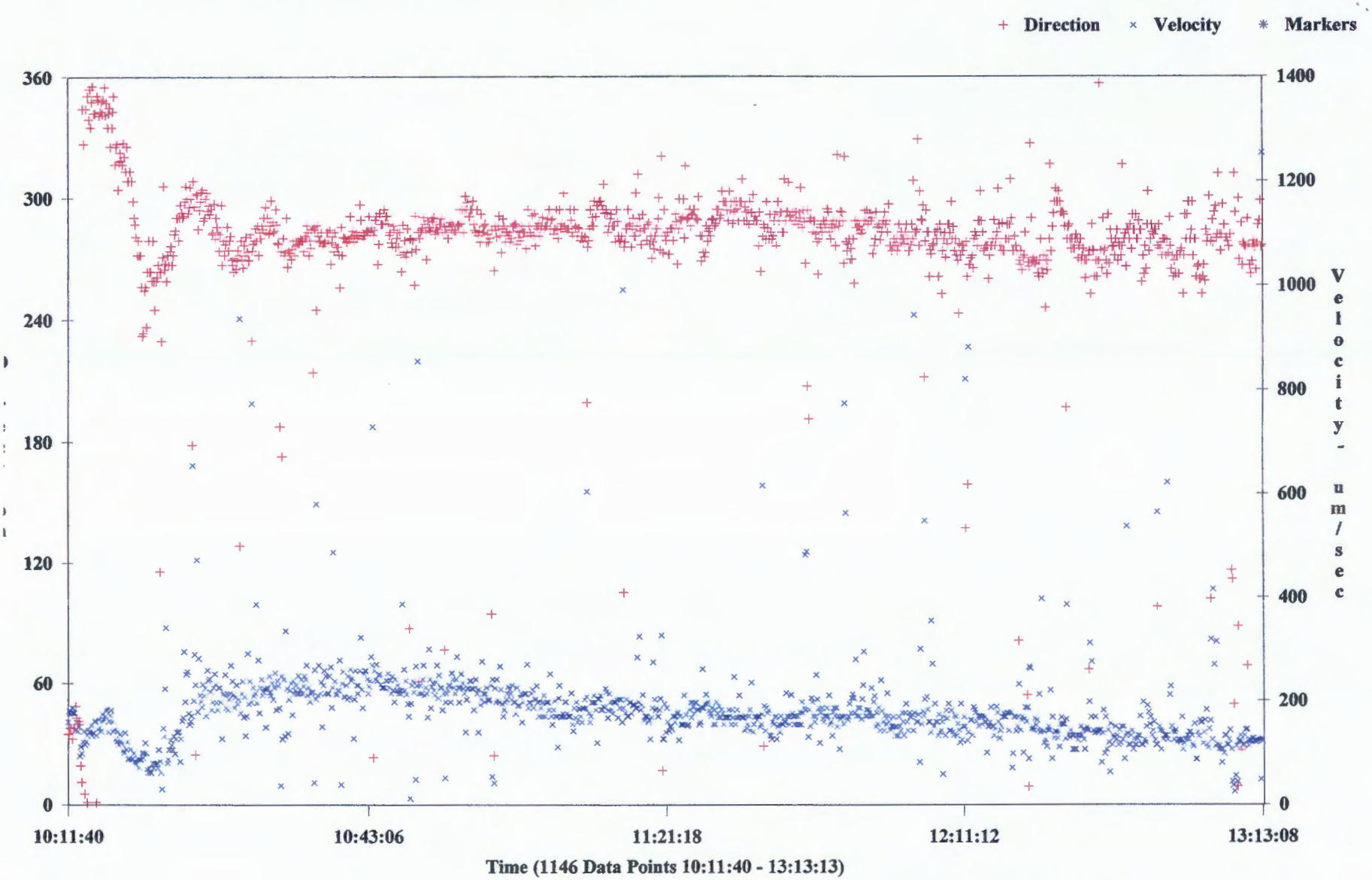

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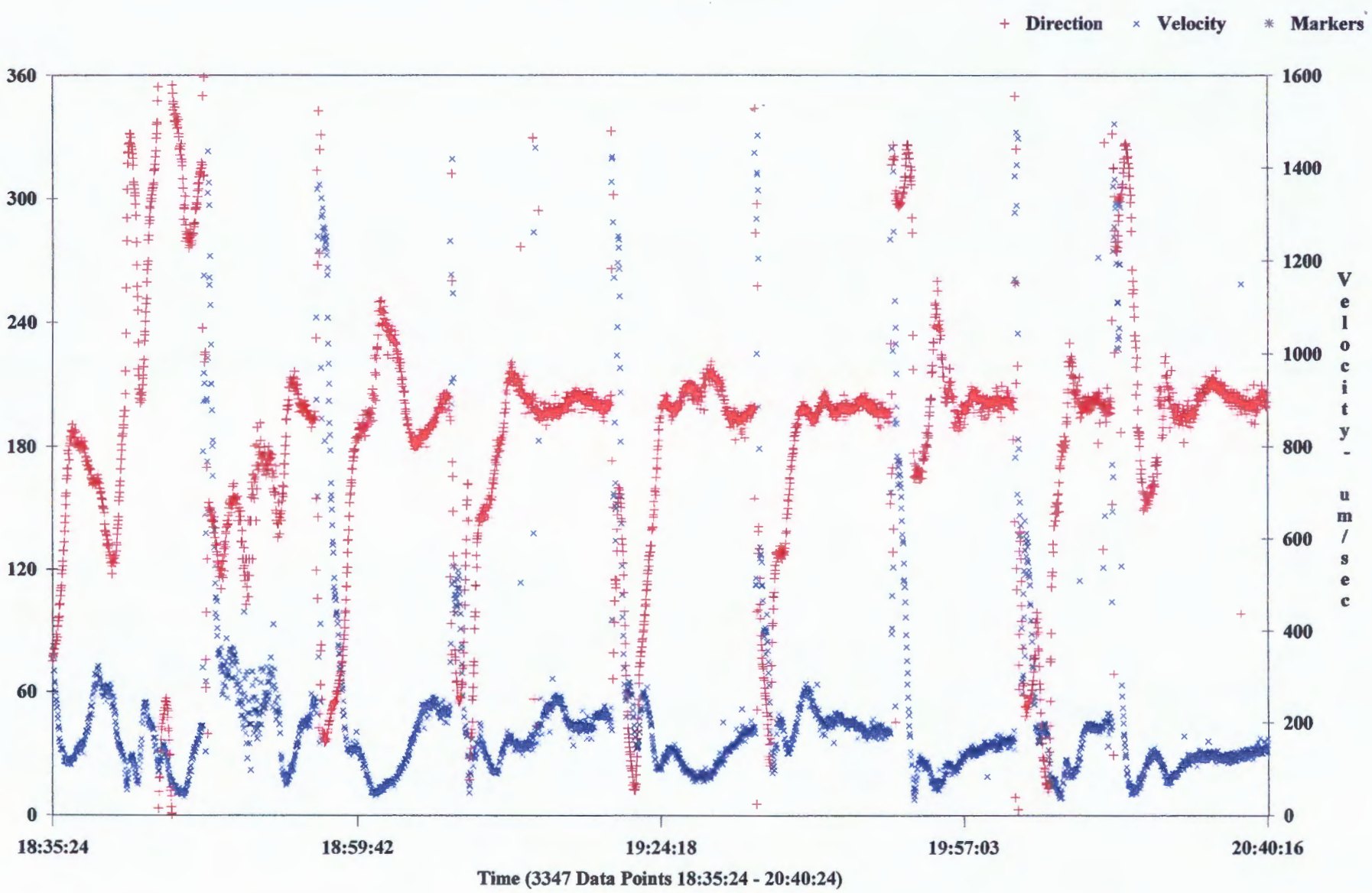

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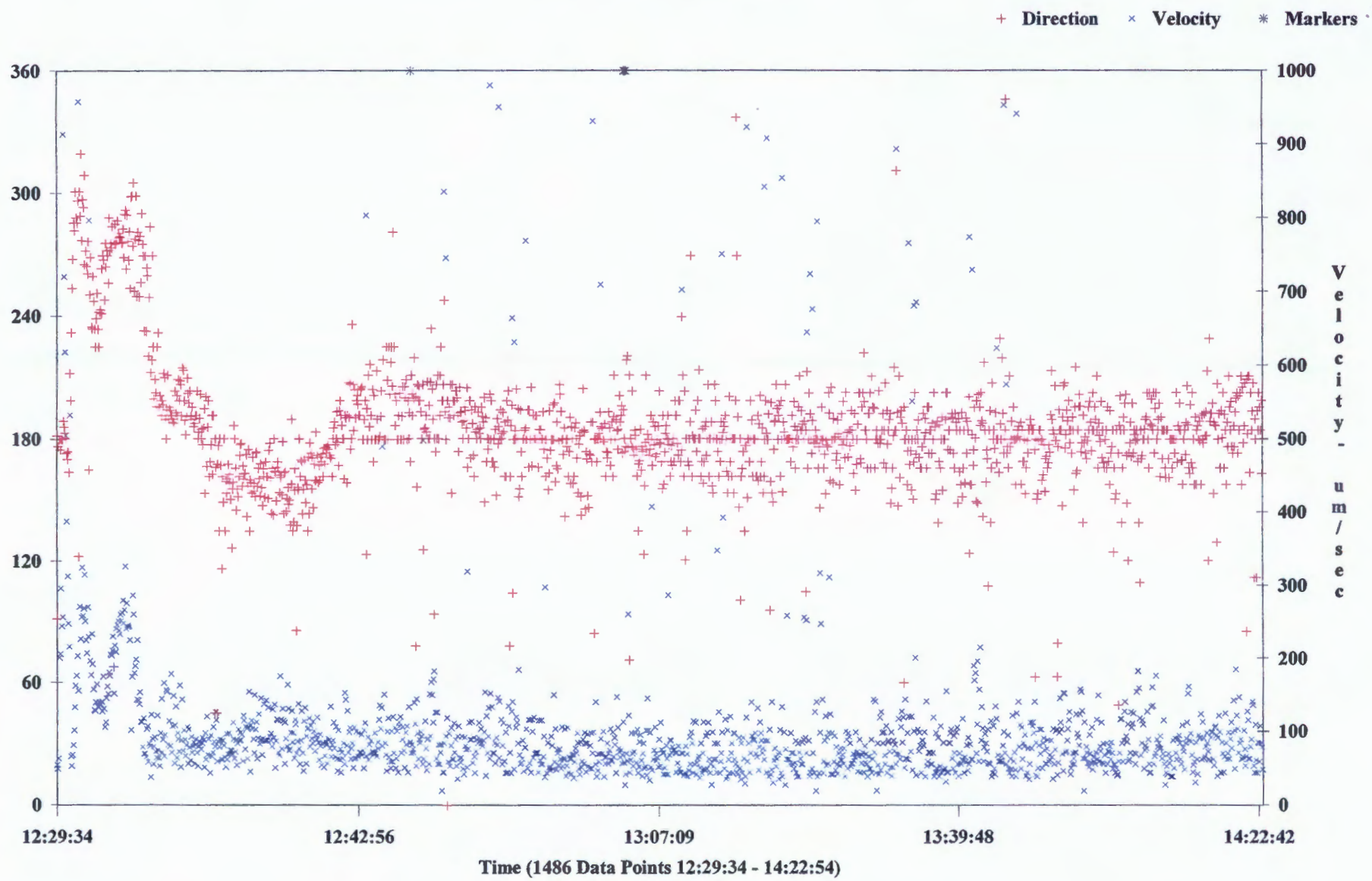

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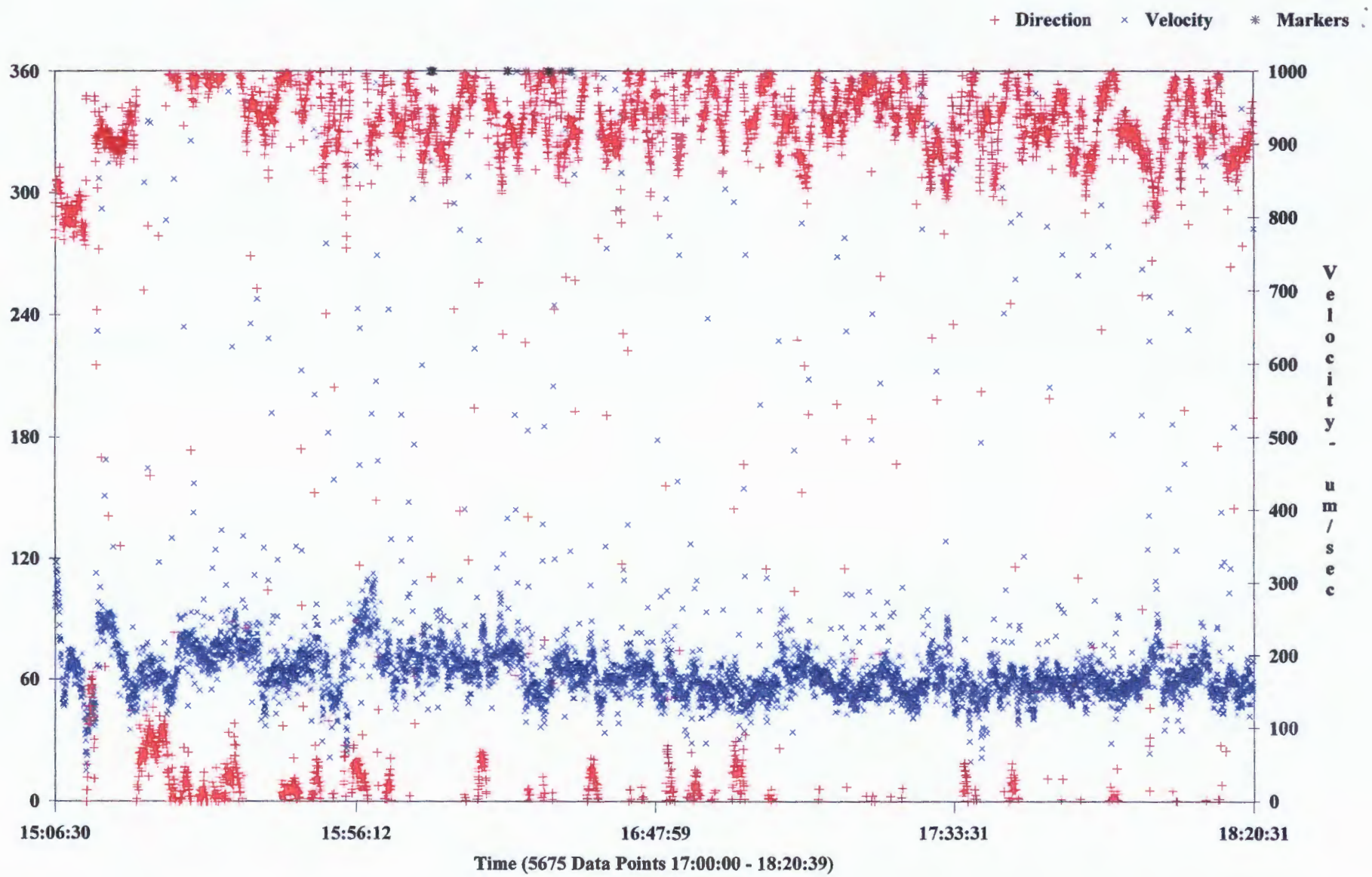

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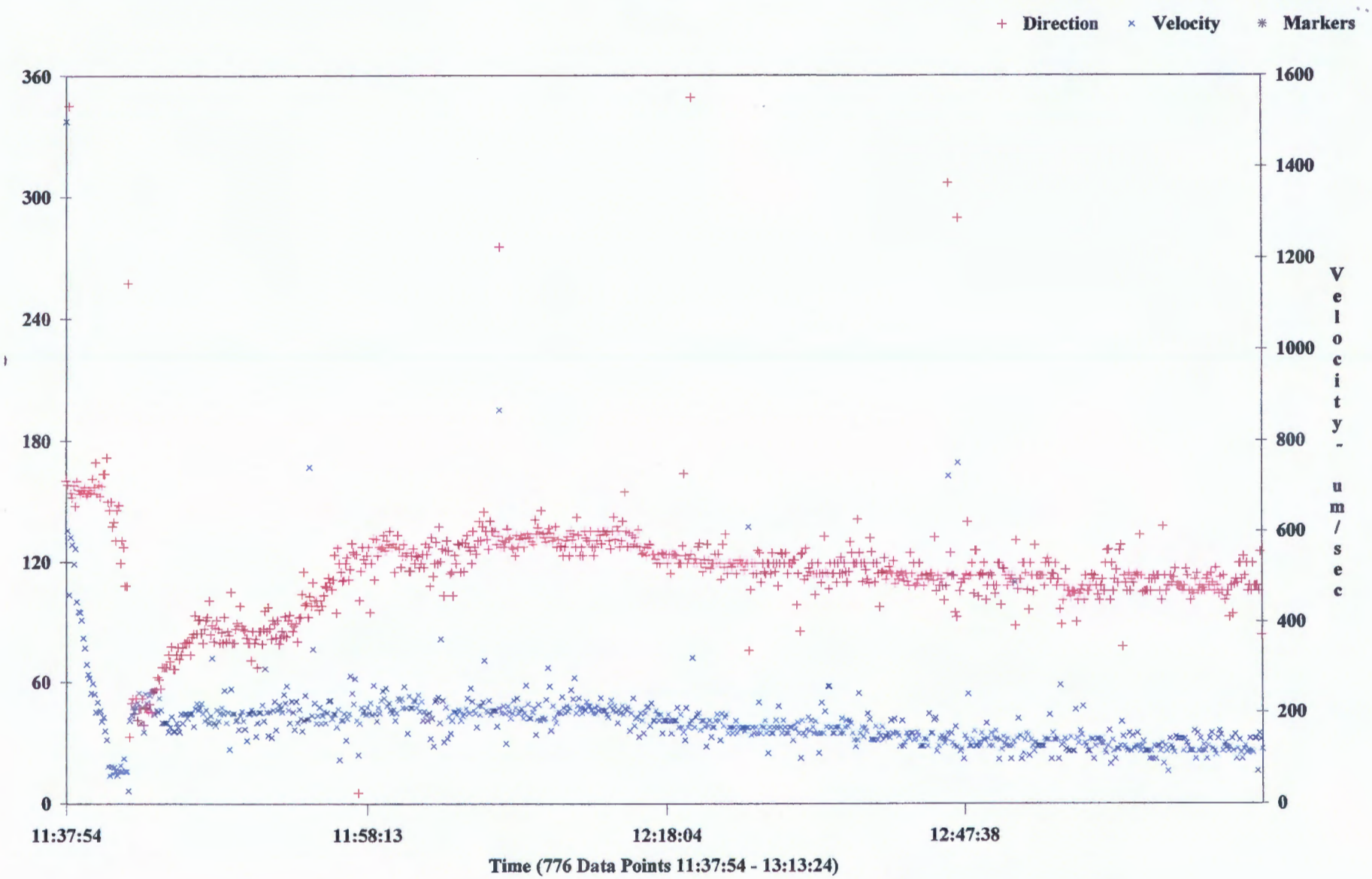

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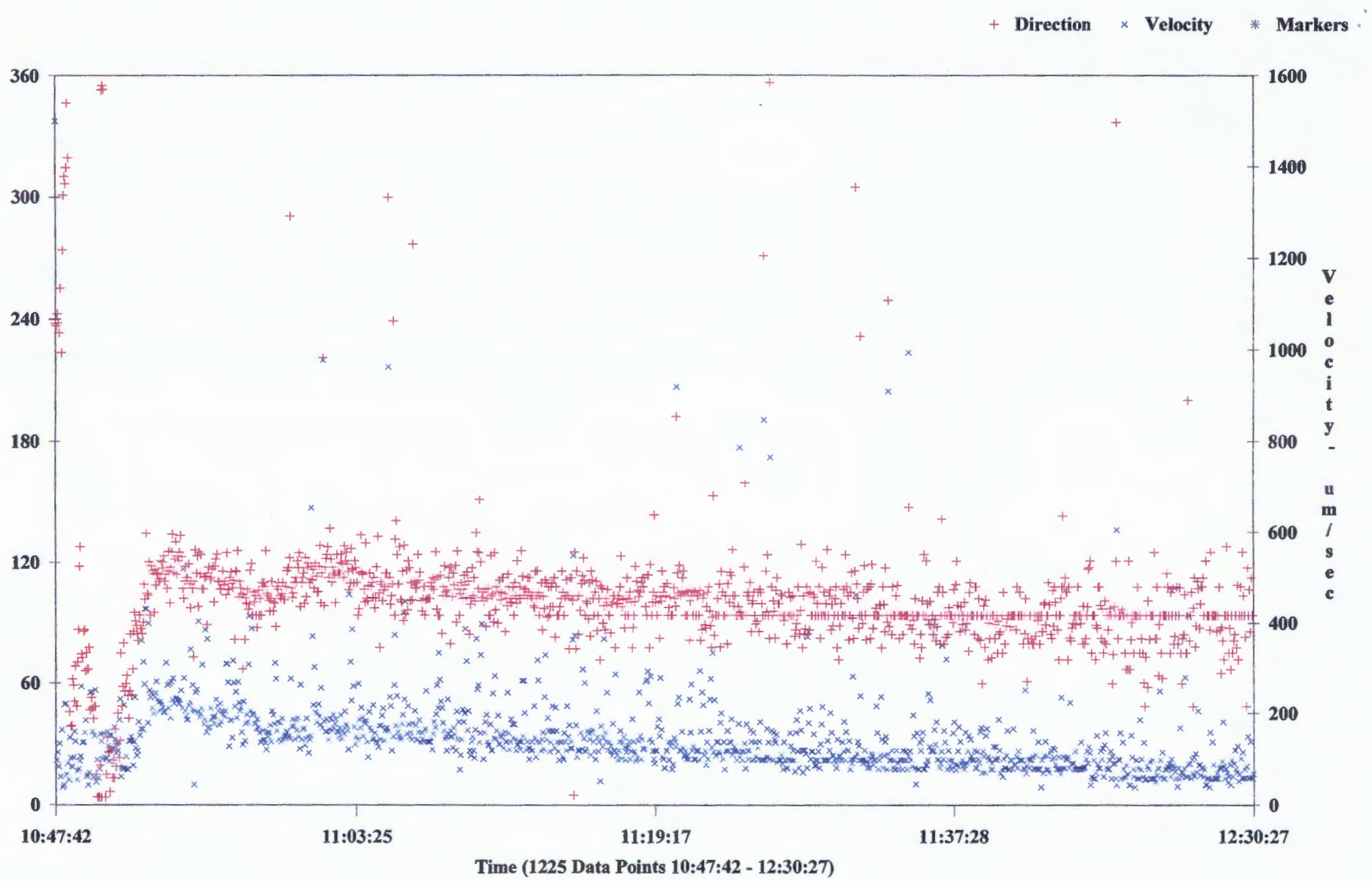

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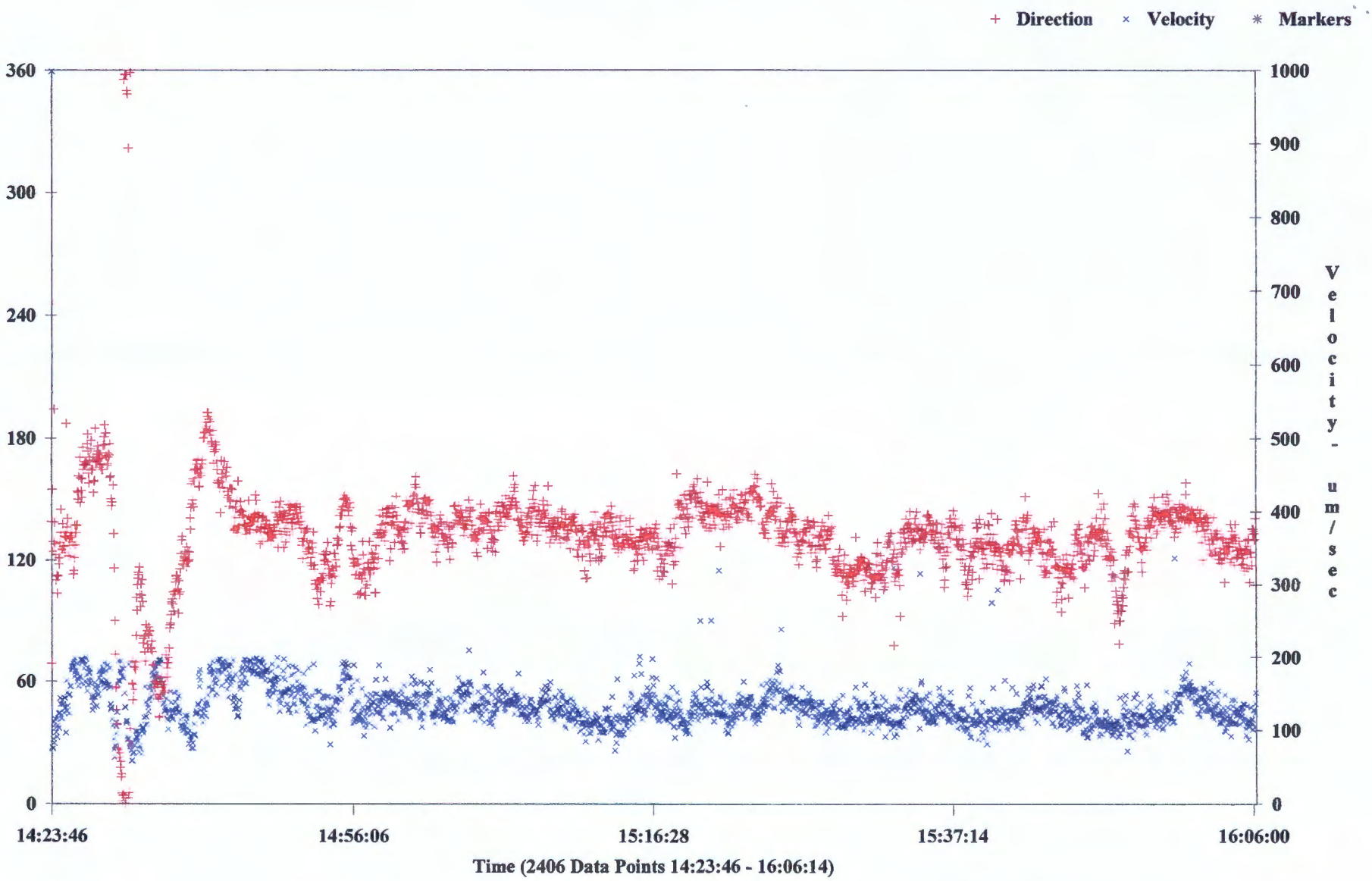

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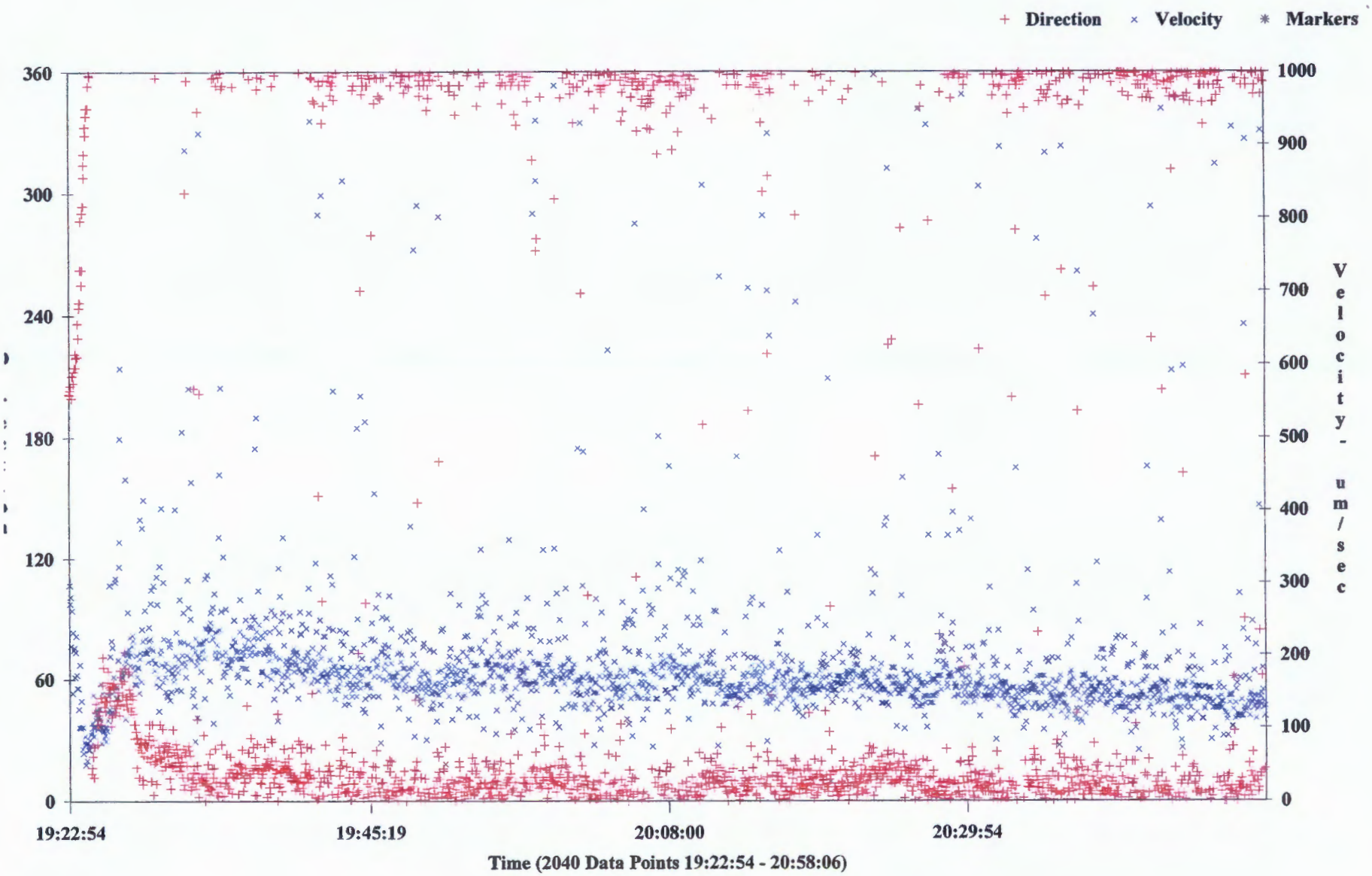

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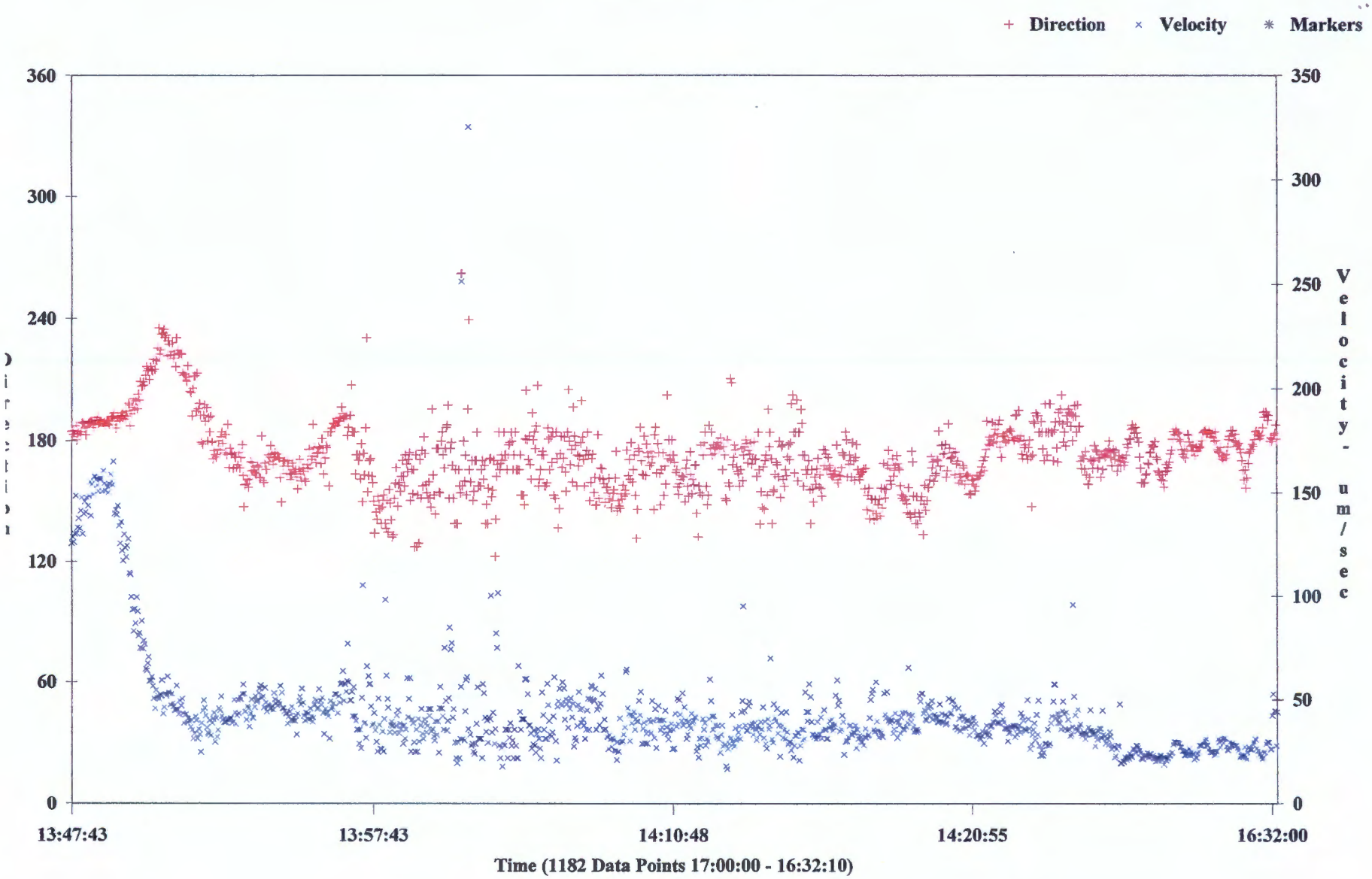

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ANNEX D
Operational Report: Tijeras Arroyo Groundwater Analysis of Pressure Transducer Monitoring Data Investigation (Chace August 2001)

SANDIA NATIONAL LABORATORIES/NEW MEXICO
Environmental Restoration, Tech Areas & Miscellaneous Sites (Department 6133)
Environmental Restoration Project

Operational Report:
Tijeras Arroyo Groundwater Analysis of Pressure Transducer Monitoring Data Investigation

Prepared for

Sandia National Laboratories
Albuquerque, New Mexico

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ER Project
Pressure Transducer Monitoring Data Investigation
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1. INTRODUCTION

The following letter report describes the objectives and methodologies for the investigation of the pressure transducer monitoring data associated with the SNL/NM ER Project on Kirtland Air Force Base (KAFB), Albuquerque, New Mexico. The activities described herein were carried out as part of the Sandia National Laboratories, New Mexico (SNL/NM) Environmental Restoration (ER) Project Tijeras Arroyo Groundwater (TAG) investigation. The work activities described in this letter report were accomplished in order to provide information to identify potential sources and pathways for contaminant transport to the underlying aquifer systems.

2.0 OBJECTIVES FOR THE TIJERAS ARROYO GROUNDWATER ANALYSIS OF PRESSURE TRANSDUCER MONITORING DATA INVESTIGTION

The water levels in each of the monitoring wells listed in Table 2-1 were monitored during calendar years 1996, 1997, 1998, 1999, and 2000 using Geoguard pressure transducers. Both the shallow groundwater system (SGWS) and the regional aquifer were monitored at various locations. Barometric pressure data was also collected for this period of time. None of the monitoring wells were monitored continuously for this entire period of time due to mechanical/electronic problems associated with the pressure transducers, the need for these pressure transducers elsewhere, or the lack of funding to allow for the continuous monitoring of all monitoring wells. Table 1 in Appendix A details the monitoring periods for all of the monitoring wells in calendar years 1999 and 2000.

Table 2-1. Data Collection Periods

Data Type	Well I.D.	Groundwater System	Start Date (mm/dd/yy)	End Date (mm/dd/yy)
Barometric Pressure	N/A	N/A	05/01/97	09/30/00
Water Level	KAFB-0311	Regional	10/02/99	02/23/00
Water Level	TA1-W-01	Regional	11/19/99	10/11/00
Water Level	TA1-W-06	SGWS	08/01/00	10/09/00
Water Level	TA1-W-07	SGWS	11/19/99	10/01/00
Water Level	TA2-NW1-325	SGWS	03/16/97	10/11/00
Water Level	PGS-2	Regional	02/02/99	11/22/99
Water Level	TA2-NW1-595	Regional	11/18/98	10/09/00
Water Level	TA2-SW1-320	SGWS	3/16/97	08/01/99
Water Level	TA2-W-01	SGWS	01/07/99	11/23/99
Water Level	TA2-W-19	SGWS	01/12/99	11/23/99
Water Level	TA2-W-24	Regional	03/27/00	10/09/00
Water Level	TA2-W-25	Regional	01/12/99	10/09/00
Water Level	TA2-W-26	SGWS	05/20/00	10/09/00
Water Level	TA2-W-27	SGWS	03/27/00	07/17/00
Water Level	TJA-2	SGWS	01/12/99	06/02/00
Water Level	TJA-4	SGWS (intermediate)	12/03/99	07/20/00
Water Level	TJA-5	SGWS	12/03/99	03/30/00
Water Level	WYO-1	Regional	11/26/96	10/11/00
Water Level	WYO-2	SGWS	12/02/99	07/20/00

As part of this historical water level investigation a network of monitoring wells, completed in both the regional aquifer and the SGWS (see Table 2-1 above), were monitored in order to gain information regarding the hydraulic connectivity between the two groundwater systems. Figure 2-1 shows the locations of the wells monitored during this investigation. By monitoring the water levels in a variety of wells under a variety of conditions at many different locations over an extended period of time, the resulting data could be used to address a number of issues.

Kirtland Air Force Base (KAFB) maintains and operates a network of water supply wells. Monitoring water levels in wells in the vicinity of any of these KAFB water supply wells would give an indication of the effect that the water supply well network (pumping from the regional aquifer) is having on the regional groundwater system on a more localized scale. Also, with water level data from both the SGWS and the regional aquifer, it could be determined if regional pumping effects the SGWS.

In addition to KAFB water supply well pumping the City of Albuquerque (COA) maintains an extensive water supply well network. Some of these COA water supply wells are in relatively close proximity to the KAFB boundary. Figure 2-1 shows that there are seven COA water supply wells immediately to the north of the KAFB boundary in the vicinity of the observation wells that were monitored as part of this task. The seven COA water supply wells include Ridgecrest 1, Ridgecrest 2, Ridgecrest 3, Ridgecrest 5, Lomas 1, Lomas 5, and Lomas 6. There are several additional COA water supply wells located to the north and west of these wells that are not shown in Figure 2-1. It is conceivable that the COA water supply wells that are in relatively close proximity to the KAFB boundary, in general, and to the observation wells that were monitored as part of this task, specifically, could impact the water levels. However, considering that the pumping schedules for the COA water supply wells are not available there was no attempt made to establish any such correlation.

Therefore, the specific objectives for this historical water level investigation include:

- Identify water level changes in the wells listed in Table 2-1 due to pumping from the KAFB water supply well network.
- Develop a data set on the potential for significant hydraulic connection between the SGWS and the regional aquifer.
- Identify water level trends (i.e. a decrease in depth to water in the SGWS due to aquifer recharge and/or an increase in depth to water in the aquifers due to water supply well pumping [regional aquifer] or leakage [SGWS]).

This information will be used to provide a better and more complete understanding of the subsurface geology/hydrogeology of the region. Integration of this data with the existing information associated with the TAG area might provide more insight into an obviously complex groundwater system.

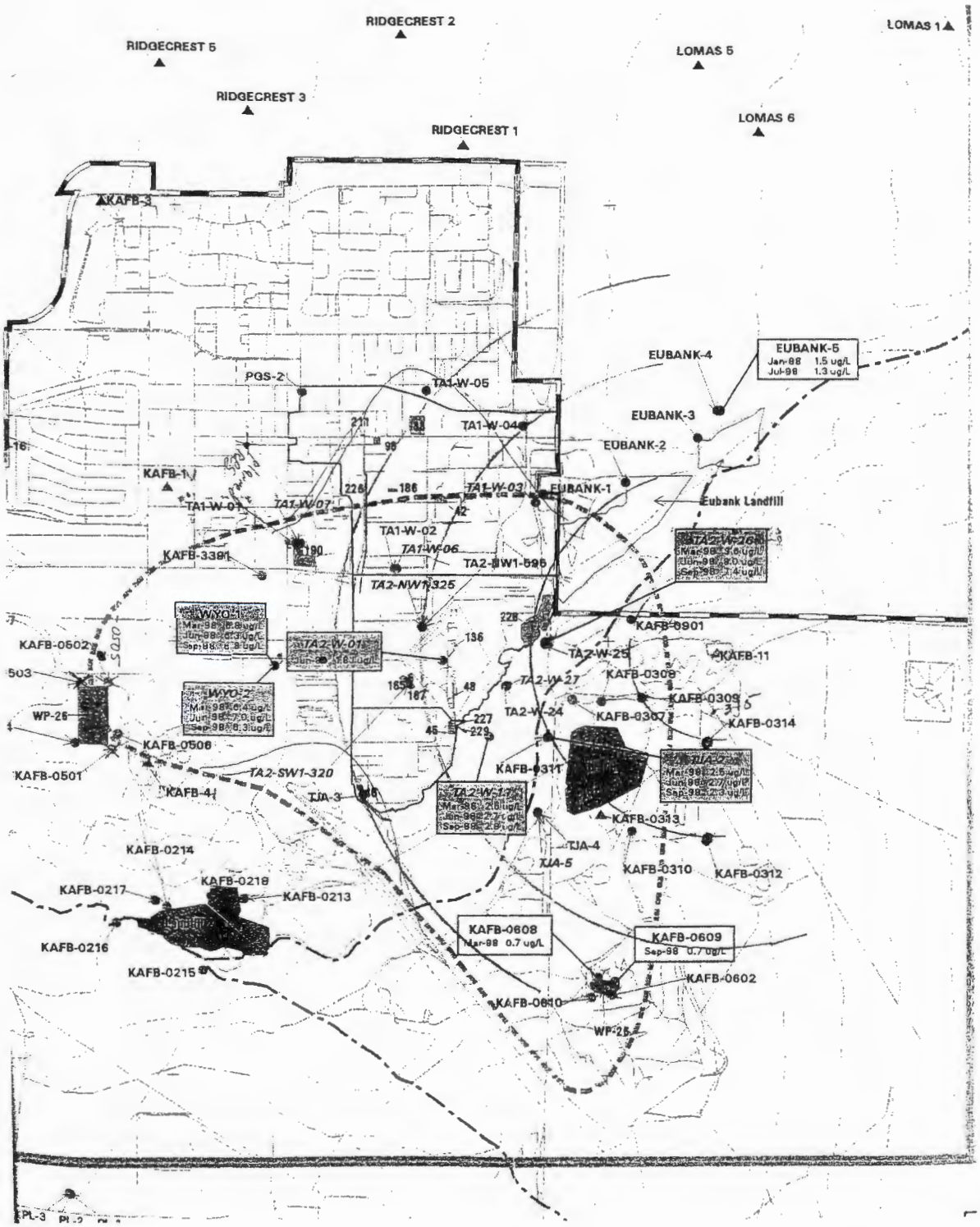


Figure 2-1. Monitor well network

3.0. BACKGROUND

3.1 Overview of the Tijeras Arroyo Groundwater Analysis of Pressure Transducer Monitoring Data Investigation Task

The TAG Analysis of Pressure Transducer Monitoring Data was performed in an effort to develop a better understanding of the TAG hydrogeologic environment. The overall objective of this task was to provide information to identify potential sources and pathways for contaminant transport to the underlying aquifer systems. A total of 19 observation wells make up the monitoring well network associated with this task. Figure 2-1 shows the locations of these observation wells. At seven of these locations monitoring wells were completed in both the SGWS and the regional aquifer. At one location the monitoring wells were completed in two intervals of the SGWS. Table 3-1 summarizes the construction information for these well pairs.

Table 3-1. Construction Information for Monitoring Wells at Locations that Include both SGWS and Regional Monitoring Wells

Well Pair	Screened Interval (depth bgs, ft)	Water Level (depth bgs, ft)
SGWS Well: WYO-2 Regional Well: WYO-1	265 – 285 510 - 560	274.23 524.88
SGWS Well: TA1-W-07 Regional Well: TA1-W-01	268 – 288 575 – 595	275.36 540.28
SGWS Well: TA1-W-06 Regional Well: TA1-W-02	300 – 320 540 – 560	299.61 528.90
SGWS Well: TA2-NW1-325 Regional Well: TA2-NW1-595	295 – 325 535 – 555 585 – 595	311.32 531.30
SGWS Well: TA2-W-26 Regional Well: TA2-W-25	276 – 296 492 – 512	280.14 478.14
SGWS Well: TA2-W-27 Regional Well: TA2-W-24	275 – 295 465 – 485	275.09 450.74
SGWS Well: TJA-2 Regional Well: KAFB-0311	275 – 295 433 – 458	273.83 329.17
SGWS Well: TJA-5 SGWS Intermediate Well: TJA-4	267 – 287 360 - 380	270.61 317.87

The observation wells included in the monitoring well network show significant water level fluctuations in response to changes in barometric pressure. As part of this task an algorithm was developed in order to make corrections to the measured water level data to account for fluctuations in response to changes in barometric pressure. Section 3.3 gives more detailed information regarding the barometric pressure corrections that were made to the data. Figures 3-1 through 3-19 show the raw water level data as well as the barometric pressure corrected water level data to illustrate the magnitude of the effect that changes in barometric pressure had on the water levels in the various wells. Figures 3-20 through 3-26 show the barometric pressure corrected water levels for the SGWS/regional well pairs listed in Table 3-1 as a means to compare the responses in the two groundwater systems relative to one another to the same stresses. Figures 3-27 through 3-34 show the average daily pumping rates for the seven KAFB water supply wells for which data was available.

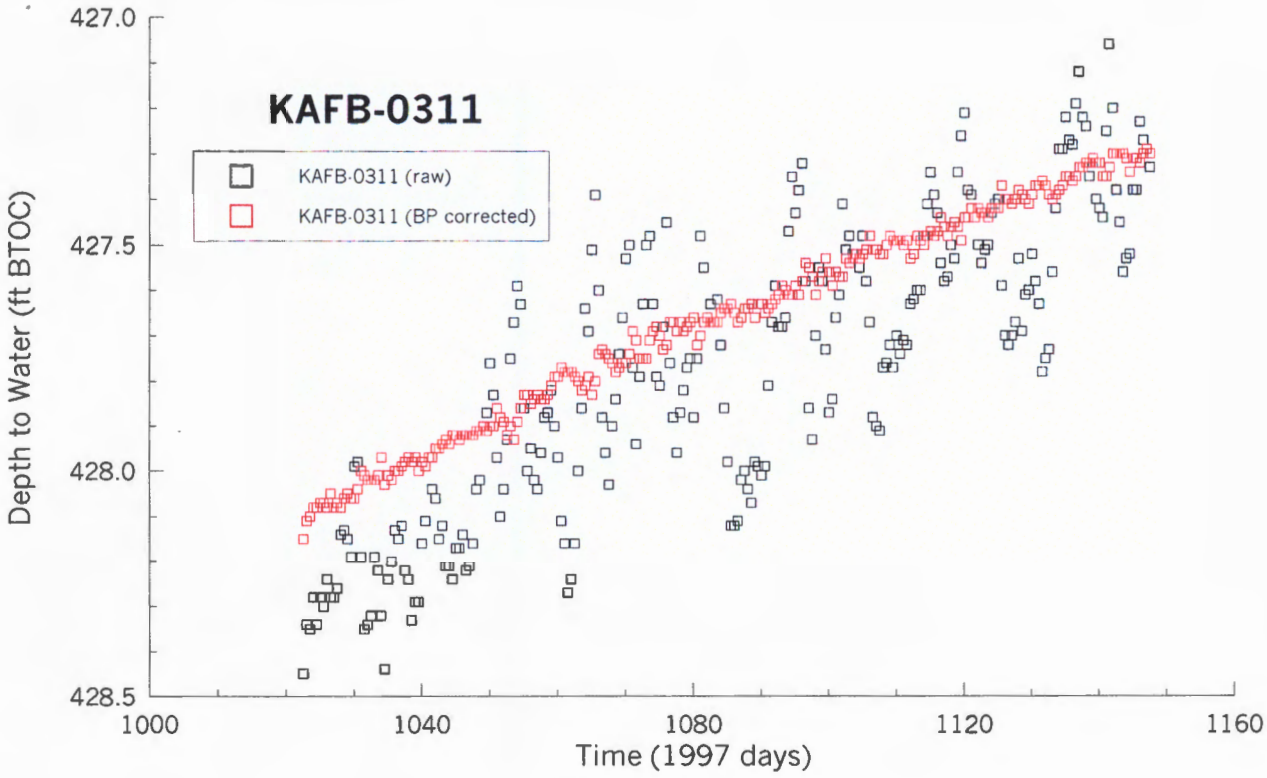


Figure 3-1. KAFB-0311 water level data (regional aquifer)

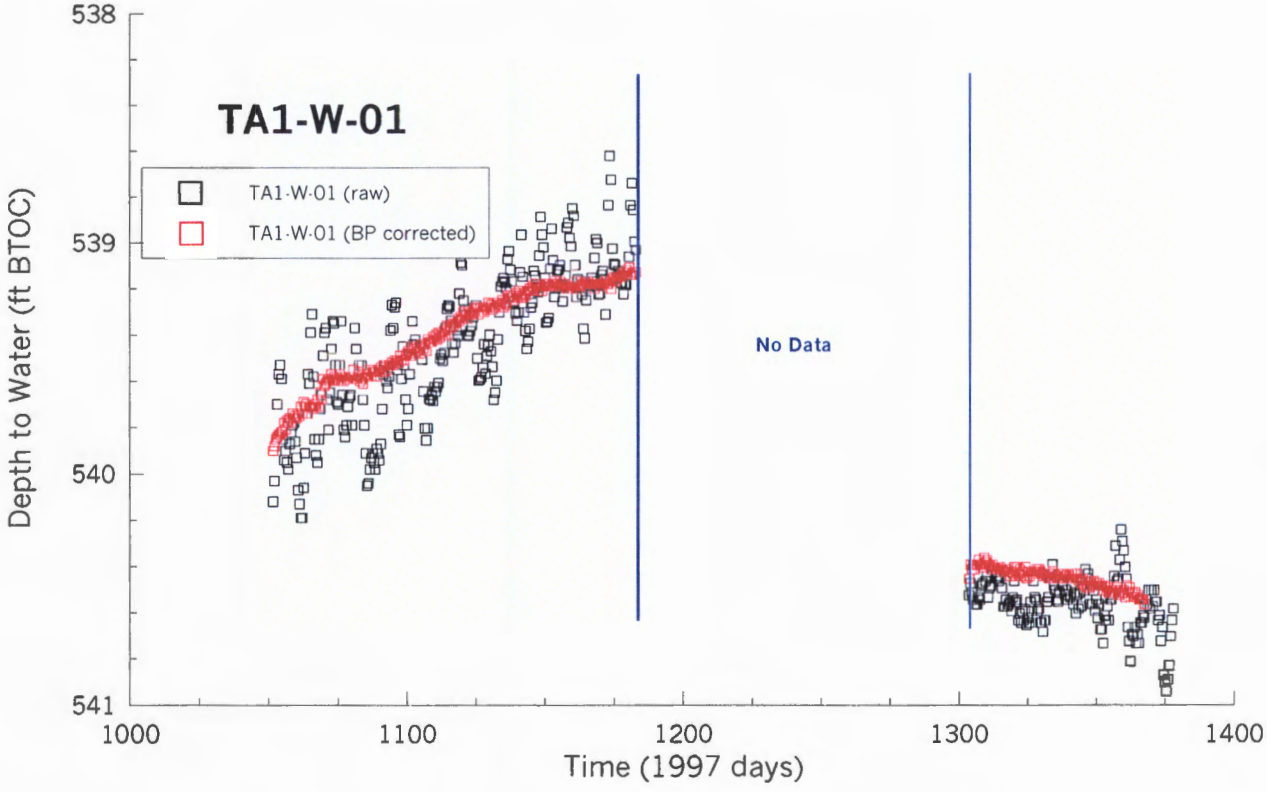


Figure 3-2. TA1-W-01 water level data (regional aquifer)

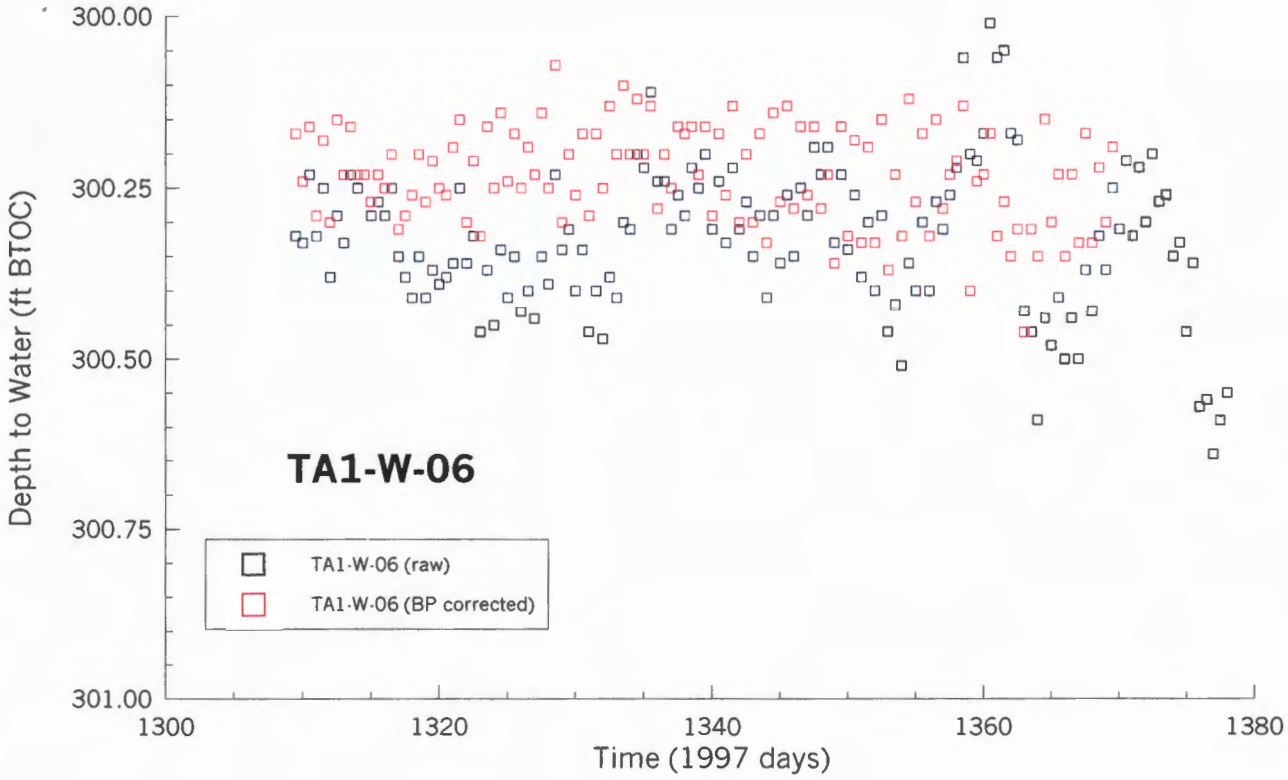


Figure 3-3. TA1-W-06 water level data (SGWS)

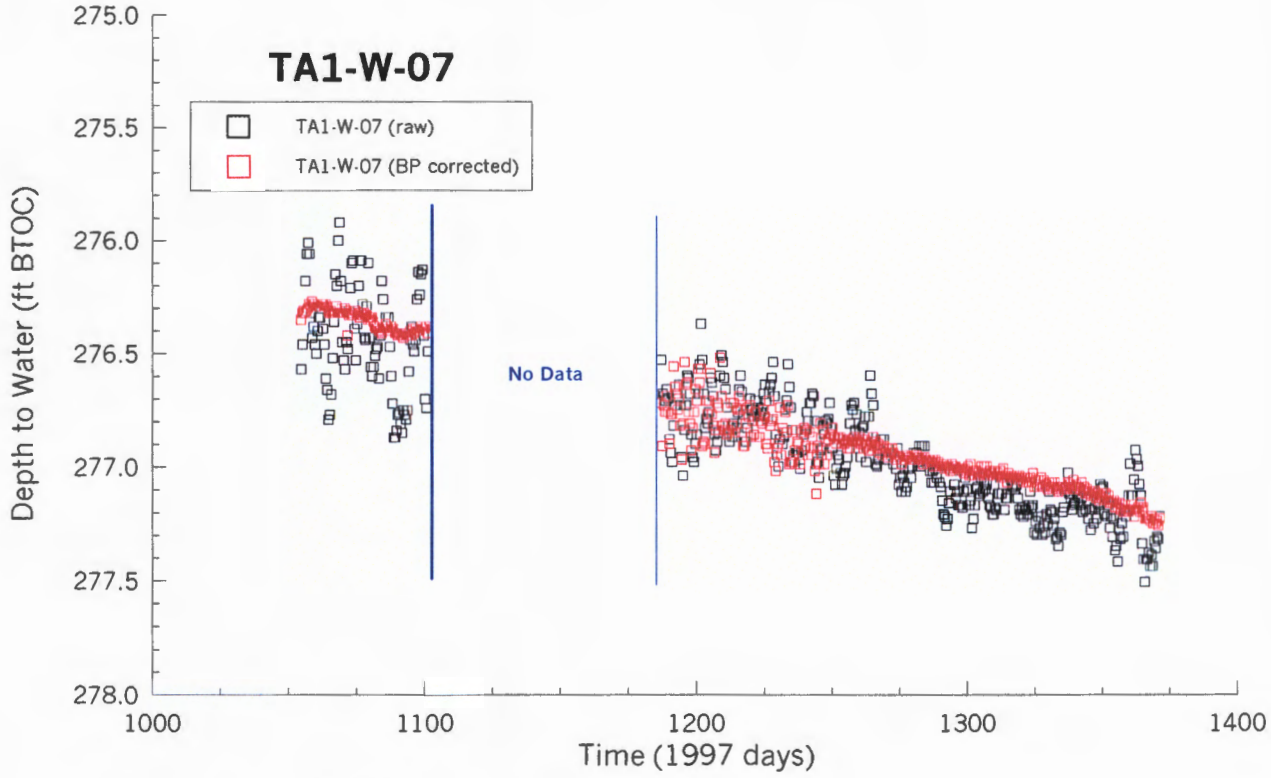


Figure 3-4. TA1-W-07 water level data (SGWS)

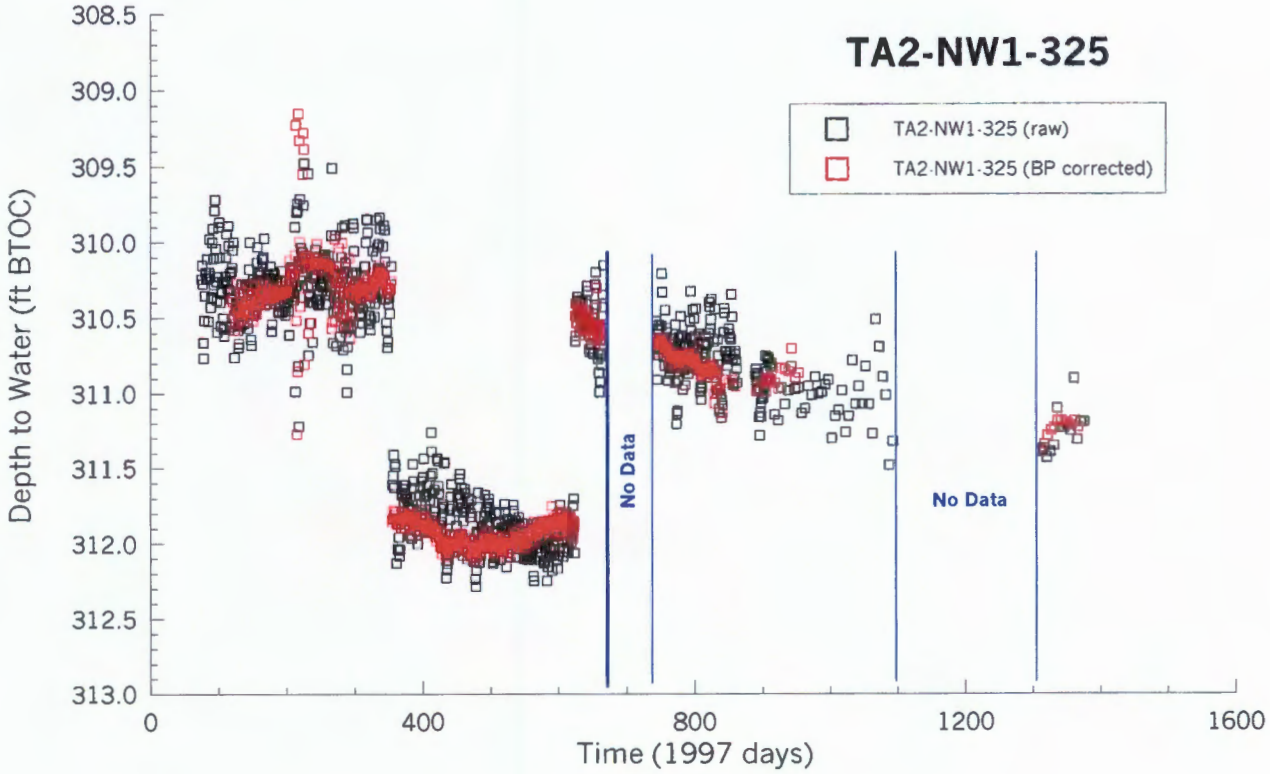


Figure 3-5. TA2-NW1-325 water level data (SGWS)

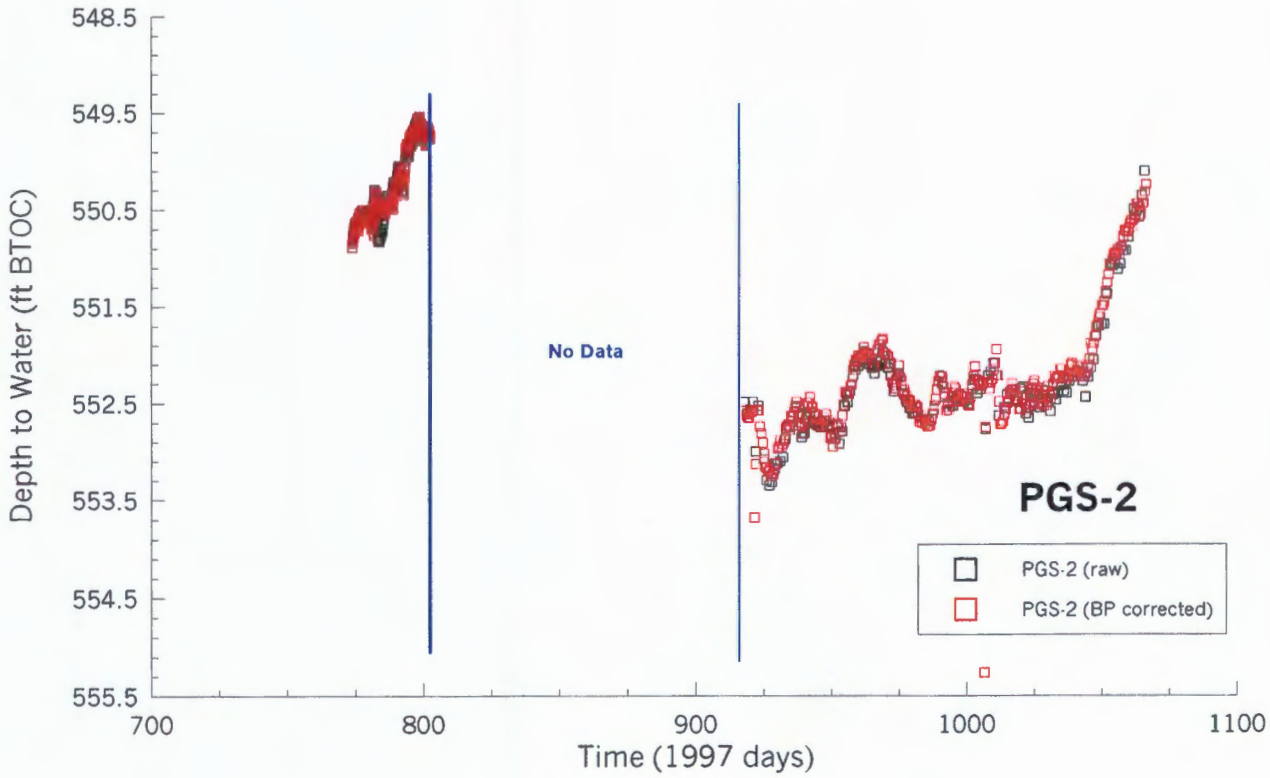


Figure 3-6. PGS-2 water level data (regional aquifer)

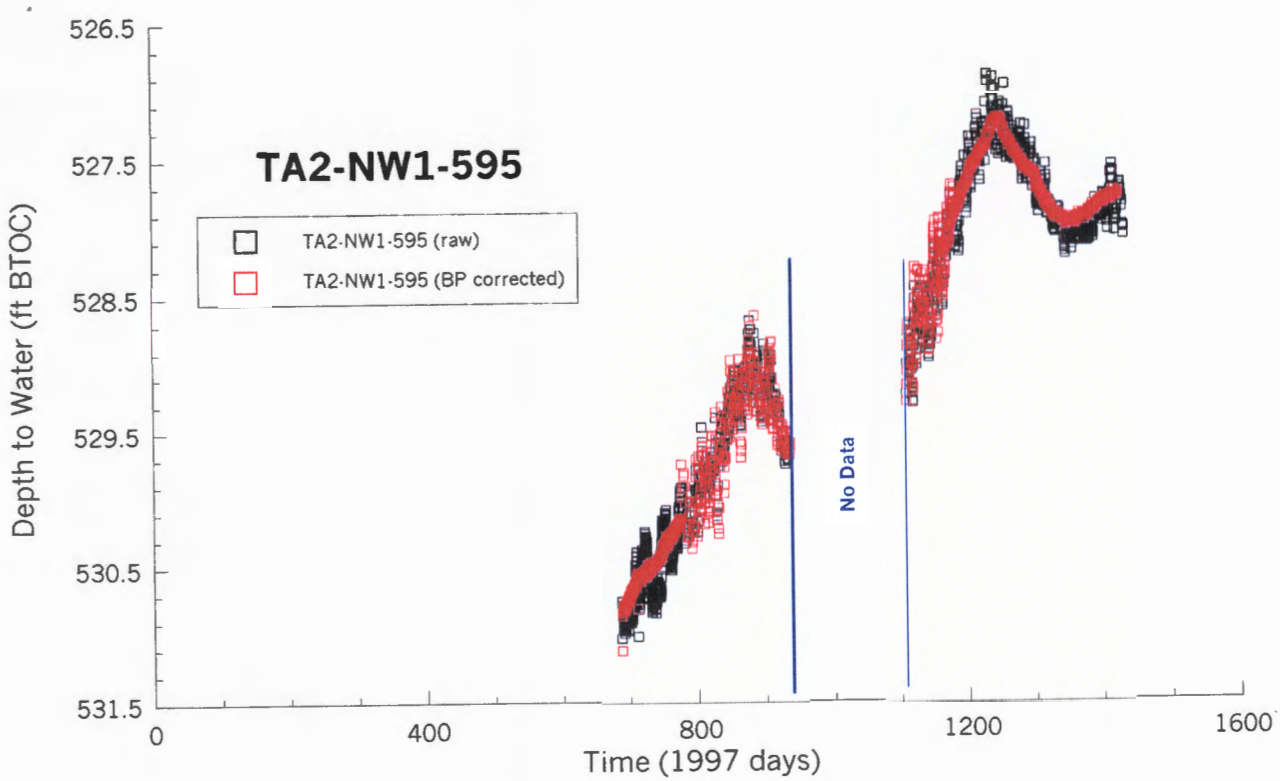


Figure 3-7. TA2-NW1-595 water level data (regional aquifer)

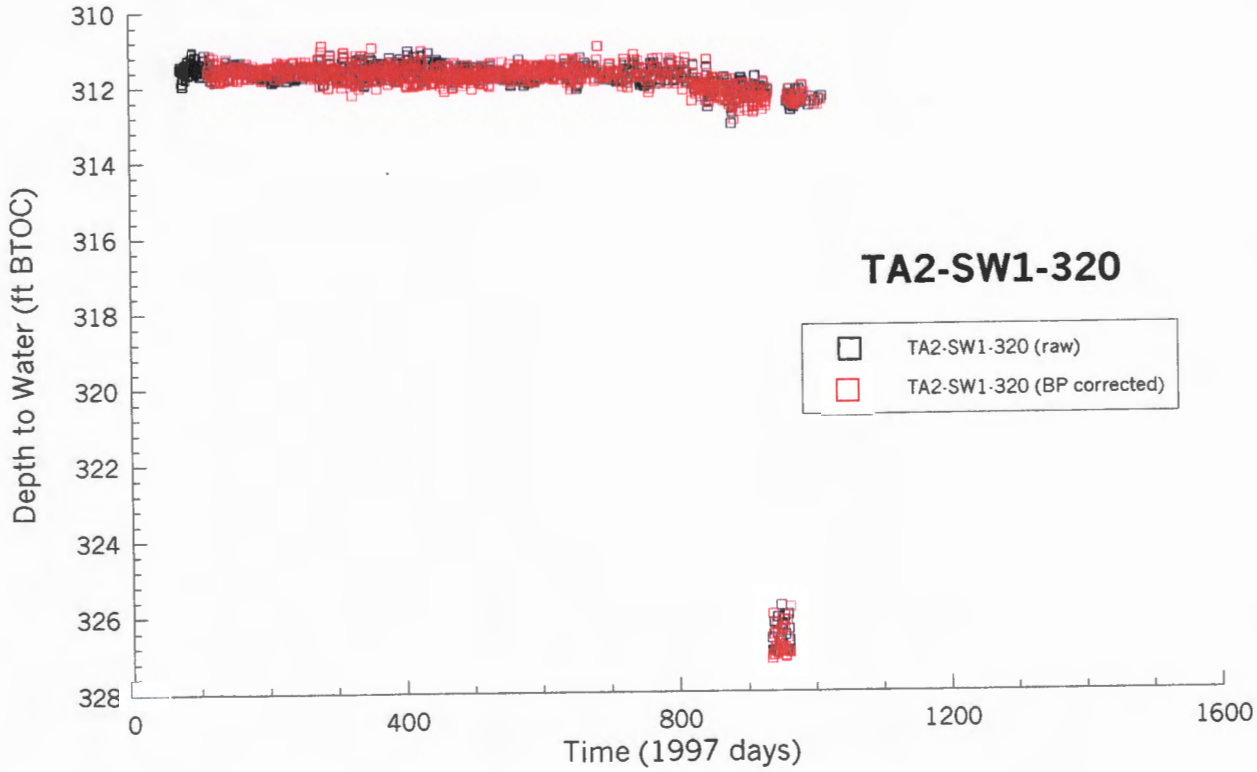


Figure 3-8. TA2-SW1-320 water level data (SGWS)

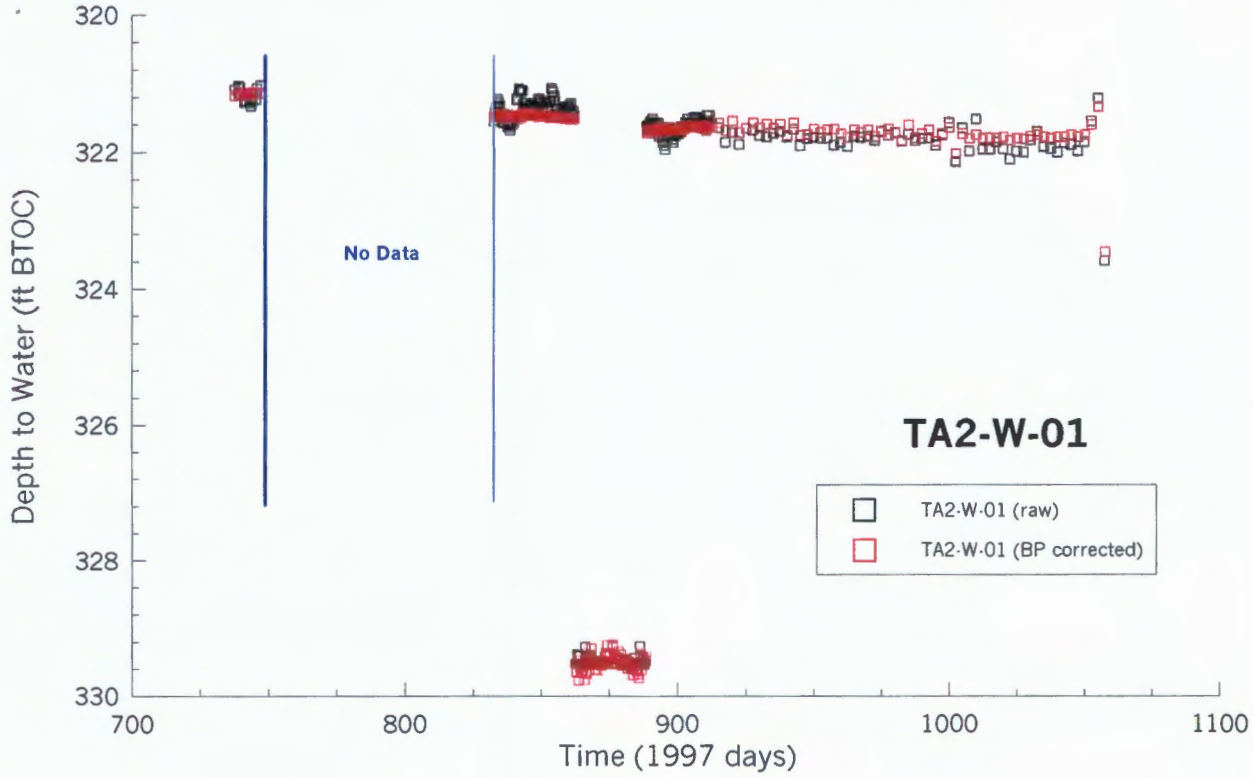


Figure 3-9. TA2-W-01 water level data (SGWS)

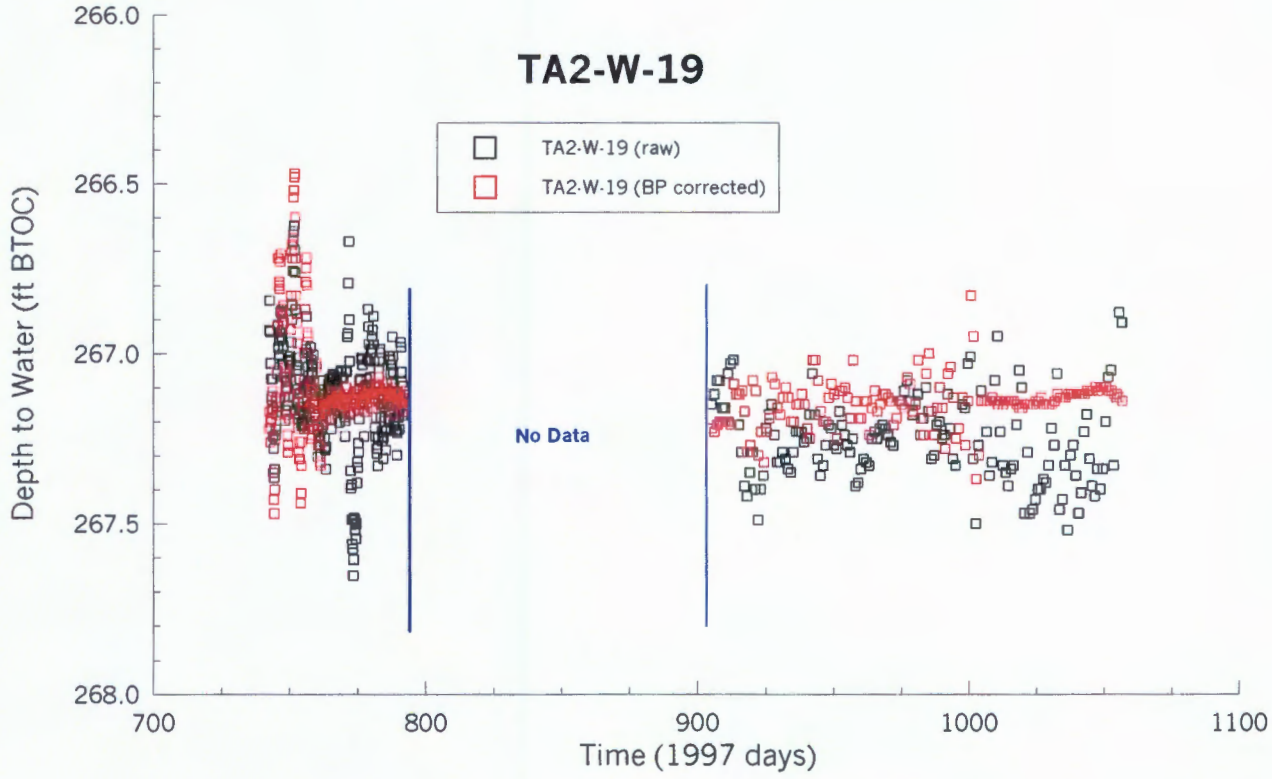


Figure 3-10. TA2-W-19 water level data (SGWS)

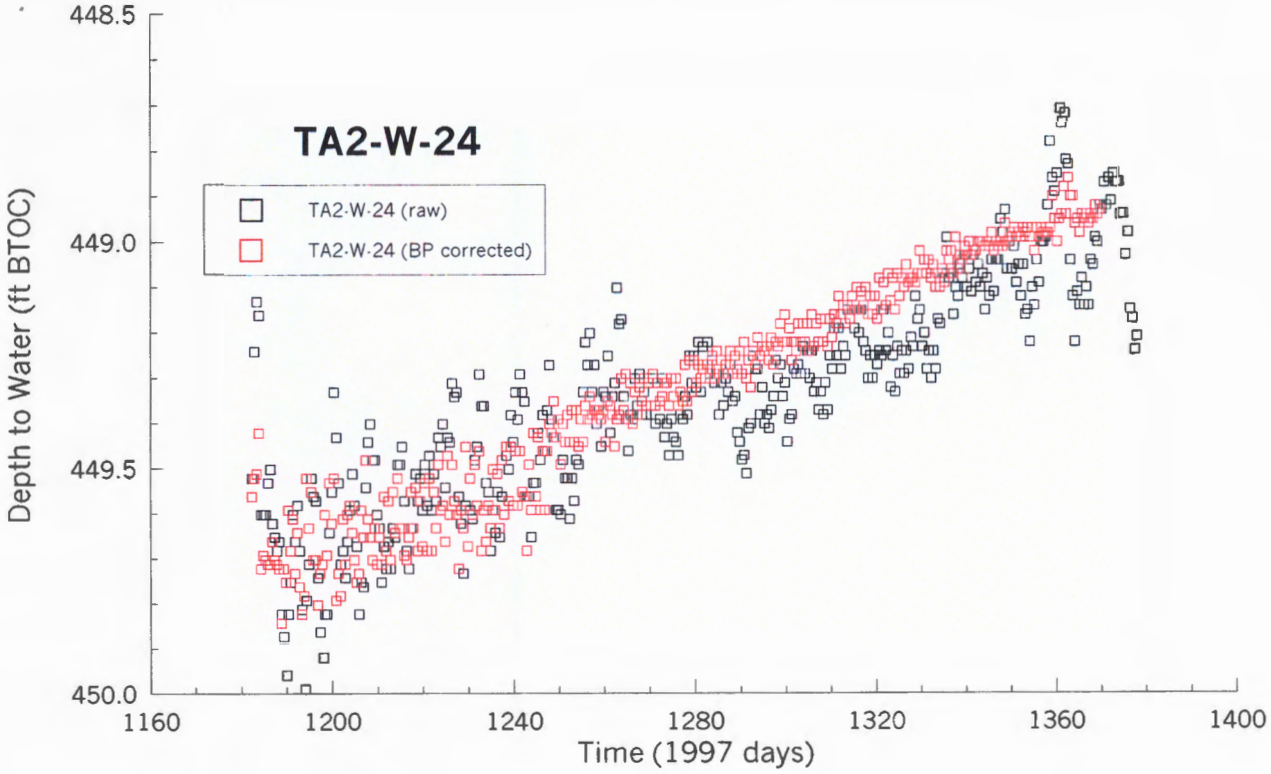


Figure 3-11. TA2-W-24 water level data (regional aquifer)

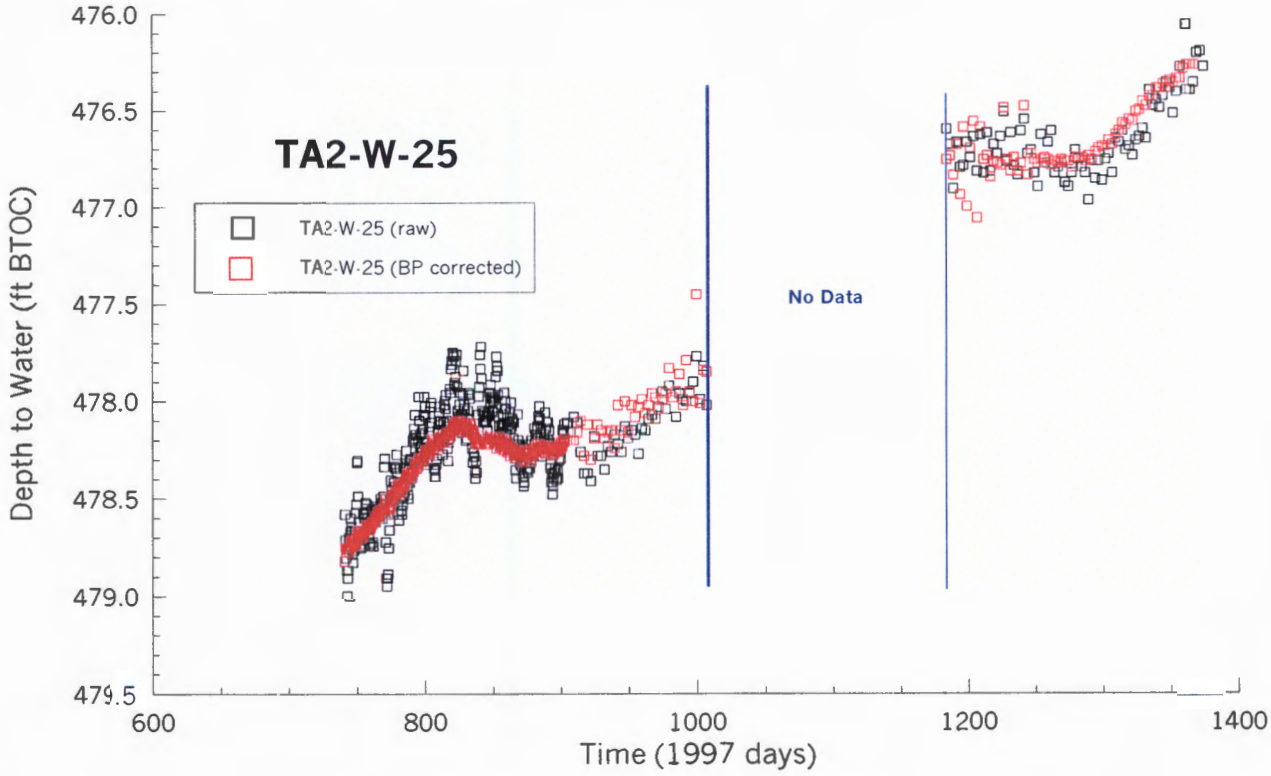


Figure 3-12. TA2-W-25 water level data (regional aquifer)

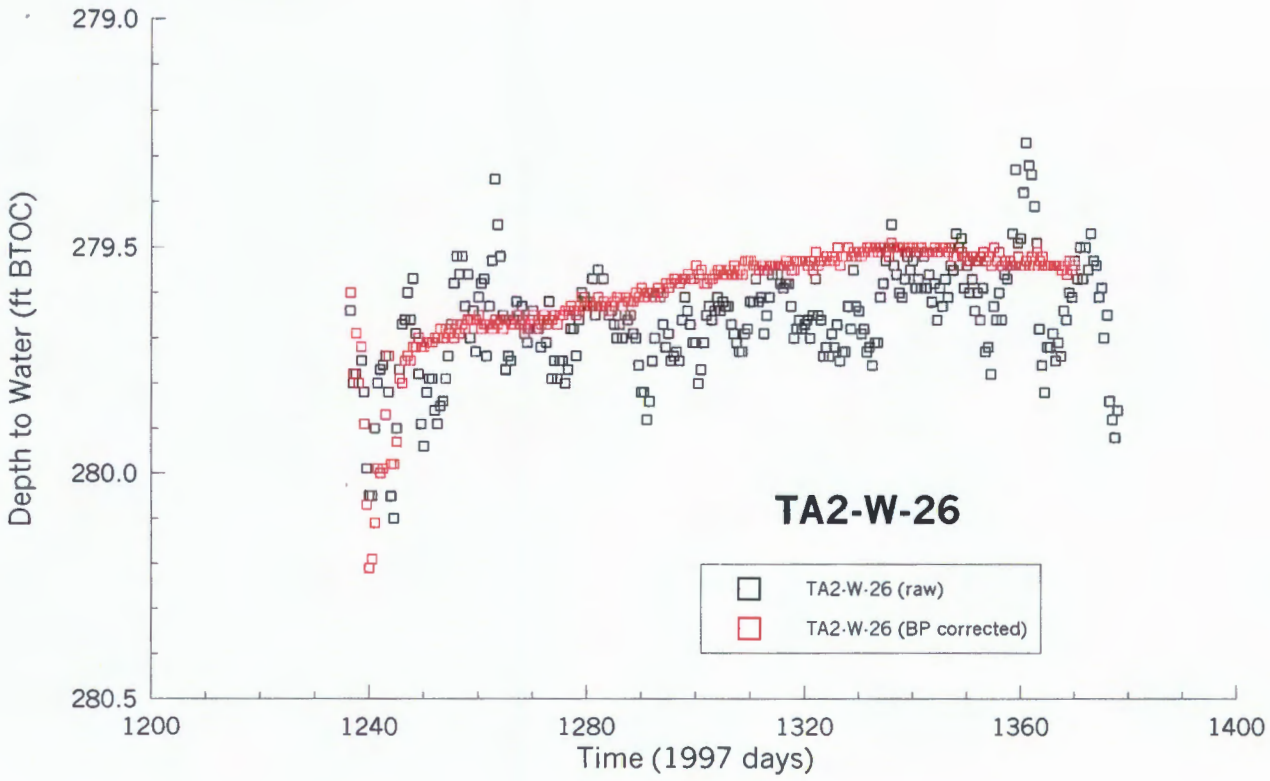


Figure 3-13. TA2-W-26 water level data (SGWS)

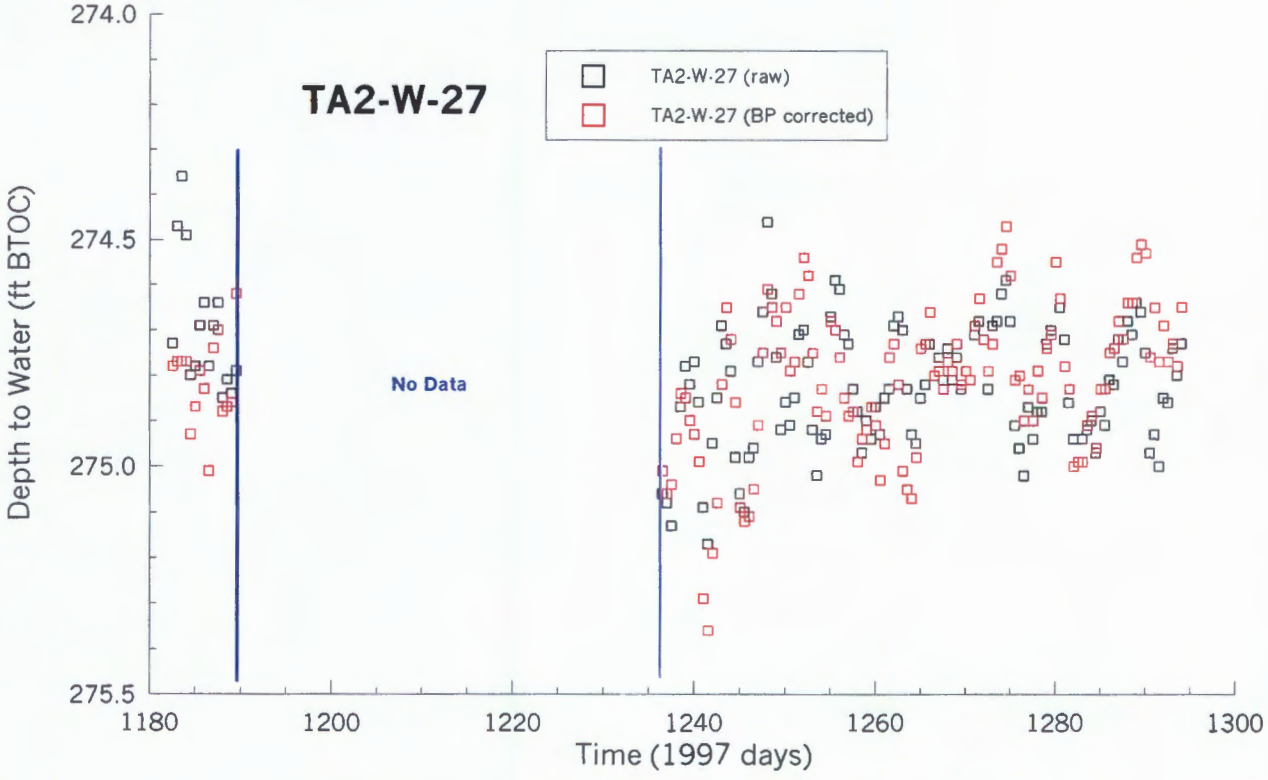


Figure 3-14. TA2-W-27 water level data (SGWS)

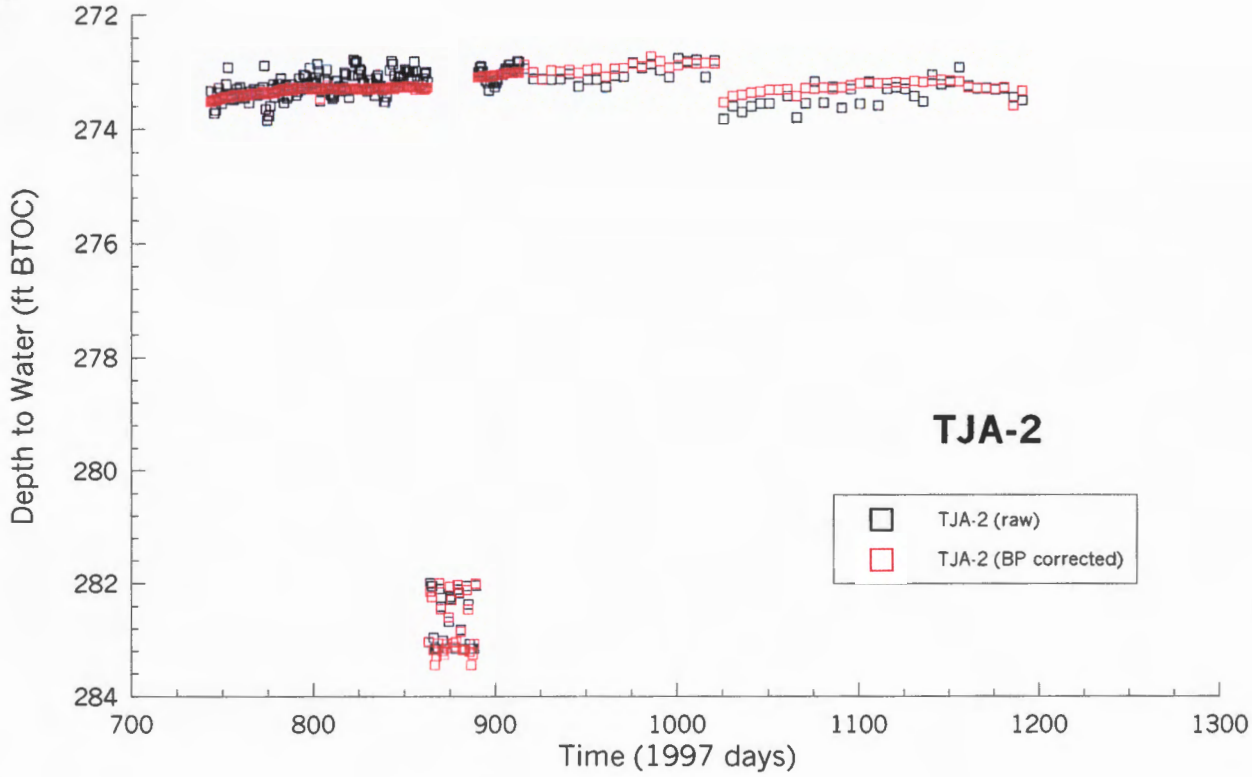


Figure 3-15. TJA-2 water level data (SGWS)

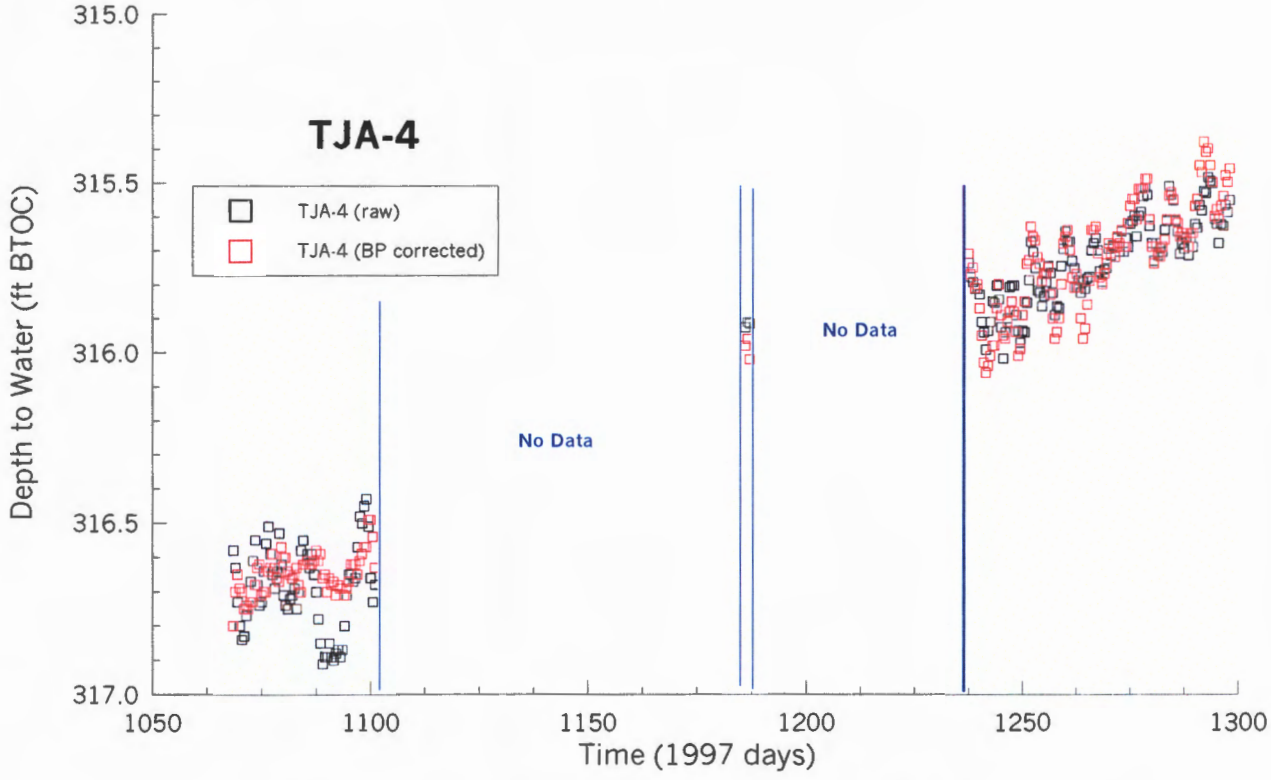


Figure 3-16. TJA-4 water level data (SGWS intermediate)

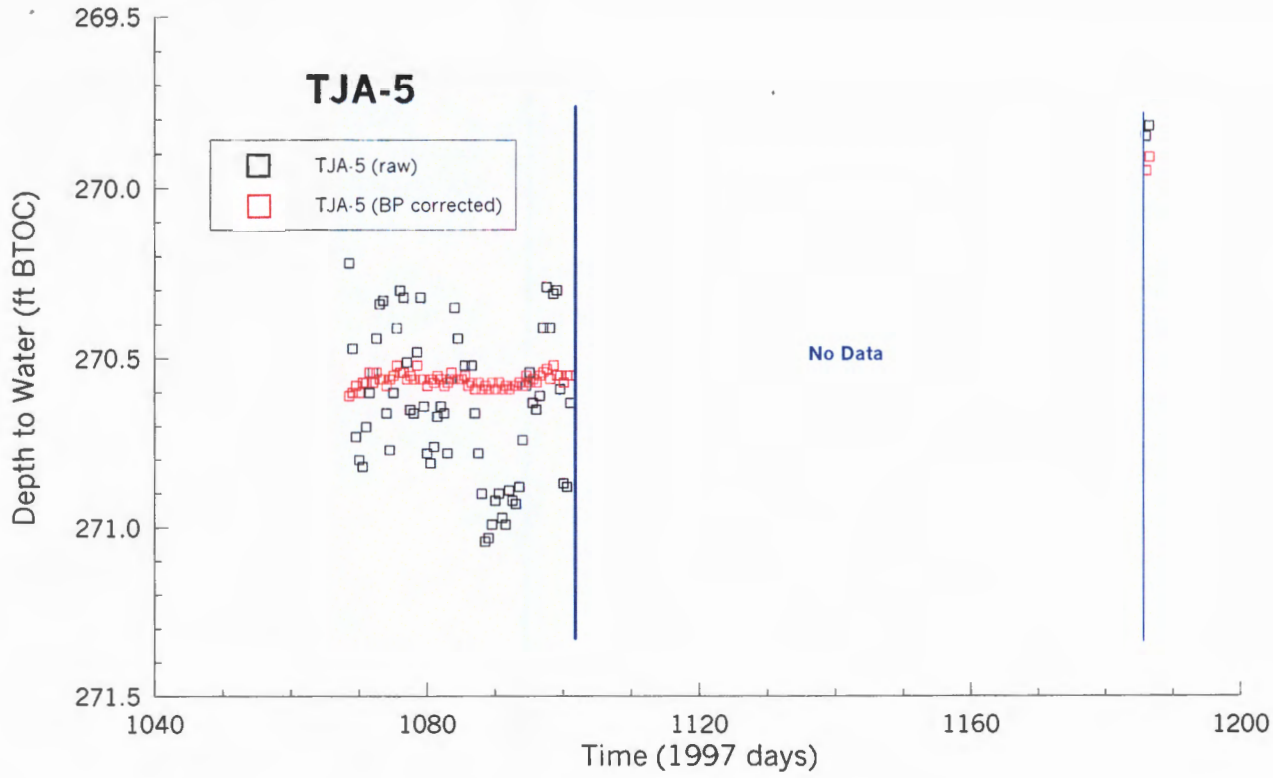


Figure 3-17. TJA-5 water level data (SGWS)

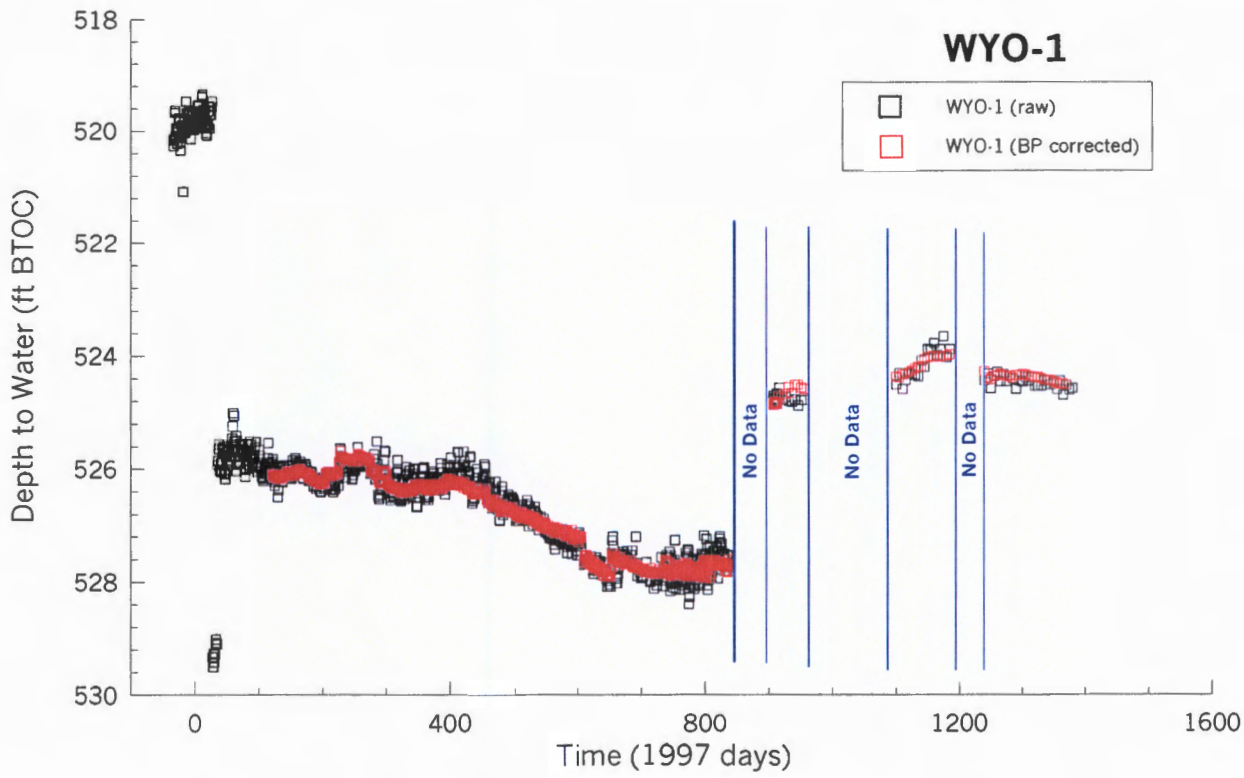


Figure 3-18. WYO-1 water level data (regional aquifer)

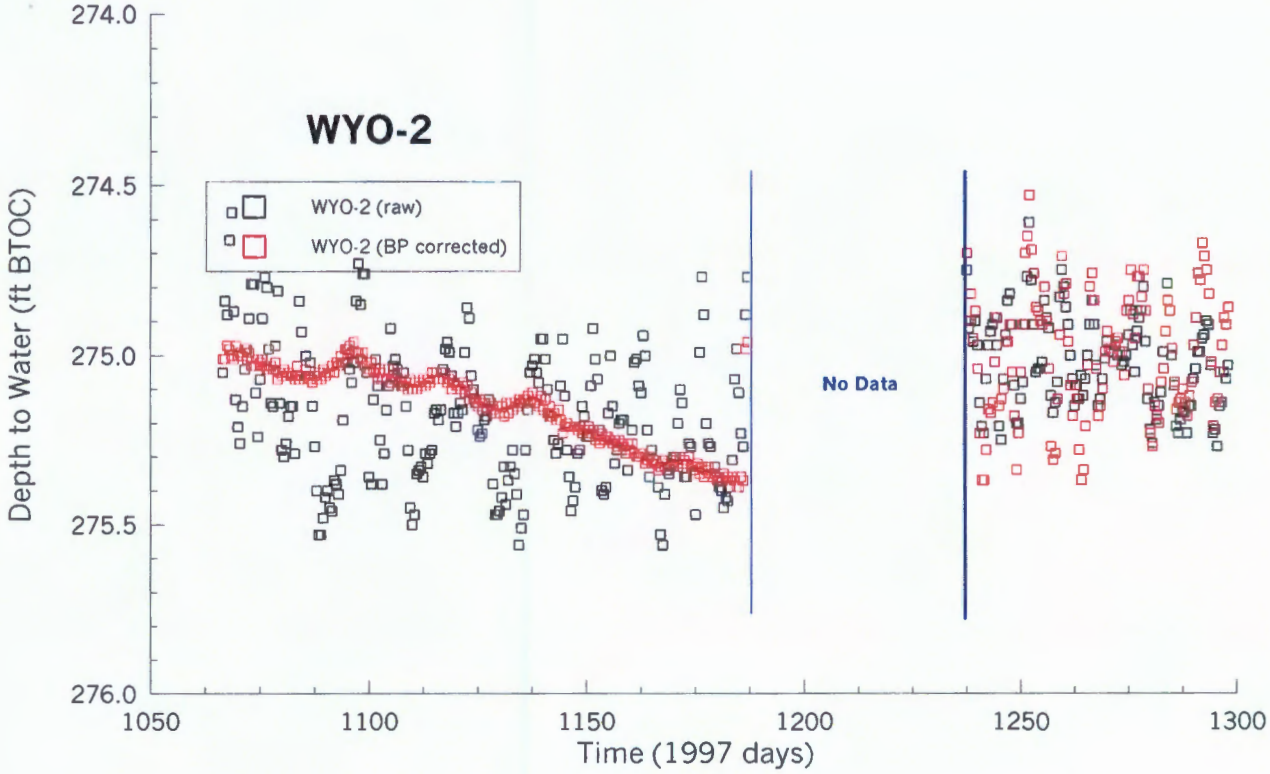


Figure 3-19. WYO-2 water level data (SGWS)

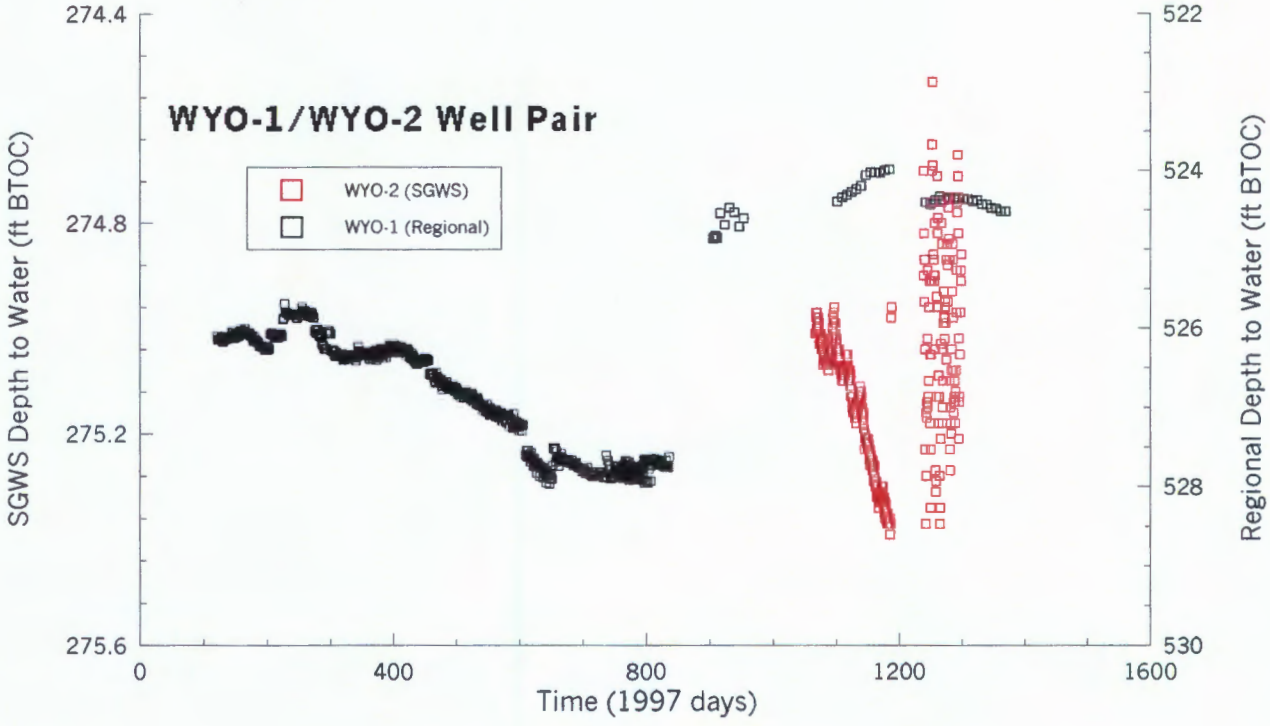


Figure 3-20. WYO-1/WYO-2 well pair water level responses

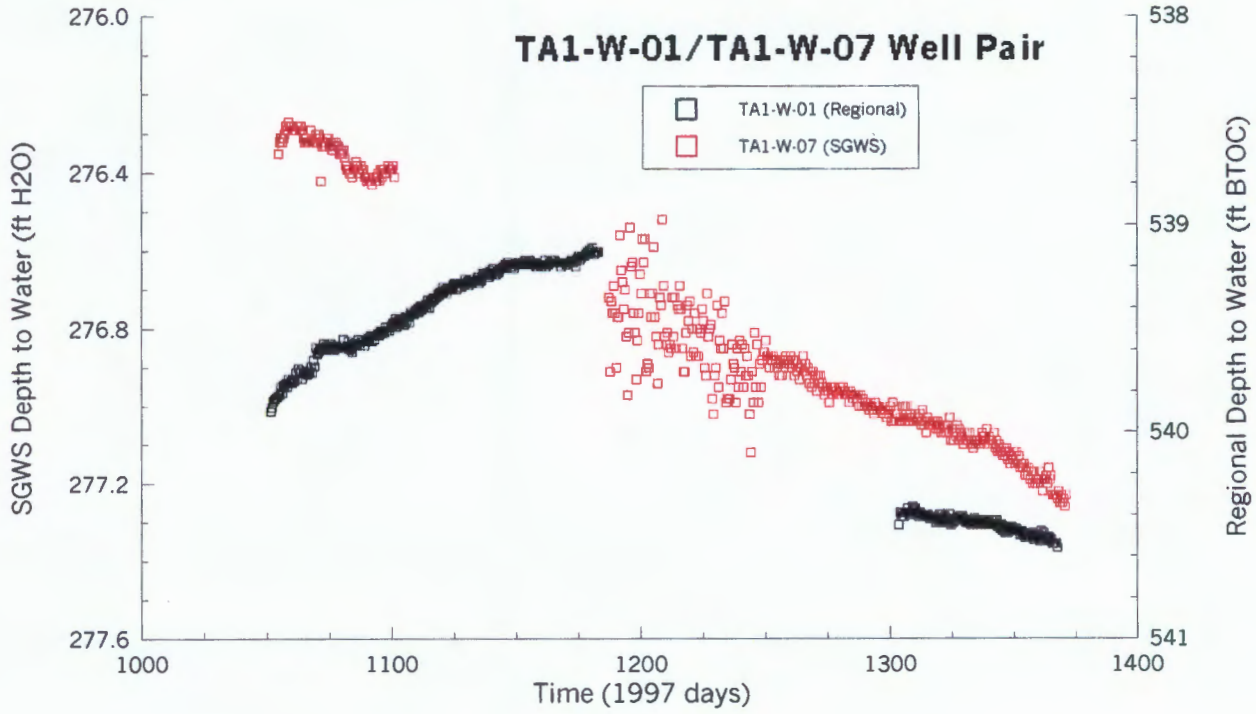


Figure 3-21. TA1-W-01/TA1-W-07 well pair water level responses

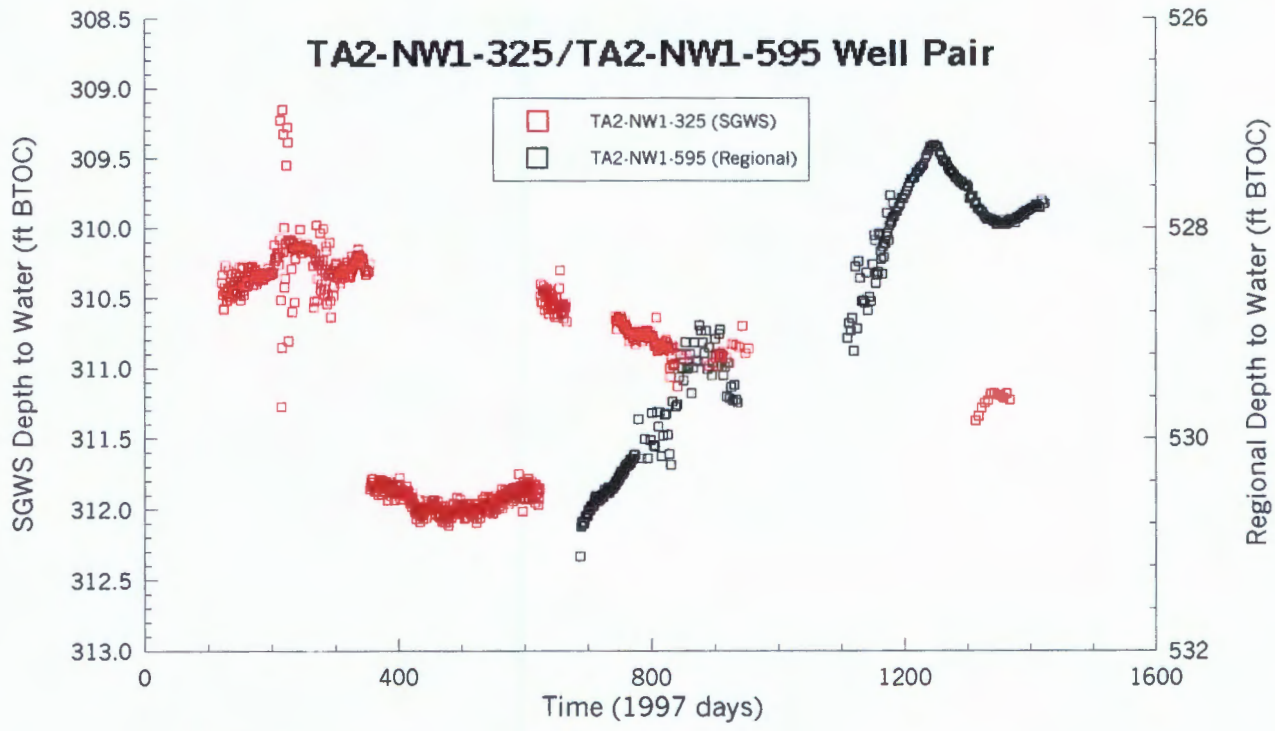


Figure 3-22. TA2-NW1-595/TA2-NW1-325 well pair water level responses

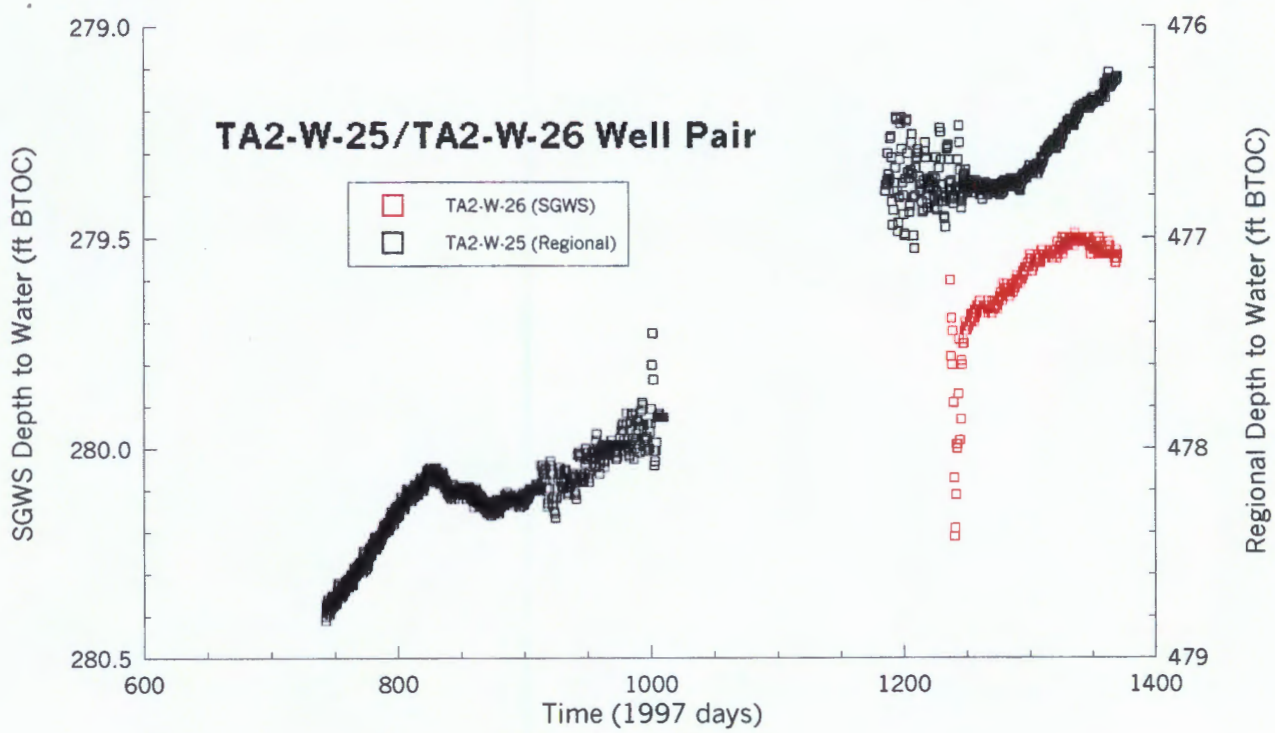


Figure 3-23. TA2-W-25/TA2-W-26 well pair water level responses

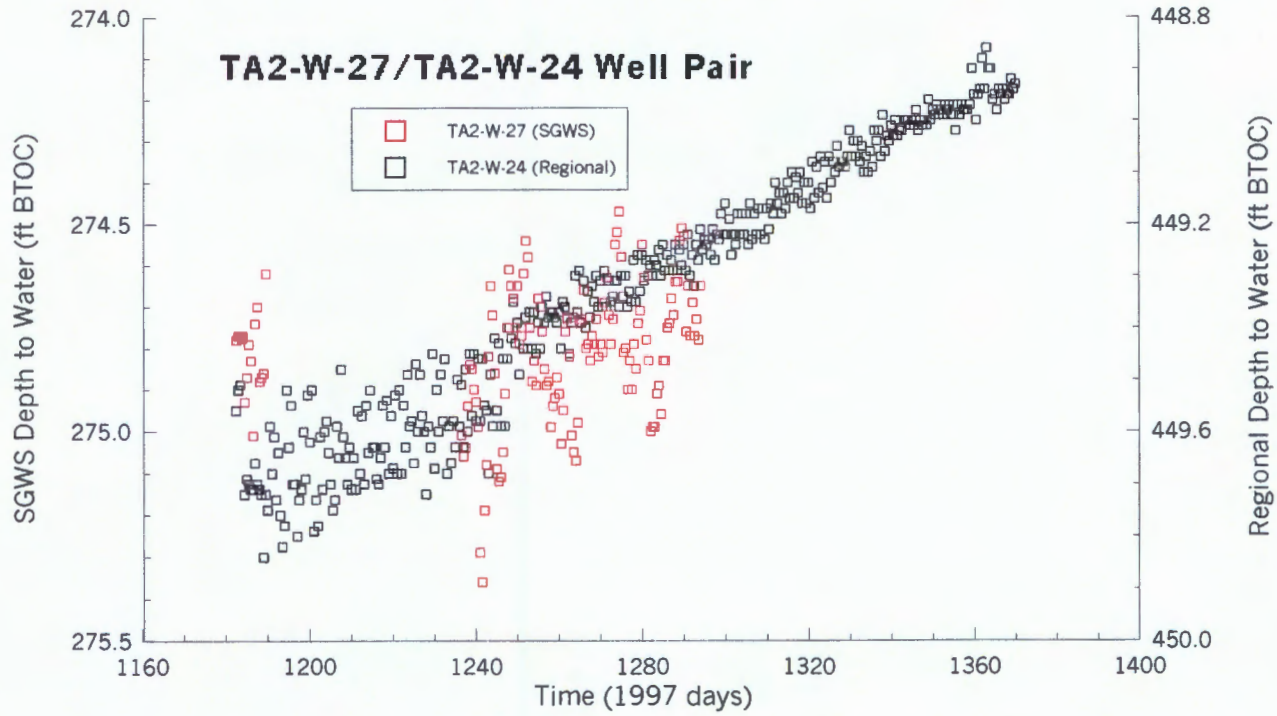


Figure 3-24. TA2-W-24/TA2-W-27 well pair water level responses

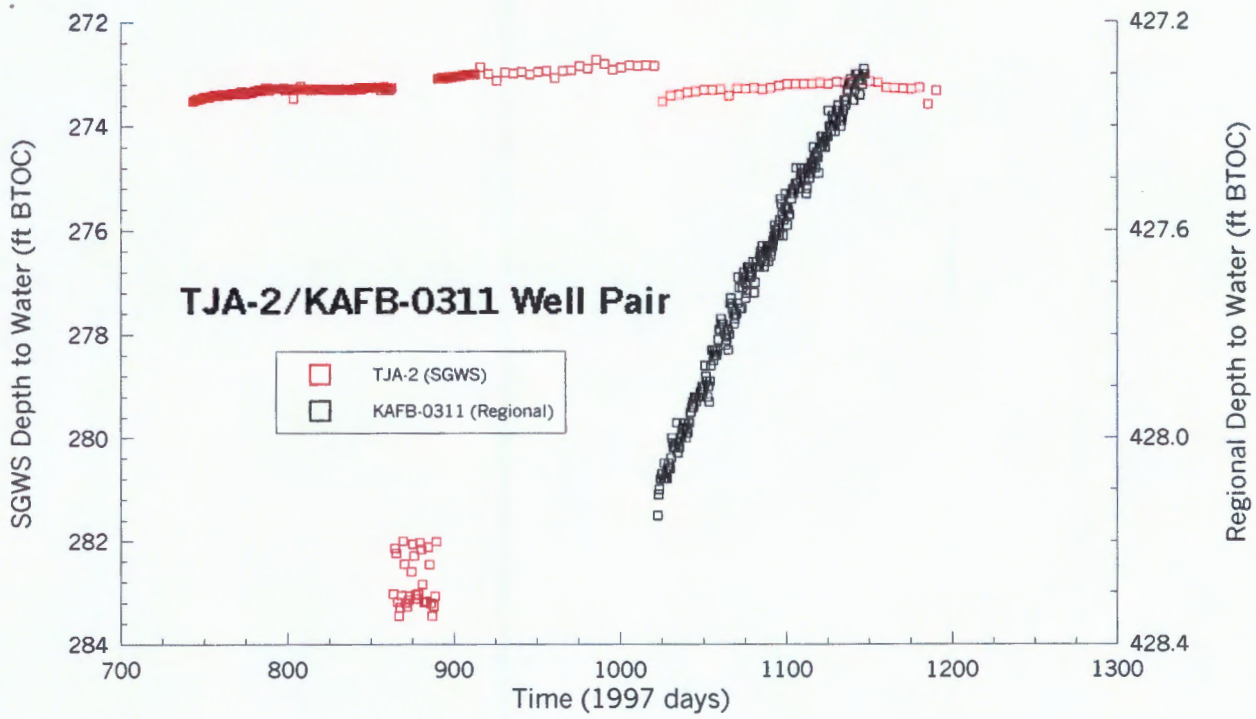


Figure 3-25. KAFB-0311/TJA-2 well pair water level responses

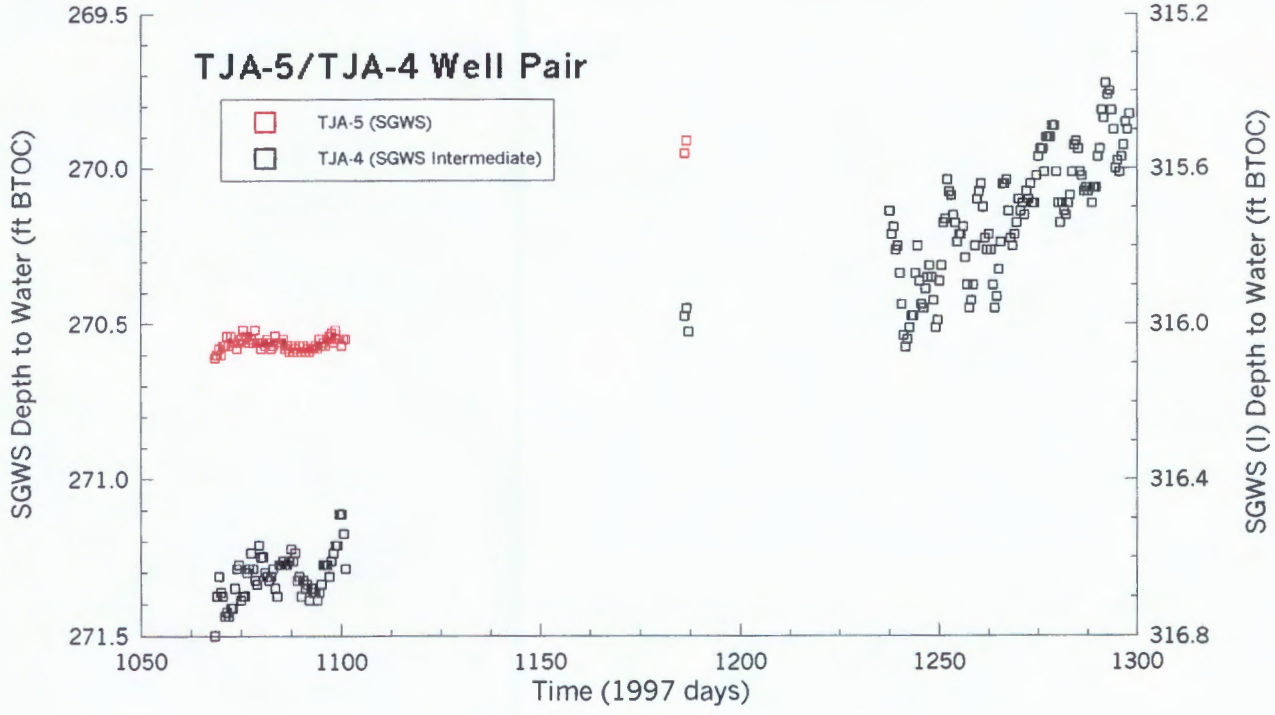


Figure 3-26. TJA-4/TJA-5 well pair water level responses

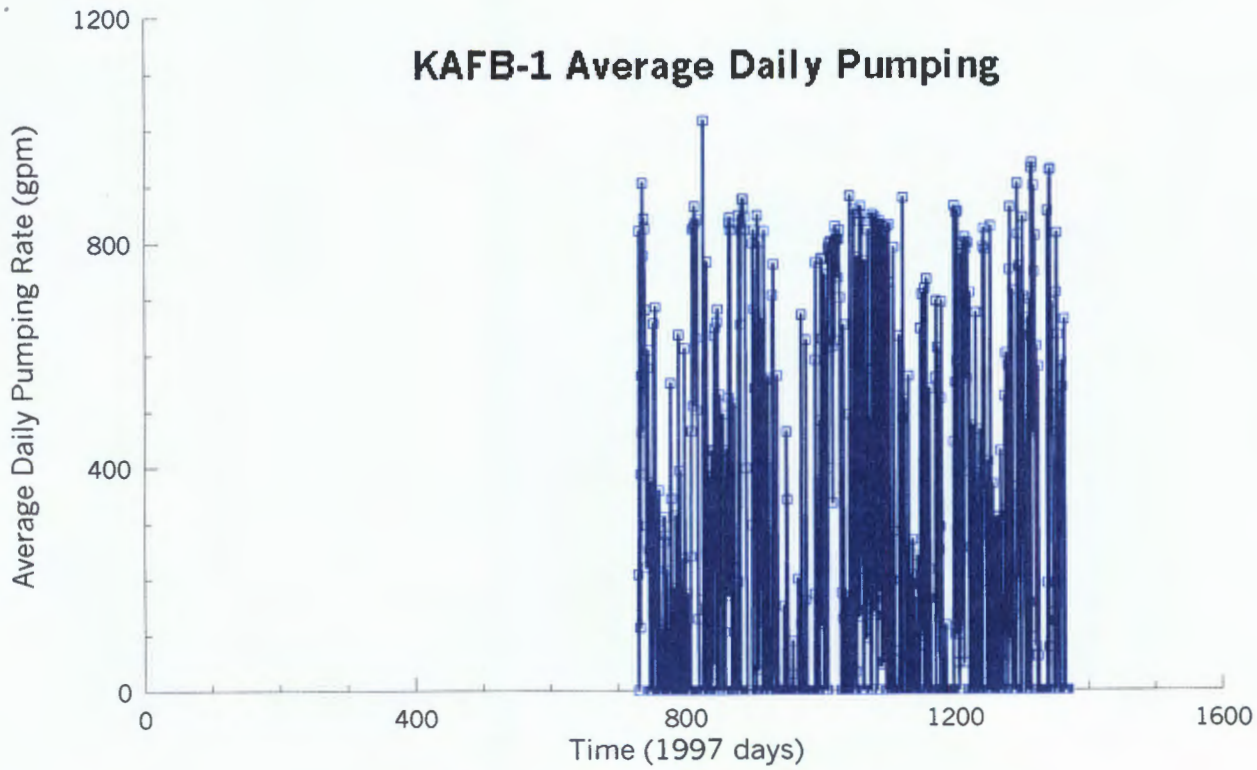


Figure 3-27. KAFB-1 average daily pumping rates

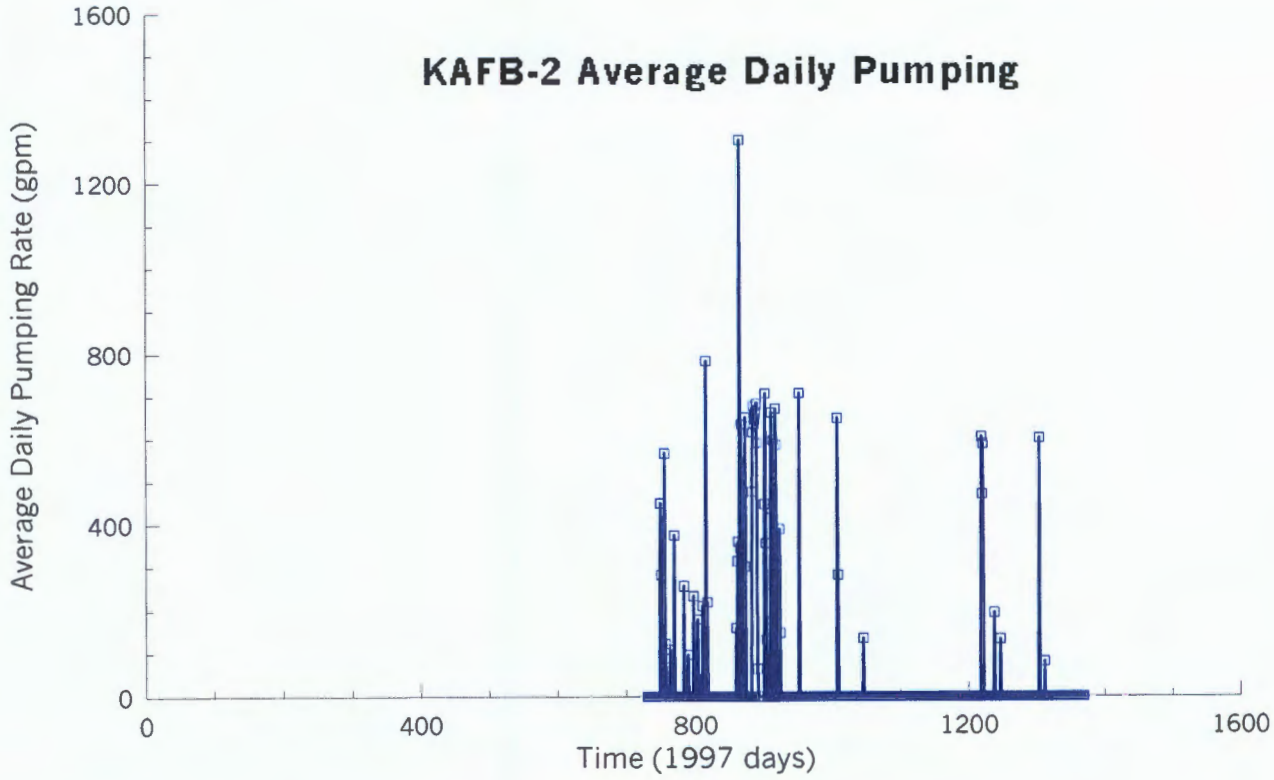


Figure 3-28. KAFB-2 average daily pumping rates

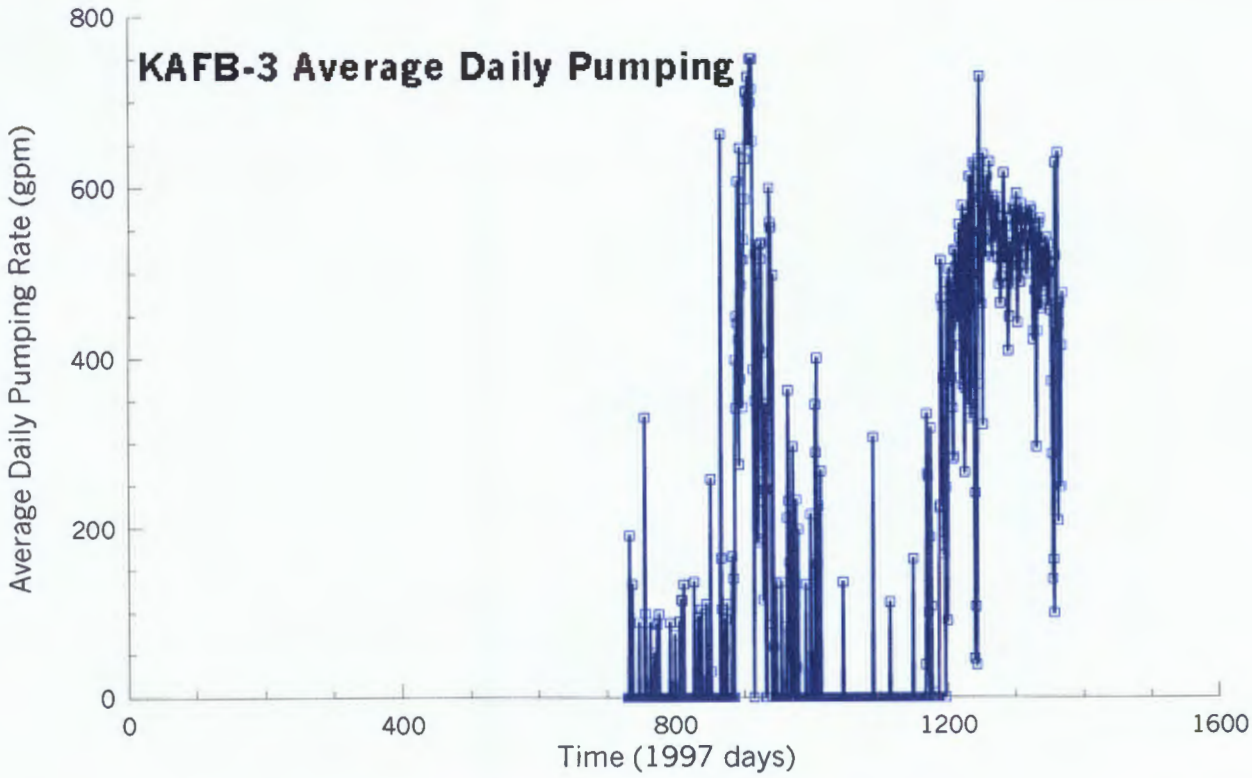


Figure 3-29. KAFB-3 average daily pumping rates

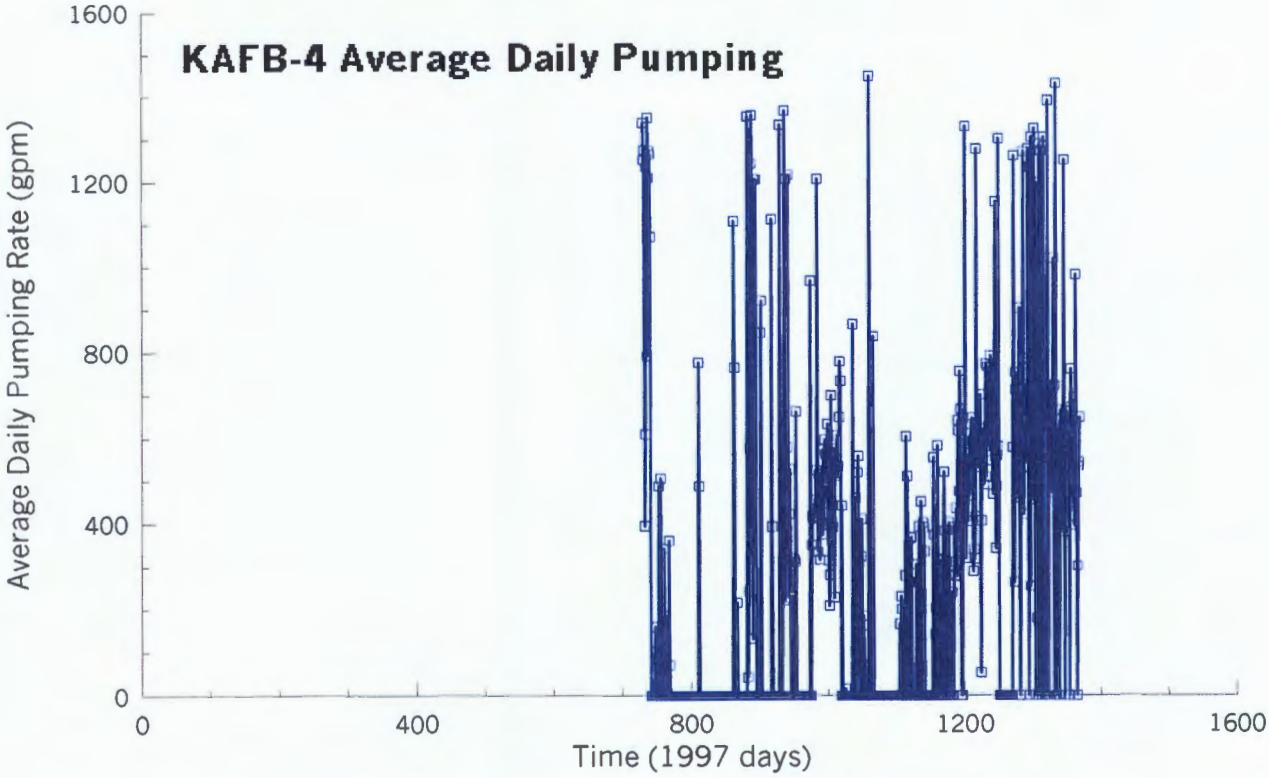


Figure 3-30. KAFB-4 average daily pumping rates

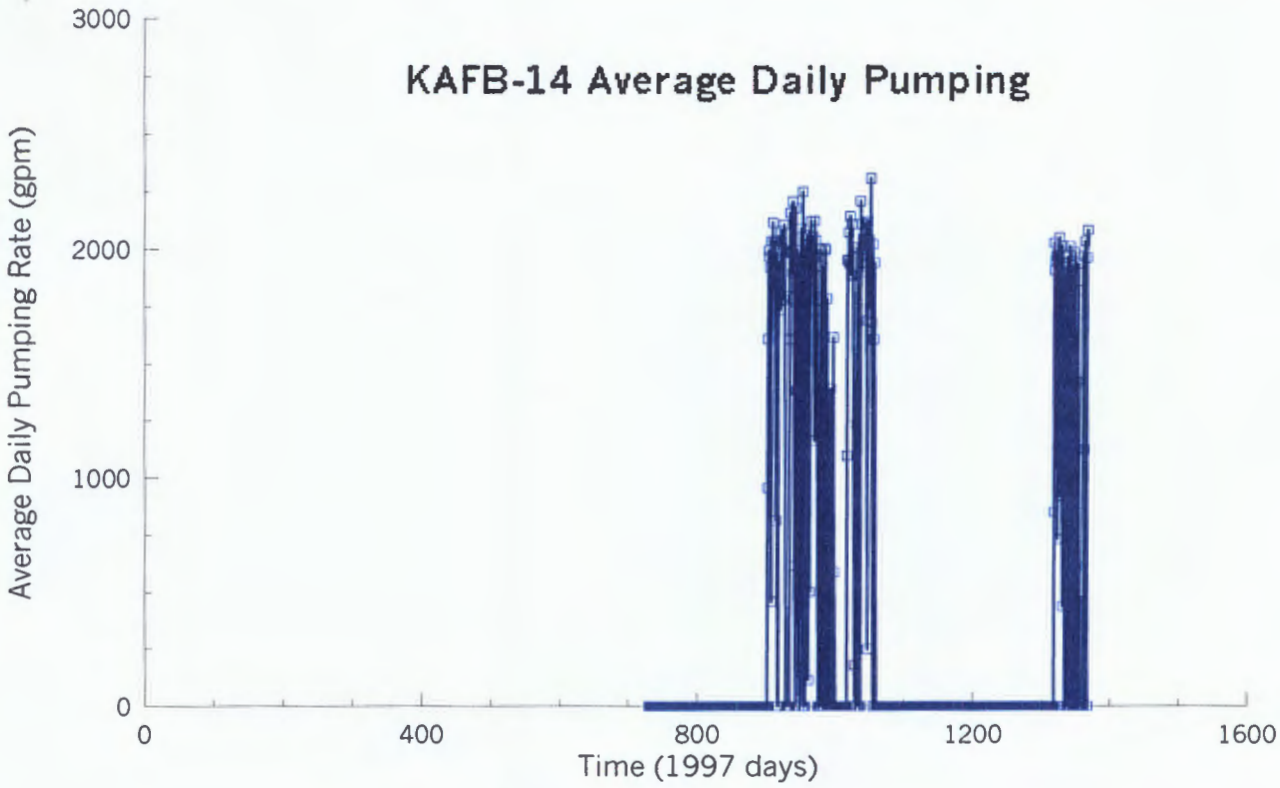


Figure 3-31. KAFB-14 average daily pumping rates

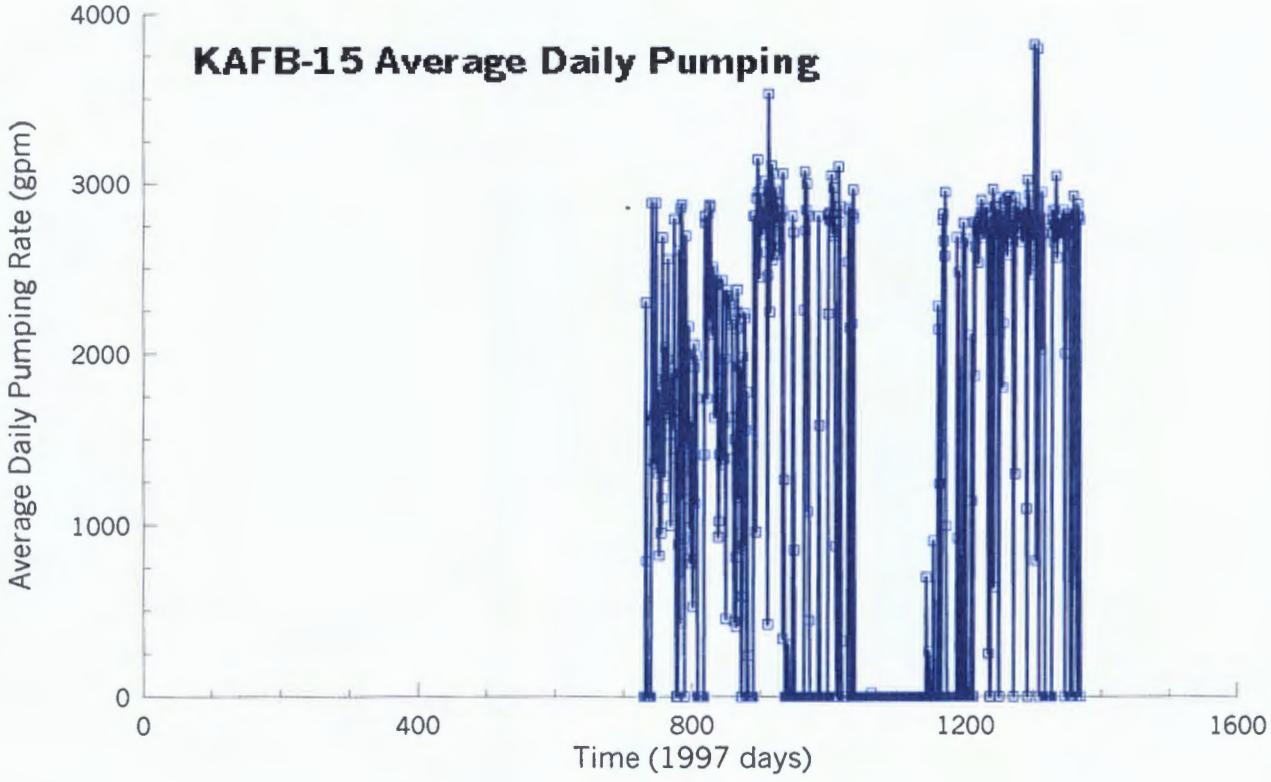


Figure 3-32. KAFB-15 average daily pumping rates

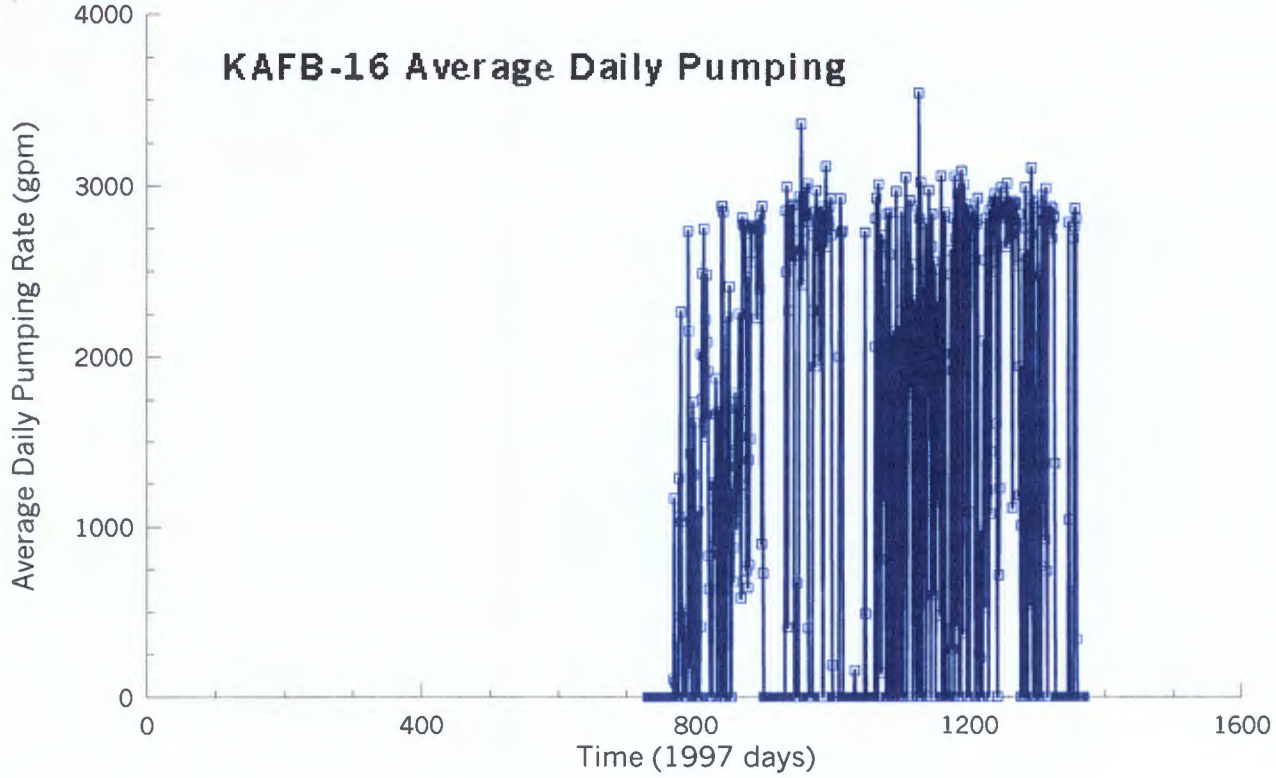


Figure 3-33. KAFB-16 average daily pumping rates

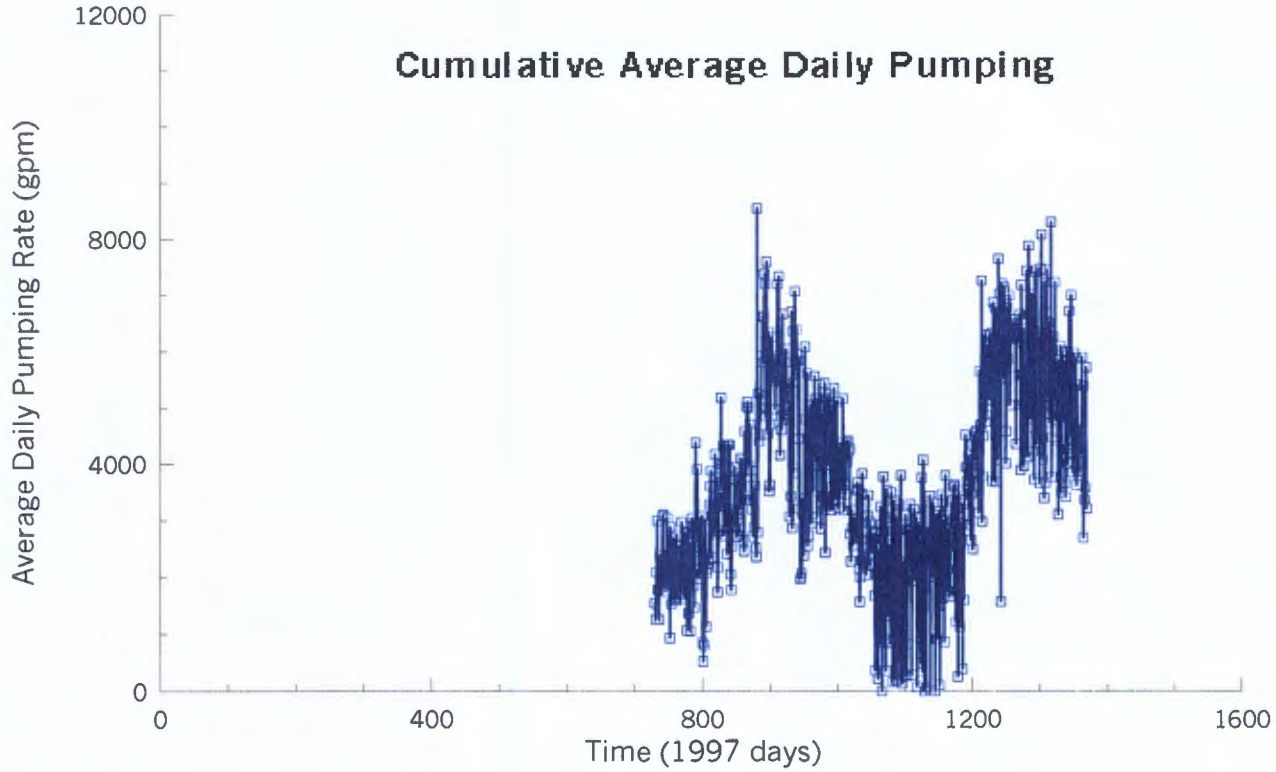


Figure 3-34. Cumulative average daily pumping rates

3.2 Monitoring Well Descriptions

In order to meet the objectives stated in Section 2.0, pressure transducers were placed in a network of monitor wells within the TAG area in order to capture water level data that might provide information with respect to the potential sources of long-term water-level trends in the area. Table 3-2 gives information regarding the wells included in the monitoring network as well as water supply wells in the vicinity along with completion information for each well. Figure 2-1 shows the locations of all of the wells relative to one another except for water supply wells KAFB-2, KAFB-14, KAFB-15, and KAFB-16. Water supply wells KAFB-14, KAFB-15, and KAFB-16 are directly west of KAFB-1 and KAFB-2 is southwest of KAFB-1.

Table 3-2. Monitor Well Information

Well I.D.	Total Depth (ft BGS)	Total Depth (ft AMSL)	TOC (ft AMSL)	Screened Interval (ft BGS)		Ground Water System
				Top	Bottom	
KAFB-0311	468.0	4882.45	5350.45	433.0	458.0	Regional
TA1-W-01	600.0	4801.15	5401.15	575.0	595.0	Regional
TA1-W-02	N/A	N/A	N/A	N/A	N/A	Regional
TA1-W-06	325.6	5088.83	5414.43	300.0	320.0	SGWS
TA1-W-07	289.1	5113.15	5402.25	268.6	288.6	SGWS
TA2-NW1-325	330.3	5089.53	5419.83	295.0	325.0	SGWS
PGS-2	655.0	4750.62	5405.62	585.0	595.0	Regional
TA2-NW1-595	598.0	4820.59	5418.59	585.0	595.0	Regional
TA2-SW1-320	324.6	5084.58	5409.18	299.6	319.6	SGWS
TA2-W-01	332.0	5085.33	5417.33	312.0	322.0	SGWS
TA2-W-19	285.9	5062.67	5348.54	265.9	285.9	SGWS
TA2-W-24	490.6	4870.39	5360.99	465.0	485.0	Regional
TA2-W-25	517.8	4854.39	5372.19	492.0	512.0	Regional
TA2-W-26	301.6	5071.50	5373.10	276.0	296.0	SGWS
TA2-W-27	300.6	5059.58	5360.18	275.0	295.0	SGWS
TJA-2	305.0	5044.81	5349.81	275.0	295.0	SGWS
TJA-4	385.7	4952.79	5338.49	360.0	380.0	SGWS (I)
TJA-5	292.7	5046.09	5338.79	267.0	287.0	SGWS
WYO-1	570.0	4819.83	5389.83	510.0	560.0	Regional
WYO-2	295.0	5094.83	5389.83	265.0	285.0	SGWS
KAFB-1	1199.0	4184.79	5383.79	550.0 970.0	800.0 1199.0	Regional
KAFB-2	1000.0	4324.39	5324.39	494.0	1000.0	Regional
KAFB-3	900.0	4454.26	5354.26	452.0	900.0	Regional
KAFB-4	1000.0	4357.54	5357.54	494.0	1000.0	Regional
KAFB-14	1000.0	4322.00	5322.00	380.0	1000.0	Regional
KAFB-15	N/A	N/A	N/A	N/A	N/A	Regional
KAFB-16	N/A	N/A	N/A	N/A	N/A	Regional

Pumping rate information was available for seven KAFB water supply wells. Table 3-3 shows the distances from each of the monitor wells in the monitoring network to the various water supply wells. This information was used to make a qualitative assessment as to the relative effect of pumping that each of the water supply wells might have on the water levels in the various

monitoring wells if a response was observed. Also, the likelihood of a water supply well(s) being responsible for a given change in water level in a monitoring well(s) could be evaluated.

Examination of Table 3-3 would, under radial flow conditions, provide information as to which monitor wells would be effected by the water supply well pumping as well as the relative magnitude of response that might be expected. Under radial flow conditions the hydraulic response to pumping (water level decline) in a monitor well decreases as a function of distance from the pumping well. Therefore, the monitor wells that are closer to a given water supply well would respond to pumping from that well more quickly and with a greater magnitude than to a water supply well that was farther away. However, this system at SNL/NM does not behave as a radial system (see Section 5.0) and therefore, the assessment of how the water supply wells effect the various monitor wells is much more complicated.

Table 3-3. Distances from Monitoring Wells to Water Supply Wells

Well I.D.	Distance to KAFB-1 (ft)	Distance to KAFB-2 (ft)	Distance to KAFB-3 (ft)	Distance to KAFB-4 (ft)	Distance to KAFB-14 (ft)	Distance to KAFB-15 (ft)	Distance to KAFB-16 (ft)
KAFB-0311	8936.59	14965.31	13631.39	7852.02	19509.48	N/A**	N/A**
TA1-W-02	N/A*	N/A*	N/A*	N/A*	N/A*	N/A*	N/A*
TA1-W-01	2741.33	9987.44	7649.68	5177.75	13900.11	N/A**	N/A**
TA1-W-06	4748.76	11862.96	9175.21	6148.52	15903.05	N/A**	N/A**
TA1-W-07	2791.64	10297.65	7324.18	5727.29	14071.77	N/A**	N/A**
TA2-NW1-325	5682.21	12314.63	10385.75	5967.03	16582.52	N/A**	N/A**
PGS-2	3217.66	10974.57	5369.28	7852.28	14010.42	N/A**	N/A**
TA2-NW1-595	5666.46	12303.36	10369.23	5962.37	16569.14	N/A**	N/A**
TA2-SW1-320	6066.38	12075.55	11133.27	5284.24	16546.52	N/A**	N/A**
TA2-W-01	6356.71	12723.99	11150.06	6072.36	17102.04	N/A**	N/A**
TA2-W-19	7977.85	13805.12	12904.04	6682.99	18381.62	N/A**	N/A**
TA2-W-24	7688.82	14002.90	12326.25	7136.97	18433.16	N/A**	N/A**
TA2-W-25	8016.62	14740.74	12241.42	8102.17	19026.35	N/A**	N/A**
TA2-W-26	8000.65	14743.08	12208.60	8119.88	19020.65	N/A**	N/A**
TA2-W-27	7736.60	14063.61	12357.64	7199.70	18490.76	N/A**	N/A**
TJA-2	8942.56	14972.40	13635.95	7859.18	19516.37	N/A**	N/A**
TJA-4	9447.41	15076.11	14339.54	7792.55	19734.46	N/A**	N/A**
TJA-5	9452.72	15073.35	14348.88	7787.22	19733.70	N/A**	N/A**
WYO-1	4072.19	9464.07	9648.99	3115.26	13953.99	N/A**	N/A**
WYO-2	4072.19	9464.07	9648.99	3115.26	13953.99	N/A**	N/A**

* - no data available for this monitoring well

** - no information available for these KAFB water supply wells

3.3 Barometric Efficiency

Based on previous activities associated with long-term water-level monitoring at KAFB, it was clear that the water level in many wells responded to changes in barometric pressure. The pressure transducers used to record the water level in the wells associated with this test were not designed to account for these changes in response to changes in barometric pressure. Therefore, the barometric efficiency (BE) was determined for each of the wells and a subsequent correction was made to the

recorded water level measurement. The correction made to the recorded water level measurement was based on the following equation:

$$\text{Corrected WLM} = \text{WLM}-((\text{BP}-\text{RBP})*\text{BE})$$

Where, WLM = actual water level measurement
BP = barometric pressure associated (in time) with the water level measurement
RBP = reference barometric pressure (in this case taken to be 1 atmosphere)
BE = barometric efficiency

Table 3-4 gives the barometric efficiency associated with each of the wells in the monitoring well network.

Table 3-4. Barometric Efficiencies

Well I.D.	Barometric Efficiency
KAFB-0311	1.00
TA1-W-02	N/A
TA1-W-01	0.98
TA1-W-06	0.94
TA1-W-07	0.98
TA2-NW1-325	1.00
PGS-2	0.70
TA2-NW1-595	0.89
TA2-SW1-320	1.00
TA2-W-01	0.80
TA2-W-19	0.98
TA2-W-24	0.92
TA2-W-25	0.85
TA2-W-26	1.00
TA2-W-27	1.00
TJA-2	1.00
TJA-4	0.53
TJA-5	0.94
WYO-1	1.00
WYO-2	1.00

As can be seen from Table 3-4, the barometric efficiency for many of the wells in the monitoring well network approaches or is equal to 1.00. It is accepted that no aquifer has a barometric efficiency of 1. However, in this case, there were several factors that influenced the water levels in the observation wells (barometric pressure fluctuations, earth tides, temperature, etc.). Some or all of these could have contributed to the apparent barometric efficiency being artificially high. Table 3-4 above represents the best estimates of BE given the available information. The end result was that the water levels in these wells changed with the same or very close to the same magnitude as the barometric pressure. This, quite often, manifested itself as water level changes of several inches

in relatively short periods of time. These water level fluctuations caused by changes in barometric pressure often times masked the more subtle trends that were occurring in response to stresses in the groundwater system. Figures 3-1 through 3-19 show the raw and barometric pressure (BP) corrected water levels for the wells in the monitoring well network for the duration of the activities.

Application of the barometric pressure correction to the raw water level measurements did not appreciably smooth the data in some cases and in other cases this correction smoothed the data nicely for a period of time but then failed to eliminate the water level fluctuations at other times. This was probably the result of other elements such as temperature and/or earth tides contributing to the water level fluctuations along with barometric pressure effects. As the temperature and/or earth tide effects varied in magnitude over time or season the success of the barometric correction would change. Table 3-5 identifies the monitoring wells in which the application of the barometric pressure correction was not or only partially successful.

Table 3-5. Monitoring Wells in which the Barometric Correction was not Successful

Well I.D.	Degree of Success
TA1-W-06	None
TA1-W-07	Partial
TA2-NW1-595	Partial
TA2-W-19	Partial
TA2-W-24	Partial
TA2-W-25	Partial
TA2-W-27	None
TJA-4	Partial
WYO-2	Partial

3.4 Tijeras Arroyo Groundwater System

The TAG area is underlain by the SGWS at a depth of approximately 275 to 325 feet below ground surface (bgs). This system includes multiple saturated intervals extending down to the regional aquifer (500 to 550 ft bgs). Section 5.0 in the TAG Annual Report (SNL/NM, 1999) provides a summary overview of the hydrogeologic conceptual model for the shallow and regional groundwater systems.

4.0 FIELD OPERATIONS FOR THE TIJERAS ARROYO GROUNDWATER ANALYSIS OF PRESSURE TRANSDUCER MONITORING DATA INVESTIGATION

4.1 Deviations from Task Plan

The TAG Analysis of Pressure Transducer Monitoring Data Task Plan stated that data from 1999 and 2000 would be summarized and assessed with the following items addressed:

- Identification of abrupt changes in water levels.

- Correlation of any abrupt changes with the pumping schedules of the KAFB water supply wells, if possible.
- Assessment of long-term water level trends in each well.
- Correlation of any abrupt water level changes between individual wells in each well pair.

The only deviation from the task plan was that these items were addressed for data from November 1996 to October 2000.

4.2 Equipment Installation and Operation

Geoguard pressure transducers were used to measure and record the water levels in all of the observation well in the monitoring well network during the activities described in this letter report. These pressure transducers were installed in the various wells at different times throughout the course of the monitoring period. Table 2-1 summarizes the initial installation and final removal of the pressure transducer for each of the wells. Examination of the water level data presented in Figures 3-1 through 3-19 shows that there were many periods when data was not collected in the various wells. The initiation and/or termination of data collection in the various monitoring wells occurred for unknown reasons. It should be noted that these gaps in the data made it very difficult to assess what was happening in the monitoring wells with regard to the stated objectives. In many cases significant changes in the water level occurred when data collection was reinitiated following a period of no data collection. In many of these cases it was unclear whether these water level changes were a result of actual water level responses to some stress or changes in the pressure transducer positions following reinstallation.

5.0 PRESSURE TRANSDUCER MONITORING DATA ANALYSIS RESULTS

5.1 Long Term Water level Trends in the Regional Aquifer

The first objective, as stated in Section 2.0, of the TAG Analysis of Pressure Transducer Monitoring Data Investigation was to identify water level changes that could be attributed to pumping from the KAFB water supply well network. Because all of the water supply wells withdraw water from the regional aquifer and based on results from pumping tests conducted in the past it was assumed that changes in water levels as a result of KAFB water supply well pumping would be limited to monitoring wells that were completed in the regional aquifer. Tables 2-1 and 3-2 indicate which monitoring wells were completed in the regional aquifer. The following paragraphs describe the analysis of the observed water level changes in the regional aquifer monitor wells.

The TA2-NW1-595 water level history is shown in Figure 3-7. At late time (~1250 to 1400 days) there appeared to be a hydraulic response to some unknown stress. The response in TA2-NW1-595 suggested that it was responding to a well being pumped for approximately 100 days at which time the pumping ceased. This suspected hydraulic response did not correlate to any of the seven KAFB water supply wells pumping schedules. Both TA2-NW1-595 and TA2-W-25 showed significant hydraulic response to KAFB-11 pumping (based upon recent testing). However, the pumping schedule for KAFB-11 was not available and it was not known whether this water supply well was

operational during this period of time. Therefore, the source of this suspected hydraulic response could not be verified.

The TA2-W-25 water level history is shown in Figure 3-12. Based on recent test results TA2-W-25 and TA2-NW1-595 respond hydraulically similar to one another to KAFB-11 pumping. Examination of the historical water level data showed that these two wells mimic one another in general appearance but not in magnitude of response. As stated above, the pumping schedule for KAFB-11 was not provided and it is not known whether this water supply well was operational during this period of time. Therefore, the source of this suspected hydraulic response could not be verified.

TheTA2-W-24 water level history is shown in Figure 3-11. This monitoring well along with KAFB-0311 showed an increasing trend for the duration of the data collection period. The cause of this water level increase could not be identified. Both of these wells were in relatively close proximity to one another and were completed to similar depths. There were no other deep wells in the vicinity and there was no apparent correlation to the pumping schedules of water supply wells KAFB-4 and KAFB-1 (the closest water supply wells). The average daily pumping rates for KAFB-4 and KAFB-1 are shown in Figures 3-30 and 3-27 respectively.

The PGS-2 water level history is shown in Figure 3-6. This monitoring well showed a dramatic increase in water level from day 1045 to day 1067. There may have been a correlation (with some time lag) between this well and water supply wells KAFB-16 and KAFB-3 having been shut down approximately on day 1015 (see Figures 3-33 and 3-29, respectively). These two KAFB water supply wells were the closest to PGS-2 except for KAFB-1 (see Table 3-3). KAFB-1 average daily pumping remained relatively constant prior to the water level increase in PGS-2 as shown in Figure 3-27. There was not enough information available to verify the suspected correlation between the water supply well pumping and the water level response in PGS-2.

The TA1-W-01 water level history is shown in Figure 3-9. The water level decline that began at approximately day 1300 may be correlated to the initiation of production from water supply well KAFB-3 which began at approximately day 1200 (see Figure 3-29). The production from KAFB-4 and KAFB-1, the other two water supply wells in the vicinity of TA1-W-01, remained relatively constant during the period of interest. Additional information would be necessary to verify this correlation. KAFB-3 was farther from TA1-W-01 than the other water supply wells mentioned, however, it was the only one with an extended change in stress level that might be observed in an observation well.

The WYO-1 water level history is shown in Figure 3-18. The water level in this monitoring well remained relatively stable for the duration of the data collection period other than for after the gap in the data from approximately 840 days to Approximately 900 days. This change in water level could not be correlated to any change in pumping schedule in any of the water supply wells for which data was available. The change in water level may have been an artifact of the pressure transducer having been reinstalled to a different position within the well. There was not sufficient information to verify this one way or another.

The KAFB-0311 water level history is shown in Figure 3-1. Monitoring wells KAFB-0311, TA2-W-25, TA2-W-24, and TA2-NW1-595 all showed an increasing water level trend during the various data collection periods. It has been established that both TA2-NW1-595 and TA2-W-25 respond in an observable real-time manner to water supply well KAFB-11 pumping. Given that all of the monitoring wells mentioned above were in relatively close proximity to one another and in the same general direction relative to KAFB-11, it was suspected that all were recovering from an extended pumping period in KAFB-11 after it was shut down due to air entrainment problems. Information was not available as to when KAFB-11 was taken off line, therefore, this could not be verified.

Considering the monitoring wells that were completed in the regional aquifer, there did not appear to be any correlation between completion depth and magnitude of response to water supply well pumping as previously thought (SNL/NM, 1998) but there may be a correlation with location. The paleochannel that was proposed in the KAFB-11 letter report would be an example of this idea. TA2-NW1-595 and TA2-W-25 were both very well connected to KAFB-11 as shown by the hydraulic responses to KAFB-11 pumping. However, other monitor wells that were significantly closer to KAFB-11 showed no apparent hydraulic response.

5.2 SGWS/Regional Aquifer Well Pair Correlation

Given that no pumping occurred from the SGWS during the period of interest, no correlation between water level trends in the SGWS and KAFB water supply well pumping was attempted. Only correlation between trends at the various SGWS/regional aquifer well pairs was attempted in an effort to assess possible hydraulic connection between the two systems.

The WYO-1/WYO-2 well pair water level histories are shown in Figure 3-20. In this well pair WYO-1 was the regional aquifer completion while WYO-2 was the SGWS completion. Beginning at approximately day 1100 and continuing to approximately day 1185 the water in WYO-1 increased at the same rate that the water level in WYO-2 decreased. The result was that the WYO-1 water level increased by approximately 0.5 feet while the WYO-2 water level decreased by approximately 0.5 feet. It is conceivable that the SGWS was yielding water to the regional aquifer during this time period but this could not be verified. The data preceding and following this 85 day period were inconclusive.

The TA1-W-01/TA1-W-07 well pair water level histories are shown in Figure 3-21. In this well pair TA1-W-01 was the regional aquifer completion while TA1-W-07 was the SGWS completion. There was no apparent correlation between the water level trends in this well pair. TA1-W-07 water level monotonically decreased for the entire data collection period. TA1-W-01 water level increased and then decreased dramatically following a gap in the data collection. The water level in this well continued to decrease until data collection was terminated.

The TA2-NW1-595/TA2-NW1-325 well pair water level histories are shown in Figure 3-22. In this well pair TA2-NW1-595 was the regional aquifer completion while TA2-NW1-325 was the SGWS completion. There was no apparent correlation between the water level trends in these two wells. TA2-NW1-325 had a general decreasing trend for the data collection period while TA2-NW1-595

appeared to be responding to various stresses to the regional aquifer system (probably KAFB-11 pumping).

The TA2-W-25/TA2-W-26 well pair water level histories are shown in Figure 3-23. In this well pair TA2-W-25 was the regional aquifer completion while TA2-W-26 was the SGWS completion. There was no apparent correlation between the water level in these two wells. The water level in monitoring well TA2-W-26 was inconsistent; initially increasing and then decreasing at the termination of data collection. At approximately day 1290 the water level in monitoring well TA2-W-25 started to increase and continued to do so for the remainder of the data collection period (this was the only common data collection period associated with this well pair). It should be noted that monitoring wells TA2-W-25 and TA2-NW1-595 responded in a similar manner to KAFB-11 pumping as observed during various KAFB-11 pumping tests. Over the course of the data collection period illustrated in Figure 3-23 (day 750 to day 1400) these two monitoring wells exhibited the same general behavior to stresses and followed the same general water level trends. Upon examination of the water level and KAFB water supply well pumping data, it was suspected that these two wells were correlated to the cumulative water supply well pumping at KAFB when KAFB-11 is off-line. When the water levels from these two wells were compared to the cumulative KAFB water supply well pumping (the seven wells for which data was available) as shown in Figure 3-34, similarities were observed. At approximately day 775 when the cumulative water supply well pumping rate was relatively low, the water levels in both TA2-W-25 and TA2-NW1-595 were increasing. As the cumulative pumping rate increased to a peak value of approximately 6700 gpm at day 920 the rate of water level increase in both of the monitoring wells slowed to almost zero. Then, as the cumulative pumping rate decreased to day 1180, the water level in the monitor wells increased. This pattern was then repeated as part of, what was suspected to be, a seasonal trend of high and low water usage at KAFB.

The TA2-W-24/TA2-W-27 well pair water level histories are shown in Figure 3-24. In this well pair TA2-W-24 was the regional aquifer completion while TA2-W-27 was the SGWS completion. There was no apparent correlation between the water levels in these two wells. The water level in monitoring well TA2-W-27 was relatively stable but exhibited a considerable amount of associated noise even after the barometric pressure corrections had been applied. The water level in monitoring well TA2-W-24 was monotonically increasing for the duration of the data collection period. The increasing water level trend in this well did not appear to be the result of pumping in any one or any combination of the seven KAFB water supply wells for which data was available.

The KAFB-0311/TJA-2 well pair water level histories are shown in Figure 3-25. In this well pair KAFB-0311 was the regional aquifer completion while TJA-2 was the SGWS completion. There was no apparent correlation between the water level trends in these two wells. TJA-2 was relatively stable for the entire data collection period (the dramatic water level decrease between 850 and 900 days cannot be explained but is probably not a reliable reflection of the water level given that the water level returned to the original level at approximately 900 days). Similar to monitoring well TA2-W-24 described above, the water level in well KAFB-0311 increased monotonically for the duration of the data collection period with no apparent correlation to any of the KAFB water supply wells for which pumping data was available.

The TJA-4/TJA-5 well pair water level histories are shown in Figure 3-26. In this well pair TJA-4 was the SGWS (intermediate) completion while TJA-5 was the SGWS completion. The water levels in these two monitoring wells appeared to be directly correlated. The water level in both wells was monotonically increasing at approximately the same rate for the duration of the data collection period. This was not surprising given that both wells were completed in the SGWS, only TJA-4 was completed slightly deeper. The two wells were completed in the same groundwater system and were in close proximity to one another, therefore, it was reasonable to assume that these wells would respond to stresses in a similar manner. The cause of the water level increased observed during the data collection period could not be identified with the available information.

6.0 RECOMMENDATIONS

Following a thorough assessment of the water level and KAFB water supply well pumping data there were no instances in which KAFB water supply well pumping was conclusively the cause of water level changes in any of the wells included in the monitoring well network. In some cases (particularly the water level trends observed in monitor wells TA2-W-25 and TA2-NW1-595) there was subtle evidence that KAFB water supply well pumping might have effected the water levels in wells completed in the regional aquifer but there was insufficient information to verify these observations. Because there was no conclusive evidence, based on water level measurements, of KAFB water supply well pumping effecting the water levels in monitoring wells completed in the regional aquifer (pumping from the regional aquifer creating drawdown in the regional aquifer at some radial distance) it was not expected that any response to KAFB water supply well pumping would be observed in monitoring wells completed in the SGWS. This was indeed the case. Therefore, with available information, the only conclusion that could be drawn was that, under the conditions that were present, there did not appear to be a hydraulic connection between the SGWS and the regional aquifer. Any statements regarding the absolute causes of observed water level trends in the monitoring wells would be speculative given that information was not available to verify any such statements.

If further activities are to be undertaken to meet the objectives that are stated in Section 2.0, the following recommendations are made:

- In order to fully assess the impact that KAFB water supply well pumping has on the regional aquifer, more information needs to be made available. It is abundantly clear that effects from KAFB-11 pumping can be observed at more than 1 mile (monitoring well TA2-NW1-595) based upon relatively short tests that have been conducted at this well. However, it is also clear based upon results from the same tests that the regional aquifer is an extremely complex groundwater system exhibiting highly preferential flow paths (paleochannel). The existing monitoring well network has the highest density surrounding KAFB-11 yet only two wells show any response to KAFB-11 pumping because of the nonradial nature of the flow to this well (these two wells are in or near the preferential flow path while the others are not). In order to see a conclusive response to pumping of the other water supply wells it may be necessary to monitor a higher density of observation wells in the vicinity of each of the water supply wells. Otherwise, a water level response occurring in a finite preferential flow path would go undetected. Therefore, it is recommended that water levels be monitored in the vicinity of

KAFB water supply wells that are actually pumping for extended periods of time. If monitoring wells do not exist in the vicinity of other KAFB water supply wells then this objective cannot be met with any degree of certainty.

- In order to establish that a hydraulic connection does or does not exist between the SGWS and the regional aquifer a gradient must be established between the two systems at a given point. Therefore, it is recommended that pumping tests be conducted at one or more of the SGWS/regional aquifer well pairs listed in Table 3-1. Pumping from the well completed in the regional aquifer at any of the well pairs would create a downward gradient of significantly higher magnitude than has been observed as a result of KAFB water supply well pumping. By monitoring the water level in both of the groundwater systems at a given well pair any hydraulic communication between the two systems would be observed.
- In order to quantify the impact that pumping from the COA water supply wells in the vicinity of KAFB have on the water levels in some or all of the monitoring wells mentioned in this report detailed pumping records for the COA water supply wells should be obtained. In particular, pumping records for COA water supply wells Ridgecrest 1, Ridgecrest 2, Ridgecrest 3, Ridgecrest 5, Lomas 1, Lomas 5, and Lomas 6 should be examined to determine if any correlation exists between production from these wells and water levels in the monitoring wells on KAFB.

7.0 REFERENCES

SNL/NM, 1998. Sandia North Groundwater Investigation Annual Report, Fiscal Year 1997. Sandia National Laboratories, Environmental Restoration Project, Albuquerque, NM.

SNL/NM, 1999. Sandia North Groundwater Investigation Annual Report, Fiscal Year 1998. Sandia National Laboratories, Environmental Restoration Project, Albuquerque, NM.

APPENDIX A

Sandia North Analysis of Pressure Transducer Monitoring Data

SANDIA NATIONAL LABORATORIES
Environmental Restoration, Tech Areas & Miscellaneous Sites (Department 6133)
Environmental Restoration Project

Test Plan:
Sandia North Analysis of Pressure Transducer Monitoring Data

Prepared for

Sandia National Laboratories
Albuquerque, New Mexico

Prepared by

John McCord and Erik Storms
ER Project
Sandia North Groundwater Investigation
September 13,1999

Task Plan:

Sandia North Analysis of Pressure Transducer Monitoring Data

Sandia National Laboratories
Albuquerque, NM 87186

Prepared by: _____ _____
J.P. McCord, Sandia North Contractor Support Date

Reviewed by: _____ _____
M. Skelly, Dept 6133 Date
Assistant Task Leader B Sandia North Groundwater Investigation

_____ _____
S. Collins, Dept 6133 Date
Task Leader B Sandia North Groundwater Investigation

Sandia North Analysis of Pressure Transducer Monitoring Data Task

Background:
The SNL/NM ER Project includes a task to develop an understanding of the Sandia North hydrogeologic environment. The overall objective of the Sandia North task is to provide information to identify potential sources and pathways for contaminant transport to the underlying aquifer systems. Detailed information on the Sandia North groundwater investigation can be found in the investigation plan (SNL/NM, 1996), and task annual reports (SNL/NM, 1997; SNL/NM, 1998; and SNL/NM, 1999).

The Sandia North area is underlain by a shallow groundwater system (SGWS) at a depth of approximately 275 to 325 feet below ground surface (bgs). This system includes multiple saturated intervals extending down to the regional aquifer (500 to 550 ft bgs). Section 5.0 in the 1998 Sandia North Annual Report (SNL/NM, 1999) provides a summary overview of the hydrogeologic conceptual model for the shallow and regional groundwater systems.

Figure 1 shows the location of the Sandia North area and identifies groundwater monitoring well locations (as of August 1999). At seven of these locations monitoring wells are completed in both the SGWS and the regional aquifer. At one location monitoring wells are completed in two intervals of the SGWS. Table 1 summarizes construction information for these well pairs. Table 2 presents an inventory of water level data for those wells that were monitored with pressure transducers for the years 1999 and 2000.

Table 1 – Construction Information for Monitoring Wells at Locations that Include both SGWS and Regional Monitoring Wells

Well Designation	Screen Interval (depth bgs, ft)	Water Level* (depth bgs, ft)
SGWS well – WYO-2 Regional well – WYO-1	265 – 285 510 – 560	274.23 524.88
SGWS well – TA1-W-07 Regional well – TA1-W-01	268 – 288 575 – 595	275.36 540.28
SGWS well – TA1-W-06 Regional well – TA1-W-02	300 – 320 540 – 560	299.61 528.90
SGWS well – TA2-NW1-325 Regional well – TA2-NW1-595	295 – 325 535 – 555 585 – 595	311.32 531.30
SGWS well – TA2-W-26 Regional well – TA2-W-25	276 – 296 492 – 512	280.14 478.14
SGWS well – TA2-W-27 Regional well – TA2-W-24	275 – 295 465 – 485	275.09 450.74
SGWS well – TJA-2 Regional well – KAFB-0311	275 – 295 433 – 458	273.83 329.17
SGWS well – TJA-5 SGWS Intermediate well – TJA-4	267 – 287 360 - 380	270.61 317.87

* - December 1998 water level measurements

Objective:
The water levels in each of the monitoring wells listed in Table 1 were monitored in fiscal years 1999 and 2000 using Geoguard pressure transducers. The objectives for collecting continuous water level data include:

- Identifying water level changes in these wells due to pumping from the KAFB water supply well network;
- Developing a data set on the potential for significant hydraulic connection between the SGWS and the regional aquifer; and
- Identifying water level trends (i.e. a decrease in depth to water in the SGWS due to aquifer recharge and/or an increase in depth to water in the aquifers due to water supply well pumping [regional aquifer] or leakage [SGWS]).

Data Compilation:

- Review and if necessary revise algorithm used for barometric pressure correction and correct data for barometric effect.
- Plot data for each well on a single graph.
- Present combined plots for each well pair correlated on time.
- Plot pumping data.

After reviewing the data summarized in Table 2, it is estimated that it will require 24 hours to complete the data compilation tasks listed above. Most of the effort will be spent revising the algorithm used for barometric pressure correction.

Data Analysis and Reporting:

- Prepare a report summarizing 1999 – 2000 data, data assessments, and trend analysis.
  - Review each graph to identify abrupt changes in water levels.
  - Correlate any observed abrupt changes to pumping schedules in the KAFB water supply wells.
  - Assess long term (monthly, quarterly) water trends in each well.
  - Compare and contrast any abrupt water level changes between individual wells in each well pair.
  - Compare and contrast water level trends between individual wells in each well pair.
- Copy Franz Lauffer on the report.

It is estimated that it will require 32 hours to complete the data analysis and reporting tasks listed above. Comparing and contrasting water level trends will require reviewing water level data collected prior to 1999.

Task End Point:

- Prepare a letter report and a write-up to be included in the FY-2000 annual report.
- Review results presented in the annual report in relationship to the objectives and determine the need for task continuation.

It is estimated that it will require 32 hours to complete a letter report and a write-up to be included in the FY-2000 annual report.

Table 2 – Inventory of Pressure Transducer Water Level Data for Years 1999 and 2000

Well Designation	Date Interval of Data Collected in 1999	Date Intervals of Data Collected in 2000
SGS well – WYO-2 Regional well – WYO-1	December 1 – December 31 January 1 – January 7 January 13 – April 16 June 23 – August 13	January 1 – March 31 May 20 – July 20 January 1 – March 31 May 20 – October 11
SGS well – TA1-W-07 Regional well – TA1-W-01	November 19 – December 31 December 19 – December 31	January 1 – January 5 May 20 – October 11 July 28 – October 11
SGS well – TA1-W-06 Regional well – TA1-W-02	No Data No Data	July 29 – September 9 July 29 – August 1
SGS well – TA2-NW1-325 Regional well – TA2-NW1-595	January 13 – May 12 June 7 – December 31 January 1 – May 31 November 11 – December 31	January 1 – January 5 August 1 – October 11 January 1 – October 9
SGS well – TA2-W-26 Regional well – TA2-W-25	No Data No Data	May 20 – October 10 March 31 – October 10
SGS well – TA2-W-27 Regional well – TA2-W-24	No Data No Data	January 1 – September 30 March 27 – October 10
SGS well – TJA-2 Regional well – KAFB-0311	January 13 – May 12 June 8 – December 12 January 1 – December 31	January 1 – April 4 May 31 – June 2 January 1 – September 30
SGS well – TJA-5 SGS Intermediate well – TJA-4	December 3 – December 31 December 3 – December 31	January 1 – January 5 January 1 – January 5 May 20 – July 20
SGS well – PGS-2	February 1 – March 2 June 27 – November 22	No Data
SGS well – TA2-SW1-320	January 1 – January 14 January 19 – May 11 June 7 – August 1	No Data
SGS well – TA2-W-01	January 8 – January 12 April 12 – May 12 June 8 – November 23	No Data
SGS well – TA2-W-19	January 12 – March 3 June 24 – November 23	No Data

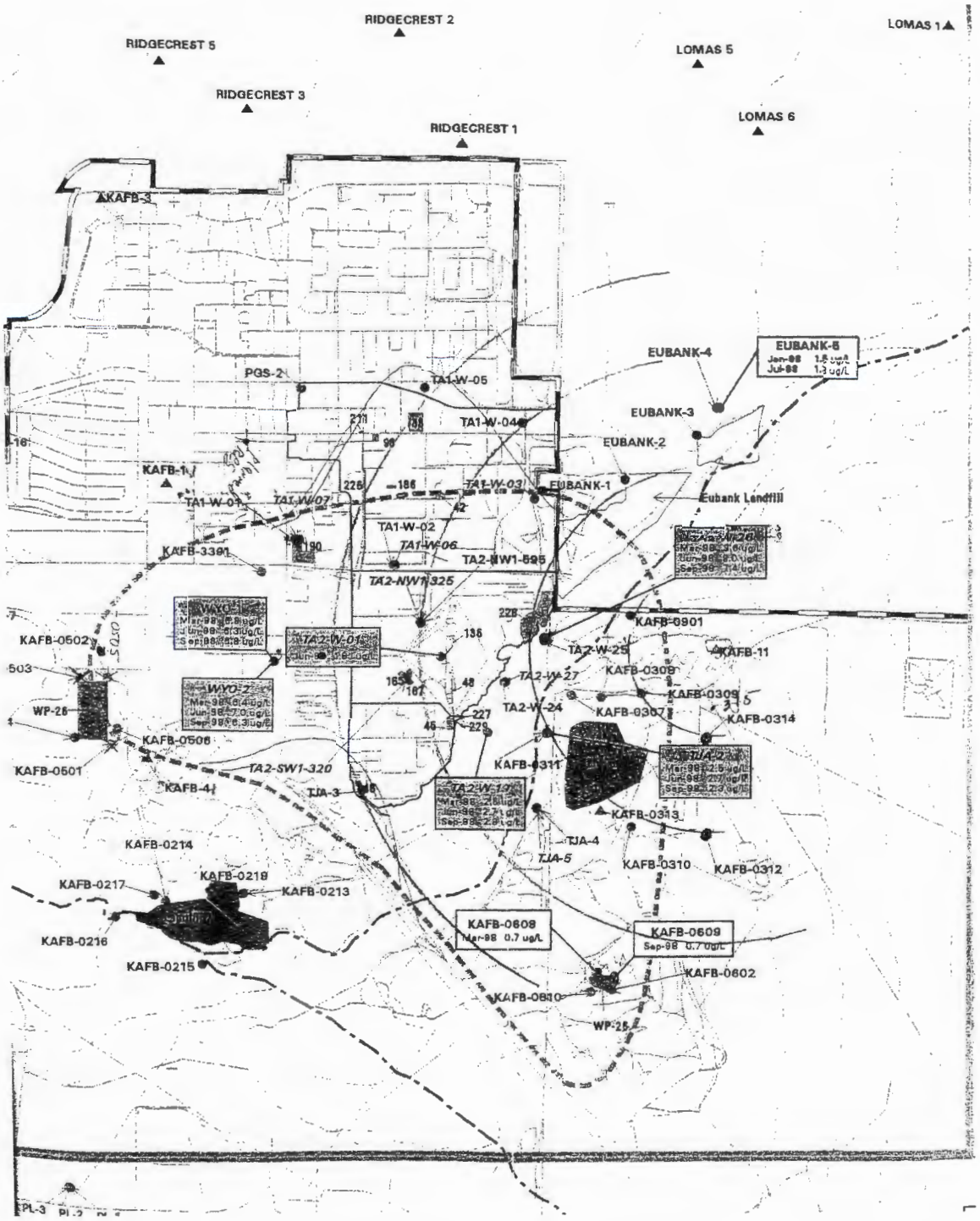


Figure 1. Groundwater monitoring well locations

ANNEX E
Tijeras Arroyo Groundwater Investigation—Monitor Well Completion Diagrams

WELL DATABASE SUMMARY SHEET

Project Name:	IRP	**Geo Location:**	KAFB EAST LANDFILL
ER ADS #:	NA	**Well Completion Date:**	27-AUG-91
Well Name:	KAFB-0310	**Completion Zone:**	SILTY SAND
Owner Name:	KAFB	**Formation of Completion:**	SANTA FE
Date Drilling Started:	23-AUG-91	**Well Comment:**	
Drilling Contractor:	USGS		
Drilling Method:	MUD ROTARY		
Borehole Depth:	510		
Casing Depth:	455		

Survey Data

Survey Date: 01-JAN-97

Surveyed By: HALL ENGINEERING COMPANY

State Plane Coordinates

(X) Easting: 416996.42

(Y) Northing: 1466797.27

Surveyed Elevations (FAMSL)

Protective Casing:	5419.24
Top of Inner Well Casing:	5413.81
Concrete Pad:	5416.79
Ground Surface:	5410.5

Calculated Depths and Elevations

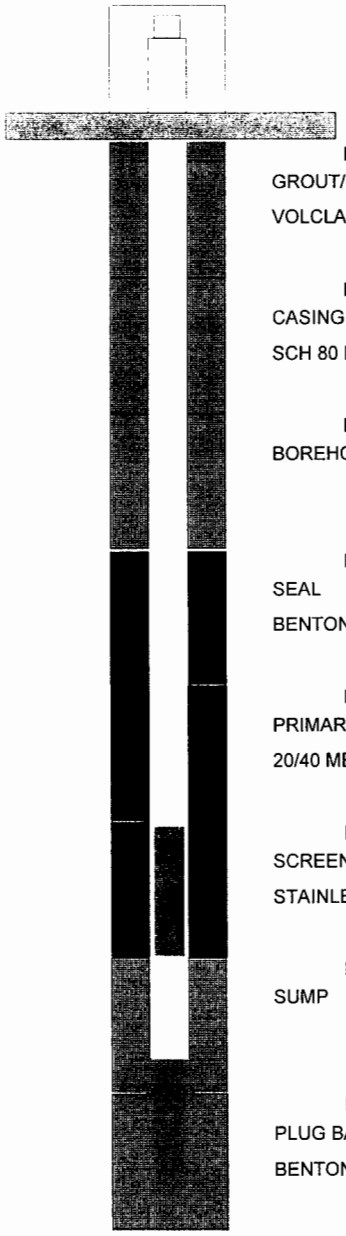
Initial Water Elevation: (FAMSL)

Initial Depth To Water: (FBGS)

Last measured water level was 5052.47 **FASL**
measured on 05-AUG-96

Date Updated: 01-OCT-01

Date Printed: 08-NOV-01



Completion Data Measured Depths (FBGS)

Casing Stickup: 1.67

Interval	Start	Stop
GROUT/BACKFILL	0'	320'
VOLCLAY		

Interval	Start	Stop
CASING	0'	455'
SCH 80 PVC	I.D. 3.826"	

Interval	Start	Stop
BOREHOLE	0'	510'
	O.D. 7.875"	

Interval	Start	Stop
SEAL	320'	331'
BENTONITE		

Interval	Start	Stop
PRIMARY PACK	331'	465'
20/40 MESH		

Interval	Start	Stop
SCREEN	400'	445'
STAINLESS STEEL	O.D. .01"	

Interval	Start	Stop
SUMP	445'	455'

Interval	Start	Stop
PLUG BACK	465'	510'
BENTONITE/PEA GRAVEL		

WELL DATABASE SUMMARY SHEET

Project Name:	IRP	**Geo Location:**	TIJERAS ARROYO/EAST LANDFILL
ER ADS #:	NA	**Well Completion Date:**	24-JUL-92
Well Name:	KAFB-0311	**Completion Zone:**	SOFT BROWN SILTY CLAY
Owner Name:	KAFB	**Formation of Completion:**	SANTA FE
Date Drilling Started:	20-JUL-92	**Well Comment:**	
Drilling Contractor:	USGS		
Drilling Method:	MUD ROTARY		
Borehole Depth:	470		
Casing Depth:	468		

Survey Data

Survey Date: 01-JAN-97

Surveyed By: HALL ENGINEERING COMPANY

State Plane Coordinates

(X) Easting: 415335.94

(Y) Northing: 1468620.3

Surveyed Elevations (FAMSL)

Protective Casing: 5355.45

Top of Inner Well Casing: 5350.62

Concrete Pad: 5353.57

Ground Surface: 5349

Calculated Depths and Elevations

Initial Water Elevation: (FAMSL) 4925.48

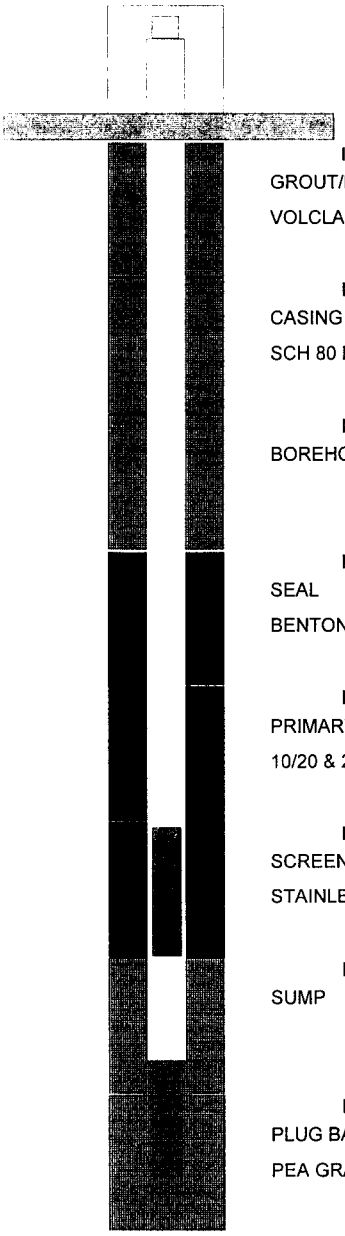
Initial Depth To Water: (FBGS) 428

Last measured water level was FASL

measured on 25-SEP-97

Date Updated: 01-OCT-01

Date Printed: 08-NOV-01



Completion Data Measured Depths (FBGS)

Casing Stickup: 1.58

Interval	Start	Stop
GROUT/BACKFILL	0'	335'
VOLCLAY		

Interval	Start	Stop		
CASING	0'	468'		
SCH 80 PVC	I.D. 3.826"		O.D.	4.5"

Interval	Start	Stop		
BOREHOLE	0'	470'		
			O.D.	7.875"

Interval	Start	Stop
SEAL	335'	355'
BENTONITE PELLETS		

Interval	Start	Stop
PRIMARY PACK	355'	468'
10/20 & 20/40 MESH		

Interval	Start	Stop
SCREEN	433'	458'
STAINLESS STEEL		
	Slot Size	.01"

Interval	Start	Stop
SUMP	458'	468'

Interval	Start	Stop
PLUG BACK	468'	470'
PEA GRAVEL		

WELL DATABASE SUMMARY SHEET

Project Name:	IRP	**Geo Location:**	KAFB LAGOON
ER ADS #:	NA	**Well Completion Date:**	10-NOV-89
Well Name:	KAFB-0501	**Completion Zone:**	VFG/FG SAND AND SILT
Owner Name:	KAFB	**Formation of Completion:**	SANTA FE
Date Drilling Started:	07-SEP-89	**Well Comment:**	ALTERNATE NAME: LAGOONS - SE
Drilling Contractor:	USGS		
Drilling Method:	HOLLOW STEM AUGER/MUD ROTAF		
Borehole Depth:	515		
Casing Depth:	503		

Survey Data

Survey Date:

Surveyed By:

State Plane Coordinates

(X) Easting: 406793.248

(Y) Northing: 1468358.601

Surveyed Elevations (FAMSL)

Protective Casing:

Top of Inner Well Casing: 5358.04

Concrete Pad:

Ground Surface: 5358.04

Calculated Depths and Elevations

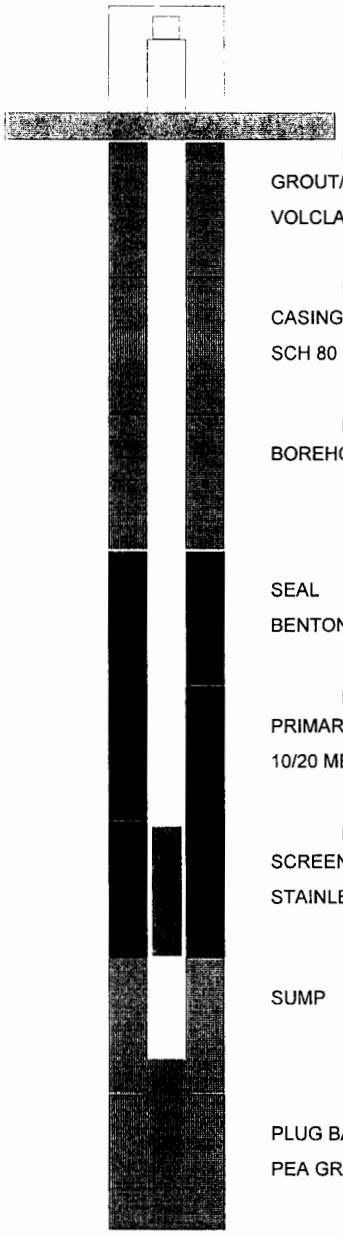
Initial Water Elevation: (FAMSL)

Initial Depth To Water: (FBGS)

Last measured water level was 4868.49 **FASL**
measured on 21-DEC-95

Date Updated: 01-OCT-01

Date Printed: 08-NOV-01



Completion Data Measured Depths (FBGS)

Casing Stickup:

Interval	Start	Stop
GROUT/BACKFILL	0'	410'
VOLCLAY		

Interval	Start	Stop
CASING	0'	503'
SCH 80 PVC	I.D. 4"	

Interval	Start	Stop
BOREHOLE	0'	515'
	O.D. 7.875"	

Interval	Start	Stop
SEAL	410'	430'
BENTONITE PELLET		

Interval	Start	Stop
PRIMARY PACK	430'	498'
10/20 MESH		

Interval	Start	Stop
SCREEN	473'	493'
STAINLESS STEEL		
	Slot Size	.02"

Interval	Start	Stop
SUMP	493'	503'

Interval	Start	Stop
PLUG BACK	503'	515'
PEA GRAVEL		

WELL DATABASE SUMMARY SHEET

Project Name:	IRP	**Geo Location:**	KAFB LAGOONS
ER ADS #:	NA	**Well Completion Date:**	21-JAN-90
Well Name:	KAFB-0504	**Completion Zone:**	VFG SAND
Owner Name:	KAFB	**Formation of Completion:**	SANTA FE
Date Drilling Started:	27-SEP-89	**Well Comment:**	ALTERNATE NAME: LAGOONS - SW
Drilling Contractor:	USGS		
Drilling Method:	HOLLOW STEM AUGER/MUD ROTAF		
Borehole Depth:	518		
Casing Depth:	500		

Survey Data

Survey Date: 01-JAN-90

Surveyed By:

State Plane Coordinates

(X) Easting: 406080.662

(Y) Northing: 1468493.37

Surveyed Elevations (FAMSL)

Protective Casing:

Top of Inner Well Casing: 5354.22

Concrete Pad:

Ground Surface: 5354.23

Calculated Depths and Elevations

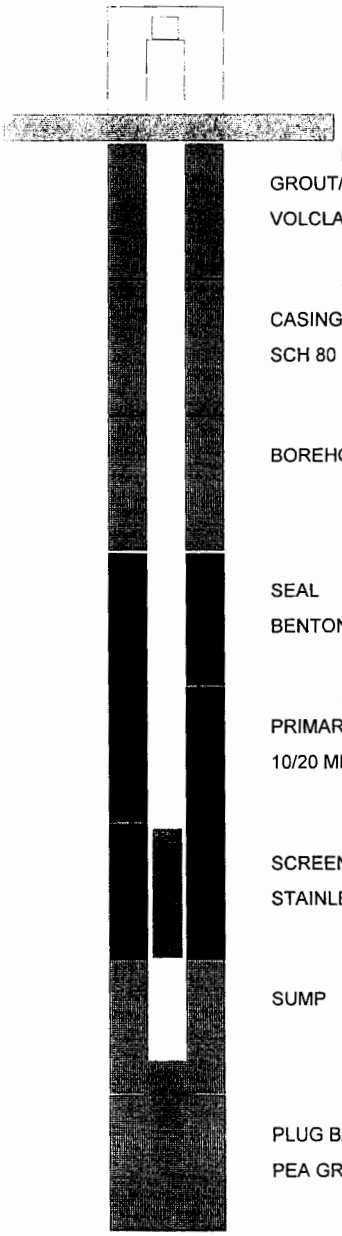
Initial Water Elevation: (FAMSL)

Initial Depth To Water: (FBGS)

Last measured water level was 4868.96 **FASL**
measured on 28-AUG-95

Date Updated: 01-OCT-01

Date Printed: 08-NOV-01



Completion Data Measured Depths (FBGS)

Casing Stickup:

Interval	Start	Stop
GROUT/BACKFILL	0'	422'
VOLCLAY		

Interval	Start	Stop
CASING	0'	500'
SCH 80 PVC	I.D. 3.826"	O.D. 4.5"

Interval	Start	Stop
BOREHOLE	0'	518'
		O.D. 7.875"

Interval	Start	Stop
SEAL	422'	442'
BENTONITE PELLET		

Interval	Start	Stop
PRIMARY PACK	442'	494.5'
10/20 MESH		

Interval	Start	Stop
SCREEN	470'	490'
STAINLESS STEEL		
	Slot Size	.02"

Interval	Start	Stop
SUMP	490'	500'

Interval	Start	Stop
PLUG BACK	500'	518'
PEA GRAVEL		

WELL DATABASE SUMMARY SHEET

Project Name:	IRP	**Geo Location:**	TIJERAS ARROYO SE OF CHANNEL
ER ADS #:	NA	**Well Completion Date:**	15-MAR-90
Well Name:	KAFB-0901	**Completion Zone:**	FG GRAVEL/SAND
Owner Name:	KAFB	**Formation of Completion:**	SANTA FE
Date Drilling Started:	03-FEB-90	**Well Comment:**	ALTERNATE NAME: TIJERAS - EAST
Drilling Contractor:	USGS		
Drilling Method:	MUD ROTARY		
Borehole Depth:	571		
Casing Depth:	537		

Survey Data

Survey Date: 01-JAN-97

Surveyed By: HALL ENGINEERING COMPANY

State Plane Coordinates

(X) Easting: 416938.84

(Y) Northing: 1470936.65

Surveyed Elevations (FAMSL)

Protective Casing:

Top of Inner Well Casing: 5387.4

Concrete Pad:

Ground Surface: 5387.13

Calculated Depths and Elevations

Initial Water Elevation: (FAMSL) 4911.13

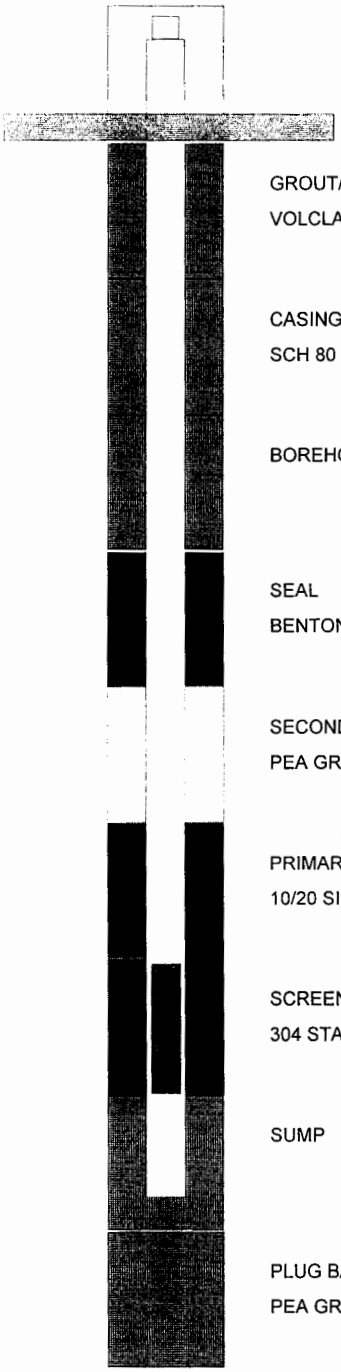
Initial Depth To Water: (FBGS) 476

Last measured water level was FASL

measured on 25-SEP-97

Date Updated: 01-OCT-01

Date Printed: 08-NOV-01



Completion Data Measured Depths (FBGS)

Casing Stickup:

Interval	Start	Stop
GROUT/BACKFILL	0'	335'
VOLCLAY		

Interval	Start	Stop
CASING	0'	537'
SCH 80 PVC	I.D. 4"	

Interval	Start	Stop
BOREHOLE	0'	571'
	O.D. 7.875"	

Interval	Start	Stop
SEAL	335'	358.5'
BENTONITE PELLET		

Interval	Start	Stop
SECONDARY PACK	358.5'	461'
PEA GRAVEL		

Interval	Start	Stop
PRIMARY PACK	461'	539.5'
10/20 SILICA SAND		

Interval	Start	Stop
SCREEN	465'	527'
304 STAINLESS STEEL		
	Slot Size	.02"

Interval	Start	Stop
SUMP	527'	537'

Interval	Start	Stop
PLUG BACK	537'	571'
PEA GRAVEL/BENTONITE		

WELL DATABASE SUMMARY SHEET

Project Name:	SWHC	**Geo Location:**	SOUTH OF PARADE GROUNDS
ER ADS #:	1330	**Well Completion Date:**	22-SEP-95
Well Name:	PGS-2	**Completion Zone:**	SILTY SAND
Owner Name:	SNL - NM	**Formation of Completion:**	UPPER SANTA FE UNIT
Date Drilling Started:	09-SEP-95	**Well Comment:**	3 SCREEN INTERVALS (535-565,585-595,625-645) SEPARATED BY BENTONITE CHIPS
Drilling Contractor:	USGS		
Drilling Method:	ROTARY MUD		
Borehole Depth:	660		
Casing Depth:	655		

Survey Data

Survey Date: 27-OCT-95

Surveyed By: GREINER, INC.

State Plane Coordinates

(X) Easting: 410481.946

(Y) Northing: 1475379.818

Surveyed Elevations (FAMSL)

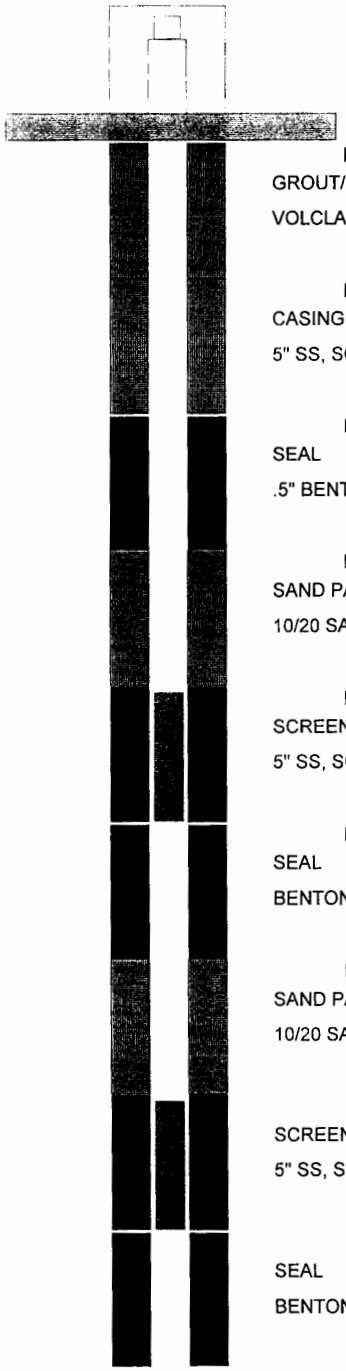
Protective Casing:	5405.99
Top of Inner Well Casing:	5405.62
Concrete Pad:	5405.27
Ground Surface:	5405.19

Calculated Depths and Elevations

Initial Water Elevation: (FAMSL)	4859.32	
Initial Depth To Water: (FBGS)	546.3	
Last measured water level was	4859.8	**FASL**
measured on	15-AUG-96	

Date Updated: 01-OCT-01

Date Printed: 08-NOV-01



Completion Data Measured Depths (FBGS)

Casing Stickup: .5

Interval	Start	Stop
GROUT/BACKFILL	0'	480'
VOLCLAY		

Interval	Start	Stop
CASING	0'	655'
5" SS, SCH 10	I.D. 5"	

Interval	Start	Stop
SEAL	480'	485'
.5" BENTONITE PELLET		

Interval	Start	Stop
SAND PACK	495'	567'
10/20 SAND		

Interval	Start	Stop
SCREEN	535'	565'
5" SS, SCH10		
	Slot Size	.02"

Interval	Start	Stop
SEAL	567'	580'
BENTONITE CHIPS		

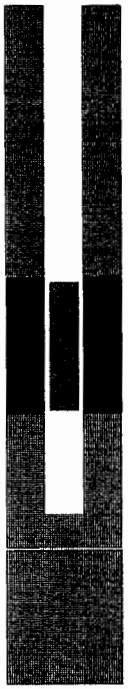
Interval	Start	Stop
SAND PACK	580'	596'
10/20 SAND		

Interval	Start	Stop
SCREEN	585'	595'
5" SS, SCH 10		
	Slot Size	.02"

Interval	Start	Stop
SEAL	596'	616'
BENTONITE CHIPS		

WELL DATABASE SUMMARY SHEET

Project Name:	SWHC	**Geo Location:**	SOUTH OF PARADE GROUNDS
ER ADS #:	1330	**Well Completion Date:**	22-SEP-95
Well Name:	PGS-2	**Completion Zone:**	SILTY SAND
Owner Name:	SNL - NM	**Formation of Completion:**	UPPER SANTA FE UNIT
Date Drilling Started:	09-SEP-95	**Well Comment:**	3 SCREEN INTERVALS (535-565,585-595,625-645) SEPARATED BY BENTONITE CHIPS
Drilling Contractor:	USGS		
Drilling Method:	ROTARY MUD		
Borehole Depth:	660		
Casing Depth:	655		



Interval	Start	Stop
SAND PACK 16/40 SAND	616'	620'
SAND PACK 10/20 SAND	620'	660'
SCREEN 5" SS, SCH 10	625'	645'
Slot Size		.02"
SUMP	645'	655'
PLUG BACK 10/20 SAND	655'	660'

WELL DATABASE SUMMARY SHEET

Project Name:	SANDIA NORTH GW	**Geo Location:**	TA-I ER SITE 190
ER ADS #:	1303	**Well Completion Date:**	22-MAR-97
Well Name:	TAI-W-01	**Completion Zone:**	SILTY SAND AND GRAVEL
Owner Name:	SNL/NM	**Formation of Completion:**	UPPER SANTA FE GROUP
Date Drilling Started:	06-MAR-97	**Well Comment:**	WELL DEVELOPMENT COMPLETED 28-APR-97
Drilling Contractor:	WATER DEVELOPMENT CORPOI		
Drilling Method:	AIR ROTARY-CASING HAMMER		
Borehole Depth:	613		
Casing Depth:	600		

Survey Data

Survey Date: 23-MAY-97

Surveyed By: GREINER, INC.

State Plane Coordinates

(X) Easting: 410373.39

(Y) Northing: 1472422.88

Surveyed Elevations (FAMSL)

Protective Casing:	5401.86
Top of Inner Well Casing:	5401.15
Concrete Pad:	5399.39
Ground Surface:	5399.1

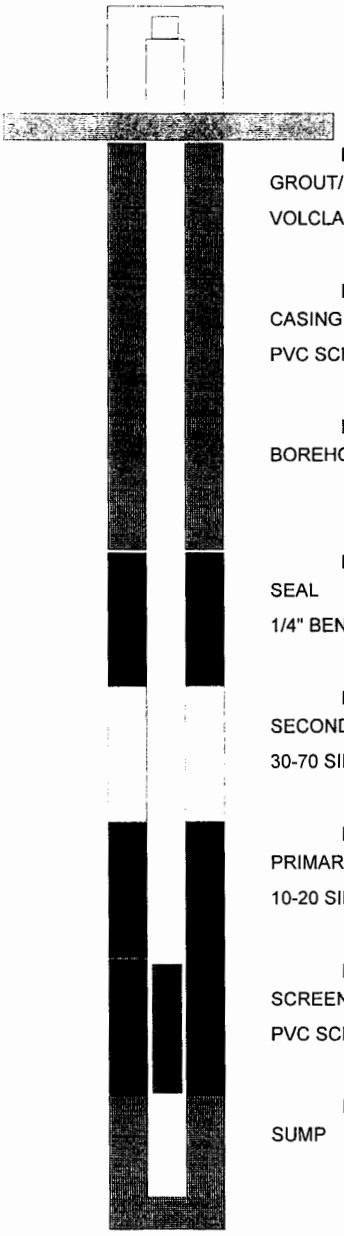
Calculated Depths and Elevations

Initial Water Elevation: (FAMSL)	4861.58
Initial Depth To Water: (FBGS)	539.57

Last measured water level was measured on FASL

Date Updated: 01-OCT-01

Date Printed: 08-NOV-01



Completion Data Measured Depths (FBGS)

Casing Stickup: 2.05

Interval	Start	Stop
GROUT/BACKFILL	0'	559.2'
VOLCLAY GROUT		

Interval	Start	Stop
CASING	0'	575'
PVC SCHEDULE 80	I.D. 4.75"	O.D. 5.62"

Interval	Start	Stop
BOREHOLE	0'	613'
		O.D. 10"

Interval	Start	Stop
SEAL	559.2'	563.6'
1/4" BENT PELLETS		

Interval	Start	Stop
SECONDARY PACK	563.6'	566.5'
30-70 SILICA SAND		

Interval	Start	Stop
PRIMARY PACK	566.5'	613'
10-20 SILICA SAND		

Interval	Start	Stop
SCREEN	575'	595'
PVC SCHEDULE 80		
	Slot Size	.02"

Interval	Start	Stop
SUMP	595'	600.8'

WELL DATABASE SUMMARY SHEET

Project Name:	SANDIA NORTH GW	**Geo Location:**	
ER ADS #:	1303	**Well Completion Date:**	27-FEB-98
Well Name:	TAI-W-02	**Completion Zone:**	SANDS,GRAVELS, CLAY
Owner Name:	SNL	**Formation of Completion:**	SANTA FE GROUP
Date Drilling Started:	11-FEB-98	**Well Comment:**	
Drilling Contractor:	WATER DEVELOPMENT CORP.		
Drilling Method:	AIR ROTARY/CASING HAMMER		
Borehole Depth:	578		
Casing Depth:	565.6		

Survey Data

Survey Date: 09-APR-98

Surveyed By: SANTIAGO ROMERO JR.

State Plane Coordinates

(X) Easting: 412293.62

(Y) Northing: 1471918.76

Surveyed Elevations (FAMSL)

Protective Casing:	5414.23
Top of Inner Well Casing:	5413.95
Concrete Pad:	5414.23
Ground Surface:	5414.23

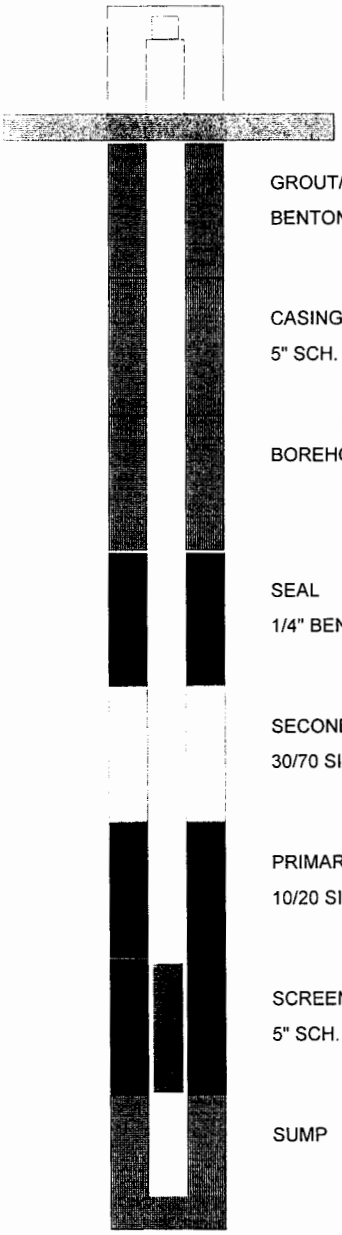
Calculated Depths and Elevations

Initial Water Elevation: (FAMSL)	4885.55
Initial Depth To Water: (FBGS)	528.4

Last measured water level was measured on FASL

Date Updated: 01-OCT-01

Date Printed: 08-NOV-01



Completion Data Measured Depths (FBGS)

Casing Stickup: -.28

Interval	Start	Stop
GROUT/BACKFILL	0'	520'
BENTONITE PELLETS		

Interval	Start	Stop
CASING	0'	565.6'
5" SCH. 80 PVC	I.D. 5"	O.D. 5.5"

Interval	Start	Stop
BOREHOLE	0'	578'
	I.D. 10"	O.D. 12"

Interval	Start	Stop
SEAL	520'	530'
1/4" BENT. PELLETS		

Interval	Start	Stop
SECONDARY PACK	530'	534'
30/70 SILICA SAND		

Interval	Start	Stop
PRIMARY PACK	534'	578'
10/20 SILICA SAND		

Interval	Start	Stop
SCREEN	540'	560'
5" SCH. 80 PVC		
	Slot Size	.02"

Interval	Start	Stop
SUMP	560'	565.6'

WELL DATABASE SUMMARY SHEET

Project Name:	SANDIA NORTH GW	**Geo Location:**	
ER ADS #:	1303	**Well Completion Date:**	27-JAN-98
Well Name:	TAI-W-03	**Completion Zone:**	SANDS, GRAVELS,CLAY
Owner Name:	SNL	**Formation of Completion:**	SANTA FE GROUP
Date Drilling Started:	19-JAN-98	**Well Comment:**	
Drilling Contractor:	WATER DEVELOPMENT CORP.		
Drilling Method:	AIR ROTARY/CASING HAMMER		
Borehole Depth:	363		
Casing Depth:	362.6		

Survey Data

Survey Date: 09-APR-98

Surveyed By: SANTIAGO ROMERO JR.

State Plane Coordinates

(X) Easting: 415058.11

(Y) Northing: 1473207.18

Surveyed Elevations (FAMSL)

Protective Casing:	5454.91
Top of Inner Well Casing:	5454.36
Concrete Pad:	5452.66
Ground Surface:	5452.24

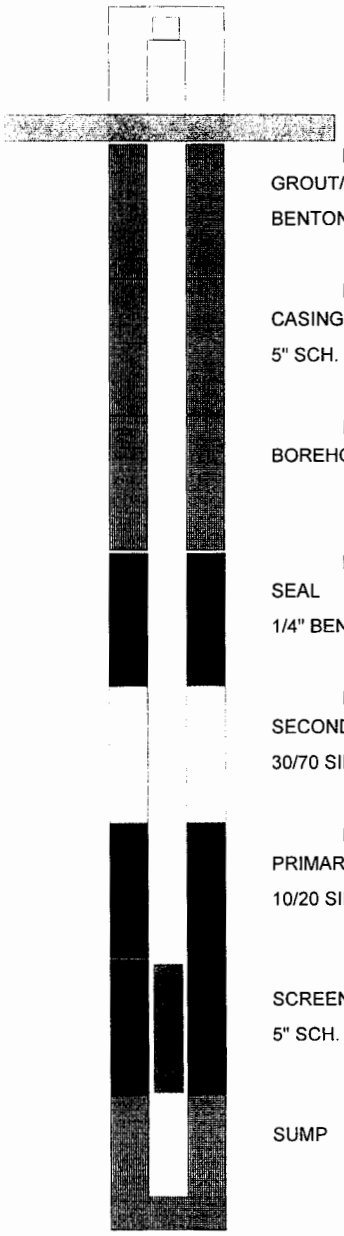
Calculated Depths and Elevations

Initial Water Elevation: (FAMSL)	5116.62
Initial Depth To Water: (FBGS)	337.74

Last measured water level was measured on FASL

Date Updated: 01-OCT-01

Date Printed: 08-NOV-01



Completion Data Measured Depths (FBGS)

Casing Stickup: 1.7

Interval	Start	Stop
GROUT/BACKFILL	0'	320'
BENTONITE GROUT		

Interval	Start	Stop
CASING	0'	362.6'
5" SCH. 80 PVC	I.D. 5"	O.D. 5.5"

Interval	Start	Stop
BOREHOLE	0'	363'
	I.D. 10"	O.D. 12"

Interval	Start	Stop
SEAL	320'	326'
1/4" BENT. PELLETS		

Interval	Start	Stop
SECONDARY PACK	326'	330'
30/70 SILICA SAND		

Interval	Start	Stop
PRIMARY PACK	330'	363'
10/20 SILICA SAND		

Interval	Start	Stop
SCREEN	337'	357'
5" SCH. 80 PVC		
	Slot Size	.02"

Interval	Start	Stop
SUMP	357'	362.6'

WELL DATABASE SUMMARY SHEET

Project Name:	SANDIA NORTH GW	**Geo Location:**	SW CORNER EUBANK AND G AVENUE
ER ADS #:	1303	**Well Completion Date:**	06-OCT-98
Well Name:	TAI-W-04	**Completion Zone:**	SILTY GRAVELLY SAND
Owner Name:	SNL/NM	**Formation of Completion:**	SANTA FE GROUP
Date Drilling Started:	07-SEP-98	**Well Comment:**	WELL DEVELOPED 07-DEC-98. DRILLED AT 3 LOCATIONS BEFORE BOREHOLE WAS SUCCESSFULLY COMPLETED. NO PROBLEMS WITH WELL.
Drilling Contractor:	WATER DEVELOPMENT CORP.		
Drilling Method:	AIR ROTARY/CASING HAMMER		
Borehole Depth:	630		
Casing Depth:	601.7		

Survey Data

Survey Date: 15-JAN-99

Surveyed By: BOHANNAN HUSTON INC.

State Plane Coordinates

(X) Easting: 414813.45

(Y) Northing: 1474707.295

Surveyed Elevations (FAMSL)

Protective Casing:	5458.7
Top of Inner Well Casing:	5458.31
Concrete Pad:	5455.66
Ground Surface:	5455.55

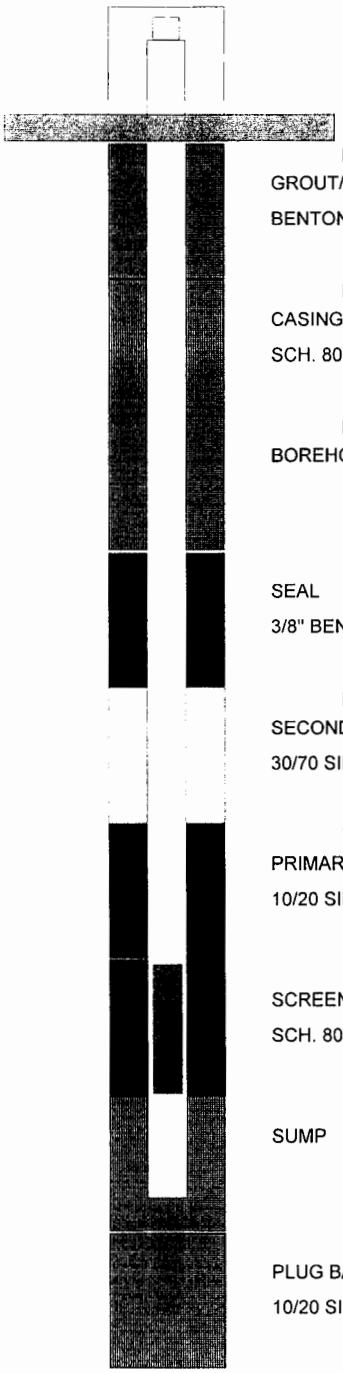
Calculated Depths and Elevations

Initial Water Elevation: (FAMSL)	4886.31
Initial Depth To Water: (FBGS)	572

Last measured water level was measured on FASL

Date Updated: 01-OCT-01

Date Printed: 08-NOV-01



Completion Data Measured Depths (FBGS)

Casing Stickup: 2.76

Interval	Start	Stop
GROUT/BACKFILL	0'	560'
BENTONITE GROUT		

Interval	Start	Stop
CASING	0'	601.7'
SCH. 80 PVC	I.D. 5"	O.D. 5.5"

Interval	Start	Stop
BOREHOLE	0'	630'
		O.D. 9.625"

Interval	Start	Stop
SEAL	560'	564'
3/8" BENTONITE PELL		

Interval	Start	Stop
SECONDARY PACK	564'	568'
30/70 SILICA SAND		

Interval	Start	Stop
PRIMARY PACK	568'	630'
10/20 SILICA SAND		

Interval	Start	Stop
SCREEN	576'	596'
SCH. 80 PVC		
	Slot Size	.02"

Interval	Start	Stop
SUMP	596'	601.7'

Interval	Start	Stop
PLUG BACK	601.7'	630'
10/20 SILICA SAND		

WELL DATABASE SUMMARY SHEET

Project Name:	SANDIA NORTH GW	**Geo Location:**	N. SIDE "F" AVENUE
ER ADS #:	1303	**Well Completion Date:**	16-NOV-98
Well Name:	TAI-W-05	**Completion Zone:**	FINE COURSE SAND
Owner Name:	SNL/NM	**Formation of Completion:**	SANTA FE GROUP
Date Drilling Started:	08-OCT-98	**Well Comment:**	WELL DEVELOPED 08-DEC-98. DRILLED AT 2 LOCATIONS BEFORE BOREHOLE COMPLETED. CASING INSTALLED AT 1ST LOCATION.
Drilling Contractor:	WATER DEVELOPMENT CORP.		ABANDONED DUE TO DROPPED TREMIE. NO PROBLEMS ENCOUNTERED DURING 2ND INSTALLATION.
Drilling Method:	AIR ROTARY/CASING HAMMER		
Borehole Depth:	625		
Casing Depth:	623.2		

Survey Data

Survey Date: 15-JAN-99

Surveyed By: BOHANNAN HUSTON, INC.

State Plane Coordinates

(X) Easting: 412758.816

(Y) Northing: 1475381.943

Surveyed Elevations (FAMSL)

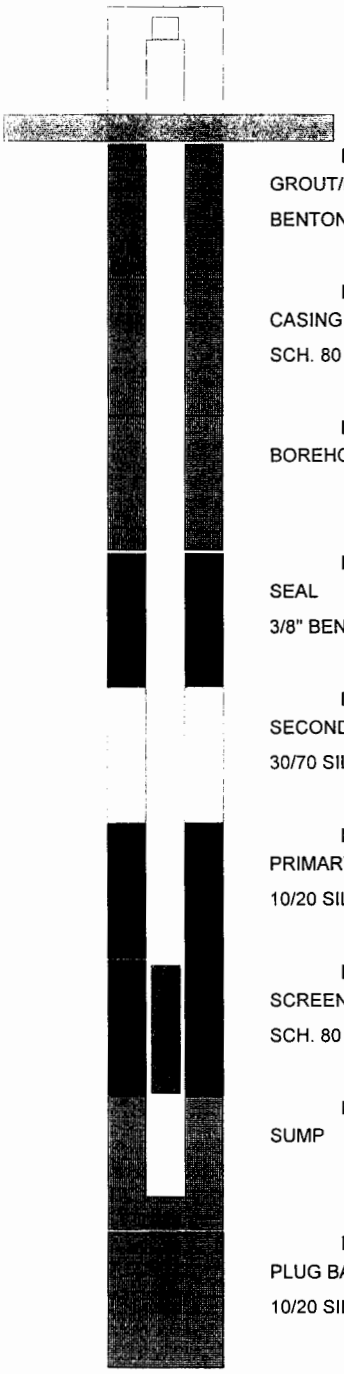
Protective Casing:	5433.42
Top of Inner Well Casing:	5433.11
Concrete Pad:	5431.68
Ground Surface:	5431.45

Calculated Depths and Elevations

Initial Water Elevation: (FAMSL)	4857.8	
Initial Depth To Water: (FBGS)	575.62	
Last measured water level was measured on		**FASL**

Date Updated: 01-OCT-01

Date Printed: 08-NOV-01



Completion Data Measured Depths (FBGS)

Casing Stickup: 1.66

Interval	Start	Stop		
GROUT/BACKFILL	0'	580'		
BENTONITE GROUT				
Interval	**Start**	**Stop**		
CASING	0'	623.2'		
SCH. 80 PVC	I.D. 5"		O.D. 5.5"	
Interval	**Start**	**Stop**		
BOREHOLE	0'	625'		
			O.D. 9.625"	
Interval	**Start**	**Stop**		
SEAL	580'	585'		
3/8" BENTONITE PELL				
Interval	**Start**	**Stop**		
SECONDARY PACK	585'	589'		
30/70 SILICA SAND				
Interval	**Start**	**Stop**		
PRIMARY PACK	589'	625'		
10/20 SILICA SAND				
Interval	**Start**	**Stop**		
SCREEN	597.5'	617.5'		
SCH. 80 PVC				
			Slot Size	.02"
Interval	**Start**	**Stop**		
SUMP	617.5'	623.2'		
Interval	**Start**	**Stop**		
PLUG BACK	623.2'	625'		
10/20 SILICA SAND				

WELL DATABASE SUMMARY SHEET

Project Name:	SANDIA NORTH GW	**Geo Location:**	
ER ADS #:	1303	**Well Completion Date:**	27-FEB-98
Well Name:	TAI-W-06	**Completion Zone:**	SANDS, GRAVELS, CLAY
Owner Name:	SNL	**Formation of Completion:**	SANTA FE GROUP
Date Drilling Started:	24-FEB-98	**Well Comment:**	
Drilling Contractor:	WATER DEVELOPMENT CORP.		
Drilling Method:	AIR ROTARY/CASING HAMMER		
Borehole Depth:	330		
Casing Depth:	325.6		

Survey Data

Survey Date: 09-APR-98

Surveyed By: SANTIAGO ROMERO JR.

State Plane Coordinates

(X) Easting: 412331.38

(Y) Northing: 1471918.6

Surveyed Elevations (FAMSL)

Protective Casing:	5414.71
Top of Inner Well Casing:	5414.43
Concrete Pad:	5414.71
Ground Surface:	5414.71

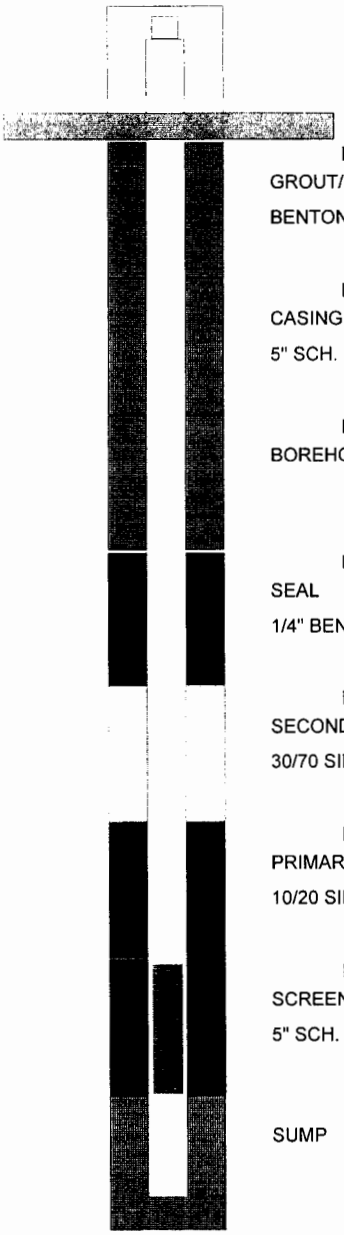
Calculated Depths and Elevations

Initial Water Elevation: (FAMSL)	5114.68
Initial Depth To Water: (FBGS)	299.75

Last measured water level was measured on **FASL**

Date Updated: 01-OCT-01

Date Printed: 08-NOV-01



Completion Data Measured Depths (FBGS)

Casing Stickup: -.28

Interval	Start	Stop
GROUT/BACKFILL	0'	285'
BENTONITE GROUT		

Interval	Start	Stop
CASING	0'	325.6'
5" SCH. 80 PVC	I.D. 5"	O.D. 5.5"

Interval	Start	Stop
BOREHOLE	0'	330'
		O.D. 10"

Interval	Start	Stop
SEAL	285'	291'
1/4" BENT. PELLETS		

Interval	Start	Stop
SECONDARY PACK	291'	294'
30/70 SILICA SAND		

Interval	Start	Stop
PRIMARY PACK	294'	330'
10/20 SILICA SAND		

Interval	Start	Stop
SCREEN	300'	320'
5" SCH. 80 PVC		
	Slot Size	.02"

Interval	Start	Stop
SUMP	320'	325.6'

WELL DATABASE SUMMARY SHEET

Project Name:	SANDIA NORTH GW	**Geo Location:**	N. SIDE OF TANK FARM
ER ADS #:	1303	**Well Completion Date:**	13-AUG-98
Well Name:	TAI-W-07	**Completion Zone:**	SILTY CLAYEY SAND
Owner Name:	SNL/NM	**Formation of Completion:**	SANTA FE GROUP
Date Drilling Started:	11-AUG-98	**Well Comment:**	WELL DEVELOPED 04-DEC-98. VERY LOW PRODUCER. NO PROBLEMS ENCOUNTERED DURING WELL INSTALLATION.
Drilling Contractor:	WATER DEVELOPMENT CORP.		
Drilling Method:	AIR ROTARY/CASING HAMMER		
Borehole Depth:	290		
Casing Depth:	289.1		

Survey Data

Survey Date: 15-JAN-99

Surveyed By: BOHANNAN HUSTON, INC.

State Plane Coordinates

(X) Easting: 410446.228

(Y) Northing: 1472422.68

Surveyed Elevations (FAMSL)

Protective Casing:	5402.74
Top of Inner Well Casing:	5402.25
Concrete Pad:	5400.13
Ground Surface:	5400.08

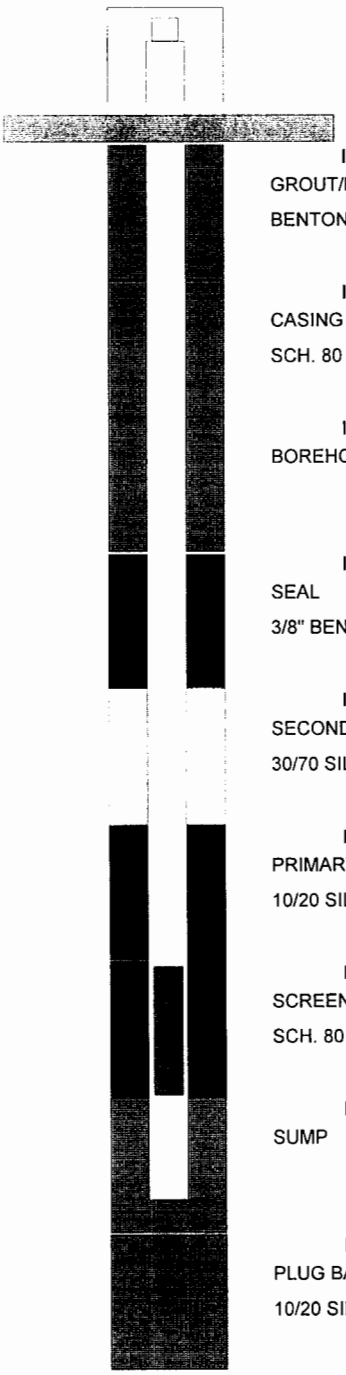
Calculated Depths and Elevations

Initial Water Elevation: (FAMSL)	5128.25
Initial Depth To Water: (FBGS)	274

Last measured water level was measured on FASL

Date Updated: 01-OCT-01

Date Printed: 08-NOV-01



Completion Data Measured Depths (FBGS)

Casing Stickup: 2.33

Interval	Start	Stop
GROUT/BACKFILL	0'	252'
BENTONITE GROUT		

Interval	Start	Stop
CASING	0'	289.1'
SCH. 80 PVC	I.D. 5"	O.D. 5.5"

Interval	Start	Stop
BOREHOLE	0'	290'
		O.D. 9.625"

Interval	Start	Stop
SEAL	252'	257.8'
3/8" BENTONITE PELL		

Interval	Start	Stop
SECONDARY PACK	257.8'	262.5'
30/70 SILICA SAND		

Interval	Start	Stop
PRIMARY PACK	262.5'	290'
10/20 SILICA SAND		

Interval	Start	Stop
SCREEN	268.6'	288.6'
SCH. 80 PVC		
	Slot Size	.02"

Interval	Start	Stop
SUMP	288.6'	289.1'

Interval	Start	Stop
PLUG BACK	289.1'	290'
10/20 SILICA SAND		

WELL DATABASE SUMMARY SHEET

Project Name:	TECHNICAL AREA II	**Geo Location:**	NW CORNER TA-II
ER ADS #:	1303	**Well Completion Date:**	01-APR-93
Well Name:	TA2-NW1-325	**Completion Zone:**	SAND
Owner Name:	SNL	**Formation of Completion:**	SANTA FE GROUP
Date Drilling Started:	25-MAR-93	**Well Comment:**	WATER LEVEL MEASURED ON 07-OCT-93
Drilling Contractor:			
Drilling Method:	AIR ROTARY/DRIVE CASING		
Borehole Depth:	330.9		
Casing Depth:	330.3		

Survey Data

Survey Date: 09-NOV-93

Surveyed By: GREINER

State Plane Coordinates

(X) Easting: 412839.455

(Y) Northing: 1470779.575

Surveyed Elevations (FAMSL)

Protective Casing:	5419.825
Top of Inner Well Casing:	5419.27
Concrete Pad:	5417.308
Ground Surface:	5417.308

Calculated Depths and Elevations

Initial Water Elevation: (FAMSL) 5110.772

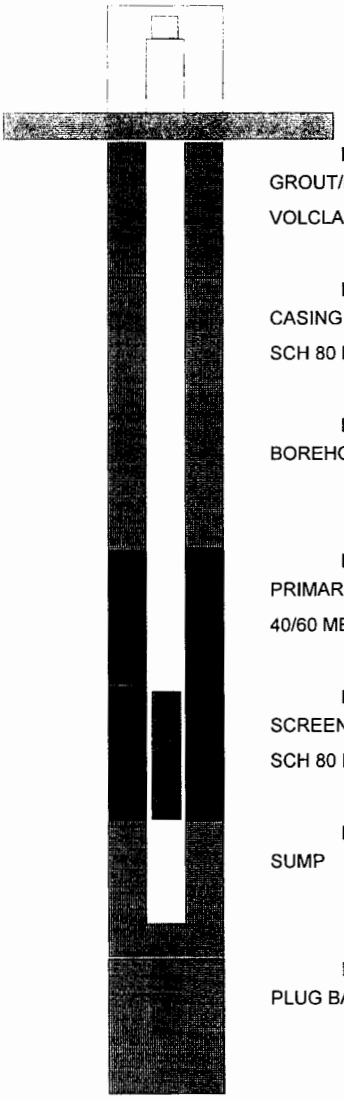
Initial Depth To Water: (FBGS)

Last measured water level was **FASL**

measured on 13-SEP-95

Date Updated: 01-OCT-01

Date Printed: 08-NOV-01



Completion Data Measured Depths (FBGS)

Casing Stickup:

Interval	Start	Stop
GROUT/BACKFILL	0'	283'
VOLCLAY		

Interval	Start	Stop			
CASING	0'	330.3'			
SCH 80 PVC			I.D.	4.768"	O.D. 5.563"

Interval	Start	Stop		
BOREHOLE	0'	330.9'	O.D.	11"

Interval	Start	Stop
PRIMARY PACK	283'	330.9'
40/60 MESH SILICA		

Interval	Start	Stop	
SCREEN	295'	325'	
SCH 80 PVC			Slot Size .01"

Interval	Start	Stop
SUMP	325'	330.3'

Interval	Start	Stop
PLUG BACK	330.3'	330.9'

WELL DATABASE SUMMARY SHEET

Project Name:	TECHNICAL AREA II	**Geo Location:**	NW CORNER TA-II
ER ADS #:	1303	**Well Completion Date:**	27-JUL-93
Well Name:	TA2-NW1-595	**Completion Zone:**	SAND
Owner Name:	SNL	**Formation of Completion:**	SANTA FE GROUP
Date Drilling Started:	08-JUL-93	**Well Comment:**	WATER LEVEL MEASURED ON 07-OCT-93
Drilling Contractor:			
Drilling Method:	AIR ROTARY/CABLE TOOL/SONIC		
Borehole Depth:	650		
Casing Depth:	598		

Survey Data

Survey Date: 09-NOV-93

Surveyed By: GREINER

State Plane Coordinates

(X) Easting: 412828.16

(Y) Northing: 1470791.739

Surveyed Elevations (FAMSL)

Protective Casing:	5419.254
Top of Inner Well Casing:	5418.588
Concrete Pad:	5417.275
Ground Surface:	5417.275

Calculated Depths and Elevations

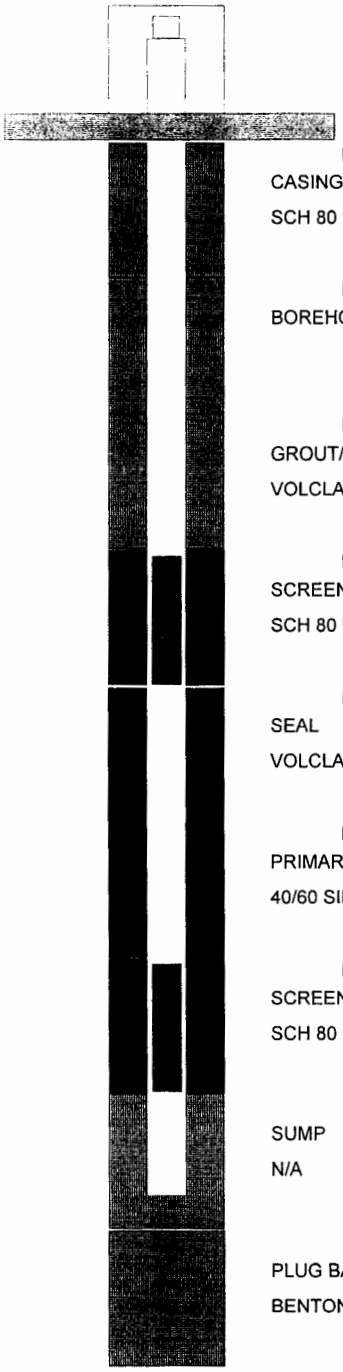
Initial Water Elevation: (FAMSL)

Initial Depth To Water: (FBGS)

Last measured water level was 4877.39 **FASL**
measured on 13-SEP-95

Date Updated: 01-OCT-01

Date Printed: 08-NOV-01



Completion Data Measured Depths (FBGS)

Casing Stickup:

Interval	Start	Stop
CASING	0'	598'
SCH 80 PVC	I.D. 4.768"	O.D. 5.563"

Interval	Start	Stop
BOREHOLE	0'	650'
	O.D.	10"

Interval	Start	Stop
GROUT/BACKFILL	3'	523'
VOLCLAY		

Interval	Start	Stop
SCREEN	535'	555'
SCH 80 PVC		
	Slot Size	.01"

Interval	Start	Stop
SEAL	562'	572'
VOLCLAY		

Interval	Start	Stop
PRIMARY PACK	572'	605'
40/60 SILICA SAND		

Interval	Start	Stop
SCREEN	585'	595'
SCH 80 PVC		

Interval	Start	Stop
SUMP	595'	598'
N/A		

Interval	Start	Stop
PLUG BACK	605'	650'
BENTONITE PELLETS		

WELL DATABASE SUMMARY SHEET

Project Name:	TECHNICAL AREA II	**Geo Location:**	SW CORNER TA-II
ER ADS #:	1303	**Well Completion Date:**	30-NOV-92
Well Name:	TA2-SW1-320	**Completion Zone:**	SAND
Owner Name:	SNL	**Formation of Completion:**	SANTA FE GROUP
Date Drilling Started:	21-NOV-92	**Well Comment:**	WATER LEVEL MEASURED ON 07-OCT-93
Drilling Contractor:			
Drilling Method:	AIR ROTARY/DRIVE CASING		
Borehole Depth:	324.8		
Casing Depth:	324.6		

Survey Data

Survey Date: 09-NOV-93

Surveyed By: GREINER

State Plane Coordinates

(X) Easting: 412550.757

(Y) Northing: 1469669.428

Surveyed Elevations (FAMSL)

Protective Casing:	5410.03
Top of Inner Well Casing:	5409.181
Concrete Pad:	5407.364
Ground Surface:	5407.364

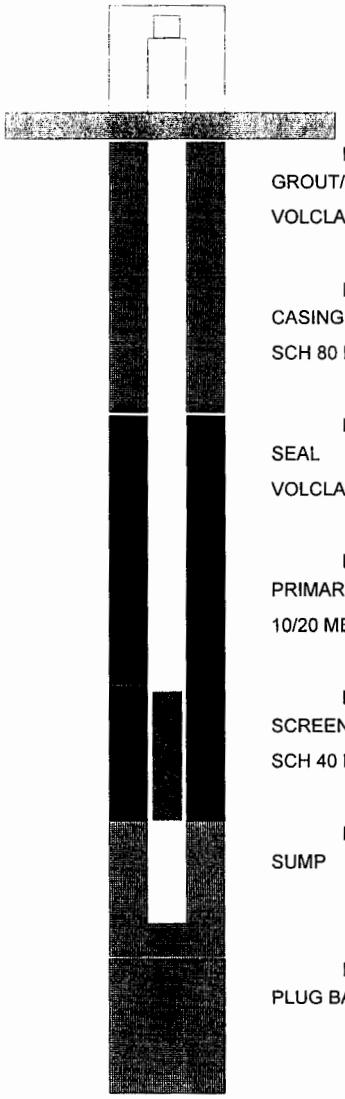
Calculated Depths and Elevations

Initial Water Elevation: (FAMSL)	5098.251
Initial Depth To Water: (FBGS)	310.93

Last measured water level was 5097.78 **FASL**
measured on 13-SEP-95

Date Updated: 01-OCT-01

Date Printed: 08-NOV-01



Completion Data Measured Depths (FBGS)

Casing Stickup:

Interval	Start	Stop
GROUT/BACKFILL	0'	277.5'
VOLCLAY		

Interval	Start	Stop
CASING	0'	324.6'
SCH 80 PVC	I.D. 3.826"	O.D. 4.5"

Interval	Start	Stop
SEAL	277.5'	287'
VOLCLAY PELLETS		

Interval	Start	Stop
PRIMARY PACK	287'	324.8'
10/20 MESH SILICA		

Interval	Start	Stop
SCREEN	299.6'	319.6'
SCH 40 PVC		
	Slot Size	.01"

Interval	Start	Stop
SUMP	319.6'	324.6'

Interval	Start	Stop
PLUG BACK	324.6'	324.8'

WELL DATABASE SUMMARY SHEET

Project Name:	TECHNICAL AREA II	**Geo Location:**	TA2 CENTRAL
ER ADS #:	1303	**Well Completion Date:**	27-JUN-94
Well Name:	TA2-W-01	**Completion Zone:**	SILTY SAND/GRAVEL
Owner Name:	SNL	**Formation of Completion:**	SANTA FE GROUP
Date Drilling Started:	07-MAR-94	**Well Comment:**	
Drilling Contractor:	WATER DEVELOPMENT		
Drilling Method:	SONIC CORING;AIR WATER		
Borehole Depth:	338		NEUTRON SHOWED SATURATION AT 314.5 AND BELOW SAND AND GRAVEL IN CUTTINGS IN SCREENED ZONE
Casing Depth:	332		

Survey Data

Survey Date: 05-AUG-94

Surveyed By: GREINER, INC.

State Plane Coordinates

(X) Easting: 413232.503

(Y) Northing: 1470118.94

Surveyed Elevations (FAMSL)

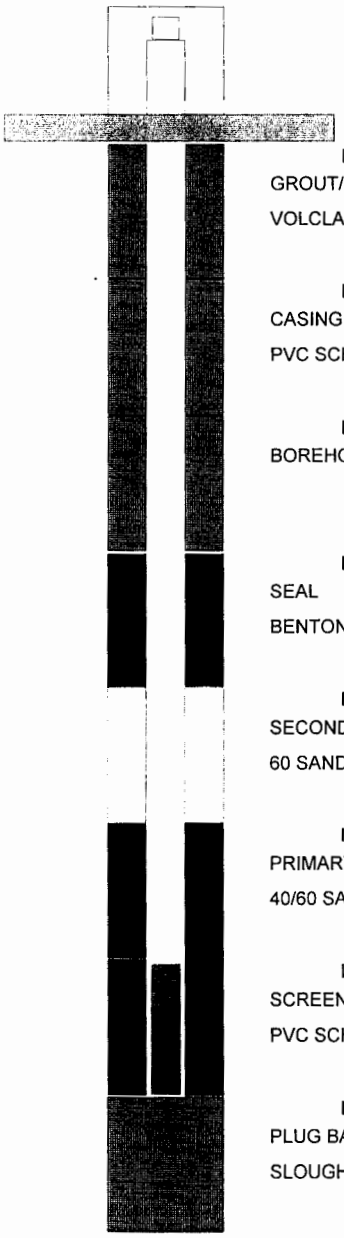
Protective Casing:	5417.496
Top of Inner Well Casing:	5417.322
Concrete Pad:	5414.999
Ground Surface:	5414.712

Calculated Depths and Elevations

Initial Water Elevation: (FAMSL)	5100.21	
Initial Depth To Water: (FBGS)	314.5	
Last measured water level was	5096.8	**FASL**
measured on	13-SEP-95	

Date Updated: 01-OCT-01

Date Printed: 08-NOV-01



Completion Data Measured Depths (FBGS)

Casing Stickup: 2.5

Interval	Start	Stop
GROUT/BACKFILL	0'	301'
VOLCLAY GROUT		

Interval	Start	Stop
CASING	0'	332'
PVC SCH 80	I.D. 4.77"	O.D. 5.56"

Interval	Start	Stop
BOREHOLE	0'	338'
		O.D. 11.075"

Interval	Start	Stop
SEAL	301'	305'
BENTONITE PELLETS		

Interval	Start	Stop
SECONDARY PACK	305'	307'
60 SAND		

Interval	Start	Stop
PRIMARY PACK	307'	332.3'
40/60 SAND		

Interval	Start	Stop
SCREEN	312'	332'
PVC SCH 80		
	Slot Size	.01"

Interval	Start	Stop
PLUG BACK	332'	338'
SLOUGH		

WELL DATABASE SUMMARY SHEET

Project Name:	TA-II	**Geo Location:**	TIJERAS ARROYO;SE TA-II/TA-VI
ER ADS #:	1303	**Well Completion Date:**	09-NOV-95
Well Name:	TA2-W-19	**Completion Zone:**	GRAVELLY SAND/SANDY GRAVEL
Owner Name:	SNL/NM	**Formation of Completion:**	SANTA FE GROUP
Date Drilling Started:	08-NOV-95	**Well Comment:**	WELL DEVELOPED ON 29-NOV-95; CLEANED UP WELL W/TURBIDITY AT 2.6 (TCE=8.1 PPB)
Drilling Contractor:	WATER DEVELOPMENT CORP.		
Drilling Method:	AIR-CASING ROTARY HAMMER		
Borehole Depth:	300		
Casing Depth:	285.87		

Survey Data

Survey Date: 08-DEC-95

Surveyed By: GREINER INC.

State Plane Coordinates

(X) Easting: 414163.596

(Y) Northing: 1468626.417

Surveyed Elevations (FAMSL)

Protective Casing:	5349.147
Top of Inner Well Casing:	5348.543
Concrete Pad:	5346.613
Ground Surface:	5346.263

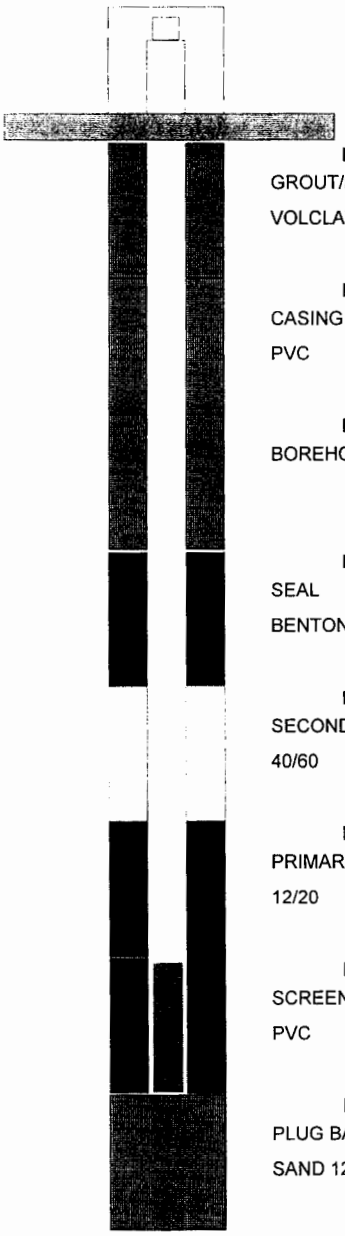
Calculated Depths and Elevations

Initial Water Elevation: (FAMSL)	5060.54
Initial Depth To Water: (FBGS)	288

Last measured water level was measured on **FASL**

Date Updated: 01-OCT-01

Date Printed: 08-NOV-01



Completion Data Measured Depths (FBGS)

Casing Stickup: 2.13

Interval	Start	Stop
GROUT/BACKFILL	0'	249'
VOLCLAY GROUT		

Interval	Start	Stop
CASING	0'	285.87'
PVC	I.D. 4.8"	O.D. 5.25"

Interval	Start	Stop
BOREHOLE	0'	300'
		O.D. 10"

Interval	Start	Stop
SEAL	249'	254'
BENTONITE CHIPS		

Interval	Start	Stop
SECONDARY PACK	254'	260'
40/60		

Interval	Start	Stop
PRIMARY PACK	260'	300'
12/20		

Interval	Start	Stop
SCREEN	265.87'	285.87'
PVC		
	Slot Size	.2"

Interval	Start	Stop
PLUG BACK	285.87'	300'
SAND 12/20		

WELL DATABASE SUMMARY SHEET

Project Name:	SANDIA NORTH GW	**Geo Location:**	
ER ADS #:	1303	**Well Completion Date:**	09-FEB-98
Well Name:	TA2-W-24	**Completion Zone:**	SANDS, GRAVELS CLAY
Owner Name:	SNL	**Formation of Completion:**	SANTA FE GROUP
Date Drilling Started:	27-JAN-98	**Well Comment:**	
Drilling Contractor:	WATER DEVELOPMENT CORP.		
Drilling Method:	AIR ROTARY/CASING HAMMER		
Borehole Depth:	505		
Casing Depth:	490.6		

Survey Data

Survey Date: 09-APR-98

Surveyed By: SANTIAGO ROMERO JR.

State Plane Coordinates

(X) Easting: 414479.82

(Y) Northing: 1469605.69

Surveyed Elevations (FAMSL)

Protective Casing:	5361.48
Top of Inner Well Casing:	5360.99
Concrete Pad:	5359.26
Ground Surface:	5359.05

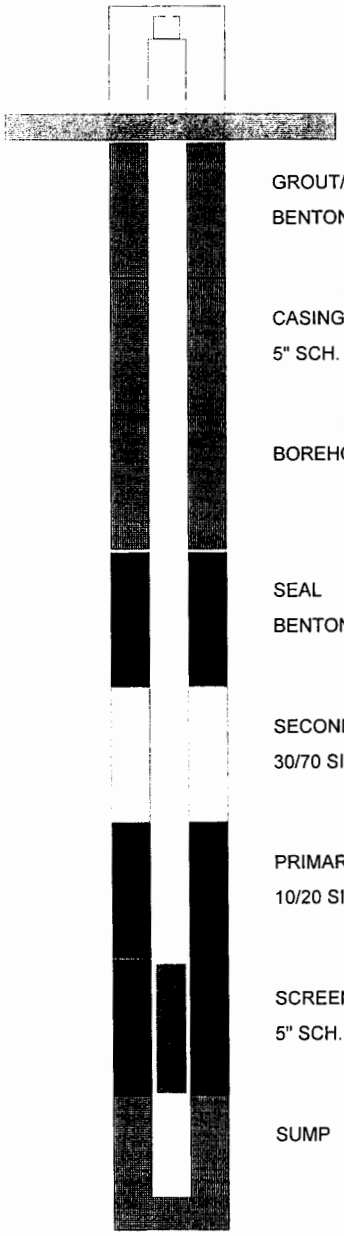
Calculated Depths and Elevations

Initial Water Elevation: (FAMSL)	4910.55
Initial Depth To Water: (FBGS)	450.44

Last measured water level was measured on FASL

Date Updated: 01-OCT-01

Date Printed: 08-NOV-01



Completion Data Measured Depths (FBGS)

Casing Stickup: 1.73

Interval	Start	Stop
GROUT/BACKFILL	0'	445'
BENTONITE GROUT		

Interval	Start	Stop
CASING	0'	490.6'
5" SCH. 80 PVC	I.D. 5"	O.D. 5.5"

Interval	Start	Stop
BOREHOLE	0'	505'
	I.D. 10"	O.D. 12"

Interval	Start	Stop
SEAL	445'	451'
BENTONITE GROUT		

Interval	Start	Stop
SECONDARY PACK	451'	457'
30/70 SILICA SAND		

Interval	Start	Stop
PRIMARY PACK	457'	505'
10/20 SILICA SAND		

Interval	Start	Stop
SCREEN	465'	485'
5" SCH. 80 PVC		
	Slot Size	.02"

Interval	Start	Stop
SUMP	485'	490.6'

WELL DATABASE SUMMARY SHEET

Project Name:	SANDIA NORTH GW	**Geo Location:**	TIJERAS ARROYO
ER ADS #:	1303	**Well Completion Date:**	01-APR-97
Well Name:	TA2-W-25	**Completion Zone:**	SILTY SAND AND GRAVEL
Owner Name:	SNL/NM	**Formation of Completion:**	UPPER SANTA FE GROUP
Date Drilling Started:	24-MAR-97	**Well Comment:**	WELL DEVELOPMENT COMPLETED ON 28-APR-97
Drilling Contractor:	WATER DEVELOPMENT CORPOI		
Drilling Method:	AIR ROTARY-CASING HAMMER		
Borehole Depth:	520		ONE STAINLESS STEEL CENRALIZER ABOVE AND BELOW SCREEN
Casing Depth:	517.8		

Survey Data

Survey Date: 23-MAY-97

Surveyed By: GREINER, INC.

State Plane Coordinates

(X) Easting: 415262.01

(Y) Northing: 1470439.03

Surveyed Elevations (FAMSL)

Protective Casing:	5372.69
Top of Inner Well Casing:	5372.19
Concrete Pad:	5370.22
Ground Surface:	5369.8

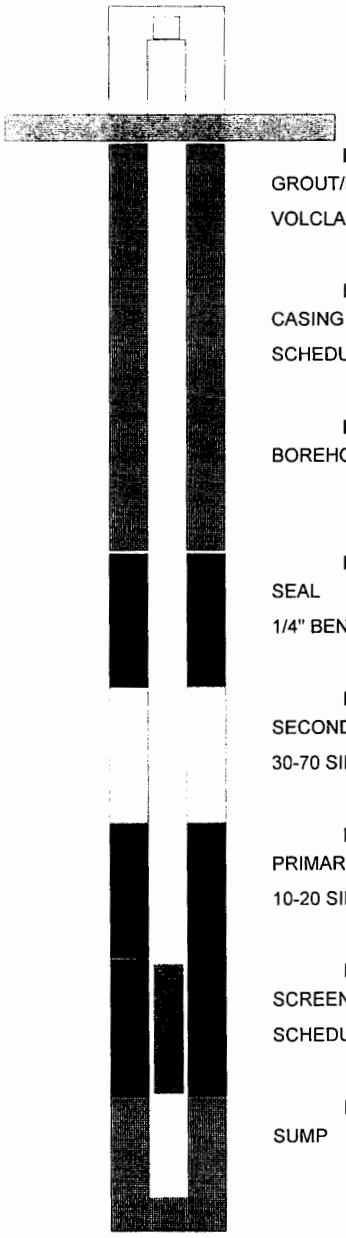
Calculated Depths and Elevations

Initial Water Elevation: (FAMSL)	4892.55
Initial Depth To Water: (FBGS)	479.64

Last measured water level was measured on FASL

Date Updated: 01-OCT-01

Date Printed: 08-NOV-01



Completion Data Measured Depths (FBGS)

Casing Stickup: 2.39

Interval	Start	Stop
GROUT/BACKFILL	0'	475.4'
VOLCLAY GROUT		

Interval	Start	Stop		
CASING	0'	492'		
SCHEDULE 80 PVC	I.D. 4.75"		O.D.	5.62"

Interval	Start	Stop		
BOREHOLE	0'	520'		
			O.D.	10"

Interval	Start	Stop
SEAL	475.4'	481'
1/4" BENTONITE PELL		

Interval	Start	Stop
SECONDARY PACK	481'	487'
30-70 SILICA SAND		

Interval	Start	Stop
PRIMARY PACK	487'	517.8'
10-20 SILICA SAND		

Interval	Start	Stop
SCREEN	492'	512'
SCHEDULE 80 PVC		
	Slot Size	.02"

Interval	Start	Stop
SUMP	512'	517.8'

WELL DATABASE SUMMARY SHEET

Project Name:	SANDIA NORTH GW	**Geo Location:**	
ER ADS #:	1303	**Well Completion Date:**	19-JAN-98
Well Name:	TA2-W-26	**Completion Zone:**	SANDS, GRAVELS, CLAY
Owner Name:	SNL	**Formation of Completion:**	SANTA FE GROUP
Date Drilling Started:	12-JAN-98	**Well Comment:**	
Drilling Contractor:	WATER DEVELOPMENT CORP.		
Drilling Method:	AIR ROTARY/CASING HAMMER		
Borehole Depth:	305		
Casing Depth:	301.6		

Survey Data

Survey Date: 09-APR-98

Surveyed By: SANTIAGO ROMERO JR.

State Plane Coordinates

(X) Easting: 415265.37

(Y) Northing: 1470489.1

Surveyed Elevations (FAMSL)

Protective Casing:	5373.68
Top of Inner Well Casing:	5373.1
Concrete Pad:	5371.47
Ground Surface:	5371.09

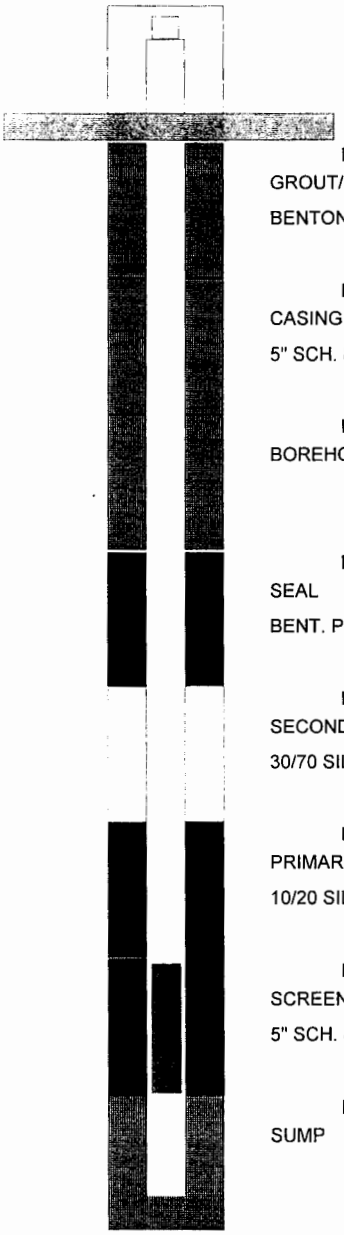
Calculated Depths and Elevations

Initial Water Elevation: (FAMSL)	5093.68
Initial Depth To Water: (FBGS)	279.42

Last measured water level was measured on FASL

Date Updated: 01-OCT-01

Date Printed: 08-NOV-01



Completion Data Measured Depths (FBGS)

Casing Stickup: 1.63

Interval	Start	Stop
GROUT/BACKFILL	0'	255'
BENTONITE GROUT		

Interval	Start	Stop
CASING	0'	301.6'
5" SCH. 80 PVC	I.D. 5"	O.D. 5.5"

Interval	Start	Stop
BOREHOLE	0'	305'
		O.D. 10"

Interval	Start	Stop
SEAL	255'	261.5'
BENT. PELLETS		

Interval	Start	Stop
SECONDARY PACK	261.5'	271'
30/70 SILICA SAND		

Interval	Start	Stop
PRIMARY PACK	271'	305'
10/20 SILICA SAND		

Interval	Start	Stop
SCREEN	276'	296'
5" SCH. 80 PVC		
	Slot Size	.02"

Interval	Start	Stop
SUMP	296'	301.6'

WELL DATABASE SUMMARY SHEET

Project Name:	SANDIA NORTH GW	**Geo Location:**	
ER ADS #:	1303	**Well Completion Date:**	09-FEB-98
Well Name:	TA2-W-27	**Completion Zone:**	SANDS, GRAVELS, CLAY
Owner Name:	SNL	**Formation of Completion:**	SANTA FE GROUP
Date Drilling Started:	04-FEB-98	**Well Comment:**	
Drilling Contractor:	WATER DEVELOPMENT CORP.		
Drilling Method:	AIR ROTARY/CASING HAMMER		
Borehole Depth:	306.5		
Casing Depth:	300.6		

Survey Data

Survey Date: 09-APR-98

Surveyed By: SANTIAGO ROMERO JR.

State Plane Coordinates

(X) Easting: 414514.63

(Y) Northing: 1469616.61

Surveyed Elevations (FAMSL)

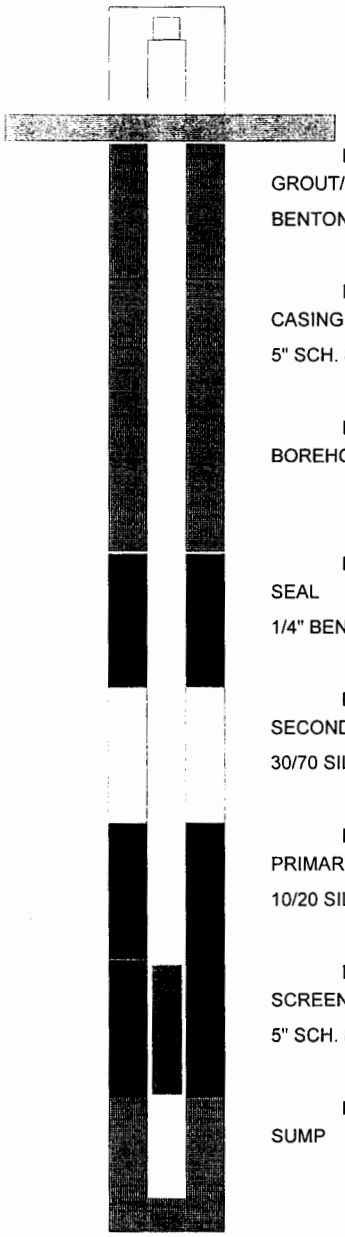
Protective Casing:	5360.63
Top of Inner Well Casing:	5360.18
Concrete Pad:	5358.37
Ground Surface:	5358.1

Calculated Depths and Elevations

Initial Water Elevation: (FAMSL)	5085.59	
Initial Depth To Water: (FBGS)	274.59	
Last measured water level was measured on		**FASL**

Date Updated: 01-OCT-01

Date Printed: 08-NOV-01



Completion Data Measured Depths (FBGS)

Casing Stickup: 1.81

Interval	Start	Stop
GROUT/BACKFILL	0'	259'
BENTONITE GROUT		

Interval	Start	Stop
CASING	0'	300.6'
5" SCH. 80 PVC	I.D. 5"	O.D. 5.5"

Interval	Start	Stop
BOREHOLE	0'	306.5'
		O.D. 10"

Interval	Start	Stop
SEAL	259'	264.5'
1/4" BENT. PELLETS		

Interval	Start	Stop
SECONDARY PACK	264.5'	270'
30/70 SILICA SAND		

Interval	Start	Stop
PRIMARY PACK	270'	306.5'
10/20 SILICA SAND		

Interval	Start	Stop
SCREEN	275'	295'
5" SCH. 80 PVC		
	Slot Size	.02"

Interval	Start	Stop
SUMP	295'	300.6'

WELL DATABASE SUMMARY SHEET

Project Name:	SWHC	**Geo Location:**	TIJERAS ARROYO
ER ADS #:	1330	**Well Completion Date:**	12-JUL-94
Well Name:	TJA-2	**Completion Zone:**	GRAVELLY SAND
Owner Name:	SNL/NM	**Formation of Completion:**	SANTA FE GROUP
Date Drilling Started:	09-JUL-94	**Well Comment:**	THIS WELL REPLACES FAILED WELL TJA-1
Drilling Contractor:	USGS		
Drilling Method:	MUD ROTARY		
Borehole Depth:	310		
Casing Depth:	305		

Survey Data

Survey Date: 01-JAN-97

Surveyed By: HALL ENGINEERING COMPANY

State Plane Coordinates

(X) Easting: 415343.11

(Y) Northing: 1468620.36

Surveyed Elevations (FAMSL)

Protective Casing:	5351.603
Top of Inner Well Casing:	5350.533
Concrete Pad:	5348.825
Ground Surface:	5348.579

Calculated Depths and Elevations

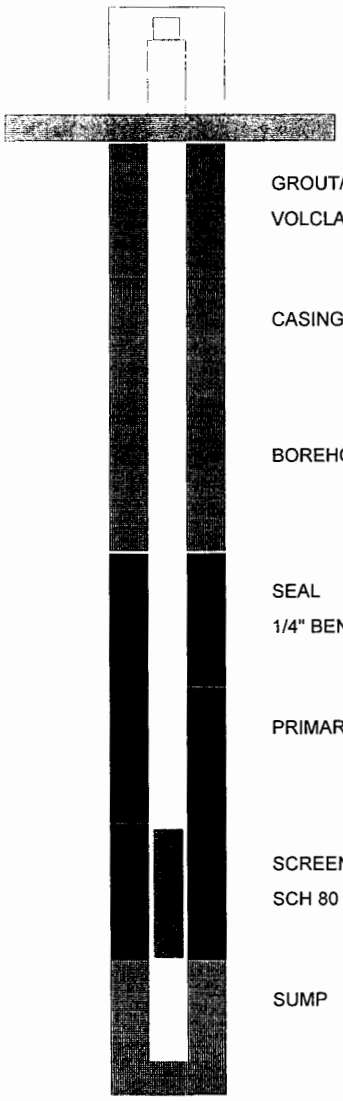
Initial Water Elevation: (FAMSL)	5078.53
Initial Depth To Water: (FBGS)	274

Last measured water level was FASL

measured on 25-SEP-97

Date Updated: 01-OCT-01

Date Printed: 08-NOV-01



Completion Data Measured Depths (FBGS)

Casing Stickup: 1.84

Interval	Start	Stop
GROUT/BACKFILL	0'	248'
VOLCLAY BENT. SLURRY		

Interval	Start	Stop
CASING	0'	305'

I.D. 3.82" **O.D.** 4.5"

Interval	Start	Stop
BOREHOLE	0'	310'

O.D. 7.875"

Interval	Start	Stop
SEAL	248'	263'
1/4" BENT. PELLETS		

Interval	Start	Stop
PRIMARY PACK	263'	310'

Interval	Start	Stop
SCREEN	275'	295'
SCH 80 PVC		

Slot Size .02"

Interval	Start	Stop
SUMP	295'	305'

WELL DATABASE SUMMARY SHEET

Project Name:	SANDIA NORTH GW	**Geo Location:**	E. OF SKEET RANGE, W. OF TA-IV
ER ADS #:	1303	**Well Completion Date:**	31-AUG-98
Well Name:	TJA-3	**Completion Zone:**	SAND AND GRAVEL
Owner Name:	SNL/NM	**Formation of Completion:**	SANTA FE GROUP
Date Drilling Started:	14-AUG-98	**Well Comment:**	WELL DEVELOPED 04-DEC-98. NO PROBLEMS ENCOUNTERED DURING WELL INSTALLATION. PROTECTIVE CASING EXTENDED 2/16/99.
Drilling Contractor:	WATER DEVELOPMENT CORP.		
Drilling Method:	AIR ROTARY/CASING HAMMER		
Borehole Depth:	522		
Casing Depth:	521.7		

Survey Data

Survey Date: 15-JAN-99

Surveyed By: BOHANNAN HUSTON, INC.

State Plane Coordinates

(X) Easting: 411705.936

(Y) Northing: 1467501.549

Surveyed Elevations (FAMSL)

Protective Casing:	5388.62
Top of Inner Well Casing:	5387.89
Concrete Pad:	5385.32
Ground Surface:	5385.07

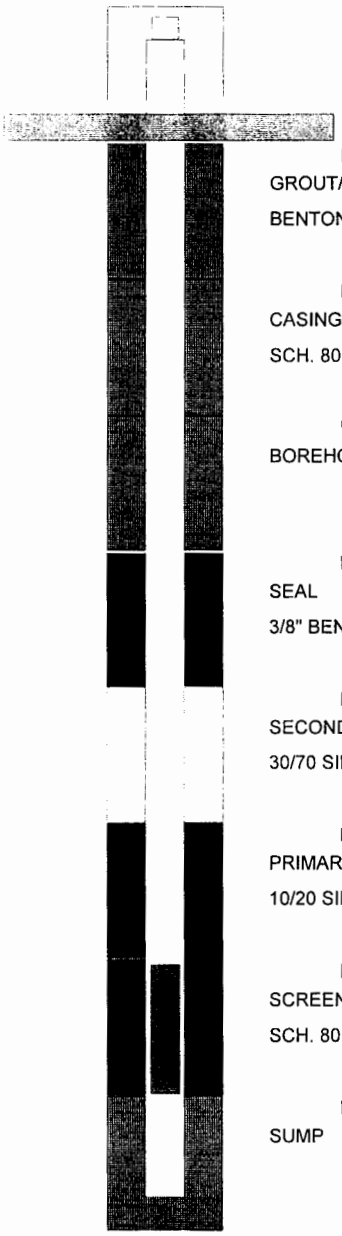
Calculated Depths and Elevations

Initial Water Elevation: (FAMSL)	4892.64
Initial Depth To Water: (FBGS)	495.25

Last measured water level was measured on FASL

Date Updated: 01-OCT-01

Date Printed: 08-NOV-01



Completion Data Measured Depths (FBGS)

Casing Stickup: 3.01

Interval	Start	Stop
GROUT/BACKFILL	0'	480'
BENTONITE GROUT		

Interval	Start	Stop
CASING	0'	521.7'
SCH. 80 PVC	I.D. 5"	O.D. 5.5"

Interval	Start	Stop
BOREHOLE	0'	522'
		O.D. 9.625"

Interval	Start	Stop
SEAL	480'	484'
3/8" BENTONITE PELL		

Interval	Start	Stop
SECONDARY PACK	484'	492'
30/70 SILICA SAND		

Interval	Start	Stop
PRIMARY PACK	492'	521'
10/20 SILICA SAND		

Interval	Start	Stop
SCREEN	496'	516'
SCH. 80 PVC		
	Slot Size	.02"

Interval	Start	Stop
SUMP	516'	521.7'

WELL DATABASE SUMMARY SHEET

Project Name:	SANDIA NORTH GW	**Geo Location:**	W. OF POWERLINE RD. S.SIDE TJ
ER ADS #:	1303	**Well Completion Date:**	04-AUG-98
Well Name:	TJA-4	**Completion Zone:**	SILTY GRAVELLY SAND
Owner Name:	SNL/NM	**Formation of Completion:**	SANTA FE GROUP
Date Drilling Started:	28-JUL-98	**Well Comment:**	WELL DEVELOPED 01-DEC-98 NO PROBLEMS WITH WELL INSTALLATION. PROTECTIVE CASING EXTENDED 2/16/99.
Drilling Contractor:	WATER DEVELOPMENT CORP.		
Drilling Method:	AIR ROTARY/CASING HAMMER		
Borehole Depth:	399		
Casing Depth:	385.7		

Survey Data

Survey Date: 15-JAN-99

Surveyed By: BOHANNAN HUSTON INC.

State Plane Coordinates

(X) Easting: 415135.481

(Y) Northing: 1467154.123

Surveyed Elevations (FAMSL)

Protective Casing:	5339.31
Top of Inner Well Casing:	5338.49
Concrete Pad:	5335.9
Ground Surface:	5335.8

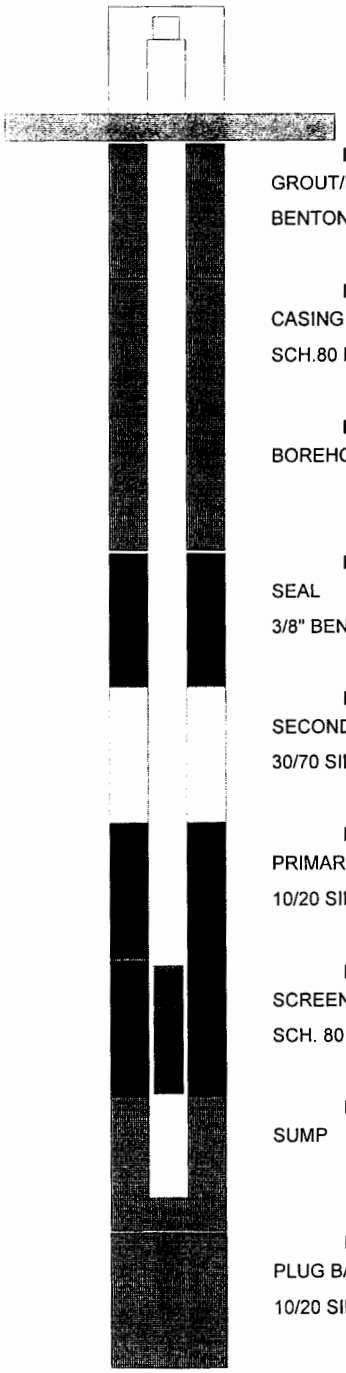
Calculated Depths and Elevations

Initial Water Elevation: (FAMSL)	5023.64
Initial Depth To Water: (FBGS)	314.9

Last measured water level was measured on FASL

Date Updated: 01-OCT-01

Date Printed: 08-NOV-01



Completion Data Measured Depths (FBGS)

Casing Stickup: 2.86

Interval	Start	Stop
GROUT/BACKFILL	0'	345'
BENTONITE GROUT		

Interval	Start	Stop
CASING	0'	385.7'
SCH.80 PVC	I.D. 5"	O.D. 5.5"

Interval	Start	Stop
BOREHOLE	0'	399'
		O.D. 9.625"

Interval	Start	Stop
SEAL	345'	350'
3/8" BENTONITE PELL		

Interval	Start	Stop
SECONDARY PACK	350'	354.5'
30/70 SILICA SAND		

Interval	Start	Stop
PRIMARY PACK	354.5'	399'
10/20 SILICA SAND		

Interval	Start	Stop
SCREEN	360'	380'
SCH. 80 PVC		
	Slot Size	.02"

Interval	Start	Stop
SUMP	380'	385.7'

Interval	Start	Stop
PLUG BACK	385.7'	399'
10/20 SILICA SAND		

WELL DATABASE SUMMARY SHEET

Project Name:	SANDIA NORTH GW	**Geo Location:**	W. OF POWERLINE RD. S.SIDE TJA
ER ADS #:	1303	**Well Completion Date:**	07-AUG-98
Well Name:	TJA-5	**Completion Zone:**	SAND AND GRAVEL
Owner Name:	SNL/NM	**Formation of Completion:**	SANTA FE GROUP
Date Drilling Started:	05-AUG-98	**Well Comment:**	WELL DEVELOPED 02-DEC-98. NO PROBLEMS ENCOUNTERED DURING WELL INSTALLATION. PROTECTIVE CASING EXTENDED 2/16/99
Drilling Contractor:	WATER DEVELOPMENT CORP.		
Drilling Method:	AIR ROTARY/CASING HAMMER		
Borehole Depth:	298		
Casing Depth:	292.7		

Survey Data

Survey Date: 15-JAN-99

Surveyed By: BOHANNAN HUSTON, INC.

State Plane Coordinates

(X) Easting: 415129.026

(Y) Northing: 1467136.269

Surveyed Elevations (FAMSL)

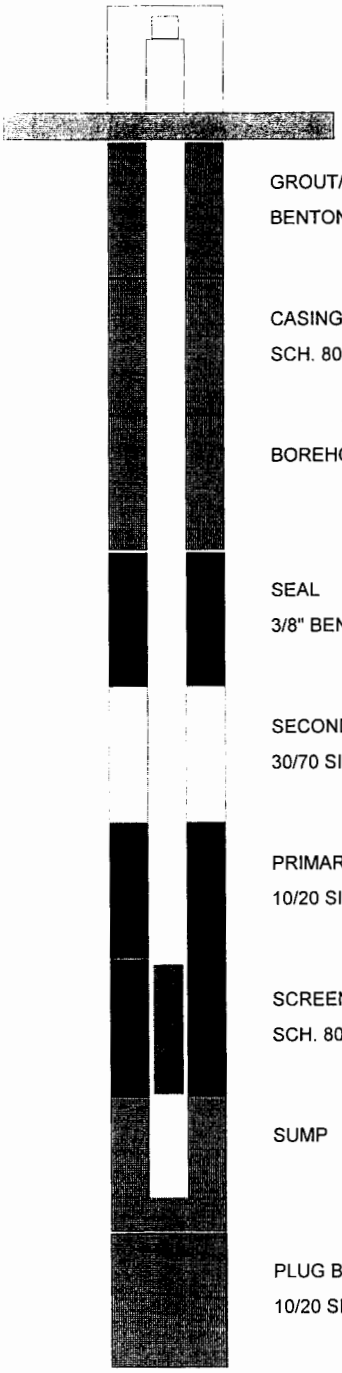
Protective Casing:	5339.56
Top of Inner Well Casing:	5338.66
Concrete Pad:	5335.943
Ground Surface:	5335.77

Calculated Depths and Elevations

Initial Water Elevation: (FAMSL)	5070.99	
Initial Depth To Water: (FBGS)	267.8	
Last measured water level was measured on		**FASL**

Date Updated: 01-OCT-01

Date Printed: 08-NOV-01



Completion Data Measured Depths (FBGS)

Casing Stickup: 3.07

Interval	Start	Stop
GROUT/BACKFILL	0'	249'
BENTONITE GROUT		

Interval	Start	Stop
CASING	0'	292.7'
SCH. 80 PVC	I.D. 5"	O.D. 5.5"

Interval	Start	Stop
BOREHOLE	0'	298'
		O.D. 9.625"

Interval	Start	Stop
SEAL	249'	254'
3/8" BENTONITE PELL		

Interval	Start	Stop
SECONDARY PACK	254'	257'
30/70 SILICA SAND		

Interval	Start	Stop
PRIMARY PACK	257'	298'
10/20 SILICA SAND		

Interval	Start	Stop
SCREEN	267'	287'
SCH. 80 PVC		
	Slot Size	.02"

Interval	Start	Stop
SUMP	287'	292.7'

Interval	Start	Stop
PLUG BACK	292.7'	298'
10/20 SILICA SAND		

WELL DATABASE SUMMARY SHEET

Project Name:	TIJERAS ARROYO GW	**Geo Location:**	S. OF TA IV, N OF TIJERAS ARYO
ER ADS #:	1303	**Well Completion Date:**	04-FEB-01
Well Name:	TJA-6	**Completion Zone:**	SILTY SAND
Owner Name:	SNL-NM	**Formation of Completion:**	SANTA FE GROUP
Date Drilling Started:	16-JAN-01	**Well Comment:**	ODEX 0-245' ROTARY MUD 245-300' 245-500' 8" TRICONE
Drilling Contractor:	LAYNE		
Drilling Method:	ODEX & ROTARY MUD		
Borehole Depth:	503		
Casing Depth:	480.7		

Survey Data

Survey Date: 19-JUN-01

Surveyed By: ASCI, VLADIMIR JIRIK

State Plane Coordinates

(X) Easting: 412434.41

(Y) Northing: 1466976.14

Surveyed Elevations (FAMSL)

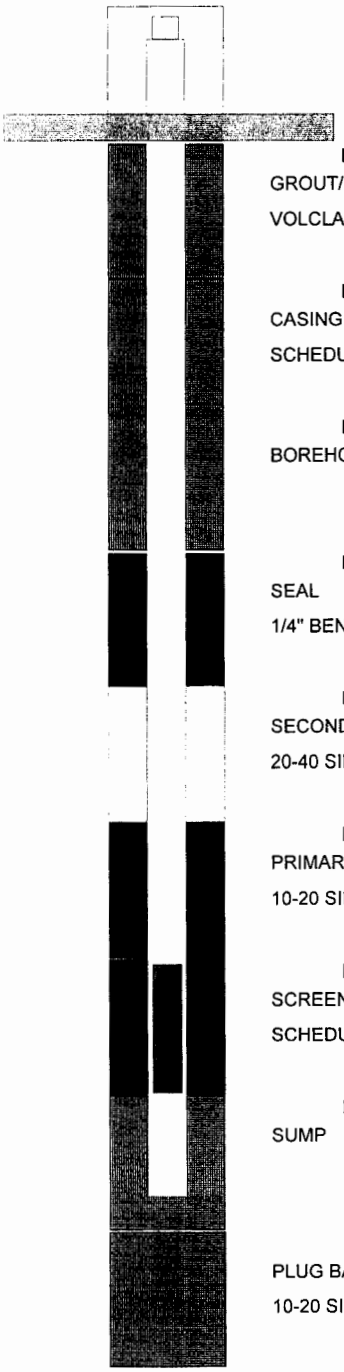
Protective Casing:	5341.11
Top of Inner Well Casing:	5340.49
Concrete Pad:	5338.28
Ground Surface:	5337.9

Calculated Depths and Elevations

Initial Water Elevation: (FAMSL)	4926.9	
Initial Depth To Water: (FBGS)	450.5	
Last measured water level was measured on		**FASL**

Date Updated: 01-OCT-01

Date Printed: 08-NOV-01



Completion Data Measured Depths (FBGS)

Casing Stickup: 2.5

Interval	Start	Stop
GROUT/BACKFILL	0'	441'
VOLCLAY GROUT		

Interval	Start	Stop
CASING	0'	480.7'
SCHEDULE 80 PVC	I.D. 5"	O.D. 5.5"

Interval	Start	Stop
BOREHOLE	0'	503'
		O.D. 10"

Interval	Start	Stop
SEAL	441'	446.5'
1/4" BENTONITE PELTS		

Interval	Start	Stop
SECONDARY PACK	446.5'	451'
20-40 SILICA SAND		

Interval	Start	Stop
PRIMARY PACK	451'	480.7'
10-20 SILICA SAND		

Interval	Start	Stop
SCREEN	454.9'	474.9'
SCHEDULE 80 PVC		
	Slot Size	.02"

Interval	Start	Stop
SUMP	474.9'	480.7'

Interval	Start	Stop
PLUG BACK	480.7'	503'
10-20 SILICA SAND		

WELL DATABASE SUMMARY SHEET

Project Name:	TIJERAS ARROYO GW	**Geo Location:**	SW OF TA IV, N OF TIJERAS ARYO
ER ADS #:	1303	**Well Completion Date:**	07-MAR-01
Well Name:	TJA-7	**Completion Zone:**	SILTY SAND / CLAYEY SILT
Owner Name:	SNL-NM	**Formation of Completion:**	SANTA FE GROUP
Date Drilling Started:	03-MAR-01	**Well Comment:**	PERCHED AQUIFER WELL
Drilling Contractor:	LAYNE		
Drilling Method:	ODEX		
Borehole Depth:	316		
Casing Depth:	316.3		

Survey Data

Survey Date: 19-JUN-01

Surveyed By: ASCI, VLADIMIR JIRIK

State Plane Coordinates

(X) Easting: 411737.38

(Y) Northing: 1467543.6

Surveyed Elevations (FAMSL)

Protective Casing:	5389.18
Top of Inner Well Casing:	5388.6
Concrete Pad:	5386.06
Ground Surface:	5385.7

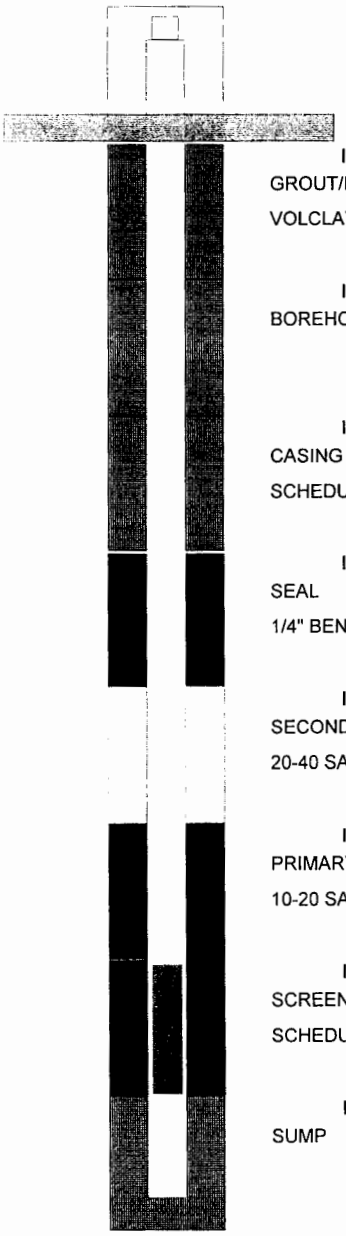
Calculated Depths and Elevations

Initial Water Elevation: (FAMSL)	5087
Initial Depth To Water: (FBGS)	298.7

Last measured water level was measured on FASL

Date Updated: 01-OCT-01

Date Printed: 08-NOV-01



Completion Data Measured Depths (FBGS)

Casing Stickup: 3

Interval	Start	Stop
GROUT/BACKFILL	0'	275.5'
VOLCLAY GROUT		

Interval	Start	Stop
BOREHOLE	0'	316'

O.D. 8"

Interval	Start	Stop
CASING	0'	316.3'
SCHEDULE 80 PVC		

I.D. 5" O.D. 5.5"

Interval	Start	Stop
SEAL	275.5'	282'
1/4" BENTONITE PELTS		

Interval	Start	Stop
SECONDARY PACK	282'	283'
20-40 SAND		

Interval	Start	Stop
PRIMARY PACK	283'	316.3'
10-20 SAND		

Interval	Start	Stop
SCREEN	290.5'	310.5'
SCHEDULE 80 PVC		

Slot Size .02"

Interval	Start	Stop
SUMP	310.5'	316.3'

WELL DATABASE SUMMARY SHEET

Project Name:	SWHC	**Geo Location:**	N. OF WYOMING AND PENNSYLVANIA
ER ADS #:	1330	**Well Completion Date:**	27-AUG-95
Well Name:	WY0-1	**Completion Zone:**	SILTY SAND
Owner Name:	SNL/NM	**Formation of Completion:**	UPPER SANTA FE UNIT
Date Drilling Started:	15-AUG-95	**Well Comment:**	DUAL COMPLETION IN A SINGLE BOREHOLE WITH WYO-2
Drilling Contractor:	USGS		
Drilling Method:	ROTARY MUD		
Borehole Depth:	650		
Casing Depth:	570		

Survey Data

Survey Date: 27-OCT-95

Surveyed By: GREINER, INC.

State Plane Coordinates

(X) Easting: 409960.217

(Y) Northing: 1470026.768

Surveyed Elevations (FAMSL)

Protective Casing:	5390.29
Top of Inner Well Casing:	5389.83
Concrete Pad:	5387.85
Ground Surface:	5387.72

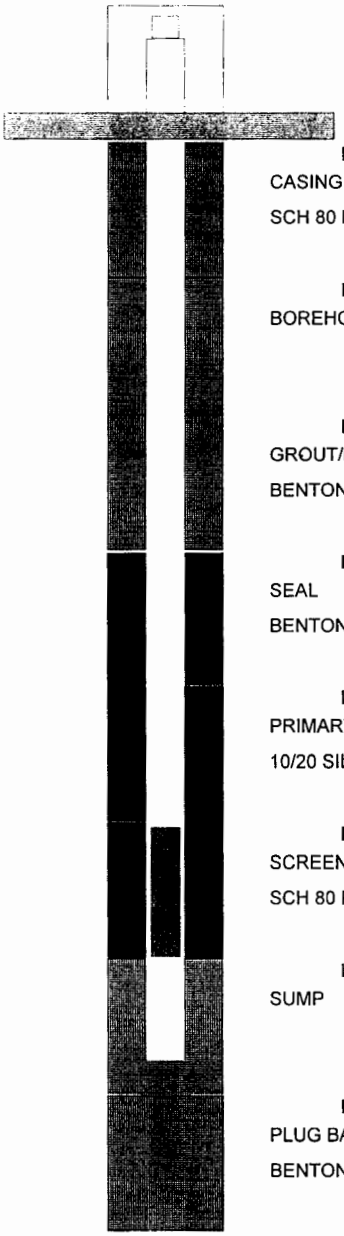
Calculated Depths and Elevations

Initial Water Elevation: (FAMSL)	4876.41
Initial Depth To Water: (FBGS)	513.42

Last measured water level was 4868.52 **FASL**
measured on 28-JUN-96

Date Updated: 01-OCT-01

Date Printed: 08-NOV-01



Completion Data Measured Depths (FBGS)

Casing Stickup: 2

Interval	Start	Stop				
CASING	0'	570'				
SCH 80 PVC			I.D.	4.25"	O.D.	4.75"

Interval	Start	Stop		
BOREHOLE	0'	650'	O.D.	9.875"

Interval	Start	Stop
GROUT/BACKFILL	299'	476'
BENTONITE CHIPS		

Interval	Start	Stop
SEAL	299'	476'
BENTONITE CHIPS		

Interval	Start	Stop
PRIMARY PACK	476'	572'
10/20 SILICA SAND		

Interval	Start	Stop		
SCREEN	510'	560'	Slot Size	.02"
SCH 80 PVC				

Interval	Start	Stop
SUMP	560'	570'

Interval	Start	Stop
PLUG BACK	572'	650'
BENTONITE CHIPS		

WELL DATABASE SUMMARY SHEET

Project Name:	SWHC	**Geo Location:**	N OF WYOMING & PENN. BLVDS
ER ADS #:	1330	**Well Completion Date:**	27-AUG-95
Well Name:	WYO-2	**Completion Zone:**	SILTY SAND ETC
Owner Name:	SNL - NM	**Formation of Completion:**	UPPER SANTA FE UNIT
Date Drilling Started:	15-AUG-95	**Well Comment:**	DUAL COMPLETION IN A SINGLE BOREHOLE WITH WYO-1. 2" SCH 80 PVC
Drilling Contractor:	USGS		
Drilling Method:	ROTARY MUD		
Borehole Depth:	650		
Casing Depth:	295		

Survey Data

Survey Date: 27-OCT-95

Surveyed By: GREINER, INC.

State Plane Coordinates

(X) Easting: 409960.217

(Y) Northing: 1470026.768

Surveyed Elevations (FAMSL)

Protective Casing:	5390.29
Top of Inner Well Casing:	5389.83
Concrete Pad:	5387.85
Ground Surface:	5387.72

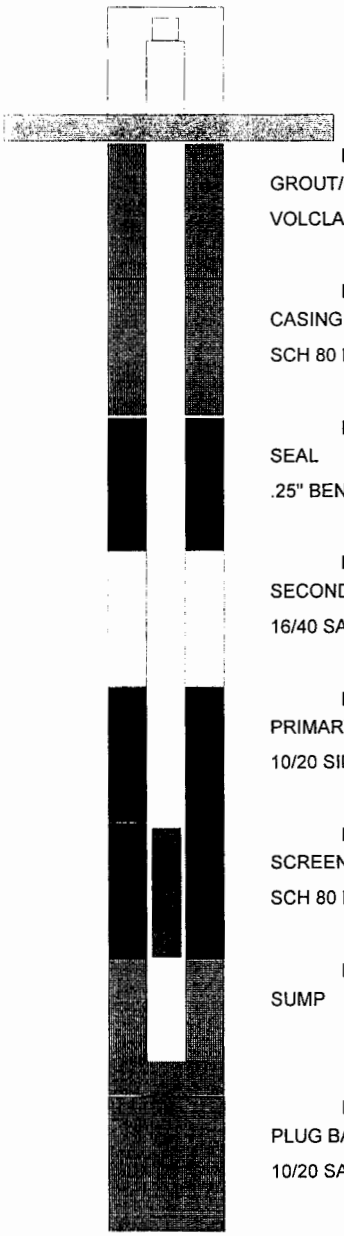
Calculated Depths and Elevations

Initial Water Elevation: (FAMSL)	5116.93
Initial Depth To Water: (FBGS)	272.9

Last measured water level was 5117.66 **FASL**
measured on 28-JUN-96

Date Updated: 01-OCT-01

Date Printed: 08-NOV-01



Completion Data Measured Depths (FBGS)

Casing Stickup: 2

Interval	Start	Stop
GROUT/BACKFILL	0'	215'
VOLCLAY		

Interval	Start	Stop
CASING	0'	295'
SCH 80 PVC		

Interval	Start	Stop
SEAL	215'	220'
.25" BENT PELLETS		

Interval	Start	Stop
SECONDARY PACK	220'	233'
16/40 SAND		

Interval	Start	Stop
PRIMARY PACK	233'	299'
10/20 SILICON		

Interval	Start	Stop
SCREEN	265'	285'
SCH 80 PVC		

Slot Size .02"

Interval	Start	Stop
SUMP	285'	295'

Interval	Start	Stop
PLUG BACK	295'	299'
10/20 SAND		

ANNEX F-1
Tijeras Arroyo Groundwater Investigation—Summary of Field Parameter Data

Table F.1-1
Tijeras Arroyo Groundwater Investigation—
Summary of Field Parameter Data

Well Location	Date	Field Parameter	Measurement	Units
PGS-2	30-Jun-99	Dissolved Oxygen	21.7	% SAT
	30-Jun-99	Oxidization Reduction Potential	190	MV
	30-Jun-99	pH	7.84	SU
	30-Jun-99	Specific Conductance	510	UMHOS/CM
	30-Jun-99	Temperature	30.4	C
	30-Jun-99	Turbidity	1.14	NTU
	23-Sep-99	Oxidization Reduction Potential	47	MV
	23-Sep-99	pH	8.15	SU
	23-Sep-99	Specific Conductance	502	UMHOS/CM
	23-Sep-99	Temperature	23.2	C
	23-Sep-99	Turbidity	0.51	NTU
	3-Dec-99	Oxidization Reduction Potential	63	MV
	3-Dec-99	pH	8.17	SU
	3-Dec-99	Specific Conductance	570	UMHOS/CM
	3-Dec-99	Temperature	15.2	C
	3-Dec-99	Turbidity	0.99	NTU
	12-Apr-00	Dissolved Oxygen	9.8	% SAT
	12-Apr-00	Oxidization Reduction Potential	146	MV
	12-Apr-00	pH	7.4	SU
	12-Apr-00	Specific Conductance	685	UMHOS/CM
	12-Apr-00	Temperature	19.8	C
	12-Apr-00	Turbidity	1.36	NTU
TA1-W-01	22-Jul-99	Oxidization Reduction Potential	117	MV
	22-Jul-99	pH	7.72	SU
	22-Jul-99	Specific Conductance	480	UMHOS/CM
	22-Jul-99	Temperature	20.3	C
	22-Jul-99	Turbidity	0.63	NTU
	16-Sep-99	Oxidization Reduction Potential	88	MV
	16-Sep-99	pH	8	SU
	16-Sep-99	Specific Conductance	220	UMHOS/CM
	16-Sep-99	Temperature	21.1	C
	16-Sep-99	Turbidity	0.6	NTU
	9-Dec-99	Oxidization Reduction Potential	39	MV
	9-Dec-99	pH	7.46	SU
	9-Dec-99	Specific Conductance	593	UMHOS/CM
	9-Dec-99	Temperature	14.5	C
	9-Dec-99	Turbidity	1.34	NTU
	16-Mar-00	Dissolved Oxygen	30.4	% SAT
	16-Mar-00	Oxidization Reduction Potential	173	MV
	16-Mar-00	pH	7.2	SU

Refer to footnotes at end of table.

Table F.1-1 (Continued)
Tijeras Arroyo Groundwater Investigation—
Summary of Field Parameter Data

Well Location	Date	Field Parameter	Measurement	Units
TA1-W-01 (cont.)	16-Mar-00	Specific Conductance	561	UMHOS/CM
	16-Mar-00	Temperature	13.4	C
	16-Mar-00	Turbidity	0.64	NTU
	10-Jan-01	Dissolved Oxygen	40.3	% SAT
	10-Jan-01	pH	7.24	SU
	10-Jan-01	Specific Conductance	561	UMHOS/CM
	10-Jan-01	Temperature	14.4	C
	10-Jan-01	Turbidity	0.32	NTU
TA1-W-02	27-Jul-99	Oxidization Reduction Potential	74	MV
	27-Jul-99	pH	7.35	SU
	27-Jul-99	Specific Conductance	574	UMHOS/CM
	27-Jul-99	Temperature	21.3	C
	27-Jul-99	Turbidity	1.28	NTU
	10-Sep-99	Dissolved Oxygen	0.5	% SAT
	10-Sep-99	Oxidization Reduction Potential	98	MV
	10-Sep-99	pH	7.31	SU
	10-Sep-99	Specific Conductance	310	UMHOS/CM
	10-Sep-99	Temperature	18.9	C
	22-Nov-99	Dissolved Oxygen	45.1	% SAT
	22-Nov-99	Oxidization Reduction Potential	87	MV
	22-Nov-99	pH	7.02	SU
	22-Nov-99	Specific Conductance	593	UMHOS/CM
	22-Nov-99	Temperature	15.5	C
	22-Nov-99	Turbidity	0.31	NTU
	17-Mar-00	Dissolved Oxygen	31.2	% SAT
	17-Mar-00	Oxidization Reduction Potential	138	MV
	17-Mar-00	pH	7.29	SU
	17-Mar-00	Specific Conductance	576	UMHOS/CM
	17-Mar-00	Temperature	15.8	C
	17-Mar-00	Turbidity	0.55	NTU
	9-Jan-01	Dissolved Oxygen	41.8	% SAT
	9-Jan-01	pH	7.16	SU
	9-Jan-01	Specific Conductance	567	UMHOS/CM
	9-Jan-01	Temperature	13.9	C
	9-Jan-01	Turbidity	30	NTU
TA1-W-03	13-Jul-99	Oxidization Reduction Potential	73	MV
	13-Jul-99	pH	7.16	SU
	13-Jul-99	Specific Conductance	424	UMHOS/CM
	13-Jul-99	Temperature	19.7	C
	13-Jul-99	Turbidity	1.17	NTU

Refer to footnotes at end of table.

Table F.1-1 (Continued)
Tijeras Arroyo Groundwater Investigation—
Summary of Field Parameter Data

Well Location	Date	Field Parameter	Measurement	Units
TA1-W-03	14-Sep-99	Oxidization Reduction Potential	99	MV
(cont.)	14-Sep-99	pH	7.33	SU
	14-Sep-99	Specific Conductance	1947	UMHOS/CM
	14-Sep-99	Temperature	17.5	C
	14-Sep-99	Turbidity	0.32	NTU
	24-Nov-99	Oxidization Reduction Potential	101	MV
	24-Nov-99	pH	7.13	SU
	24-Nov-99	Specific Conductance	2020	UMHOS/CM
	24-Nov-99	Temperature	13	C
	24-Nov-99	Turbidity	0.44	NTU
	5-Jan-01	Dissolved Oxygen	48.6	% SAT
	5-Jan-01	Oxidization Reduction Potential	206	MV
	5-Jan-01	pH	7.26	SU
	5-Jan-01	Specific Conductance	1910	UMHOS/CM
	5-Jan-01	Temperature	12.5	C
	5-Jan-01	Turbidity	0.43	NTU
TA1-W-04	30-Jun-99	Dissolved Oxygen	29.1	% SAT
	30-Jun-99	Oxidization Reduction Potential	216	MV
	30-Jun-99	pH	7.19	SU
	30-Jun-99	Specific Conductance	581	UMHOS/CM
	30-Jun-99	Temperature	22.2	C
	30-Jun-99	Turbidity	1	NTU
	22-Sep-99	Oxidization Reduction Potential	91	MV
	22-Sep-99	pH	7.22	SU
	22-Sep-99	Specific Conductance	576	UMHOS/CM
	22-Sep-99	Temperature	21.6	C
	22-Sep-99	Turbidity	0.9	NTU
	8-Dec-99	Oxidization Reduction Potential	71	MV
	8-Dec-99	pH	7.38	SU
	8-Dec-99	Specific Conductance	580	UMHOS/CM
	8-Dec-99	Temperature	14.1	C
	8-Dec-99	Turbidity	0.78	NTU
	10-Apr-00	Dissolved Oxygen	20.4	% SAT
	10-Apr-00	Oxidization Reduction Potential	71	MV
	10-Apr-00	pH	7.01	SU
	10-Apr-00	Specific Conductance	571	UMHOS/CM
	10-Apr-00	Temperature	19.3	C
	10-Apr-00	Turbidity	0.37	NTU
	15-Jan-01	Dissolved Oxygen	40.6	% SAT
	15-Jan-01	pH	7.15	SU

Refer to footnotes at end of table.

Table F.1-1 (Continued)
Tijeras Arroyo Groundwater Investigation—
Summary of Field Parameter Data

Well Location	Date	Field Parameter	Measurement	Units
TA1-W-04 (cont.)	15-Jan-01	Specific Conductance	568	UMHOS/CM
	15-Jan-01	Temperature	13.6	C
	15-Jan-01	Turbidity	0.92	NTU
TA1-W-05	17-Jun-99	Oxidization Reduction Potential	257	MV
	17-Jun-99	pH	7.14	SU
	17-Jun-99	Specific Conductance	648	UMHOS/CM
	17-Jun-99	Temperature	19.3	C
	17-Jun-99	Turbidity	1.05	NTU
	22-Sep-99	Oxidization Reduction Potential	82	MV
	22-Sep-99	pH	7.18	SU
	22-Sep-99	Specific Conductance	653	UMHOS/CM
	22-Sep-99	Temperature	19	C
	22-Sep-99	Turbidity	0.4	NTU
	7-Dec-99	Oxidization Reduction Potential	64	MV
	7-Dec-99	pH	7.16	SU
	7-Dec-99	Specific Conductance	662	UMHOS/CM
	7-Dec-99	Temperature	15.8	C
	7-Dec-99	Turbidity	0.4	NTU
	16-Jan-01	Dissolved Oxygen	44.8	% SAT
	16-Jan-01	pH	7.09	SU
	16-Jan-01	Specific Conductance	655	UMHOS/CM
	16-Jan-01	Temperature	13.6	C
	16-Jan-01	Turbidity	0.25	NTU
TA1-W-06	25-Jun-99	Dissolved Oxygen	82.1	% SAT
	25-Jun-99	Oxidization Reduction Potential	209	MV
	25-Jun-99	pH	7.42	SU
	25-Jun-99	Specific Conductance	974	UMHOS/CM
	25-Jun-99	Temperature	22.7	C
	25-Jun-99	Turbidity	81.1	NTU
	8-Jul-99	Oxidization Reduction Potential	126	MV
	8-Jul-99	pH	7.44	SU
	8-Jul-99	Specific Conductance	969	UMHOS/CM
	8-Jul-99	Temperature	21.9	C
	8-Jul-99	Turbidity	0.42	NTU
	27-Jul-99	Oxidization Reduction Potential	107	MV
	27-Jul-99	pH	7.44	SU
	27-Jul-99	Specific Conductance	964	UMHOS/CM
	27-Jul-99	Temperature	22.6	C
	27-Jul-99	Turbidity	0.3	NTU
	10-Sep-99	Oxidization Reduction Potential	128	MV

Refer to footnotes at end of table.

Table F.1-1 (Continued)
Tijeras Arroyo Groundwater Investigation—
Summary of Field Parameter Data

Well Location	Date	Field Parameter	Measurement	Units
TA1-W-06	10-Sep-99	pH	7.42	SU
(cont.)	10-Sep-99	Specific Conductance	961	UMHOS/CM
	10-Sep-99	Temperature	20.9	C
	10-Sep-99	Turbidity	0.43	NTU
	22-Nov-99	Dissolved Oxygen	47.2	% SAT
	22-Nov-99	Oxidization Reduction Potential	95	MV
	22-Nov-99	pH	7.35	SU
	22-Nov-99	Specific Conductance	991	UMHOS/CM
	22-Nov-99	Temperature	15.7	C
	22-Nov-99	Turbidity	0.39	NTU
	17-Mar-00	Dissolved Oxygen	31.9	% SAT
	17-Mar-00	Oxidization Reduction Potential	157	MV
	17-Mar-00	pH	7.45	SU
	17-Mar-00	Specific Conductance	978	UMHOS/CM
	17-Mar-00	Temperature	17	C
	17-Mar-00	Turbidity	0.22	NTU
TA1-W-07	21-Jul-99	Oxidization Reduction Potential	230	MV
	21-Jul-99	pH	7.34	SU
	21-Jul-99	Specific Conductance	1216	UMHOS/CM
	21-Jul-99	Temperature	21.4	C
	21-Jul-99	Turbidity	3.16	NTU
	16-Sep-99	Oxidization Reduction Potential	180	MV
	16-Sep-99	pH	7.53	SU
	16-Sep-99	Specific Conductance	1095	UMHOS/CM
	16-Sep-99	Temperature	21.2	C
	16-Sep-99	Turbidity	1.07	NTU
	6-Dec-99	Oxidization Reduction Potential	75	MV
	6-Dec-99	pH	7.59	SU
	6-Dec-99	Specific Conductance	1260	UMHOS/CM
	6-Dec-99	Temperature	15	C
	6-Dec-99	Turbidity	0.74	NTU
	16-Mar-00	Dissolved Oxygen	32.2	% SAT
	16-Mar-00	Oxidization Reduction Potential	179	MV
	16-Mar-00	pH	7.41	SU
	16-Mar-00	Specific Conductance	1239	UMHOS/CM
	16-Mar-00	Temperature	13.9	C
	16-Mar-00	Turbidity	0.49	NTU
TA2-NW1-325	15-Jun-99	Oxidization Reduction Potential	124	MV
	15-Jun-99	pH	7.72	SU
	15-Jun-99	Specific Conductance	780	UMHOS/CM

Refer to footnotes at end of table.

Table F.1-1 (Continued)
Tijeras Arroyo Groundwater Investigation—
Summary of Field Parameter Data

Well Location	Date	Field Parameter	Measurement	Units
TA2-NW1-325 (cont.)	15-Jun-99	Temperature	21.3	C
	15-Jun-99	Turbidity	1.04	NTU
	15-Sep-99	Oxidization Reduction Potential	75	MV
	15-Sep-99	pH	7.86	SU
	15-Sep-99	Specific Conductance	775	UMHOS/CM
	15-Sep-99	Temperature	19.4	C
	15-Sep-99	Turbidity	0.46	NTU
	17-Nov-99	Dissolved Oxygen	3.32	% SAT
	17-Nov-99	Oxidization Reduction Potential	77	MV
	17-Nov-99	pH	7.6	SU
	17-Nov-99	Specific Conductance	781	UMHOS/CM
	17-Nov-99	Temperature	16.1	C
	17-Nov-99	Turbidity	0.58	NTU
	21-Apr-00	Dissolved Oxygen	35	% SAT
	21-Apr-00	Oxidization Reduction Potential	86	MV
	21-Apr-00	pH	7.54	SU
	21-Apr-00	Specific Conductance	758	UMHOS/CM
	21-Apr-00	Temperature	18.4	C
	21-Apr-00	Turbidity	0.64	NTU
TA2-NW1-595	15-Jun-99	Oxidization Reduction Potential	76	MV
	15-Jun-99	pH	7.15	SU
	15-Jun-99	Specific Conductance	826	UMHOS/CM
	15-Jun-99	Temperature	20.2	C
	15-Jun-99	Turbidity	0.62	NTU
	15-Sep-99	Dissolved Oxygen	0.29	% SAT
	15-Sep-99	Oxidization Reduction Potential	90	MV
	15-Sep-99	pH	7.11	SU
	15-Sep-99	Specific Conductance	820	UMHOS/CM
	15-Sep-99	Temperature	18.3	C
	18-Nov-99	Dissolved Oxygen	4.7	% SAT
	18-Nov-99	Oxidization Reduction Potential	112	MV
	18-Nov-99	pH	7.09	SU
	18-Nov-99	Specific Conductance	841	UMHOS/CM
	18-Nov-99	Temperature	16.9	C
	18-Nov-99	Turbidity	0.53	NTU
	21-Apr-00	Dissolved Oxygen	29.7	% SAT
	21-Apr-00	Oxidization Reduction Potential	117	MV
	21-Apr-00	pH	7.2	SU
	21-Apr-00	Specific Conductance	840	UMHOS/CM
	21-Apr-00	Temperature	18.1	C

Refer to footnotes at end of table.

Table F.1-1 (Continued)
Tijeras Arroyo Groundwater Investigation—
Summary of Field Parameter Data

Well Location	Date	Field Parameter	Measurement	Units
TA2-NW1-595 (cont.)	21-Apr-00	Turbidity	0.69	NTU
	11-Jan-01	Dissolved Oxygen	42.1	% SAT
	11-Jan-01	pH	7.06	SU
	11-Jan-01	Specific Conductance	849	UMHOS/CM
	11-Jan-01	Temperature	14.3	C
	11-Jan-01	Turbidity	0.26	NTU
TA2-SW1-320	13-Sep-99	Oxidization Reduction Potential	82	MV
	13-Sep-99	pH	7.49	SU
	13-Sep-99	Specific Conductance	550	UMHOS/CM
	13-Sep-99	Temperature	19.4	C
	13-Sep-99	Turbidity	0.74	NTU
	19-Nov-99	Dissolved Oxygen	51	% SAT
	19-Nov-99	Oxidization Reduction Potential	107	MV
	19-Nov-99	pH	7.42	SU
	19-Nov-99	Specific Conductance	559	UMHOS/CM
	19-Nov-99	Temperature	16	C
	19-Nov-99	Turbidity	1.89	NTU
	12-Apr-00	Dissolved Oxygen	42.1	% SAT
	12-Apr-00	Oxidization Reduction Potential	161	MV
	12-Apr-00	pH	7.54	SU
	12-Apr-00	Specific Conductance	549	UMHOS/CM
	12-Apr-00	Temperature	15.7	C
	12-Apr-00	Turbidity	2.09	NTU
TA2-W-01	28-Jul-99	Oxidization Reduction Potential	96	MV
	28-Jul-99	pH	7.61	SU
	28-Jul-99	Specific Conductance	671	UMHOS/CM
	28-Jul-99	Temperature	21.2	C
	28-Jul-99	Turbidity	1.57	NTU
	15-Sep-99	Oxidization Reduction Potential	116	MV
	15-Sep-99	pH	7.66	SU
	15-Sep-99	Specific Conductance	675	UMHOS/CM
	15-Sep-99	Temperature	20.5	C
	15-Sep-99	Turbidity	0.4	NTU
	2-Dec-99	Oxidization Reduction Potential	70	MV
	2-Dec-99	pH	7.66	SU
	2-Dec-99	Specific Conductance	699	UMHOS/CM
	2-Dec-99	Temperature	13.9	C
	2-Dec-99	Turbidity	0.24	NTU
	11-Apr-00	Dissolved Oxygen	26.7	% SAT
	11-Apr-00	Oxidization Reduction Potential	158	MV

Refer to footnotes at end of table.

Table F.1-1 (Continued)
Tijeras Arroyo Groundwater Investigation—
Summary of Field Parameter Data

Well Location	Date	Field Parameter	Measurement	Units
TA2-W-01 (cont.)	11-Apr-00	pH	7.37	SU
	11-Apr-00	Specific Conductance	677	UMHOS/CM
	11-Apr-00	Temperature	14.1	C
	11-Apr-00	Turbidity	0.25	NTU
	12-Jan-01	Dissolved Oxygen	5.2	% SAT
	12-Jan-01	pH	7.45	SU
	12-Jan-01	Specific Conductance	688	UMHOS/CM
	12-Jan-01	Temperature	11.5	C
	12-Jan-01	Turbidity	0.48	NTU
TA2-W-19	16-Jun-99	Oxidization Reduction Potential	195	MV
	16-Jun-99	pH	7.62	SU
	16-Jun-99	Specific Conductance	573	UMHOS/CM
	16-Jun-99	Temperature	20	C
	16-Jun-99	Turbidity	13.9	NTU
	24-Sep-99	Oxidization Reduction Potential	-56	MV
	24-Sep-99	pH	7.49	SU
	24-Sep-99	Specific Conductance	890	UMHOS/CM
	24-Sep-99	Temperature	18.5	C
	24-Sep-99	Turbidity	9.21	NTU
	30-Nov-99	Oxidization Reduction Potential	80	MV
	30-Nov-99	pH	7.79	SU
	30-Nov-99	Specific Conductance	659	UMHOS/CM
	30-Nov-99	Temperature	14.5	C
	30-Nov-99	Turbidity	8.8	NTU
	15-Mar-00	Dissolved Oxygen	4.6	% SAT
	15-Mar-00	Oxidization Reduction Potential	117	MV
	15-Mar-00	pH	7.65	SU
	15-Mar-00	Specific Conductance	651	UMHOS/CM
	15-Mar-00	Temperature	15.9	C
	15-Mar-00	Turbidity	4.92	NTU
TA2-W-24	29-Jun-99	Dissolved Oxygen	3.1	% SAT
	29-Jun-99	Oxidization Reduction Potential	163	MV
	29-Jun-99	pH	7.69	SU
	29-Jun-99	Specific Conductance	340	UMHOS/CM
	29-Jun-99	Temperature	22.7	C
	29-Jun-99	Turbidity	4.83	NTU
	9-Sep-99	Oxidization Reduction Potential	119	MV
	9-Sep-99	pH	7.46	SU
	9-Sep-99	Specific Conductance	220	UMHOS/CM
	9-Sep-99	Temperature	20	C

Refer to footnotes at end of table.

Table F.1-1 (Continued)
Tijeras Arroyo Groundwater Investigation—
Summary of Field Parameter Data

Well Location	Date	Field Parameter	Measurement	Units
TA2-W-24	9-Sep-99	Turbidity	2.22	NTU
(cont.)	23-Nov-99	Oxidization Reduction Potential	94	MV
	23-Nov-99	pH	7.4	SU
	23-Nov-99	Specific Conductance	621	UMHOS/CM
	23-Nov-99	Temperature	14.6	C
	23-Nov-99	Turbidity	2.38	NTU
	14-Mar-00	Dissolved Oxygen	3.9	% SAT
	14-Mar-00	Oxidization Reduction Potential	110	MV
	14-Mar-00	pH	7.56	SU
	14-Mar-00	Specific Conductance	298	UMHOS/CM
	14-Mar-00	Temperature	17.4	C
	14-Mar-00	Turbidity	1.12	NTU
	3-Jan-01	Dissolved Oxygen	5.2	% SAT
	3-Jan-01	Oxidization Reduction Potential	91	MV
	3-Jan-01	pH	7.88	SU
	3-Jan-01	Specific Conductance	560	UMHOS/CM
	3-Jan-01	Temperature	12.6	C
	3-Jan-01	Turbidity	3.62	NTU
TA2-W-25	29-Jun-99	Dissolved Oxygen	62.8	% SAT
	29-Jun-99	Oxidization Reduction Potential	213	MV
	29-Jun-99	pH	7.37	SU
	29-Jun-99	Specific Conductance	543	UMHOS/CM
	29-Jun-99	Temperature	22.8	C
	29-Jun-99	Turbidity	1.01	NTU
	13-Sep-99	Oxidization Reduction Potential	111	MV
	13-Sep-99	pH	7.35	SU
	13-Sep-99	Specific Conductance	548	UMHOS/CM
	13-Sep-99	Temperature	20.4	C
	13-Sep-99	Turbidity	0.54	NTU
	24-Nov-99	Oxidization Reduction Potential	100	MV
	24-Nov-99	pH	7.19	SU
	24-Nov-99	Specific Conductance	562	UMHOS/CM
	24-Nov-99	Temperature	12.4	C
	24-Nov-99	Turbidity	0.77	NTU
	28-Apr-00	Dissolved Oxygen	34.4	% SAT
	28-Apr-00	Oxidization Reduction Potential	74	MV
	28-Apr-00	pH	7.33	SU
	28-Apr-00	Specific Conductance	542	UMHOS/CM
	28-Apr-00	Temperature	19.3	C
	28-Apr-00	Turbidity	0.59	NTU

Refer to footnotes at end of table.

Table F.1-1 (Continued)
Tijeras Arroyo Groundwater Investigation—
Summary of Field Parameter Data

Well Location	Date	Field Parameter	Measurement	Units
TA2-W-26	7-Jul-99	Oxidization Reduction Potential	134	MV
	7-Jul-99	pH	7.47	SU
	7-Jul-99	Specific Conductance	640	UMHOS/CM
	7-Jul-99	Temperature	19.4	C
	7-Jul-99	Turbidity	1.99	NTU
	9-Sep-99	Oxidization Reduction Potential	148	MV
	9-Sep-99	pH	7.4	SU
	9-Sep-99	Specific Conductance	625	UMHOS/CM
	9-Sep-99	Temperature	20.6	C
	9-Sep-99	Turbidity	1.28	NTU
	2-Dec-99	Oxidization Reduction Potential	89	MV
	2-Dec-99	pH	7.49	SU
	2-Dec-99	Specific Conductance	639	UMHOS/CM
	2-Dec-99	Temperature	14.8	C
	2-Dec-99	Turbidity	0.82	NTU
	8-Jan-01	Dissolved Oxygen	59.4	% SAT
	8-Jan-01	pH	7.47	SU
	8-Jan-01	Specific Conductance	612	UMHOS/CM
	8-Jan-01	Temperature	11.4	C
	8-Jan-01	Turbidity	0.93	NTU
TA2-W-27	8-Jul-99	Oxidization Reduction Potential	139	MV
	8-Jul-99	pH	7.39	SU
	8-Jul-99	Specific Conductance	1040	UMHOS/CM
	8-Jul-99	Temperature	19.2	C
	8-Jul-99	Turbidity	0.66	NTU
	9-Sep-99	Oxidization Reduction Potential	37	MV
	9-Sep-99	pH	7.33	SU
	9-Sep-99	Specific Conductance	1043	UMHOS/CM
	9-Sep-99	Temperature	19.6	C
	9-Sep-99	Turbidity	0.64	NTU
	23-Nov-99	Oxidization Reduction Potential	108	MV
	23-Nov-99	pH	7.35	SU
	23-Nov-99	Specific Conductance	576	UMHOS/CM
	23-Nov-99	Temperature	13.9	C
	23-Nov-99	Turbidity	0.98	NTU
	14-Mar-00	Dissolved Oxygen	43.1	% SAT
	14-Mar-00	Oxidization Reduction Potential	105	MV
	14-Mar-00	pH	7.26	SU
	14-Mar-00	Specific Conductance	1022	UMHOS/CM
	14-Mar-00	Temperature	15.3	C
	14-Mar-00	Turbidity	1.02	NTU

Refer to footnotes at end of table.

Table F.1-1 (Continued)
Tijeras Arroyo Groundwater Investigation—
Summary of Field Parameter Data

Well Location	Date	Field Parameter	Measurement	Units
TJA-2	16-Jun-99	Oxidization Reduction Potential	225	MV
	16-Jun-99	pH	7.46	SU
	16-Jun-99	Specific Conductance	648	UMHOS/CM
	16-Jun-99	Temperature	20.9	C
	16-Jun-99	Turbidity	0.85	NTU
	13-Sep-99	Oxidization Reduction Potential	14	MV
	13-Sep-99	pH	7.36	SU
	13-Sep-99	Specific Conductance	664	UMHOS/CM
	13-Sep-99	Temperature	16.8	C
	13-Sep-99	Turbidity	0.99	NTU
	30-Nov-99	Oxidization Reduction Potential	84	MV
	30-Nov-99	pH	7.46	SU
	30-Nov-99	Specific Conductance	666	UMHOS/CM
	30-Nov-99	Temperature	16.3	C
	30-Nov-99	Turbidity	1	NTU
	15-Mar-00	Dissolved Oxygen	20.4	% SAT
	15-Mar-00	Oxidization Reduction Potential	125	MV
	15-Mar-00	pH	7.4	SU
	15-Mar-00	Specific Conductance	662	UMHOS/CM
	15-Mar-00	Temperature	16.8	C
	15-Mar-00	Turbidity	0.54	NTU
	4-Jan-01	Dissolved Oxygen	40.1	% SAT
	4-Jan-01	Oxidization Reduction Potential	120	MV
	4-Jan-01	pH	7.46	SU
	4-Jan-01	Specific Conductance	658	UMHOS/CM
	4-Jan-01	Temperature	14.4	C
	4-Jan-01	Turbidity	0.62	NTU
TJA-3	20-Sep-99	Dissolved Oxygen	0.59	% SAT
	20-Sep-99	Oxidization Reduction Potential	36	MV
	20-Sep-99	pH	7.31	SU
	20-Sep-99	Specific Conductance	550	UMHOS/CM
	20-Sep-99	Temperature	17.7	C
	29-Nov-99	Oxidization Reduction Potential	99	MV
	29-Nov-99	pH	7.1	SU
	29-Nov-99	Specific Conductance	563	UMHOS/CM
	29-Nov-99	Temperature	14.1	C
	29-Nov-99	Turbidity	0.72	NTU
	11-Apr-00	Dissolved Oxygen	5.2	% SAT
	11-Apr-00	Oxidization Reduction Potential	122	MV

Refer to footnotes at end of table.

Table F.1-1 (Continued)
Tijeras Arroyo Groundwater Investigation—
Summary of Field Parameter Data

Well Location	Date	Field Parameter	Measurement	Units
TJA-3	11-Apr-00	pH	7.4	SU
(cont.)	11-Apr-00	Specific Conductance	540	UMHOS/CM
	11-Apr-00	Temperature	14.9	C
	11-Apr-00	Turbidity	1.01	NTU
TJA-4	12-Jul-99	Oxidization Reduction Potential	67	MV
	12-Jul-99	pH	7.16	SU
	12-Jul-99	Specific Conductance	593	UMHOS/CM
	12-Jul-99	Temperature	18.6	C
	12-Jul-99	Turbidity	2.47	NTU
	20-Sep-99	Oxidization Reduction Potential	67	MV
	20-Sep-99	pH	7.4	SU
	20-Sep-99	Specific Conductance	586	UMHOS/CM
	20-Sep-99	Temperature	19.8	C
	20-Sep-99	Turbidity	1.88	NTU
	29-Nov-99	Dissolved Oxygen	30.2	% SAT
	29-Nov-99	Oxidization Reduction Potential	83	MV
	29-Nov-99	pH	7.56	SU
	29-Nov-99	Specific Conductance	596	UMHOS/CM
	29-Nov-99	Temperature	15.1	C
	29-Nov-99	Turbidity	0.78	NTU
	20-Apr-00	Dissolved Oxygen	24.5	% SAT
	20-Apr-00	Oxidization Reduction Potential	129	MV
	20-Apr-00	pH	7.32	SU
	20-Apr-00	Specific Conductance	595	UMHOS/CM
	20-Apr-00	Temperature	15.2	C
	20-Apr-00	Turbidity	1.22	NTU
	2-Jan-01	Dissolved Oxygen	30.2	% SAT
	2-Jan-01	Oxidization Reduction Potential	13	MV
	2-Jan-01	pH	7.34	SU
	2-Jan-01	Specific Conductance	604	UMHOS/CM
	2-Jan-01	Temperature	10.1	C
	2-Jan-01	Turbidity	3.92	NTU
TJA-5	28-Jun-99	Dissolved Oxygen	62.2	% SAT
	28-Jun-99	Oxidization Reduction Potential	227	MV
	28-Jun-99	pH	7.36	SU
	28-Jun-99	Specific Conductance	595	UMHOS/CM
	28-Jun-99	Temperature	20.2	C
	28-Jun-99	Turbidity	0.67	NTU
	14-Sep-99	Oxidization Reduction Potential	105	MV
	14-Sep-99	pH	7.42	SU

Refer to footnotes at end of table.

Table F.1-1 (Continued)
Tijeras Arroyo Groundwater Investigation—
Summary of Field Parameter Data

Well Location	Date	Field Parameter	Measurement	Units
TJA-5 (cont.)	14-Sep-99	Specific Conductance	601	UMHOS/CM
	14-Sep-99	Temperature	18.7	C
	14-Sep-99	Turbidity	0.59	NTU
	29-Nov-99	Dissolved Oxygen	51.8	% SAT
	29-Nov-99	Oxidization Reduction Potential	98	MV
	29-Nov-99	pH	7.33	SU
	29-Nov-99	Specific Conductance	609	UMHOS/CM
	29-Nov-99	Temperature	16.8	C
	29-Nov-99	Turbidity	3.75	NTU
	28-Apr-00	Dissolved Oxygen	40.4	% SAT
	28-Apr-00	Oxidization Reduction Potential	99	MV
	28-Apr-00	pH	7.38	SU
	28-Apr-00	Specific Conductance	622	UMHOS/CM
	28-Apr-00	Temperature	17.4	C
	28-Apr-00	Turbidity	0.33	NTU
WYO-1	14-Jul-99	Oxidization Reduction Potential	109	MV
	14-Jul-99	pH	7.61	SU
	14-Jul-99	Specific Conductance	719	UMHOS/CM
	14-Jul-99	Temperature	21.2	C
	14-Jul-99	Turbidity	1.79	NTU
	16-Sep-99	Oxidization Reduction Potential	179	MV
	16-Sep-99	pH	7.65	SU
	16-Sep-99	Specific Conductance	618	UMHOS/CM
	16-Sep-99	Temperature	20	C
	16-Sep-99	Turbidity	1.53	NTU
	1-Dec-99	Oxidization Reduction Potential	94	MV
	1-Dec-99	pH	7.53	SU
	1-Dec-99	Specific Conductance	729	UMHOS/CM
	1-Dec-99	Temperature	15.9	C
	1-Dec-99	Turbidity	0.31	NTU
	12-Jan-01	Dissolved Oxygen	52.2	% SAT
	12-Jan-01	pH	7.4	SU
	12-Jan-01	Specific Conductance	702	UMHOS/CM
	12-Jan-01	Temperature	14.5	C
	12-Jan-01	Turbidity	0.26	NTU
WYO-2	16-Jul-99	Oxidization Reduction Potential	155	MV
	16-Jul-99	pH	7.6	SU
	16-Jul-99	Specific Conductance	716	UMHOS/CM
	16-Jul-99	Temperature	19.3	C
	16-Jul-99	Turbidity	2.89	NTU

Refer to footnotes at end of table.

Table F.1-1 (Concluded)
Tijeras Arroyo Groundwater Investigation—
Summary of Field Parameter Data

Well Location	Date	Field Parameter	Measurement	Units
WYO-2	19-Jul-99	Oxidization Reduction Potential	123	MV
(cont.)	19-Jul-99	pH	7.19	SU
	19-Jul-99	Specific Conductance	722	UMHOS/CM
	19-Jul-99	Temperature	18.1	C
	19-Jul-99	Turbidity	3.7	NTU
	16-Sep-99	Oxidization Reduction Potential	87	MV
	16-Sep-99	pH	7.52	SU
	16-Sep-99	Specific Conductance	716	UMHOS/CM
	16-Sep-99	Temperature	18.8	C
	16-Sep-99	Turbidity	1.36	NTU
	1-Dec-99	Oxidization Reduction Potential	97	MV
	1-Dec-99	pH	7.56	SU
	1-Dec-99	Specific Conductance	725	UMHOS/CM
	1-Dec-99	Temperature	15.4	C
	1-Dec-99	Turbidity	7.32	NTU

C = Degrees Celsius.
MV = Millivolts.
NTU = Nephelometric turbidity units.
% Sat = Percent saturation.
SU = Standard units.
UMHOS/CM = Micromhos per centimeter.

ANNEX F-2
Tijeras Arroyo Groundwater Investigation—Inorganic Analytical Results

Table F.2-1
Tijeras Arroyo Groundwater Investigation--Metals Analytical Results (Exceedences Only)

Well Location	Analyte	Amount Detected	Units	Qualifier	MDL	RL	Sample Date	Sample Type
PGS-2	Arsenic	32	□g/L		3.4	13	11-Jun-97	SA
PGS-2	Arsenic	29	□g/L		3.4	14	22-Sep-97	SA
TA2-W-26	Arsenic	26	□g/L		3.4	14	17-Mar-98	DU
PGS-2	Arsenic	24	□g/L		3.4	14	16-Dec-97	SA
PGS-2	Arsenic	17	□g/L		3.4	14	8-Jul-98	SA
PGS-2	Arsenic	0.0268	mg/L		0.00293	0.005	22-Sep-97	SA
PGS-2	Arsenic	0.018	mg/L		0.01		26-Jan-96	SA
TA2-NW1-325	Barium	280	□g/L		4	16	8-Dec-97	SA
TA2-NW1-325	Barium	240	□g/L		3.9	16	9-Jun-97	SA
TA2-SW1-320	Barium	240	□g/L		4	16	6-Jul-98	SA
TA2-SW1-320	Barium	230	□g/L		4	16	19-Nov-99	SA
TA2-NW1-325	Barium	220	□g/L		4	16	26-Sep-97	SA
TA2-NW1-325	Barium	220	□g/L		4	16	15-Sep-98	SA
TA2-SW1-320	Barium	220	□g/L		3.9	16	9-Jun-97	DU
TA2-SW1-320	Barium	220	□g/L		4	16	6-Mar-98	SA
TA2-SW1-320	Barium	220	□g/L		4	16	10-Sep-98	SA
TA2-SW1-320	Barium	220	□g/L		4	16	30-Nov-98	SA
TA2-SW1-320	Barium	220	□g/L		4	16	20-Jul-99	SA
TA2-SW1-320	Barium	220	□g/L		4	16	13-Sep-99	SA
TA2-SW1-320	Barium	220	□g/L		4	16	21-Mar-01	SA
TA2-NW1-325	Barium	210	□g/L		4	16	30-Nov-98	SA
TA2-SW1-320	Barium	210	□g/L		4	16	12-Apr-00	SA
TA2-SW1-320	Barium	210	□g/L		4	16	12-Jan-01	SA
TA2-NW1-325	Barium	200	□g/L		4	16	9-Mar-98	SA
TJA-4	Barium	200	□g/L		4	16	2-Jan-01	SA
TA2-NW1-325	Barium	190	□g/L		4	16	8-Mar-99	SA
TA2-W-01	Barium	190	□g/L		4	16	18-Sep-98	SA
TJA-4	Barium	190	□g/L		4	16	12-Jul-99	DU
TJA-4	Barium	190	□g/L		4	16	20-Sep-99	SA
TJA-4	Barium	190	□g/L		4	16	7-Mar-01	SA
TJA-4	Barium	190	□g/L		4	16	20-Jun-01	SA
TA2-NW1-325	Barium	180	□g/L		4	16	6-Jul-98	SA
TJA-4	Barium	180	□g/L		4	16	4-Mar-99	DU
TJA-4	Barium	180	□g/L		4	16	4-Mar-99	SA
TJA-4	Barium	180	□g/L		4	16	12-Jul-99	SA
TJA-4	Barium	180	□g/L		4	16	29-Nov-99	SA
TJA-4	Barium	180	□g/L		4	16	20-Apr-00	SA
TA2-W-01	Barium	170	□g/L		4	16	24-Jun-98	SA
TA2-W-01	Barium	170	□g/L		4	16	28-Jul-99	SA
TA2-W-01	Barium	170	□g/L		4	16	15-Sep-99	SA
TA2-W-01	Barium	170	□g/L		4	16	17-Jan-01	SA
TA2-W-01	Barium	170	□g/L		4	16	28-Mar-01	SA
TJA-4	Barium	170	□g/L		4	16	15-Dec-98	SA
TA2-W-01	Barium	160	□g/L		3.9	16	6-Jun-97	SA
TA2-W-01	Barium	160	□g/L		4	16	2-Oct-97	SA
TA2-W-01	Barium	160	□g/L		4	16	8-Dec-97	SA
TA2-W-01	Barium	160	□g/L		4	16	13-Mar-98	SA
TA2-W-01	Barium	160	□g/L		4	16	30-Nov-98	SA
TA2-W-01	Barium	160	□g/L		4	16	9-Mar-99	SA
TA2-W-01	Barium	160	□g/L		4	16	2-Dec-99	SA
TJA-3	Barium	160	□g/L		4	16	11-Apr-00	SA
TA2-NW1-325	Barium	150	□g/L		4	16	15-Jun-99	SA
TA2-NW1-325	Barium	140	□g/L		4	16	15-Sep-99	SA
TA2-NW1-325	Barium	140	□g/L		4	16	17-Nov-99	SA
TA2-NW1-325	Barium	120	□g/L		4	16	21-Mar-01	SA

Refer to footnotes at end of table.

Table F.2-1 (Continued)
Tijeras Arroyo Groundwater Investigation--Metals Analytical Results (Exceedences Only)

Well Location	Analyte	Amount Detected	Units	Qualifier	MDL	RL	Sample Date	Sample Type
TA2-SW1-320	Barium	1.9	mg/L		0.02		5-Jan-94	SA
TA2-SW1-320	Barium	1.4	mg/L		0.2		12-Oct-94	DU
TA2-SW1-320	Barium	1.4	mg/L		0.2		12-Oct-94	SA
TA2-W-01	Barium	1.3	mg/L		0.02		20-Jul-94	SA
TA2-SW1-320	Barium	0.44	mg/L		0.02		15-Jul-94	SA
TA2-SW1-320	Barium	0.36	mg/L		0.02		7-Apr-94	SA
TA2-NW1-325	Barium	0.28	mg/L		0.2		27-Sep-95	SA
TA2-NW1-325	Barium	0.26	mg/L		0.2		20-Jun-95	SA
TA2-NW1-325	Barium	0.25	mg/L		0.02		11-Apr-94	SA
TA2-NW1-325	Barium	0.25	mg/L		0.2		25-Jan-96	SA
TA2-NW1-325	Barium	0.24	mg/L		0.02		6-Jan-94	SA
TA2-NW1-325	Barium	0.24	mg/L		0.02		11-Apr-94	DU
TA2-NW1-325	Barium	0.24	mg/L		0.02		18-Jul-94	DU
TA2-NW1-325	Barium	0.23	mg/L		0.02		18-Jul-94	SA
TA2-NW1-325	Barium	0.23	mg/L		0.2		13-Oct-94	SA
TA2-SW1-320	Barium	0.23	mg/L		0.01		12-Oct-94	SA
TA2-SW1-320	Barium	0.22	mg/L		0.2		27-Sep-95	SA
TA2-SW1-320	Barium	0.21	mg/L		0.2		20-Jun-95	DU
TA2-SW1-320	Barium	0.21	mg/L		0.2		20-Jun-95	SA
TA2-SW1-320	Barium	0.19	mg/L	J	0.2		25-Jan-96	SA
TA2-SW1-320	Barium	0.17	mg/L		0.01		17-Dec-92	SA
TJA-4	Barium	0.17	mg/L		0.00051	0.005	4-Mar-99	SA
WYO-2	Barium	0.17	mg/L	J	0.2		24-Jan-96	SA
PGS-2	Barium	0.16	mg/L	J	0.2		26-Jan-96	SA
TA2-SW1-320	Barium	0.16	mg/L		0.01		17-Dec-92	SA
TA2-NW1-325	Barium	0.15	mg/L		0.01		26-Mar-93	SA
TA2-NW1-325	Barium	0.15	mg/L	J	0.1	0.38	25-Jan-96	SA
TA2-W-01	Barium	0.15	mg/L	J	0.2		26-Jan-96	SA
TA2-W-25	Cadmium	10	□g/L		0.23	0.91	13-Sep-99	SA
TA1-W-06	Cadmium	1.7	□g/L		0.23	0.91	17-Mar-00	SA
TA1-W-03	Cadmium	1.6	□g/L		0.23	0.91	17-Sep-98	SA
TA2-NW1-325	Cadmium	1.4	□g/L		0.23	0.91	15-Sep-98	SA
TA2-W-19	Cadmium	1.3	□g/L		0.23	0.91	6-Mar-98	SA
TA2-W-19	Cadmium	1.1	□g/L		0.22	0.9	10-Jun-97	SA
TA2-SW1-320	Cadmium	1	□g/L		0.23	0.91	10-Sep-98	SA
TA1-W-03	Cadmium	0.92	□g/L		0.23	0.91	14-Sep-99	SA
TA2-NW1-595	Cadmium	0.78	□g/L	J	0.23	0.91	8-Mar-99	SA
TJA-5	Cadmium	0.73	□g/L	J	0.23	0.91	20-Jun-01	SA
TA2-W-01	Cadmium	0.72	□g/L	J	0.23	0.91	15-Sep-99	SA
TA2-NW1-595	Cadmium	0.62	□g/L	J	0.23	0.91	15-Sep-99	SA
WYO-1	Cadmium	0.62	□g/L	J	0.23	0.91	14-Sep-98	SA
WYO-1	Cadmium	0.58	□g/L	J	0.23	0.91	28-Aug-98	SA
PGS-2	Cadmium	0.55	□g/L	J,B	0.23	0.91	22-Sep-97	SA
TA2-W-01	Cadmium	0.49	□g/L	J,B	0.23	0.91	2-Oct-97	SA
TA2-W-25	Cadmium	0.47	□g/L	J	0.23	0.91	28-Apr-00	SA
TA2-W-01	Cadmium	0.0048	mg/L	J	0.005		26-Jan-96	SA
TA1-W-03	Cadmium	0.00047	mg/L	J	0.00044	0.005	17-Sep-98	SA
TA2-SW1-320	Chromium	0.05	mg/L		0.02		7-Apr-94	SA
TJA-4	Cobalt	6.1	□g/L		0.23	0.91	29-Nov-99	SA
TA2-W-24	Cobalt	4.1	□g/L	B	0.23	0.91	9-Sep-99	SA
TA1-W-07	Cobalt	3.8	□g/L	B	0.23	0.91	16-Sep-99	SA
TA1-W-03	Cobalt	3.7	□g/L	B	0.23	0.91	14-Sep-99	SA
TA1-W-03	Cobalt	3.3	□g/L	B	0.23	0.91	24-Nov-99	SA
PGS-2	Cobalt	2.7	□g/L	B	0.23	0.91	22-Sep-97	SA
WYO-1	Cobalt	0.009	mg/L	J	0.05		25-Jan-96	SA
WYO-2	Cobalt	0.0059	mg/L	J	0.05		24-Jan-96	SA
TA2-SW1-320	Cobalt	0.0042	mg/L	J	0.01		12-Oct-94	SA

Refer to footnotes at end of table.

Table F.2-1 (Continued)
Tijeras Arroyo Groundwater Investigation--Metals Analytical Results (Exceedences Only)

Well Location	Analyte	Amount Detected	Units	Qualifier	MDL	RL	Sample Date	Sample Type
PGS-2	Cobalt	0.0041	mg/L	J	0.05		26-Jan-96	SA
TA2-W-19	Cobalt	0.0041	mg/L	J	0.05		24-Jan-96	DU
TA2-SW1-320	Copper	0.061	mg/L		0.02		17-Dec-92	SA
TA2-SW1-320	Copper	0.05	mg/L		0.025		12-Oct-94	DU
PGS-2	Lead	0.023	mg/L		0.003		26-Jan-96	SA
WYO-2	Lead	0.012	mg/L		0.003		24-Jan-96	SA
TA2-W-19	Nickel	130	□g/L		1.1	4.5	6-Jul-01	SA
PGS-2	Nickel	45	□g/L		1.1	4.5	16-Dec-97	SA
PGS-2	Nickel	45	□g/L		1.1	4.5	12-Apr-00	SA
PGS-2	Nickel	43	□g/L		1.1	4.5	8-Dec-98	SA
PGS-2	Nickel	31	□g/L		1.1	4.5	22-Sep-97	SA
TA1-W-03	Selenium	74	□g/L		1.7	6.8	10-Apr-00	SA
TA1-W-03	Selenium	59	□g/L		1.7	6.8	17-Sep-98	SA
TA1-W-03	Selenium	58	□g/L		1.7	6.8	24-Nov-99	SA
TA1-W-03	Selenium	54	□g/L		1.7	6.8	11-Mar-98	SA
TA1-W-03	Selenium	54	□g/L	B	1.7	6.8	14-Sep-99	SA
TA1-W-03	Selenium	49	□g/L		1.7	6.8	1-Jul-98	SA
TA1-W-03	Selenium	47	□g/L		1.7	6.8	26-Mar-01	SA
TA1-W-03	Selenium	42	□g/L		1.7	6.8	26-Jun-01	SA
TA1-W-03	Selenium	40	□g/L	B	1.7	6.8	5-Jan-01	SA
TA1-W-03	Selenium	27	□g/L		1.5	6	10-Mar-99	SA
TA2-W-27	Selenium	26	□g/L		1.7	6.8	8-Jul-99	SA
TA2-W-27	Selenium	26	□g/L		1.7	6.8	23-Nov-99	SA
TA1-W-07	Selenium	24	□g/L	B	1.7	6.8	21-Jul-99	SA
TA1-W-06	Selenium	22	□g/L		1.7	6.8	21-Sep-98	SA
TA1-W-07	Selenium	21	□g/L		1.7	6.8	10-Jan-01	SA
TA2-W-27	Selenium	21	□g/L		1.7	6.8	14-Mar-00	SA
TA2-W-27	Selenium	21	□g/L	B	1.7	6.8	12-Mar-01	SA
TA1-W-06	Selenium	20	□g/L		1.7	6.8	22-Nov-99	DU
TA1-W-06	Selenium	20	□g/L		1.7	6.8	22-Nov-99	SA
TA2-W-01	Selenium	20	□g/L	B	1.7	6.8	28-Jul-99	SA
TA2-W-27	Selenium	20	□g/L		1.7	6.8	24-Sep-98	SA
TA2-W-27	Selenium	20	□g/L	B	1.7	6.8	9-Sep-99	SA
TA1-W-06	Selenium	19	□g/L	B	1.7	6.8	27-Jul-99	SA
TA1-W-07	Selenium	19	□g/L		1.7	6.8	16-Dec-98	SA
TA1-W-07	Selenium	19	□g/L		1.7	6.8	16-Mar-00	SA
TA2-NW1-325	Selenium	19	□g/L		1.7	6.8	15-Sep-98	SA
TA2-W-01	Selenium	19	□g/L		1.7	6.8	18-Sep-98	SA
TA2-W-26	Selenium	19	□g/L		1.7	6.8	17-Mar-98	SA
TA2-W-27	Selenium	19	□g/L		1.7	6.8	23-Jun-98	SA
WYO-1	Selenium	19	□g/L	B	1.7	6.8	14-Jul-99	SA
WYO-2	Selenium	19	□g/L	B	1.7	6.8	19-Jul-99	SA
TA2-NW1-325	Selenium	18	□g/L		1.7	6.8	8-Dec-97	SA
TA2-NW1-325	Selenium	18	□g/L		1.7	6.8	17-Nov-99	SA
TA1-W-07	Selenium	17	□g/L		1.7	6.8	6-Dec-99	SA
TA1-W-07	Selenium	17	□g/L		1.7	6.8	15-Mar-01	SA
TA2-NW1-325	Selenium	17	□g/L		1.7	6.8	21-Mar-01	SA
TA2-W-27	Selenium	17	□g/L		1.7	6.8	3-Dec-98	SA
TA1-W-06	Selenium	16	□g/L		1.7	6.8	3-Dec-98	SA
TA1-W-07	Selenium	16	□g/L	B	1.7	6.8	16-Sep-99	SA
TA2-NW1-325	Selenium	16	□g/L		1.7	6.8	15-Jun-99	SA
TA2-NW1-325	Selenium	16	□g/L		1.7	6.8	11-Jan-01	SA
TA2-NW1-595	Selenium	16	□g/L		1.7	6.8	18-Nov-99	SA
TA2-W-01	Selenium	16	□g/L		1.7	6.8	17-Jan-01	SA
TA2-W-27	Selenium	16	□g/L		1.7	6.8	22-Jun-01	SA

Refer to footnotes at end of table.

Table F.2-1 (Continued)
Tijeras Arroyo Groundwater Investigation--Metals Analytical Results (Exceedences Only)

Well Location	Analyte	Amount Detected	Units	Qualifier	MDL	RL	Sample Date	Sample Type
WYO-2	Selenium	16	□g/L		1.7	6.8	14-Sep-98	SA
TA1-W-06	Selenium	15	□g/L	B	1.7	6.8	10-Sep-99	SA
TA1-W-06	Selenium	15	□g/L	B	1.7	6.8	22-Mar-01	SA
TA1-W-06	Selenium	15	□g/L		1.7	6.8	28-Jun-01	SA
TA1-W-07	Selenium	15	□g/L		1.7	6.8	27-Jun-01	SA
TA2-NW1-325	Selenium	15	□g/L		1.7	6.8	8-Mar-99	SA
TA2-NW1-595	Selenium	15	□g/L		1.7	6.8	15-Sep-98	SA
TA2-W-01	Selenium	15	□g/L		1.7	6.8	28-Mar-01	SA
TA2-W-19	Selenium	15	□g/L		1.7	6.8	16-Jun-99	SA
TJA-2	Selenium	15	□g/L		1.7	6.8	30-Nov-99	SA
WYO-1	Selenium	15	□g/L	B	1.7	6.8	9-Dec-97	SA
WYO-1	Selenium	15	□g/L		1.7	6.8	14-Sep-98	SA
TA1-W-06	Selenium	14	□g/L		1.7	6.8	17-Mar-00	SA
TA2-NW1-325	Selenium	14	□g/L	B	1.7	6.8	15-Sep-99	SA
TA2-W-01	Selenium	14	□g/L	B	1.7	6.8	8-Dec-97	SA
TA2-W-01	Selenium	14	□g/L		1.7	6.8	13-Mar-98	SA
WYO-1	Selenium	14	□g/L	B	1.7	6.8	9-Dec-97	SA
TA1-W-06	Selenium	13	□g/L		1.7	6.8	24-Mar-98	SA
TA2-NW1-325	Selenium	13	□g/L		1.7	6.8	26-Sep-97	SA
TA2-NW1-325	Selenium	13	□g/L		1.7	6.8	6-Jul-98	SA
TA2-NW1-325	Selenium	13	□g/L		1.7	6.8	30-Nov-98	SA
TA2-NW1-325	Selenium	13	□g/L		1.7	6.8	21-Apr-00	SA
TA2-NW1-595	Selenium	13	□g/L		1.7	6.8	8-Mar-99	SA
TA2-NW1-595	Selenium	13	□g/L	B	1.7	6.8	20-Mar-01	SA
TA2-W-01	Selenium	13	□g/L		1.7	6.8	9-Mar-99	SA
TA2-W-01	Selenium	13	□g/L		1.7	6.8	2-Dec-99	SA
TA2-W-27	Selenium	13	□g/L	B	1.7	6.8	3-Jan-01	SA
TJA-3	Selenium	13	□g/L		1.7	6.8	11-Apr-00	SA
WYO-1	Selenium	13	□g/L		1.7	6.8	28-Aug-98	SA
WYO-1	Selenium	13	□g/L		1.7	6.8	28-Aug-98	SA
WYO-2	Selenium	13	□g/L	B	1.7	6.8	9-Dec-97	SA
WYO-2	Selenium	13	□g/L		1.7	6.8	16-Jan-01	DU
WYO-2	Selenium	13	□g/L		1.7	6.8	16-Jan-01	SA
PGS-2	Selenium	12	□g/L		1.7	6.8	22-Sep-97	SA
TA1-W-06	Selenium	12	□g/L		1.7	6.8	1-Jul-98	SA
TA2-NW1-325	Selenium	12	□g/L		1.7	6.8	10-Jul-01	SA
TA2-NW1-595	Selenium	12	□g/L		1.7	6.8	15-Jun-99	SA
TA2-NW1-595	Selenium	12	□g/L		1.7	6.8	11-Jan-01	SA
TA2-W-01	Selenium	12	□g/L		1.7	6.8	24-Jun-98	SA
TA2-W-01	Selenium	12	□g/L	B	1.7	6.8	15-Sep-99	SA
TA2-W-26	Selenium	12	□g/L		1.7	6.8	22-Jun-98	SA
TJA-2	Selenium	12	□g/L		1.7	6.8	16-Dec-97	SA
TJA-2	Selenium	12	□g/L		1.7	6.8	16-Sep-98	SA
WYO-1	Selenium	12	□g/L		1.7	6.8	28-Aug-98	SA
WYO-1	Selenium	12	□g/L	B	1.7	6.8	19-Mar-01	SA
PGS-2	Selenium	11	□g/L		1.7	6.8	16-Dec-97	SA
TA2-NW1-325	Selenium	11	□g/L		1.7	6.7	9-Jun-97	SA
TA2-NW1-325	Selenium	11	□g/L		1.7	6.8	9-Mar-98	SA
TA2-NW1-595	Selenium	11	□g/L	B	1.7	6.8	15-Dec-97	SA
TA2-NW1-595	Selenium	11	□g/L		1.7	6.8	30-Nov-98	SA
TA2-NW1-595	Selenium	11	□g/L		1.7	6.8	21-Apr-00	SA
TA2-SW1-320	Selenium	11	□g/L		1.7	6.8	12-Apr-00	SA
TA2-W-01	Selenium	11	□g/L		1.7	6.8	2-Oct-97	SA
TA2-W-01	Selenium	11	□g/L		1.7	6.8	30-Nov-98	SA
TA2-W-19	Selenium	11	□g/L	B	1.7	6.8	10-Dec-97	SA

Refer to footnotes at end of table.

Table F.2-1 (Continued)
Tijeras Arroyo Groundwater Investigation--Metals Analytical Results (Exceedences Only)

Well Location	Analyte	Amount Detected	Units	Qualifier	MDL	RL	Sample Date	Sample Type
TA2-W-26	Selenium	11	□g/L		1.7	6.8	14-Dec-98	SA
TJA-2	Selenium	11	□g/L		1.7	6.8	24-Jun-98	SA
WYO-1	Selenium	11	□g/L		1.7	6.8	1-Dec-99	SA
WYO-1	Selenium	11	□g/L		1.7	6.8	21-Jun-01	SA
WYO-2	Selenium	11	□g/L		1.7	6.8	1-Oct-97	SA
WYO-2	Selenium	11	□g/L		1.7	6.8	10-Jun-98	SA
TA2-NW1-595	Selenium	10	□g/L		1.7	6.8	9-Mar-98	SA
TA2-W-19	Selenium	10	□g/L		1.7	6.8	9-Mar-99	SA
TA2-W-19	Selenium	10	□g/L		1.7	6.8	30-Nov-99	SA
TA2-W-26	Selenium	10	□g/L		1.7	6.8	25-Sep-98	SA
TA2-W-26	Selenium	10	□g/L		1.7	6.8	7-Jul-99	SA
TA2-W-27	Selenium	10	□g/L		1.5	6	11-Mar-99	SA
TJA-2	Selenium	10	□g/L		1.7	6.8	16-Jun-99	SA
WYO-1	Selenium	10	□g/L		1.7	6.8	1-Oct-97	SA
WYO-1	Selenium	10	□g/L		1.7	6.8	10-Jun-98	SA
WYO-1	Selenium	10	□g/L		1.7	6.8	5-Mar-99	SA
WYO-1	Selenium	10	□g/L	B	1.7	6.8	16-Sep-99	DU
WYO-1	Selenium	10	□g/L	B	1.7	6.8	16-Sep-99	SA
WYO-1	Selenium	10	□g/L		1.7	6.8	12-Jan-01	SA
WYO-2	Selenium	10	□g/L		1.7	6.8	1-Dec-99	DU
WYO-2	Selenium	10	□g/L		1.7	6.8	21-Jun-01	SA
PGS-2	Selenium	9.9	□g/L		1.7	6.7	11-Jun-97	SA
TA1-W-06	Selenium	9.9	□g/L	B	1.7	6.8	9-Jan-01	SA
TJA-2	Selenium	9.9	□g/L		1.7	6.8	22-Jun-01	SA
WYO-1	Selenium	9.9	□g/L		1.7	6.8	28-Aug-98	SA
TA2-NW1-595	Selenium	9.8	□g/L	B	1.7	6.8	15-Sep-99	SA
TA2-W-19	Selenium	9.8	□g/L		1.7	6.8	8-Mar-01	SA
TA2-W-24	Selenium	9.8	□g/L		1.7	6.8	19-Mar-98	SA
TA1-W-07	Selenium	9.7	□g/L		1.5	6	10-Mar-99	SA
TA2-W-01	Selenium	9.7	□g/L		1.7	6.7	6-Jun-97	SA
TA2-W-19	Selenium	9.7	□g/L		1.7	6.8	16-Sep-98	DU
WYO-2	Selenium	9.7	□g/L	B	1.7	6.8	16-Sep-99	SA
TA2-SW1-320	Selenium	9.6	□g/L		1.7	6.8	19-Nov-99	SA
TA2-W-26	Selenium	9.6	□g/L		1.7	6.8	2-Dec-99	SA
WYO-2	Selenium	9.6	□g/L		1.7	6.8	5-Mar-99	SA
TA2-NW1-595	Selenium	9.5	□g/L		1.7	6.8	30-Sep-97	SA
TA2-W-19	Selenium	9.5	□g/L		1.7	6.8	16-Sep-98	SA
TJA-2	Selenium	9.5	□g/L		1.7	6.8	15-Mar-00	SA
WYO-2	Selenium	9.5	□g/L		1.7	6.7	5-Jun-97	SA
TA2-W-19	Selenium	9.3	□g/L		1.7	6.8	15-Mar-00	SA
TA2-SW1-320	Selenium	9.2	□g/L	B	1.7	6.8	20-Jul-99	SA
TA2-W-26	Selenium	9.2	□g/L	B	1.7	6.8	9-Sep-99	DU
TA2-NW1-595	Selenium	9.1	□g/L		1.7	6.8	30-Sep-97	DU
WYO-1	Selenium	9.1	□g/L		1.7	6.7	5-Jun-97	SA
TA2-W-19	Selenium	8.9	□g/L		1.7	6.7	10-Jun-97	SA
TA2-W-19	Selenium	8.8	□g/L		1.7	6.8	2-Dec-98	DU
TJA-5	Selenium	8.8	□g/L	B	1.7	6.8	14-Sep-99	SA
TA2-NW1-595	Selenium	8.7	□g/L		1.7	6.7	10-Jun-97	SA
TA2-W-27	Selenium	8.7	□g/L		1.7	6.8	19-Mar-98	SA
TA2-W-19	Selenium	8.6	□g/L		1.7	6.8	8-Jul-98	SA
TA2-W-19	Selenium	8.3	□g/L		1.7	6.8	2-Dec-98	SA
TA2-W-26	Selenium	8.3	□g/L	B	1.7	6.8	9-Sep-99	SA
WYO-2	Selenium	8.3	□g/L		1.7	6.8	1-Dec-99	SA
TJA-2	Selenium	8.2	□g/L		1.7	6.8	8-Mar-01	SA
TJA-5	Selenium	8.2	□g/L		1.7	6.8	28-Jun-99	SA

Refer to footnotes at end of table.

Table F.2-1 (Continued)
Tijeras Arroyo Groundwater Investigation--Metals Analytical Results (Exceedences Only)

Well Location	Analyte	Amount Detected	Units	Qualifier	MDL	RL	Sample Date	Sample Type
TJA-4	Selenium	8.1	□g/L	B	1.7	6.8	12-Jul-99	DU
WYO-1	Selenium	8.1	□g/L		1.7	6.8	5-Mar-98	SA
TA2-NW1-595	Selenium	8	□g/L		1.7	6.8	6-Jul-98	SA
TA2-SW1-320	Selenium	7.8	□g/L		1.7	6.8	21-Mar-01	SA
TA2-W-19	Selenium	7.8	□g/L		1.7	6.8	6-Jul-01	SA
TJA-2	Selenium	7.8	□g/L		1.7	6.8	4-Mar-99	SA
TA2-SW1-320	Selenium	7.7	□g/L		1.7	6.8	10-Sep-98	SA
TA2-W-26	Selenium	7.6	□g/L	B	1.7	6.8	13-Mar-01	SA
TJA-2	Selenium	7.6	□g/L		1.7	6.8	2-Dec-98	SA
TJA-5	Selenium	7.6	□g/L	B	1.7	6.8	7-Mar-01	DU
TA2-SW1-320	Selenium	7.5	□g/L		1.7	6.8	12-Jan-01	SA
TJA-2	Selenium	7.5	□g/L		1.7	6.8	10-Mar-98	SA
TA2-W-19	Selenium	7.4	□g/L		1.7	6.8	29-Sep-97	SA
TA2-W-26	Selenium	7.4	□g/L		1.7	6.8	17-Mar-98	DU
WYO-2	Selenium	7.4	□g/L		1.7	6.8	6-Mar-98	SA
PGS-2	Selenium	7.3	□g/L		1.7	6.8	8-Jul-98	SA
TJA-2	Selenium	7.3	□g/L		1.7	6.7	12-Jun-97	SA
TJA-4	Selenium	7.3	□g/L	B	1.7	6.8	12-Jul-99	SA
TJA-2	Selenium	7.2	□g/L		1.7	6.8	29-Sep-97	SA
TA2-SW1-320	Selenium	7.1	□g/L		1.7	6.8	6-Jul-98	SA
TA2-W-19	Selenium	7.1	□g/L	B	1.7	6.8	24-Sep-99	SA
TJA-5	Selenium	7	□g/L		1.7	6.8	28-Jun-99	DU
TA1-W-04	Selenium	6.9	□g/L		1.7	6.8	10-Apr-00	SA
TA2-W-19	Selenium	6.9	□g/L		1.7	6.8	6-Mar-98	SA
TJA-5	Selenium	6.9	□g/L		1.7	6.8	29-Nov-99	SA
TA1-W-06	Selenium	6.8	□g/L		1.5	6	15-Mar-99	SA
TJA-5	Selenium	6.8	□g/L		1.7	6.8	20-Jun-01	SA
TJA-5	Selenium	6.7	□g/L	J	1.7	6.8	28-Apr-00	DU
TJA-5	Selenium	6.7	□g/L	J,B	1.7	6.8	7-Mar-01	SA
TJA-4	Selenium	6.6	□g/L	J	1.7	6.8	29-Nov-99	SA
TA1-W-02	Selenium	6.5	□g/L	J	1.7	6.8	22-Nov-99	SA
TJA-5	Selenium	6.5	□g/L	J	1.7	6.8	28-Apr-00	SA
TJA-2	Selenium	6.4	□g/L	J,B	1.7	6.8	13-Sep-99	SA
TA2-SW1-320	Selenium	6.3	□g/L	J	1.7	6.8	30-Nov-98	SA
TJA-4	Selenium	6.2	□g/L	J	1.7	6.8	15-Dec-98	SA
TJA-4	Selenium	6.2	□g/L	J	1.7	6.8	20-Apr-00	SA
PGS-2	Selenium	6	□g/L	J	1.7	6.8	30-Jun-99	SA
TA2-SW1-320	Selenium	6	□g/L	J	1.7	6.8	6-Mar-98	SA
TA2-SW1-320	Selenium	6	□g/L	J,B	1.7	6.8	13-Sep-99	SA
TJA-4	Selenium	6	□g/L	J	1.7	6.8	20-Jun-01	SA
TA2-W-26	Selenium	5.9	□g/L	J,B	1.7	6.8	8-Jan-01	DU
TJA-5	Selenium	5.9	□g/L	J	1.7	6.8	4-Mar-99	SA
TA1-W-02	Selenium	5.8	□g/L	J	1.7	6.8	21-Sep-98	SA
TA2-W-24	Selenium	5.8	□g/L	J	1.7	6.8	23-Jun-98	SA
TA2-W-19	Selenium	5.7	□g/L	J,B	1.7	6.8	4-Jan-01	SA
TJA-3	Selenium	5.7	□g/L	J	1.7	6.8	29-Nov-99	SA
TA1-W-01	Selenium	5.6	□g/L	J	1.7	6.8	17-Sep-98	SA
TJA-2	Selenium	5.6	□g/L	J,B	1.7	6.8	4-Jan-01	SA
TJA-4	Selenium	5.6	□g/L	J,B	1.7	6.8	20-Sep-99	SA
TJA-5	Selenium	5.6	□g/L	J	1.7	6.8	15-Dec-98	SA
TJA-3	Selenium	5.3	□g/L	J	1.7	6.8	8-Mar-99	SA
TJA-5	Selenium	5.3	□g/L	J	1.7	6.8	4-Mar-99	DU
PGS-2	Selenium	5.2	□g/L	J	1.7	6.8	3-Dec-99	SA
TA2-W-25	Selenium	5.2	□g/L	J,B	1.7	6.8	13-Sep-99	SA
TJA-5	Selenium	5.2	□g/L	J,B	1.7	6.8	2-Jan-01	SA

Refer to footnotes at end of table.

Table F.2-1 (Continued)
Tijeras Arroyo Groundwater Investigation--Metals Analytical Results (Exceedences Only)

Well Location	Analyte	Amount Detected	Units	Qualifier	MDL	RL	Sample Date	Sample Type
TA2-SW1-320	Selenium	5.1	□g/L	J	1.7	6.7	9-Jun-97	DU
TA2-W-24	Selenium	5.1	□g/L	J	1.7	6.8	23-Nov-99	SA
TA1-W-01	Selenium	5	□g/L	J,B	1.7	6.8	22-Jul-99	SA
TA1-W-04	Selenium	5	□g/L	J	1.7	6.8	30-Jun-99	SA
TA2-W-26	Selenium	5	□g/L	J	1.7	6.8	25-Jun-01	SA
TJA-3	Selenium	5	□g/L	J	1.7	6.8	16-Jun-99	SA
TJA-4	Selenium	5	□g/L	J	1.7	6.8	7-Mar-01	SA
TA1-W-03	Selenium	0.035	mg/L		0.00271	0.005	17-Sep-98	SA
PGS-2	Selenium	0.019	mg/L		0.005		26-Jan-96	SA
TA2-W-27	Selenium	0.012	mg/L		0.0014	0.005	19-Mar-98	SA
TA2-NW1-325	Selenium	0.0094	mg/L		0.005		27-Sep-95	SA
TA1-W-07	Selenium	0.00916	mg/L		0.00271	0.005	10-Mar-99	SA
TA1-W-06	Selenium	0.00911	mg/L		0.0014	0.005	18-Jun-98	SA
TA2-NW1-325	Selenium	0.008	mg/L		0.002		11-Apr-94	SA
TA1-W-06	Selenium	0.00773	mg/L		0.00271	0.005	22-Nov-99	SA
TA2-NW1-325	Selenium	0.007	mg/L		0.002		11-Apr-94	DU
TA2-W-01	Selenium	0.0069	mg/L		0.005		27-Sep-95	SA
WYO-2	Selenium	0.00678	mg/L		0.0014	0.005	1-Oct-97	SA
TA2-NW1-325	Selenium	0.0066	mg/L	J	0.01		26-Mar-93	SA
WYO-1	Selenium	0.00604	mg/L		0.00228		5-Jun-97	DU
TA2-NW1-325	Selenium	0.006	mg/L		0.002		18-Jul-94	DU
TA2-NW1-325	Selenium	0.006	mg/L		0.002		18-Jul-94	SA
WYO-1	Selenium	0.00591	mg/L		0.00236	0.005	1-Jun-00	SA
WYO-1	Selenium	0.00577	mg/L		0.00228		5-Jun-97	SA
WYO-1	Selenium	0.00569	mg/L		0.00139	0.005	16-Sep-99	SA
TA2-NW1-325	Selenium	0.0056	mg/L		0.005		25-Jan-96	SA
PGS-2	Selenium	0.00552	mg/L		0.0014	0.005	22-Sep-97	SA
TA2-W-01	Selenium	0.0055	mg/L		0.005		27-Sep-95	DU
TA2-W-26	Selenium	0.00543	mg/L		0.00139	0.005	9-Sep-99	SA
TA2-W-19	Selenium	0.0052	mg/L		0.005		24-Jan-96	SA
TJA-2	Selenium	0.0052	mg/L		0.005		24-Jan-96	SA
WYO-1	Selenium	0.0052	mg/L		0.005		25-Jan-96	SA
WYO-2	Selenium	0.00518	mg/L		0.0014	0.005	1-Oct-97	DU
TA2-W-26	Selenium	0.0051	mg/L		0.00271	0.005	14-Dec-98	SA
TA2-NW1-325	Selenium	0.005	mg/L		0.002		6-Jan-94	SA
TA2-NW1-325	Selenium	0.005	mg/L		0.005		13-Oct-94	SA
TA2-W-01	Selenium	0.005	mg/L		0.005		14-Oct-94	SA
TA2-W-19	Selenium	0.005	mg/L		0.005		24-Jan-96	DU
PGS-2	Silver	17	□g/L		0.23	0.91	12-Apr-00	SA
TA1-W-03	Silver	0.0837	mg/L		0.00073	0.005	17-Sep-98	SA
PGS-2	Thallium	2.4	□g/L	J	1.5	6	12-Mar-99	SA
TA1-W-03	Thallium	0.0292	mg/L		0.00308	0.01	17-Sep-98	SA
WYO-2	Thallium	0.00955	mg/L	J	0.00263	0.01	1-Oct-97	SA
WYO-2	Thallium	0.00571	mg/L	J	0.00263	0.01	1-Oct-97	DU
TA2-SW1-320	Thallium	0.0048	mg/L	J	0.01		12-Oct-94	SA
TJA-2	Thallium	0.0047	mg/L	J	0.01		24-Jan-96	SA
TA2-W-26	Thallium	0.00427	mg/L	J	0.00308	0.01	14-Dec-98	SA
TA2-W-19	Thallium	0.004	mg/L	J	0.01		24-Jan-96	SA
TJA-3	Thallium	0.00371	mg/L	J	0.00308	0.01	15-Dec-98	SA
TA2-SW1-320	Thallium	0.0036	mg/L	J	0.01		25-Jan-96	SA
WYO-2	Thallium	0.0036	mg/L	J	0.01		24-Jan-96	SA
TA2-NW1-325	Thallium	0.0033	mg/L	J	0.01		25-Jan-96	SA
TA2-W-19	Thallium	0.003	mg/L	J	0.01		24-Jan-96	DU
PGS-2	Vanadium	21	□g/L		2.8	11	11-Jun-97	SA
PGS-2	Vanadium	21	□g/L		2.8	11	22-Sep-97	SA
PGS-2	Vanadium	19	□g/L		2.8	11	16-Dec-97	SA
TA2-W-26	Vanadium	19	□g/L		2.8	11	17-Mar-98	DU

Refer to footnotes at end of table.

Table F.2-1 (Concluded)
Tijeras Arroyo Groundwater Investigation--Metals Analytical Results (Exceedences Only)

Well Location	Analyte	Amount Detected	Units	Qualifier	MDL	RL	Sample Date	Sample Type
PGS-2	Vanadium	18	□g/L		2.8	11	8-Jul-98	SA
PGS-2	Vanadium	18	□g/L		2.8	11	12-Apr-00	SA
PGS-2	Vanadium	13	□g/L		2.5	10	12-Mar-99	SA
PGS-2	Vanadium	0.026	mg/L	J	0.05		26-Jan-96	SA
WYO-2	Vanadium	0.025	mg/L	J	0.05		24-Jan-96	SA
PGS-2	Vanadium	0.0183	mg/L		0.00043	0.005	22-Sep-97	SA
TA2-SW1-320	Vanadium	0.013	mg/L		0.01		12-Oct-94	SA
TA2-W-19	Vanadium	0.013	mg/L	J	0.05		24-Jan-96	DU
TA2-W-19	Vanadium	0.013	mg/L	J	0.05		24-Jan-96	SA
TA2-W-19	Zinc	320	□g/L		23	91	6-Mar-98	SA
TA2-SW1-320	Zinc	0.54	mg/L		0.02		12-Oct-94	SA
TA2-SW1-320	Zinc	0.53	mg/L		0.02		12-Oct-94	DU

B = Analyte detected in an associated blank.
DU = Duplicate.
J = Estimated value, analyte detected below the MDL.
μg/L = Microgram(s) per liter.
mg/L = Milligram(s) per liter.
SA = Sample, aqueous.

ANNEX F-3
Tijeras Arroyo Groundwater Investigation—Organic Analytical Results

Table F.3-1
Tijeras Arroyo Groundwater Investigation--Summary of Groundwater Sampling SVOC Analytical Results (Detections Only)

Well ID	Analyte	Sample Date	Analytical Method	Result	Laboratory Qualifier	Minimum Detection Limit	Reporting Limit	Units	Sample Type
TA1-W-07	Di-n-octyl phthalate	21-Jul-99	EPA 8270	5.6	J,H	4.2	10.2	µg/L	SA
TA2-NW1-325	Di-n-butyl phthalate	18-Jul-94	EPA 8270	0.006	J	0.01		mg/L	SA
	bis(2-Ethylhexyl)phthalate	20-Jun-95	EPA 8270	13		10		µg/L	SA
	bis(2-Ethylhexyl)phthalate	25-Jan-96	EPA 8270	7.1	J	10		µg/L	SA
	Di-n-butyl phthalate	18-Jul-94	EPA 8270	0.001	J	0.01		mg/L	DU
TA2-W-01	bis(2-Ethylhexyl)phthalate	20-Jun-95	EPA 8270	9.3	J	10		µg/L	SA
TA2-W-19	bis(2-Ethylhexyl)phthalate	29-Sep-97	EPA 8270	180		5	39.6	µg/L	SA
	bis(2-Ethylhexyl)phthalate	16-Sep-98	EPA 8270	5.3	J,B	3.7	9.9	µg/L	SA
TA2-W-25	bis(2-Ethylhexyl)phthalate	12-Dec-97	EPA 8270	6.2	J,H	5	10	µg/L	SA
TJA-2	bis(2-Ethylhexyl)phthalate	24-Jan-96	EPA 8270	4.3	J	10		µg/L	SA
	bis(2-Ethylhexyl)phthalate	16-Dec-97	EPA 8270	18		5	10	µg/L	SA
	bis(2-Ethylhexyl)phthalate	16-Sep-98	EPA 8270	5.5	J,B	3.7	9.9	µg/L	SA
TJA-4	bis(2-Ethylhexyl)phthalate	12-Jul-99	EPA 8270	30		3.7	10	µg/L	DU
WYO-2	bis(2-Ethylhexyl)phthalate	24-Jan-96	EPA 8270	33		10		µg/L	SA
	bis(2-Ethylhexyl)phthalate	01-Oct-97	EPA 8270	45		5	9.9	µg/L	DU

B = Analyte detected in an associated blank.
DU = Duplicate.
H = Holding time was exceeded for the associated sample analysis.
J = Estimated value, analyte detected below the MDL.
SA = Sample, aqueous.

Table F.3-2
Tijeras Arroyo Groundwater Investigation--Summary of Groundwater Sampling VOC Analytical Results (Detections Only)

Well ID	Analyte	Sample Date	Analytical Method	Result	Laboratory Qualifier	Minimum Detection Limit	Reporting Limit	Units	Sample Type
PGS-2	2-Hexanone	12-Mar-99	EPA 8260	12	J	10	40	□g/L	SA
	Acetone	26-Jan-96	EPA 8260	4.6	J,B	10		□g/L	SA
	Acetone	16-Dec-97	EPA 8260	20		5	20	□g/L	SA
	Acetone	16-Mar-98	EPA 8260	5.2	J	5	20	□g/L	SA
	Bromoform	09-Jul-98	EPA 8260	1.1	J	0.5	2	□g/L	SA
	Chloroform	26-Jan-96	EPA 8260	0.15	J	5		□g/L	SA
	Dibromochloromethane	09-Jul-98	EPA 8260	0.76	J	0.5	2	□g/L	SA
	Methylene chloride	11-Jun-97	EPA 8260	6.9	J	5	20	□g/L	SA
	Methylene chloride	12-Apr-00	EPA 8260	12	B	0.5	2	□g/L	SA
	Toluene	26-Jan-96	EPA 8260	0.38	J,B	5		□g/L	SA
	Toluene	16-Dec-97	EPA 8260	580		2.5	10	□g/L	SA
	Trichloroethene	26-Jan-96	EPA 8260	1.3	J	5		□g/L	SA
	Trichloroethene	26-Jan-96	EPA 8260	1.4		5		□g/L	SA
	Trichloroethene	26-Jan-96	EPA 8260	3.2		0.5	2	□g/L	SA
	Trichloroethene	16-Dec-96	EPA 8260	1	J	0.5	2	□g/L	SA
	p-, xylene, m-Xylene	09-Jul-98	EPA 8260	1.6	J	1	4	□g/L	SA
TA1-W-01	2-Hexanone	21-Aug-98	EPA 8260	7		3.2	5	□g/L	SA
	2-Hexanone	16-Mar-00	EPA 8260	14	J	10	40	□g/L	SA
	4-methyl-, 2-Pentanone	16-Mar-00	EPA 8260	8.2	J	5	20	□g/L	SA
	Acetone	21-Aug-98	EPA 8260	3.7	J	3.7	5	□g/L	SA
TA1-W-02	1,1-Dichloroethene	27-Jul-99	EPA 8260	1.1	J	0.5	2	□g/L	SA
	Acetone	19-Feb-98	EPA 8260	9.9	J	5	20	□g/L	SA
	Acetone	17-Mar-00	EPA 8260	5.5	J	5	20	□g/L	SA
	Methylene chloride	18-Jun-98	EPA 8260	4.1	B	0.25	1	□g/L	SA
	Tetrachloroethene	09-Mar-98	EPA 8260	2.1		0.5	2	□g/L	SA
TA1-W-03	Acetone	09-Feb-98	EPA 8260	21		5	20	□g/L	SA
	Acetone	09-Feb-98	EPA 8260	25		5	20	□g/L	SA
	Chloroform	14-Sep-99	EPA 8260	0.5	J	0.5	2	□g/L	SA
	Methylene chloride	10-Apr-00	EPA 8260	10	B	0.5	2	□g/L	SA
	Tetrachloroethene	04-Mar-98	EPA 8260	2.7		0.5	2	□g/L	SA
	Toluene	13-Jul-99	EPA 8260	26		0.5	2	□g/L	SA
TA1-W-04	1,1-Dichloroethene	30-Jun-99	EPA 8260	0.89	J	0.5	2	□g/L	SA
	2-Butanone	08-Oct-98	EPA 8260	8	J	5	20	□g/L	SA
	Acetone	23-Sep-98	EPA 8260	31		5	20	□g/L	SA
	Acetone	01-Oct-98	EPA 8260	14	J	5	20	□g/L	SA
	Acetone	08-Oct-98	EPA 8260	48		5	20	□g/L	SA

Refer to footnotes at end of table.

Table F.3-2 (Continued)
Tijeras Arroyo Groundwater Investigation--Summary of Groundwater Sampling VOC Analytical Results (Detections Only)

Well ID	Analyte	Sample Date	Analytical Method	Result	Laboratory Qualifier	Minimum Detection Limit	Reporting Limit	Units	Sample Type
TA1-W-04 (cont.)	Chlorobenzene	08-Oct-98	EPA 8260	0.51	J	0.5	2	□g/L	SA
	Chloromethane	08-Oct-98	EPA 8260	0.78	J	0.5	2	□g/L	SA
	Chloromethane	08-Oct-98	EPA 8260	1.7	J	0.5	2	□g/L	SA
	Methylene chloride	10-Apr-00	EPA 8260	11	B	0.5	2	□g/L	SA
TA1-W-05	2-Butanone	19-Oct-98	EPA 8260	13	J	5	20	□g/L	SA
	4-methyl-, 2-Pentanone	19-Oct-98	EPA 8260	12	J	5	20	□g/L	SA
TA1-W-05	Acetone	19-Oct-98	EPA 8260	68		5	20	□g/L	SA
	Acetone	28-Oct-98	EPA 8260	7.9	J	5	20	□g/L	SA
	Chloromethane	19-Oct-98	EPA 8260	1.5	J	0.5	2	□g/L	SA
	Chloromethane	19-Oct-98	EPA 8260	1.7	J	0.5	2	□g/L	SA
	Trichloroethene	19-Oct-98	EPA 8260	0.58	J	0.5	2	□g/L	SA
TA1-W-06	1,1-Dichloroethane	17-Mar-00	EPA 8260	0.77	J	0.5	2	□g/L	SA
	1,1-Dichloroethene	24-Mar-98	EPA 8260	0.55	J	0.5	2	□g/L	SA
	1,1-Dichloroethene	18-Jun-98	EPA 8260	0.66	J	0.25	1	□g/L	SA
	1,1-Dichloroethene	01-Jul-98	EPA 8260	0.7	J	0.5	2	□g/L	SA
	1,1-Dichloroethene	21-Sep-98	EPA 8260	0.98	J	0.5	2	□g/L	SA
	1,1-Dichloroethene	03-Dec-98	EPA 8260	0.78	J	0.5	2	□g/L	SA
	1,1-Dichloroethene	15-Mar-99	EPA 8260	0.89	J	0.5	2	□g/L	SA
	1,1-Dichloroethene	27-Jul-99	EPA 8260	1.2	J	0.5	2	□g/L	SA
	1,1-Dichloroethene	10-Sep-99	EPA 8260	0.93	J	0.5	2	□g/L	SA
	Acetone	05-Mar-98	EPA 8260	17	J	5	20	□g/L	SA
	Acetone	11-Mar-98	EPA 8260	6	J	5	20	□g/L	SA
	Chloroform	10-Sep-99	EPA 8260	0.51	J	0.5	2	□g/L	SA
	Methylene chloride	18-Jun-98	EPA 8260	5.3	B	0.25	1	□g/L	SA
	Tetrachloroethene	11-Mar-98	EPA 8260	2.4		0.5	2	□g/L	SA
	Tetrachloroethene	24-Mar-98	EPA 8260	0.52	J	0.5	2	□g/L	SA
	Tetrachloroethene	18-Jun-98	EPA 8260	0.95	J	0.23	1	□g/L	SA
	Trichloroethene	11-Mar-98	EPA 8260	0.82	J	0.5	2	□g/L	SA
	Trichloroethene	18-Jun-98	EPA 8260	0.56	J	0.27	1	□g/L	SA
	Trichloroethene	10-Sep-99	EPA 8260	0.6	J	0.5	2	□g/L	SA
	Trichloroethene	17-Mar-00	EPA 8260	0.52	J	0.5	2	□g/L	SA
TA1-W-07	1,1-Dichloroethene	16-Dec-98	EPA 8260	0.53	J	0.5	2	□g/L	SA
	1,1-Dichloroethene	10-Mar-99	EPA 8260	0.54	J	0.5	2	□g/L	SA
	1,1-Dichloroethene	21-Jul-99	EPA 8260	0.59	J	0.5	2	□g/L	SA
	1,1-Dichloroethene	16-Mar-00	EPA 8260	0.71	J	0.5	2	□g/L	SA
	Acetone	20-Aug-98	EPA 8260	16	J	5	20	□g/L	SA
	Benzene	20-Aug-98	EPA 8260	0.56	J	0.5	2	□g/L	SA

Refer to footnotes at end of table.

Table F.3-2 (Continued)
Tijeras Arroyo Groundwater Investigation--Summary of Groundwater Sampling VOC Analytical Results (Detections Only)

Well ID	Analyte	Sample Date	Analytical Method	Result	Laboratory Qualifier	Minimum Detection Limit	Reporting Limit	Units	Sample Type
TA2-NW1-325	Acetone	26-Mar-93	EPA 8240	4.8	J,B	10		□g/L	SA
	Acetone	18-Jul-94	EPA 8240	0.004	J,B	0.01		mg/L	SA
	Acetone	25-Jan-96	EPA 8240	12	B	10		□g/L	SA
	Methylene chloride	26-Mar-93	EPA 8240	1	J	5		□g/L	SA
	Methylene chloride	06-Jan-94	EPA 8240	0.001	J	0.005		mg/L	SA
	Methylene chloride	06-Jan-94	EPA 8240	0.001	J	0.005		mg/L	SA
	Methylene chloride	18-Jul-94	EPA 8240	0.006	J,B	0.005		mg/L	SA
	Methylene chloride	13-Oct-94	EPA 8010	0.002	B	0.001		mg/L	SA
	Methylene chloride	25-Jan-96	EPA 8260	0.22	J	5		□g/L	SA
	Methylene chloride	26-Sep-97	EPA 8260	0.5	J	0.5	2	□g/L	SA
	Methylene chloride	08-Dec-97	EPA 8260	5.5		1	5	□g/L	SA
	Methylene chloride	21-Apr-00	EPA 8260	4.2	B	0.5	2	□g/L	SA
	Methylene chloride	11-Jan-01	EPA 8260	0.88	J	0.5	2	□g/L	SA
	Toluene	13-Oct-94	EPA 8020	0.002		0.001		mg/L	SA
	Trichloroethene	27-Sep-95	EPA 8010	0.6		0.5		□g/L	SA
	Trichloroethene	25-Jan-96	EPA 8260	1.2	J	0.5	2	□g/L	SA
	Acetone	18-Jul-94	EPA 8260	0.005	J,B	0.01		mg/L	DU
	Methylene chloride	18-Jul-94	EPA 8260	0.005	B	0.005		mg/L	DU
TA2-NW1-595	Benzene	10-Jun-97	EPA 8260	0.77	J	0.5	2	□g/L	SA
	Methylene chloride	21-Apr-00	EPA 8260	5.2	B	0.5	2	□g/L	SA
	Methylene chloride	11-Jan-01	EPA 8260	0.82	J	0.5	2	□g/L	SA
TA2-SW1-320	1,1-Dichloroethene	20-Jun-95	EPA 8010	2.2		0.5		□g/L	DU
	Acetone	22-Nov-92	EPA 8240	14		10		□g/L	SA
	Acetone	25-Jan-96	EPA 8260	4.9	J,B	10		□g/L	SA
	Methylene chloride	5-Jan-94	EPA 8240	0.001	J	0.005		mg/L	SA
	Methylene chloride	7-Apr-94	EPA 8240	0.001	J,B	0.005		mg/L	SA
	Methylene chloride	12-Oct-94	EPA 8010	0.002	B	0.001		mg/L	SA
	Methylene chloride	12-Oct-94	EPA 8010	0.002	B	0.001		mg/L	DU
	Methylene chloride	12-Apr-00	EPA 8260	6.1	B	0.5	2	□g/L	SA
	Toluene	5-Jan-94	EPA 8240	0.005		0.005		mg/L	SA
	Toluene	12-Oct-94	EPA 8020	0.69		0.5		□g/L	SA
	Toluene	12-Oct-94	EPA 8020	0.002		0.001		mg/L	SA
	Toluene	12-Oct-94	EPA 8020	0.001		0.001		mg/L	DU
	Toluene	25-Jan-96	EPA 8260	0.15	J,B	5		□g/L	SA
	Trichloroethene	20-Jun-95	EPA 8010	1.8		0.5		□g/L	DU
	Trichloroethene	27-Sep-95	EPA 8010	3.9		0.5		□g/L	SA
	Trichloroethene	25-Jan-96	EPA 8260	1.7	J	0.5	2	□g/L	SA

Refer to footnotes at end of table.

Table F.3-2 (Continued)
Tijeras Arroyo Groundwater Investigation--Summary of Groundwater Sampling VOC Analytical Results (Detections Only)

Well ID	Analyte	Sample Date	Analytical Method	Result	Laboratory Qualifier	Minimum Detection Limit	Reporting Limit	Units	Sample Type
TA2-W-01	1,1-Dichloroethene	18-Sep-98	EPA 8260	3.7		0.5	2	□g/L	SA
	Acetone	20-Jul-94	EPA 8260	0.006	J,B	0.01		mg/L	SA
	Acetone	26-Jan-96	EPA 8260	6.3	J,B	10		□g/L	SA
	Acetone	26-Jan-96	EPA 8260	4.3	J,B	10		□g/L	SA
	Benzene	06-Jun-97	EPA 8260	0.62	J	0.5	2	□g/L	SA
	Methylene chloride	20-Jul-94	EPA 8260	0.007	B	0.005		mg/L	SA
TA2-W-01	Methylene chloride	14-Oct-94	EPA 8010	0.003	B	0.001		mg/L	SA
	Methylene chloride	08-Dec-97	EPA 8260	5.6	B	1	5	□g/L	SA
	Methylene chloride	11-Apr-00	EPA 8260	36	B	0.5	2	□g/L	SA
	Toluene	14-Oct-94	EPA 8020	0.001		0.001		mg/L	SA
	Toluene	06-Jun-97	EPA 8260	0.63	J	0.5	2	□g/L	SA
	Trichloroethene	20-Jun-95	EPA 8010	1.6		0.5		□g/L	SA
	Trichloroethene	27-Sep-95	EPA 8010	1.9		0.5		□g/L	SA
	Trichloroethene	26-Jan-96	EPA 8260	1.9		5		□g/L	SA
	Trichloroethene	26-Jan-96	EPA 8260	1.6	J	5		□g/L	SA
	Trichloroethene	26-Jan-96	EPA 8260	1.4	J	0.5	2	□g/L	SA
	Trichloroethene	26-Jan-96	EPA 8260	1.4		0.5	2	□g/L	SA
	Trichloroethene	26-Aug-96	EPA 8260	1.7	J	0.5	2	□g/L	SA
	Trichloroethene	26-Aug-96	EPA 8260	1.7	J	0.5	2	□g/L	SA
	Trichloroethene	12-Mar-97	EPA 8260	1.3	J	0.5	2	□g/L	SA
	Trichloroethene	06-Jun-97	EPA 8260	1.9	J	0.5	2	□g/L	SA
	Trichloroethene	02-Oct-97	EPA 8260	1.4	J	0.5	2	□g/L	SA
	Trichloroethene	08-Dec-97	EPA 8260	2		1	2	□g/L	SA
	Trichloroethene	08-Dec-97	EPA 8260	1.2	J	0.5	2	□g/L	SA
	Trichloroethene	24-Jun-98	EPA 8260	1.8	J	0.5	2	□g/L	SA
	Trichloroethene	30-Nov-98	EPA 8260	2		0.5	2	□g/L	SA
	Trichloroethene	09-Mar-99	EPA 8260	1.9	J	0.5	2	□g/L	SA
	Trichloroethene	15-Sep-99	EPA 8260	1.1	J	0.5	2	□g/L	SA
	Trichloroethene	02-Dec-99	EPA 8260	1.1	J	0.5	2	□g/L	SA
	Trichloroethene	11-Apr-00	EPA 8260	1.2	J	0.5	2	□g/L	SA
	Trichloroethene	17-Jan-01	EPA 8260	1.6	J	0.5	2	□g/L	SA
	Trichloroethene	27-Sep-95	EPA 8010	1.6		0.5		□g/L	DU
TA2-W-19	1,1-Dichloroethane	24-Jan-96	EPA 8260	2.1		0.5		□g/L	SA
	1,1-Dichloroethane	24-Jan-96	EPA 8260	0.57		0.5		□g/L	SA
	1,1-Dichloroethane	22-Jan-97	EPA 8260	0.64	J	0.5	2	□g/L	SA
	1,1-Dichloroethane	23-Jan-97	EPA 8260	1.2	J	0.5	2	□g/L	SA
	1,1-Dichloroethane	23-Jan-97	EPA 8260	1.2	J	0.5	2	□g/L	SA

Refer to footnotes at end of table.

Table F.3-2 (Continued)
Tijeras Arroyo Groundwater Investigation--Summary of Groundwater Sampling VOC Analytical Results (Detections Only)

Well ID	Analyte	Sample Date	Analytical Method	Result	Laboratory Qualifier	Minimum Detection Limit	Reporting Limit	Units	Sample Type
TA2-W-19 (cont.)	1,1-Dichloroethane	28-Jan-97	EPA 8260	1.4	J	0.5	2	□g/L	SA
	1,1-Dichloroethane	10-Jun-97	EPA 8260	0.64	J	0.5	2	□g/L	SA
	1,1-Dichloroethane	29-Sep-97	EPA 8260	0.81	J	0.5	2	□g/L	SA
	1,1-Dichloroethane	10-Dec-97	EPA 8260	0.79	J	0.5	2	□g/L	SA
	1,1-Dichloroethane	06-Mar-98	EPA 8260	0.7	J	0.5	2	□g/L	SA
	1,1-Dichloroethane	15-Jun-98	EPA 8260	0.7	J	0.5	2	□g/L	SA
	1,1-Dichloroethane	16-Sep-98	EPA 8260	0.74	J	0.5	2	□g/L	SA
	1,1-Dichloroethane	02-Dec-98	EPA 8260	0.82	J	0.5	2	□g/L	SA
TA2-W-19	1,1-Dichloroethane	09-Mar-99	EPA 8260	0.95	J	0.5	2	□g/L	SA
	2-Hexanone	09-Mar-99	EPA 8260	20	J	10	40	□g/L	SA
	Acetone	24-Jan-96	EPA 8260	6	J,B	10		□g/L	SA
	Acetone	24-Jan-96	EPA 8260	8	J,B	10		□g/L	SA
	Acetone	11-Mar-97	EPA 8260	5.2	J	5	20	□g/L	SA
	Acetone	11-Mar-97	EPA 8260	5.2	J	5	20	□g/L	SA
	Acetone	02-Dec-98	EPA 8260	7	J	5	20	□g/L	SA
	Chloromethane	16-Sep-98	EPA 8260	1.4	J	0.5	2	□g/L	SA
	Methylene chloride	10-Jun-97	EPA 8260	6.9	J	5	20	□g/L	SA
	Trichloroethene	24-Jan-96	EPA 8260	2.1		0.5		□g/L	SA
	Trichloroethene	24-Jan-96	EPA 8260	2	J	5		□g/L	SA
	Trichloroethene	24-Jan-96	EPA 8260	2		0.5		□g/L	SA
	Trichloroethene	24-Jan-96	EPA 8260	1.9	J	5		□g/L	SA
	Trichloroethene	24-Jan-96	EPA 8260	5.4		0.5	2	□g/L	SA
	Trichloroethene	24-Apr-96	EPA 8010	1.1		0.5		□g/L	SA
	Trichloroethene	28-Aug-96	EPA 8260	1	J	0.5	2	□g/L	SA
	Trichloroethene	28-Aug-96	EPA 8260	1	J	0.5	2	□g/L	SA
	Trichloroethene	22-Jan-97	EPA 8260	2.6		0.5	2	□g/L	SA
	Trichloroethene	23-Jan-97	EPA 8260	4.4		0.5	2	□g/L	SA
	Trichloroethene	23-Jan-97	EPA 8260	5.2		0.5	2	□g/L	SA
	Trichloroethene	28-Jan-97	EPA 8260	6.2		0.5	2	□g/L	SA
	Trichloroethene	11-Mar-97	EPA 8260	1.4	J	0.5	2	□g/L	SA
	Trichloroethene	11-Mar-97	EPA 8260	1.4	J	0.5	2	□g/L	SA
	Trichloroethene	10-Jun-97	EPA 8260	2.7		0.5	2	□g/L	SA
	Trichloroethene	29-Sep-97	EPA 8260	1.9	J	0.5	2	□g/L	SA
	Trichloroethene	10-Dec-97	EPA 8260	2.4		0.5	2	□g/L	SA
	Trichloroethene	06-Mar-98	EPA 8260	2.5		0.5	2	□g/L	SA
	Trichloroethene	15-Jun-98	EPA 8260	2.7		0.5	2	□g/L	SA

Refer to footnotes at end of table.

Table F.3-2 (Continued)
Tijeras Arroyo Groundwater Investigation--Summary of Groundwater Sampling VOC Analytical Results (Detections Only)

Well ID	Analyte	Sample Date	Analytical Method	Result	Laboratory Qualifier	Minimum Detection Limit	Reporting Limit	Units	Sample Type
TA2-W-19 (cont.)	Trichloroethene	16-Sep-98	EPA 8260	2.8		0.5	2	□g/L	SA
	Trichloroethene	02-Dec-98	EPA 8260	3.1		0.5	2	□g/L	SA
	Trichloroethene	09-Mar-99	EPA 8260	3.2		0.5	2	□g/L	SA
	Trichloroethene	24-Sep-99	EPA 8260	1.8	J	0.5	2	□g/L	SA
	Trichloroethene	15-Mar-00	EPA 8260	1.9	J	0.5	2	□g/L	SA
	Trichloroethene	04-Jan-01	EPA 8260	2.3		0.5	2	□g/L	SA
	cis-1,2-Dichloroethene	24-Jan-96	EPA 8260	0.61		0.5		□g/L	SA
	cis-1,2-Dichloroethene	24-Jan-96	EPA 8260	0.57		0.5		□g/L	SA
	cis-1,2-Dichloroethene	22-Jan-97	EPA 8260	0.66	J	0.5	2	□g/L	SA
	cis-1,2-Dichloroethene	23-Jan-97	EPA 8260	1.3	J	0.5	2	□g/L	SA
	cis-1,2-Dichloroethene	23-Jan-97	EPA 8260	1.3	J	0.5	2	□g/L	SA
	cis-1,2-Dichloroethene	28-Jan-97	EPA 8260	1.4	J	0.5	2	□g/L	SA
	cis-1,2-Dichloroethene	10-Jun-97	EPA 8260	0.53	J	0.5	2	□g/L	SA
	cis-1,2-Dichloroethene	06-Mar-98	EPA 8260	0.68	J	0.5	2	□g/L	SA
	cis-1,2-Dichloroethene	15-Jun-98	EPA 8260	0.8	J	0.5	2	□g/L	SA
	cis-1,2-Dichloroethene	16-Sep-98	EPA 8260	0.89	J	0.5	2	□g/L	SA
	cis-1,2-Dichloroethene	02-Dec-98	EPA 8260	0.88	J	0.5	2	□g/L	SA
	cis-1,2-Dichloroethene	09-Mar-99	EPA 8260	0.92	J	0.5	2	□g/L	SA
	cis-1,2-Dichloroethene	24-Sep-99	EPA 8260	0.61	J	0.5	2	□g/L	SA
	cis-1,2-Dichloroethene	15-Mar-00	EPA 8260	0.53	J	0.5	2	□g/L	SA
	1,1-Dichloroethane	22-Jan-97	EPA 8260	0.72	J	0.5	2	□g/L	DU
TA2-W-19	1,1-Dichloroethane	15-Jun-98	EPA 8260	0.7	J	0.5	2	□g/L	DU
	1,1-Dichloroethane	16-Sep-98	EPA 8260	0.78	J	0.5	2	□g/L	DU
	1,1-Dichloroethane	02-Dec-98	EPA 8260	0.87	J	0.5	2	□g/L	DU
	Trichloroethene	28-Aug-96	EPA 8260	1	J	0.5	2	□g/L	DU
	Trichloroethene	28-Aug-96	EPA 8260	1.2	J	0.5	2	□g/L	DU
	Trichloroethene	28-Aug-96	EPA 8260	1	J	0.5	2	□g/L	DU
	Trichloroethene	28-Aug-96	EPA 8260	1.2	J	0.5	2	□g/L	DU
	Trichloroethene	22-Jan-97	EPA 8260	2.9		0.5	2	□g/L	DU
	Trichloroethene	15-Jun-98	EPA 8260	2.8		0.5	2	□g/L	DU
	Trichloroethene	16-Sep-98	EPA 8260	2.9		0.5	2	□g/L	DU
	Trichloroethene	02-Dec-98	EPA 8260	3.4		0.5	2	□g/L	DU
	cis-1,2-Dichloroethene	22-Jan-97	EPA 8260	0.7	J	0.5	2	□g/L	DU
	cis-1,2-Dichloroethene	15-Jun-98	EPA 8260	0.8	J	0.5	2	□g/L	DU
	cis-1,2-Dichloroethene	16-Sep-98	EPA 8260	0.88	J	0.5	2	□g/L	DU
	cis-1,2-Dichloroethene	02-Dec-98	EPA 8260	0.9	J	0.5	2	□g/L	DU

Refer to footnotes at end of table.

Table F.3-2 (Continued)
Tijeras Arroyo Groundwater Investigation--Summary of Groundwater Sampling VOC Analytical Results (Detections Only)

Well ID	Analyte	Sample Date	Analytical Method	Result	Laboratory Qualifier	Minimum Detection Limit	Reporting Limit	Units	Sample Type
TA2-W-24	Methylene chloride	19-Mar-98	EPA 8260	3.1	J,B	1	5	□g/L	SA
	Tetrachloroethene	05-Mar-98	EPA 8260	3		0.5	2	□g/L	SA
	Tetrachloroethene	06-Mar-98	EPA 8260	4		0.5	2	□g/L	SA
	Trichloroethene	05-Mar-98	EPA 8260	0.6	J	0.5	2	□g/L	SA
	Trichloroethene	06-Mar-98	EPA 8260	0.87	J	0.5	2	□g/L	SA
TA2-W-25	2-Hexanone	13-Sep-99	EPA 8260	10	J	10	40	□g/L	SA
	Acetone	23-Sep-98	EPA 8260	6.9	J	5	20	□g/L	SA
	Chloromethane	23-Sep-98	EPA 8260	1.4	J	0.5	2	□g/L	SA
	Chloromethane	14-Dec-98	EPA 8260	0.53	J	0.5	2	□g/L	SA
	Methylene chloride	28-Apr-00	EPA 8260	4	B	0.5	2	□g/L	SA
	1,1-Dichloroethene	22-Jun-98	EPA 8260	0.68	J	0.5	2	□g/L	TB
	Methylene chloride	23-Sep-98	EPA 8260	1.6	J,B	0.5	2	□g/L	TB
	Methylene chloride	14-Dec-98	EPA 8260	0.63	J,B	0.5	2	□g/L	TB
TA2-W-26	1,1-Dichloroethane	17-Mar-98	EPA 8260	0.96	J	0.5	2	□g/L	SA
	1,1-Dichloroethane	22-Jun-98	EPA 8260	0.79	J	0.5	2	□g/L	SA
	1,1-Dichloroethane	25-Sep-98	EPA 8260	0.79	J	0.5	2	□g/L	SA
	1,1-Dichloroethane	14-Dec-98	EPA 8260	0.89	J	0.4	1	□g/L	SA
	1,1-Dichloroethane	14-Dec-98	EPA 8260	0.86	J	0.5	2	□g/L	SA
	1,1-Dichloroethane	16-Mar-99	EPA 8260	0.86	J	0.5	2	□g/L	SA
	1,1-Dichloroethane	07-Jul-99	EPA 8260	0.84	J	0.5	2	□g/L	SA
	1,1-Dichloroethane	09-Sep-99	EPA 8260	0.95	J	0.4	1	□g/L	SA
	1,1-Dichloroethane	09-Sep-99	EPA 8260	0.87	J	0.5	2	□g/L	SA
	4-methyl-, 2-Pentanone	09-Feb-98	EPA 8260	7.3	J	5	20	□g/L	SA
	Acetone	09-Feb-98	EPA 8260	34		5	20	□g/L	SA
	Acetone	09-Feb-98	EPA 8260	25		5	20	□g/L	SA
	Benzene	09-Feb-98	EPA 8260	1.4	J	0.5	2	□g/L	SA
	Carbon disulfide	14-Dec-98	EPA 8260	0.59	J	0.5	2	□g/L	SA
	Tetrachloroethene	03-Mar-98	EPA 8260	2.3		0.5	2	□g/L	SA
	Tetrachloroethene	17-Mar-98	EPA 8260	1.6	J	0.5	2	□g/L	SA
	Tetrachloroethene	22-Jun-98	EPA 8260	2.4		0.5	2	□g/L	SA
	Tetrachloroethene	25-Sep-98	EPA 8260	1.6	J	0.5	2	□g/L	SA
	Tetrachloroethene	14-Dec-98	EPA 8260	1.8		0.7	1	□g/L	SA
	Tetrachloroethene	14-Dec-98	EPA 8260	2.1		0.5	2	□g/L	SA
	Tetrachloroethene	16-Mar-99	EPA 8260	2		0.5	2	□g/L	SA
TA2-W-26	Tetrachloroethene	07-Jul-99	EPA 8260	1.9	J	0.5	2	□g/L	SA
	Tetrachloroethene	09-Sep-99	EPA 8260	2		0.7	1	□g/L	SA

Refer to footnotes at end of table.

Table F.3-2 (Continued)
Tijeras Arroyo Groundwater Investigation--Summary of Groundwater Sampling VOC Analytical Results (Detections Only)

Well ID	Analyte	Sample Date	Analytical Method	Result	Laboratory Qualifier	Minimum Detection Limit	Reporting Limit	Units	Sample Type
TA2-W-26 (cont.)	Tetrachloroethene	09-Sep-99	EPA 8260	2.4		0.5	2	□g/L	SA
	Tetrachloroethene	02-Dec-99	EPA 8260	2.9		0.5	2	□g/L	SA
	Tetrachloroethene	26-May-00	SW846 8260	3.6		0.385	1	□g/L	SA
	Tetrachloroethene	08-Jan-01	EPA 8260	4.6		0.5	2	□g/L	SA
	Tetrachloroethene	08-Jan-01	EPA 8260	4.8		0.5	2	□g/L	SA
	Toluene	09-Feb-98	EPA 8260	4.1		0.5	2	□g/L	SA
	Trichloroethene	03-Mar-98	EPA 8260	0.91	J	0.5	2	□g/L	SA
	Trichloroethene	17-Mar-98	EPA 8260	9.6		0.5	2	□g/L	SA
	Trichloroethene	22-Jun-98	EPA 8260	9		0.5	2	□g/L	SA
	Trichloroethene	25-Sep-98	EPA 8260	7.4		0.5	2	□g/L	SA
	Trichloroethene	14-Dec-98	EPA 8260	8		0.6	1	□g/L	SA
	Trichloroethene	14-Dec-98	EPA 8260	8.6		0.5	2	□g/L	SA
	Trichloroethene	16-Mar-99	EPA 8260	7.4		0.5	2	□g/L	SA
	Trichloroethene	07-Jul-99	EPA 8260	6.8		0.5	2	□g/L	SA
	Trichloroethene	09-Sep-99	EPA 8260	8.4		0.6	1	□g/L	SA
	Trichloroethene	09-Sep-99	EPA 8260	9		0.5	2	□g/L	SA
	Trichloroethene	02-Dec-99	EPA 8260	8.7		0.5	2	□g/L	SA
	Trichloroethene	26-May-00	SW846 8260	9.2		0.15	1	□g/L	SA
	Trichloroethene	08-Jan-01	EPA 8260	8.5		0.5	2	□g/L	SA
	Trichloroethene	08-Jan-01	EPA 8260	8.7		0.5	2	□g/L	SA
	cis-1,2-Dichloroethene	25-Sep-98	EPA 8260	0.51	J	0.5	2	□g/L	SA
	cis-1,2-Dichloroethene	14-Dec-98	EPA 8260	0.73	J	0.5	2	□g/L	SA
	cis-1,2-Dichloroethene	16-Mar-99	EPA 8260	0.65	J	0.5	2	□g/L	SA
	cis-1,2-Dichloroethene	07-Jul-99	EPA 8260	0.6	J	0.5	2	□g/L	SA
	cis-1,2-Dichloroethene	09-Sep-99	EPA 8260	1		0.7	1	□g/L	SA
	cis-1,2-Dichloroethene	09-Sep-99	EPA 8260	1.2	J	0.5	2	□g/L	SA
	cis-1,2-Dichloroethene	02-Dec-99	EPA 8260	0.95	J	0.5	2	□g/L	SA
	cis-1,2-Dichloroethene	26-May-00	SW846 8260	1.08		0.129	1	□g/L	SA
	cis-1,2-Dichloroethene	08-Jan-01	EPA 8260	1.5	J	0.5	2	□g/L	SA
	cis-1,2-Dichloroethene	08-Jan-01	EPA 8260	1.5	J	0.5	2	□g/L	SA
	1,1-Dichloroethane	17-Mar-98	EPA 8260	0.99	J	0.5	2	□g/L	DU
	1,1-Dichloroethane	09-Sep-99	EPA 8260	0.82	J	0.5	2	□g/L	DU
	Tetrachloroethene	17-Mar-98	EPA 8260	1.6	J	0.5	2	□g/L	DU
	Tetrachloroethene	09-Sep-99	EPA 8260	2.4		0.5	2	□g/L	DU
	Trichloroethene	17-Mar-98	EPA 8260	9.6		0.5	2	□g/L	DU
	Trichloroethene	09-Sep-99	EPA 8260	8.8		0.5	2	□g/L	DU
	cis-1,2-Dichloroethene	09-Sep-99	EPA 8260	1.2	J	0.5	2	□g/L	DU

Refer to footnotes at end of table.

Table F.3-2 (Continued)
Tijeras Arroyo Groundwater Investigation--Summary of Groundwater Sampling VOC Analytical Results (Detections Only)

Well ID	Analyte	Sample Date	Analytical Method	Result	Laboratory Qualifier	Minimum Detection Limit	Reporting Limit	Units	Sample Type
TA2-W-27	Acetone	09-Feb-98	EPA 8260	21		5	20	□g/L	SA
	Benzene	19-Mar-98	EPA 8260	0.86	J	0.5	2	□g/L	SA
	Methylene chloride	19-Mar-98	EPA 8260	2.5	J,B	1	5	□g/L	SA
	Tetrachloroethene	19-Mar-98	EPA 8260	0.85	J	0.5	2	□g/L	SA
	Tetrachloroethene	23-Jun-98	EPA 8260	1.12	J	0.5	2	□g/L	SA
	Tetrachloroethene	24-Sep-98	EPA 8260	0.6	J	0.5	2	□g/L	SA
	Tetrachloroethene	03-Dec-98	EPA 8260	0.61	J	0.5	2	□g/L	SA
	Tetrachloroethene	08-Jul-99	EPA 8260	0.52	J	0.5	2	□g/L	SA
TA2-W-27	Tetrachloroethene	14-Mar-00	EPA 8260	0.79	J	0.5	2	□g/L	SA
	Tetrachloroethene	03-Jan-01	EPA 8260	0.76	J	0.5	2	□g/L	SA
TJA-2	1,1-Dichloroethane	24-Jan-96	EPA 8260	0.44	J	0.5		□g/L	SA
	1,1-Dichloroethane	28-Aug-96	EPA 8260	0.52	J	0.5	2	□g/L	SA
	1,1-Dichloroethane	28-Aug-96	EPA 8260	0.52	J	0.5	2	□g/L	SA
	1,1-Dichloroethane	10-Mar-98	EPA 8260	0.62	J	0.5	2	□g/L	SA
	1,1-Dichloroethane	24-Jun-98	EPA 8260	0.59	J	0.5	2	□g/L	SA
	1,1-Dichloroethane	16-Sep-98	EPA 8260	0.59	J	0.5	2	□g/L	SA
	1,1-Dichloroethane	02-Dec-98	EPA 8260	0.68	J	0.5	2	□g/L	SA
	1,1-Dichloroethane	04-Mar-99	EPA 8260	0.61	J	0.5	2	□g/L	SA
	1,1-Dichloroethane	16-Jun-99	EPA 8260	0.61	J	0.5	2	□g/L	SA
	1,1-Dichloroethane	13-Sep-99	EPA 8260	0.52	J	0.5	2	□g/L	SA
	Acetone	24-Jan-96	EPA 8260	8.3	J,B	10		□g/L	SA
	Acetone	11-Mar-97	EPA 8260	5.8	J	5	20	□g/L	SA
	Acetone	11-Mar-97	EPA 8260	5.8	J	5	20	□g/L	SA
	Acetone	04-Mar-99	EPA 8260	7.8	J	5	20	□g/L	SA
	Chlorobenzene	16-Jun-99	EPA 8260	0.53	J	0.5	2	□g/L	SA
	Chloromethane	16-Sep-98	EPA 8260	0.56	J	0.5	2	□g/L	SA
	Methylene chloride	16-Jun-99	EPA 8260	0.65	J	0.5	2	□g/L	SA
	Toluene	24-Jan-96	EPA 8260	0.22	J,B	0.5		□g/L	SA
	Toluene	16-Dec-97	EPA 8260	480		2.5	10	□g/L	SA
	Trichloroethene	24-Jan-96	EPA 8260	3.7		0.5	2	□g/L	SA
	Trichloroethene	24-Jan-96	EPA 8260	1.9		0.5		□g/L	SA
	Trichloroethene	24-Jan-96	EPA 8260	1.7	J	5		□g/L	SA
	Trichloroethene	28-Aug-96	EPA 8260	1.4	J	0.5	2	□g/L	SA
	Trichloroethene	28-Aug-96	EPA 8260	1.4	J	0.5	2	□g/L	SA
	Trichloroethene	11-Mar-97	EPA 8260	1.8	J	0.5	2	□g/L	SA
	Trichloroethene	11-Mar-97	EPA 8260	1.8	J	0.5	2	□g/L	SA

Refer to footnotes at end of table.

Table F.3-2 (Continued)
Tijeras Arroyo Groundwater Investigation--Summary of Groundwater Sampling VOC Analytical Results (Detections Only)

Well ID	Analyte	Sample Date	Analytical Method	Result	Laboratory Qualifier	Minimum Detection Limit	Reporting Limit	Units	Sample Type
TJA-2 (cont.)	Trichloroethene	12-Jun-97	EPA 8260	3.15		1		□g/L	SA
	Trichloroethene	12-Jun-97	EPA 8260	1.7	J	0.5	2	□g/L	SA
	Trichloroethene	29-Sep-97	EPA 8260	1.6	J	0.5	2	□g/L	SA
	Trichloroethene	16-Dec-97	EPA 8260	0.66	J	0.5	2	□g/L	SA
	Trichloroethene	10-Mar-98	EPA 8260	2.5		0.5	2	□g/L	SA
	Trichloroethene	24-Jun-98	EPA 8260	2.7		0.5	2	□g/L	SA
	Trichloroethene	16-Sep-98	EPA 8260	2.4		0.5	2	□g/L	SA
	Trichloroethene	02-Dec-98	EPA 8260	2.7		0.5	2	□g/L	SA
	Trichloroethene	04-Mar-99	EPA 8260	2.3		0.5	2	□g/L	SA
	Trichloroethene	16-Jun-99	EPA 8260	2.3		0.5	2	□g/L	SA
	Trichloroethene	13-Sep-99	EPA 8260	2.3		0.5	2	□g/L	SA
	Trichloroethene	30-Nov-99	EPA 8260	2.5		0.5	2	□g/L	SA
	Trichloroethene	15-Mar-00	EPA 8260	3.2		0.5	2	□g/L	SA
	Trichloroethene	04-Jan-01	EPA 8260	2.8		0.5	2	□g/L	SA
	cis-1,2-Dichloroethene	24-Jan-96	EPA 8260	0.54		0.5		□g/L	SA
	cis-1,2-Dichloroethene	10-Mar-98	EPA 8260	0.8	J	0.5	2	□g/L	SA
	cis-1,2-Dichloroethene	24-Jun-98	EPA 8260	0.72	J	0.5	2	□g/L	SA
	cis-1,2-Dichloroethene	16-Sep-98	EPA 8260	0.7	J	0.5	2	□g/L	SA
	cis-1,2-Dichloroethene	02-Dec-98	EPA 8260	0.78	J	0.5	2	□g/L	SA
TJA-2	cis-1,2-Dichloroethene	04-Mar-99	EPA 8260	0.68	J	0.5	2	□g/L	SA
	cis-1,2-Dichloroethene	13-Sep-99	EPA 8260	0.64	J	0.5	2	□g/L	SA
	cis-1,2-Dichloroethene	15-Mar-00	EPA 8260	0.69	J	0.5	2	□g/L	SA
TJA-3	2-Butanone	10-Sep-98	EPA 8260	10	J	5	20	□g/L	SA
	2-Butanone	08-Jan-01	EPA 8260	42		5	20	□g/L	SA
	4-methyl-, 2-Pentanone	10-Sep-98	EPA 8260	14	J	5	20	□g/L	SA
	Acetone	25-Aug-98	EPA 8260	6.5	J	5	20	□g/L	SA
	Acetone	01-Sep-98	EPA 8260	11	J	5	20	□g/L	SA
	Acetone	10-Sep-98	EPA 8260	43		5	20	□g/L	SA
	Benzene	10-Sep-98	EPA 8260	1	J	0.5	2	□g/L	SA
	Ethyl benzene	08-Jan-01	EPA 8260	0.63	J	0.5	2	□g/L	SA
	Methylene chloride	11-Apr-00	EPA 8260	0.61	J	0.5	2	□g/L	SA
	Methylene chloride	08-Jan-01	EPA 8260	1.2	J	0.5	2	□g/L	SA
	Toluene	01-Sep-98	EPA 8260	0.52	J	0.5	2	□g/L	SA
	Toluene	10-Sep-98	EPA 8260	1.6	J	0.5	2	□g/L	SA
	Trichloroethene	08-Jan-01	EPA 8260	0.51	J	0.5	2	□g/L	SA

Refer to footnotes at end of table.

Table F.3-2 (Continued)
Tijeras Arroyo Groundwater Investigation--Summary of Groundwater Sampling VOC Analytical Results (Detections Only)

Well ID	Analyte	Sample Date	Analytical Method	Result	Laboratory Qualifier	Minimum Detection Limit	Reporting Limit	Units	Sample Type
TJA-4	2-Butanone	04-Mar-99	EPA 8260	5	J	5	20	□g/L	SA
	Acetone	03-Aug-98	EPA 8260	10	J	5	20	□g/L	SA
	Acetone	07-Aug-98	EPA 8260	5.5	J	5	20	□g/L	SA
	Acetone	07-Aug-98	EPA 8260	12	J	5	20	□g/L	SA
	Acetone	04-Mar-99	EPA 8260	13	J	5	20	□g/L	SA
	Benzene	07-Aug-98	EPA 8260	2.9		0.5	2	□g/L	SA
	Chloromethane	15-Dec-98	EPA 8260	1.2	J	0.5	2	□g/L	SA
	Toluene	30-Jul-98	EPA 8260	0.61	J	0.5	2	□g/L	SA
	2-Butanone	04-Mar-99	EPA 8260	5.3	J	5	20	□g/L	DU
	Acetone	04-Mar-99	EPA 8260	13	J	5	20	□g/L	DU
	Chloromethane	15-Dec-98	EPA 8260	1.5	J	0.5	2	□g/L	TB
TJA-5	2-Butanone	11-Aug-98	EPA 8260	5.5	J	5	20	□g/L	SA
	4-methyl-, 2-Pentanone	11-Aug-98	EPA 8260	7.5	J	5	20	□g/L	SA
	Acetone	11-Aug-98	EPA 8260	24		5	20	□g/L	SA
	Benzene	11-Aug-98	EPA 8260	3.5		0.5	2	□g/L	SA
	Chlorobenzene	11-Aug-98	EPA 8260	0.89	J	0.5	2	□g/L	SA
	Methylene chloride	28-Apr-00	EPA 8260	6.1	B	0.5	2	□g/L	SA
	Trichloroethene	28-Apr-00	EPA 8260	0.65	J	0.5	2	□g/L	SA
	Trichloroethene	02-Jan-01	EPA 8260	1.5	J	0.5	2	□g/L	SA
	Acetone	28-Jun-99	EPA 8260	9.3	J	5	20	□g/L	DU
	Methylene chloride	28-Apr-00	EPA 8260	6.5	B	0.5	2	□g/L	DU
	Trichloroethene	28-Apr-00	EPA 8260	0.74	J	0.5	2	□g/L	DU
WYO-1	1,1,2,2-Tetrachloroethane	05-Mar-98	EPA 8260	3.3		0.3	1	□g/L	SA
	1,1,2,2-Tetrachloroethane	05-Mar-98	EPA 8260	3.8		0.3	1	□g/L	SA
	1,1-Dichloroethane	24-Jan-96	EPA 8260	0.99		0.5		□g/L	SA
	1,1-Dichloroethane	24-Jan-96	EPA 8260	1.1	J	5		□g/L	SA
	1,1-Dichloroethane	26-Aug-96	EPA 8260	1.4	J	0.5	2	□g/L	SA
	1,1-Dichloroethane	21-Jan-97	EPA 8260	1.4	J	0.5	2	□g/L	SA
	1,1-Dichloroethane	22-Jan-97	EPA 8260	1.5	J	0.5	2	□g/L	SA
	1,1-Dichloroethane	23-Jan-97	EPA 8260	1.2	J	0.5	2	□g/L	SA
	1,1-Dichloroethane	23-Jan-97	EPA 8260	1.3	J	0.5	2	□g/L	SA
WYO-1	1,1-Dichloroethane	10-Mar-97	EPA 8260	1.4		0.5		□g/L	SA
	1,1-Dichloroethane	10-Mar-97	EPA 8260	1.1	J	0.5	2	□g/L	SA
	1,1-Dichloroethane	10-Mar-97	EPA 8260	1.1	J	0.5	2	□g/L	SA
	1,1-Dichloroethane	05-Jun-97	EPA 8260	2.06		1		□g/L	SA
	1,1-Dichloroethane	05-Jun-97	EPA 8260	1.1	J	0.5	2	□g/L	SA

Refer to footnotes at end of table.

Table F.3-2 (Continued)
Tijeras Arroyo Groundwater Investigation--Summary of Groundwater Sampling VOC Analytical Results (Detections Only)

Well ID	Analyte	Sample Date	Analytical Method	Result	Laboratory Qualifier	Minimum Detection Limit	Reporting Limit	Units	Sample Type
WYO-1 (cont.)	1,1-Dichloroethane	01-Oct-97	EPA 8260	0.9	J	0.5	2	□g/L	SA
	1,1-Dichloroethane	09-Dec-97	EPA 8260	1.1	J	0.5	2	□g/L	SA
	1,1-Dichloroethane	09-Dec-97	EPA 8260	1.3	J	0.5	2	□g/L	SA
	1,1-Dichloroethane	05-Mar-98	EPA 8260	1.5		0.2	1	□g/L	SA
	1,1-Dichloroethane	05-Mar-98	EPA 8260	1.6		0.2	1	□g/L	SA
	1,1-Dichloroethane	05-Mar-98	EPA 8260	1.2	H	0.02	1	□g/L	SA
	1,1-Dichloroethane	05-Mar-98	EPA 8260	1.4		0.02	1	□g/L	SA
	1,1-Dichloroethane	05-Mar-98	EPA 8260	1.3	J	0.5	2	□g/L	SA
	1,1-Dichloroethane	05-Mar-98	EPA 8260	1.3	J	0.5	2	□g/L	SA
	1,1-Dichloroethane	05-Mar-98	EPA 8260	1.2	J	0.5	2	□g/L	SA
	1,1-Dichloroethane	10-Jun-98	EPA 8260	1.1	J	0.5	2	□g/L	SA
	1,1-Dichloroethane	14-Sep-98	EPA 8260	1.1	J	0.5	2	□g/L	SA
	1,1-Dichloroethane	01-Dec-98	EPA 8260	1.2	J	0.5	2	□g/L	SA
	1,1-Dichloroethane	05-Mar-99	EPA 8260	1.1	J	0.5	2	□g/L	SA
	1,1-Dichloroethane	14-Jul-99	EPA 8260	1	J	0.5	2	□g/L	SA
	1,1-Dichloroethane	16-Sep-99	EPA 8260	0.97	J	0.4	1	□g/L	SA
	1,1-Dichloroethane	16-Sep-99	EPA 8260	0.95	J	0.5	2	□g/L	SA
	1,1-Dichloroethene	05-Mar-98	EPA 8260	0.32	J	0.19	1	□g/L	SA
	1,1-Dichloroethene	05-Mar-98	EPA 8260	0.36	J	0.19	1	□g/L	SA
	1,1-Dichloroethene	14-Sep-98	EPA 8260	0.53	J	0.5	2	□g/L	SA
	1,2-Dichloroethene	05-Mar-98	EPA 8260	2.5		0.13	1	□g/L	SA
	1,2-Dichloroethene	05-Mar-98	EPA 8260	2.5		0.13	1	□g/L	SA
	2-Butanone	05-Mar-99	EPA 8260	5.9	J	5	20	□g/L	SA
	Acetone	05-Mar-98	EPA 8260	3.8	J,B	0.76	5	□g/L	SA
	Acetone	05-Mar-99	EPA 8260	8.1	J	5	20	□g/L	SA
	Chloroform	05-Mar-98	EPA 8260	0.24	J	0.17	1	□g/L	SA
	Methylene chloride	10-Mar-97	EPA 8260	2.3	J,B	1		□g/L	SA
	Methylene chloride	05-Mar-98	EPA 8260	0.65	J,B	0.07	1	□g/L	SA
	Methylene chloride	05-Mar-98	EPA 8260	3.8	H,B	0.07	1	□g/L	SA
	Methylene chloride	16-Sep-99	EPA 8260	2.1	J,B	1.2	5	□g/L	SA
	Tetrachloroethene	05-Mar-98	EPA 8260	0.22	J	0.18	1	□g/L	SA
	Toluene	24-Jan-96	EPA 8260	1	B	0.5		□g/L	SA
	Toluene	24-Jan-96	EPA 8260	1.2	J	5		□g/L	SA
	Trichloroethene	24-Jan-96	EPA 8260	4		0.5		□g/L	SA
	Trichloroethene	24-Jan-96	EPA 8260	4	J	5		□g/L	SA
	Trichloroethene	26-Aug-96	EPA 8260	5.6		0.5	2	□g/L	SA

Refer to footnotes at end of table.

Table F.3-2 (Continued)
Tijeras Arroyo Groundwater Investigation--Summary of Groundwater Sampling VOC Analytical Results (Detections Only)

Well ID	Analyte	Sample Date	Analytical Method	Result	Laboratory Qualifier	Minimum Detection Limit	Reporting Limit	Units	Sample Type
WYO-1 (cont.)	Trichloroethene	21-Jan-97	EPA 8260	7.2		0.5	2	□g/L	SA
	Trichloroethene	22-Jan-97	EPA 8260	8		0.5	2	□g/L	SA
	Trichloroethene	23-Jan-97	EPA 8260	6.6		0.5	2	□g/L	SA
	Trichloroethene	23-Jan-97	EPA 8260	8.3		0.5	2	□g/L	SA
	Trichloroethene	27-Jan-97	EPA 8260	3.6		0.5	2	□g/L	SA
	Trichloroethene	10-Mar-97	EPA 8260	6.5		0.5		□g/L	SA
	Trichloroethene	10-Mar-97	EPA 8260	5		0.5	2	□g/L	SA
	Trichloroethene	10-Mar-97	EPA 8260	5		0.5	2	□g/L	SA
WYO-1	Trichloroethene	05-Jun-97	EPA 8260	8.64		1		□g/L	SA
	Trichloroethene	05-Jun-97	EPA 8260	5.6		0.5	2	□g/L	SA
	Trichloroethene	01-Oct-97	EPA 8260	2.9		0.5	2	□g/L	SA
	Trichloroethene	09-Dec-97	EPA 8260	5.1		0.5	2	□g/L	SA
	Trichloroethene	09-Dec-97	EPA 8260	5.4		0.5	2	□g/L	SA
	Trichloroethene	05-Mar-98	EPA 8260	7.5		0.4	1	□g/L	SA
	Trichloroethene	05-Mar-98	EPA 8260	7.7		0.4	1	□g/L	SA
	Trichloroethene	05-Mar-98	EPA 8260	6.3	H	0.03	1	□g/L	SA
	Trichloroethene	05-Mar-98	EPA 8260	7.9		0.03	1	□g/L	SA
	Trichloroethene	05-Mar-98	EPA 8260	7		0.5	2	□g/L	SA
	Trichloroethene	05-Mar-98	EPA 8260	7.2		0.5	2	□g/L	SA
	Trichloroethene	05-Mar-98	EPA 8260	6.8		0.5	2	□g/L	SA
	Trichloroethene	10-Jun-98	EPA 8260	6.3		0.5	2	□g/L	SA
	Trichloroethene	14-Sep-98	EPA 8260	6.8		0.5	2	□g/L	SA
	Trichloroethene	01-Dec-98	EPA 8260	6.1		0.5	2	□g/L	SA
	Trichloroethene	05-Mar-99	EPA 8260	6.1		0.5	2	□g/L	SA
	Trichloroethene	14-Jul-99	EPA 8260	4.8		0.5	2	□g/L	SA
	Trichloroethene	16-Sep-99	EPA 8260	5.1		0.6	1	□g/L	SA
	Trichloroethene	16-Sep-99	EPA 8260	5.6		0.5	2	□g/L	SA
	Trichloroethene	01-Dec-99	EPA 8260	5.9		0.5	2	□g/L	SA
	Trichloroethene	01-Jun-00	SW846 8260	5.68		0.15	1	□g/L	SA
	Trichloroethene	12-Jan-01	EPA 8260	6		0.5	2	□g/L	SA
	cis-1,2-Dichloroethene	24-Jan-96	EPA 8260	2		0.5		□g/L	SA
	cis-1,2-Dichloroethene	24-Jan-96	EPA 8260	1.8	J	5		□g/L	SA
	cis-1,2-Dichloroethene	26-Aug-96	EPA 8260	2.2		0.5	2	□g/L	SA
	cis-1,2-Dichloroethene	21-Jan-97	EPA 8260	2.4		0.5	2	□g/L	SA
	cis-1,2-Dichloroethene	22-Jan-97	EPA 8260	2.5		0.5	2	□g/L	SA
	cis-1,2-Dichloroethene	23-Jan-97	EPA 8260	2		0.5	2	□g/L	SA

Refer to footnotes at end of table.

Table F.3-2 (Continued)
Tijeras Arroyo Groundwater Investigation--Summary of Groundwater Sampling VOC Analytical Results (Detections Only)

Well ID	Analyte	Sample Date	Analytical Method	Result	Laboratory Qualifier	Minimum Detection Limit	Reporting Limit	Units	Sample Type
WYO-1 (cont.)	cis-1,2-Dichloroethene	23-Jan-97	EPA 8260	2.2		0.5	2	□g/L	SA
	cis-1,2-Dichloroethene	27-Jan-97	EPA 8260	1	J	0.5	2	□g/L	SA
	cis-1,2-Dichloroethene	10-Mar-97	EPA 8260	1.4	J	0.5	2	□g/L	SA
	cis-1,2-Dichloroethene	10-Mar-97	EPA 8260	1.4	J	0.5	2	□g/L	SA
	cis-1,2-Dichloroethene	05-Jun-97	EPA 8260	3.24		1		□g/L	SA
	cis-1,2-Dichloroethene	05-Jun-97	EPA 8260	1.9	J	0.5	2	□g/L	SA
	cis-1,2-Dichloroethene	01-Oct-97	EPA 8260	0.97	J	0.5	2	□g/L	SA
	cis-1,2-Dichloroethene	09-Dec-97	EPA 8260	1.3	J	0.5	2	□g/L	SA
	cis-1,2-Dichloroethene	09-Dec-97	EPA 8260	1.4	J	0.5	2	□g/L	SA
	cis-1,2-Dichloroethene	05-Mar-98	EPA 8260	1.8	H	0.03	1	□g/L	SA
	cis-1,2-Dichloroethene	05-Mar-98	EPA 8260	2.2		0.5	2	□g/L	SA
	cis-1,2-Dichloroethene	05-Mar-98	EPA 8260	2.3		0.5	2	□g/L	SA
	cis-1,2-Dichloroethene	05-Mar-98	EPA 8260	2.1		0.5	2	□g/L	SA
	cis-1,2-Dichloroethene	10-Jun-98	EPA 8260	2.1		0.5	2	□g/L	SA
	cis-1,2-Dichloroethene	14-Sep-98	EPA 8260	2.1		0.5	2	□g/L	SA
	cis-1,2-Dichloroethene	01-Dec-98	EPA 8260	2		0.5	2	□g/L	SA
	cis-1,2-Dichloroethene	05-Mar-99	EPA 8260	2.2		0.5	2	□g/L	SA
	cis-1,2-Dichloroethene	14-Jul-99	EPA 8260	1.4	J	0.5	2	□g/L	SA
	cis-1,2-Dichloroethene	16-Sep-99	EPA 8260	1.7		0.7	1	□g/L	SA
	cis-1,2-Dichloroethene	16-Sep-99	EPA 8260	2.1		0.5	2	□g/L	SA
	cis-1,2-Dichloroethene	01-Dec-99	EPA 8260	1.9	J	0.5	2	□g/L	SA
WYO-1	cis-1,2-Dichloroethene	01-Jun-00	SW846 8260	1.46		0.129	1	□g/L	SA
	cis-1,2-Dichloroethene	12-Jan-01	EPA 8260	1.8	J	0.5	2	□g/L	SA
	1,1-Dichloroethane	22-Jan-97	EPA 8260	1.4	J	0.5	2	□g/L	DU
	1,1-Dichloroethane	10-Mar-97	EPA 8260	1	J	0.5	2	□g/L	DU
	1,1-Dichloroethane	10-Mar-97	EPA 8260	1	J	0.5	2	□g/L	DU
	1,1-Dichloroethane	05-Jun-97	EPA 8260	1.69	J	1		□g/L	DU
	1,1-Dichloroethane	16-Sep-99	EPA 8260	1	J	0.5	2	□g/L	DU
	Trichloroethene	22-Jan-97	EPA 8260	7.2		0.5	2	□g/L	DU
	Trichloroethene	10-Mar-97	EPA 8260	5.2		0.5	2	□g/L	DU
	Trichloroethene	10-Mar-97	EPA 8260	5.2		0.5	2	□g/L	DU
	Trichloroethene	05-Jun-97	EPA 8260	8.42		1		□g/L	DU
	Trichloroethene	16-Sep-99	EPA 8260	6.3		0.5	2	□g/L	DU
	cis-1,2-Dichloroethene	22-Jan-97	EPA 8260	2.2		0.5	2	□g/L	DU
	cis-1,2-Dichloroethene	10-Mar-97	EPA 8260	1.6	J	0.5	2	□g/L	DU
	cis-1,2-Dichloroethene	10-Mar-97	EPA 8260	1.6	J	0.5	2	□g/L	DU

Refer to footnotes at end of table.

Table F.3-2 (Continued)
Tijeras Arroyo Groundwater Investigation--Summary of Groundwater Sampling VOC Analytical Results (Detections Only)

Well ID	Analyte	Sample Date	Analytical Method	Result	Laboratory Qualifier	Minimum Detection Limit	Reporting Limit	Units	Sample Type
WYO-1	cis-1,2-Dichloroethene	05-Jun-97	EPA 8260	2.94		1		□g/L	DU
(cont.)	cis-1,2-Dichloroethene	16-Sep-99	EPA 8260	2.2		0.5	2	□g/L	DU
WYO-2	1,1-Dichloroethane	24-Jan-96	EPA 8260	0.76		0.5		□g/L	SA
	1,1-Dichloroethane	26-Aug-96	EPA 8260	0.87	J	0.5	2	□g/L	SA
	1,1-Dichloroethane	10-Mar-97	EPA 8260	1.5		0.5		□g/L	SA
	1,1-Dichloroethane	10-Mar-97	EPA 8260	1.2	J	0.5	2	□g/L	SA
	1,1-Dichloroethane	10-Mar-97	EPA 8260	1.2	J	0.5	2	□g/L	SA
	1,1-Dichloroethane	05-Jun-97	EPA 8260	1.2	J	0.5	2	□g/L	SA
	1,1-Dichloroethane	01-Oct-97	EPA 8260	1.4	J	0.5	2	□g/L	SA
	1,1-Dichloroethane	09-Dec-97	EPA 8260	1.1	J	0.5	2	□g/L	SA
	1,1-Dichloroethane	06-Mar-98	EPA 8260	1.2	J	0.5	2	□g/L	SA
	1,1-Dichloroethane	10-Jun-98	EPA 8260	1.1	J	0.5	2	□g/L	SA
	1,1-Dichloroethane	14-Sep-98	EPA 8260	1.1	J	0.5	2	□g/L	SA
	1,1-Dichloroethane	01-Dec-98	EPA 8260	1.2	J	0.5	2	□g/L	SA
	1,1-Dichloroethane	05-Mar-99	EPA 8260	1.2	J	0.5	2	□g/L	SA
	1,1-Dichloroethane	19-Jul-99	EPA 8260	0.95	J	0.5	2	□g/L	SA
	1,1-Dichloroethane	16-Sep-99	EPA 8260	0.98	J	0.5	2	□g/L	SA
	1,1-Dichloroethane	01-Dec-99	EPA 8260	0.99	J	0.4	1	□g/L	SA
	1,1-Dichloroethene	16-Sep-99	EPA 8260	0.71	J	0.5	2	□g/L	SA
	Acetone	24-Jan-96	EPA 8260	4.6	J,B	10		□g/L	SA
	Acetone	24-Jan-96	EPA 8260	5.5	J,B	10		□g/L	SA
	Bromomethane	01-Dec-99	EPA 8260	2.6	B	0.4	1	□g/L	SA
	Toluene	24-Jan-96	EPA 8260	0.25	J,B	0.5		□g/L	SA
	Toluene	24-Jan-96	EPA 8260	1.3	J	5		□g/L	SA
	Trichloroethene	24-Jan-96	EPA 8260	3.7		0.5		□g/L	SA
	Trichloroethene	24-Jan-96	EPA 8260	3.5	J	5		□g/L	SA
	Trichloroethene	24-Jan-96	EPA 8260	6.7		0.5	2	□g/L	SA
	Trichloroethene	26-Aug-96	EPA 8260	3.7		0.5	2	□g/L	SA
	Trichloroethene	10-Mar-97	EPA 8260	7.5		0.5		□g/L	SA
	Trichloroethene	10-Mar-97	EPA 8260	6.1		0.5	2	□g/L	SA
	Trichloroethene	10-Mar-97	EPA 8260	6.1		0.5	2	□g/L	SA
	Trichloroethene	05-Jun-97	EPA 8260	6.6		0.5	2	□g/L	SA
	Trichloroethene	01-Oct-97	EPA 8260	5.6		0.5	2	□g/L	SA
	Trichloroethene	09-Dec-97	EPA 8260	5.9		0.5	2	□g/L	SA
WYO-2	Trichloroethene	06-Mar-98	EPA 8260	6.4		0.5	2	□g/L	SA
	Trichloroethene	10-Jun-98	EPA 8260	7		0.5	2	□g/L	SA

Refer to footnotes at end of table.

Table F.3-2 (Continued)
Tijeras Arroyo Groundwater Investigation--Summary of Groundwater Sampling VOC Analytical Results (Detections Only)

Well ID	Analyte	Sample Date	Analytical Method	Result	Laboratory Qualifier	Minimum Detection Limit	Reporting Limit	Units	Sample Type
WYO-2 (cont.)	Trichloroethene	14-Sep-98	EPA 8260	6.3		0.5	2	□g/L	SA
	Trichloroethene	01-Dec-98	EPA 8260	7.5		0.5	2	□g/L	SA
	Trichloroethene	05-Mar-99	EPA 8260	7.2		0.5	2	□g/L	SA
	Trichloroethene	19-Jul-99	EPA 8260	5.2		0.5	2	□g/L	SA
	Trichloroethene	16-Sep-99	EPA 8260	6.9		0.5	2	□g/L	SA
	Trichloroethene	01-Dec-99	EPA 8260	6.6		0.6	1	□g/L	SA
	Trichloroethene	01-Dec-99	EPA 8260	6.9		0.5	2	□g/L	SA
	Trichloroethene	16-Jan-01	EPA 8260	5.9		0.5	2	□g/L	SA
	Trichloroethene	16-Jan-01	EPA 8260	6.5		0.5	2	□g/L	SA
	cis-1,2-Dichloroethene	24-Jan-96	EPA 8260	1.6		0.5		□g/L	SA
	cis-1,2-Dichloroethene	24-Jan-96	EPA 8260	1.4	J	5		□g/L	SA
	cis-1,2-Dichloroethene	24-Jan-96	EPA 8260	0.64	J	0.5	2	□g/L	SA
	cis-1,2-Dichloroethene	26-Aug-96	EPA 8260	1.6	J	0.5	2	□g/L	SA
	cis-1,2-Dichloroethene	10-Mar-97	EPA 8260	1.7	J	0.5	2	□g/L	SA
	cis-1,2-Dichloroethene	10-Mar-97	EPA 8260	1.7	J	0.5	2	□g/L	SA
	cis-1,2-Dichloroethene	05-Jun-97	EPA 8260	2	J	0.5	2	□g/L	SA
	cis-1,2-Dichloroethene	01-Oct-97	EPA 8260	1.6	J	0.5	2	□g/L	SA
	cis-1,2-Dichloroethene	09-Dec-97	EPA 8260	1.4	J	0.5	2	□g/L	SA
	cis-1,2-Dichloroethene	06-Mar-98	EPA 8260	2		0.5	2	□g/L	SA
	cis-1,2-Dichloroethene	10-Jun-98	EPA 8260	2.1		0.5	2	□g/L	SA
	cis-1,2-Dichloroethene	14-Sep-98	EPA 8260	2.1		0.5	2	□g/L	SA
	cis-1,2-Dichloroethene	01-Dec-98	EPA 8260	2.2		0.5	2	□g/L	SA
	cis-1,2-Dichloroethene	05-Mar-99	EPA 8260	2.3		0.5	2	□g/L	SA
	cis-1,2-Dichloroethene	19-Jul-99	EPA 8260	1.4	J	0.5	2	□g/L	SA
	cis-1,2-Dichloroethene	16-Sep-99	EPA 8260	2.1		0.5	2	□g/L	SA
	cis-1,2-Dichloroethene	01-Dec-99	EPA 8260	2		0.7	1	□g/L	SA
	cis-1,2-Dichloroethene	01-Dec-99	EPA 8260	2		0.5	2	□g/L	SA
	cis-1,2-Dichloroethene	16-Jan-01	EPA 8260	1.7	J	0.5	2	□g/L	SA
	cis-1,2-Dichloroethene	16-Jan-01	EPA 8260	1.9	J	0.5	2	□g/L	SA
	1,1-Dichloroethane	10-Mar-97	EPA 8260	1.2	J	0.5	2	□g/L	DU
	1,1-Dichloroethane	10-Mar-97	EPA 8260	1.2	J	0.5	2	□g/L	DU
	1,1-Dichloroethane	01-Oct-97	EPA 8260	1.2	J	1	2	□g/L	DU
	Trichloroethene	10-Mar-97	EPA 8260	6.3		0.5	2	□g/L	DU
	Trichloroethene	10-Mar-97	EPA 8260	6.3		0.5	2	□g/L	DU
	Trichloroethene	01-Oct-97	EPA 8260	7.4		1	2	□g/L	DU
	Trichloroethene	01-Dec-99	EPA 8260	6.6		0.5	2	□g/L	DU

Refer to footnotes at end of table.

Table F.3-2 (Concluded)
Tijeras Arroyo Groundwater Investigation--Summary of Groundwater Sampling VOC Analytical Results (Detections Only)

Well ID	Analyte	Sample Date	Analytical Method	Result	Laboratory Qualifier	Minimum Detection Limit	Reporting Limit	Units	Sample Type
WYO-2 (cont.)	cis-1,2-Dichloroethene	10-Mar-97	EPA 8260	1.8	J	0.5	2	□g/L	DU
	cis-1,2-Dichloroethene	10-Mar-97	EPA 8260	1.8	J	0.5	2	□g/L	DU
	cis-1,2-Dichloroethene	01-Oct-97	EPA 8260	2.1		1	2	□g/L	DU
	cis-1,2-Dichloroethene	01-Dec-99	EPA 8260	1.9	J	0.5	2	□g/L	DU

B = Analyte detected in an associate blank.
DU = Duplicate.
H = Holding time was exceeded for the associated sample analysis.
J = Estimated value, analyte detected below the MDL.
µg/L = Microgram(s) per liter.
SA = Sample, aqueous.

ANNEX F-4
Tijeras Arroyo Groundwater Investigation—Radionuclide Analytical Results (Detections Only)

Table F.4-1
Tijeras Arroyo Groundwater Investigation—
Radionuclide Analytical Results (Detections Only)

Well ID	Radionuclide	Sample Date	Units	Activity ± □□□	MDA
PGS-2	Gross Beta	11-Jun-97	pCi/L	2.91±1.51	1.19
	Gross Beta	22-Sep-97	pCi/L	3.72±1.89	1.99
	Gross Beta	16-Dec-97	pCi/L	5.83±1.89	1.49
	Gross Beta	16-Mar-98	pCi/L	4.68±1.78	1.44
	Gross Beta	11-Jun-98	pCi/L	3.67±1.53	1.36
	Gross Beta	22-Sep-98	pCi/L	2.03±0.702	0.638
	Gross Beta	08-Dec-98	pCi/L	2.58±0.918	0.776
	Gross Beta	12-Mar-99	pCi/L	3.15±1.35	1.11
	Gross Beta	30-Jun-99	pCi/L	2.42±0.648	0.503
	Gross Beta	23-Sep-99	pCi/L	2.19±0.672	0.489
	Uranium-234	11-Jun-97	pCi/L	2.93±0.467	0.05
	Uranium-234	22-Sep-97	pCi/L	4.93±0.536	0.017
	Uranium-234	16-Dec-97	pCi/L	5.21±0.605	0.0287
	Uranium-234	16-Mar-98	pCi/L	5.71±0.636	0.0165
	Uranium-234	11-Jun-98	pCi/L	5.93±0.635	0.0213
	Uranium-234	22-Sep-98	pCi/L	0.913±0.196	0.06
	Uranium-234	08-Dec-98	pCi/L	0.903±0.174	0.0273
	Uranium-234	08-Dec-98	pCi/L	2.32±0.394	0.0603
	Uranium-234	12-Mar-99	pCi/L	0.948±0.296	0.0386
	Uranium-234	30-Jun-99	pCi/L	0.322±0.107	0.0317
	Uranium-234	23-Sep-99	pCi/L	0.886±0.239	0.0255
	Uranium-234	03-Dec-99	pCi/L	0.986±0.179	0.0195
	Uranium-235	11-Jun-97	pCi/L	0.179±0.0778	0.0422
	Uranium-235	22-Sep-97	pCi/L	0.163±0.0526	0.015
	Uranium-235	16-Dec-97	pCi/L	0.121±0.0556	0.015
	Uranium-235	16-Mar-98	pCi/L	0.148±0.0534	0.0074
	Uranium-235	11-Jun-98	pCi/L	0.211±0.0594	0.019
	Uranium-235	22-Sep-98	pCi/L	0.0409±0.0368	0.024
	Uranium-235	08-Dec-98	pCi/L	0.0917±0.0654	0.0549
	Uranium-235	30-Jun-99	pCi/L	0.015±0.0212	0.0134
	Uranium-235	23-Sep-99	pCi/L	0.0731±0.0647	0.0128
	Uranium-238	11-Jun-97	pCi/L	0.979±0.253	0.0515
	Uranium-238	22-Sep-97	pCi/L	1.53±0.209	0.0172
	Uranium-238	16-Dec-97	pCi/L	1.68±0.253	0.0245
	Uranium-238	16-Mar-98	pCi/L	2.06±0.274	0.0152
	Uranium-238	11-Jun-98	pCi/L	1.88±0.243	0.0153
	Uranium-238	22-Sep-98	pCi/L	0.167±0.0769	0.0153
	Uranium-238	08-Dec-98	pCi/L	0.386±0.106	0.0197

Refer to footnotes at end of table.

Table F.4-1 (Continued)
Tijeras Arroyo Groundwater Investigation—
Radionuclide Analytical Results (Detections Only)

Well ID	Radionuclide	Sample Date	Units	Activity □□□	MDA
PGS-2 (cont.)	Uranium-238	08-Dec-98	pCi/L	0.969±0.233	0.0527
	Uranium-238	12-Mar-99	pCi/L	0.499±0.207	0.0623
	Uranium-238	30-Jun-99	pCi/L	0.149±0.0686	0.0189
	Uranium-238	23-Sep-99	pCi/L	0.339±0.14	0.0414
	Uranium-238	03-Dec-99	pCi/L	0.422±0.105	0.0172
	Gross Alpha	11-Jun-97	pCi/L	2.61±1.38	1.23
	Gross Alpha	22-Sep-97	pCi/L	10.8±2.5	1.33
	Gross Alpha	16-Dec-97	pCi/L	12.1±2.93	1.15
	Gross Alpha	16-Mar-98	pCi/L	10.1±2.63	1.24
	Gross Alpha	11-Jun-98	pCi/L	3.23±1.15	0.625
	Gross Alpha	22-Sep-98	pCi/L	1.49±0.782	0.591
	Gross Alpha	08-Dec-98	pCi/L	0.798±0.84	0.69
	Gross Alpha	12-Mar-99	pCi/L	2.68±1.09	0.702
	Gross Alpha	30-Jun-99	pCi/L	0.922±0.459	0.328
	Gross Alpha	23-Sep-99	pCi/L	1.83±0.588	0.398
	Gross Alpha	03-Dec-99	pCi/L	3.13±0.907	0.899
	Gross Beta	26-Jan-96	pCi/L	21±11	7.8
	Gross Beta	03-Dec-99	pCi/L	3.38±1.25	0.968
TA1-W-01	Gross Beta	15-Dec-97	pCi/L	3.55±1.19	0.952
	Gross Beta	12-Mar-98	pCi/L	2.39±0.911	0.769
	Gross Beta	11-Jun-98	pCi/L	2.74±0.541	0.419
	Gross Beta	21-Aug-98	pCi/L	3.06±0.71	0.558
	Gross Beta	17-Sep-98	pCi/L	2.67±0.7	0.603
	Gross Beta	10-Mar-99	pCi/L	1.99±0.849	0.833
	Gross Beta	22-Jul-99	pCi/L	3.53±0.651	0.482
	Gross Beta	16-Sep-99	pCi/L	8.83±1.04	0.733
	Radium-228	21-Aug-98	pCi/L	13.9±17.8	7.86
	Uranium-234	15-Dec-97	pCi/L	2.1±0.284	0.0289
	Uranium-234	12-Mar-98	pCi/L	2.08±0.289	0.0149
	Uranium-234	11-Jun-98	pCi/L	2.09±0.282	0.0253
	Uranium-234	17-Sep-98	pCi/L	2.07±0.313	0.0242
	Uranium-234	10-Mar-99	pCi/L	2.07±0.309	0.0222
	Uranium-234	22-Jul-99	pCi/L	1.82±0.395	0.0208

Refer to footnotes at end of table.

Table F.4-1 (Continued)
Tijeras Arroyo Groundwater Investigation—
Radionuclide Analytical Results (Detections Only)

Well ID	Radionuclide	Sample Date	Units	Activity . □□□	MDA
TA1-W-01 (cont.)	Uranium-234	16-Sep-99	pCi/L	2.48±0.38	0.0322
	Uranium-234	09-Dec-99	pCi/L	1.97±0.279	0.0224
	Uranium-235	15-Dec-97	pCi/L	0.0865±0.0458	0.0157
	Uranium-235	12-Mar-98	pCi/L	0.0845±0.0418	0
	Uranium-235	11-Jun-98	pCi/L	0.155±0.0574	0.0226
	Uranium-235	17-Sep-98	pCi/L	0.0591±0.0399	0.0133
	Uranium-235	10-Mar-99	pCi/L	0.0259±0.0306	0.0155
	Uranium-235	22-Jul-99	pCi/L	0.0446±0.0449	0.0181
	Uranium-235	16-Sep-99	pCi/L	0.0362±0.0423	0.0157
	Uranium-238	15-Dec-97	pCi/L	1.02±0.172	0.0241
	Uranium-238	12-Mar-98	pCi/L	0.882±0.159	0.0105
	Uranium-238	11-Jun-98	pCi/L	1.05±0.172	0.0192
	Uranium-238	17-Sep-98	pCi/L	1.13±0.206	0.00938
	Uranium-238	10-Mar-99	pCi/L	0.998±0.189	0.022
	Uranium-238	22-Jul-99	pCi/L	0.845±0.226	0.0148
	Uranium-238	16-Sep-99	pCi/L	1.09±0.218	0.0369
	Uranium-238	09-Dec-99	pCi/L	0.866±0.154	0.0107
	Gross Alpha	15-Dec-97	pCi/L	4.7±1.5	0.604
	Gross Alpha	12-Mar-98	pCi/L	4.3±1.08	0.657
	Gross Alpha	11-Jun-98	pCi/L	3.94±0.708	0.291
	Gross Alpha	21-Aug-98	pCi/L	2.5±0.923	0.593
	Gross Alpha	17-Sep-98	pCi/L	3.79±1.1	0.55
	Gross Alpha	10-Mar-99	pCi/L	4.62±1.12	0.467
	Gross Alpha	22-Jul-99	pCi/L	2.42±0.608	0.279
	Gross Alpha	16-Sep-99	pCi/L	4.58±1.28	0.722
	Gross Alpha	09-Dec-99	pCi/L	5.53±1.32	0.695
	Gross Beta	09-Dec-99	pCi/L	3.24±1.38	1.07
TA1-W-02	Gross Beta	24-Mar-98	pCi/L	15.9±1.51	0.823
	Gross Beta	18-Jun-98	pCi/L	3.99±1.64	1.44
	Gross Beta	21-Sep-98	pCi/L	2.73±0.737	0.634
	Gross Beta	03-Dec-98	pCi/L	2.71±1.05	0.849
	Gross Beta	15-Mar-99	pCi/L	2.45±0.796	0.777
	Gross Beta	27-Jul-99	pCi/L	2.62±0.708	0.519
	Gross Beta	10-Sep-99	pCi/L	3.07±0.768	0.621
	Uranium-234	24-Mar-98	pCi/L	3.23±0.456	0.0398
	Uranium-234	18-Jun-98	pCi/L	1.96±0.325	0.0357
	Uranium-234	21-Sep-98	pCi/L	1.96±0.269	0.0366

Refer to footnotes at end of table.

Table F.4-1 (Continued)
Tijeras Arroyo Groundwater Investigation—
Radionuclide Analytical Results (Detections Only)

Well ID	Radionuclide	Sample Date	Units	Activity	MDA
TA1-W-02 (cont.)	Uranium-234	03-Dec-98	pCi/L	2.39±0.286	0.0243
	Uranium-234	15-Mar-99	pCi/L	2.38±0.401	0.0267
	Uranium-234	27-Jul-99	pCi/L	2.71±0.561	0.0296
	Uranium-234	10-Sep-99	pCi/L	2.24±0.383	0.0483
	Uranium-234	22-Nov-99	pCi/L	2.15±0.338	0.00975
	Uranium-235	24-Mar-98	pCi/L	0.147±0.0813	0.0357
	Uranium-235	18-Jun-98	pCi/L	0.118±0.074	0.0365
	Uranium-235	21-Sep-98	pCi/L	0.276±0.0767	0.0148
	Uranium-235	03-Dec-98	pCi/L	0.0336±0.0272	0.0225
	Uranium-235	15-Mar-99	pCi/L	0.0509±0.0482	0.0204
	Uranium-235	27-Jul-99	pCi/L	0.0291±0.0455	0.025
	Uranium-235	10-Sep-99	pCi/L	0.0302±0.0479	0.0224
	Uranium-235	22-Nov-99	pCi/L	0.0611±0.0454	0.00978
	Uranium-238	24-Mar-98	pCi/L	1.47±0.254	0.0285
	Uranium-238	18-Jun-98	pCi/L	1.02±0.214	0.035
	Uranium-238	21-Sep-98	pCi/L	1.07±0.175	0.00738
	Uranium-238	03-Dec-98	pCi/L	1.14±0.164	0.0182
	Uranium-238	15-Mar-99	pCi/L	0.995±0.225	0.0325
	Uranium-238	27-Jul-99	pCi/L	0.797±0.227	0.0222
	Uranium-238	10-Sep-99	pCi/L	1.08±0.237	0.0509
	Uranium-238	22-Nov-99	pCi/L	1.27±0.234	0.0134
	Gross Alpha	24-Mar-98	pCi/L	10.5±2.08	0.777
	Gross Alpha	18-Jun-98	pCi/L	4.48±1.37	0.68
	Gross Alpha	21-Sep-98	pCi/L	2.87±0.963	0.536
	Gross Alpha	03-Dec-98	pCi/L	2.12±1.01	0.7
	Gross Alpha	15-Mar-99	pCi/L	4.74±1.19	0.516
	Gross Alpha	27-Jul-99	pCi/L	3.34±0.731	0.31
	Gross Alpha	10-Sep-99	pCi/L	5.34±1.07	0.487
	Gross Alpha	22-Nov-99	pCi/L	5.4±1.16	0.749
	Uranium-234	12-Feb-98	pCi/L	0.0591±0.0361	0.0294
	Uranium-235	12-Feb-98	pCi/L	0.0269±0.0242	0.018
TA1-W-03	Gross Beta	11-Mar-98	pCi/L	2.08±1.85	1.48
	Gross Beta	17-Sep-98	pCi/L	1.41±0.441	0.413
	Gross Beta	03-Dec-98	pCi/L	4.44±2.74	2.16
	Gross Beta	10-Mar-99	pCi/L	4.62±2.75	2.24
	Gross Beta	13-Jul-99	pCi/L	2.25±2.82	2.14
	Gross Beta	14-Sep-99	pCi/L	2.24±1.53	1.25
	Tritium	03-Dec-98	pCi/L	147±134	108

Refer to footnotes at end of table.

Table F.4-1 (Continued)
Tijeras Arroyo Groundwater Investigation—
Radionuclide Analytical Results (Detections Only)

Well ID	Radionuclide	Sample Date	Units	Activity ±□□□	MDA
TA1-W-03 (cont.)	Uranium-234	11-Mar-98	pCi/L	0.839±0.148	0.0141
	Uranium-234	17-Jun-98	pCi/L	1.04±0.228	0.0354
	Uranium-234	17-Sep-98	pCi/L	0.784±0.15	0.0238
	Uranium-234	03-Dec-98	pCi/L	0.861±0.137	0.0291
	Uranium-234	10-Mar-99	pCi/L	0.824±0.168	0.0245
	Uranium-234	13-Jul-99	pCi/L	0.903±0.238	0.039
	Uranium-234	14-Sep-99	pCi/L	1.04±0.234	0.0442
	Uranium-234	24-Nov-99	pCi/L	0.866±0.176	0.0276
	Uranium-235	17-Jun-98	pCi/L	0.257±0.107	0.0352
	Uranium-235	03-Dec-98	pCi/L	0.108±0.0435	0.0248
	Uranium-235	10-Mar-99	pCi/L	0.0226±0.0267	0.0134
	Uranium-235	24-Nov-99	pCi/L	0.0438±0.0334	0
	Uranium-238	11-Mar-98	pCi/L	0.331±0.0845	0.0127
	Uranium-238	17-Jun-98	pCi/L	0.416±0.136	0.0332
	Uranium-238	17-Sep-98	pCi/L	0.369±0.0947	0.00835
	Uranium-238	03-Dec-98	pCi/L	0.374±0.0841	0.0257
	Uranium-238	10-Mar-99	pCi/L	0.409±0.111	0.0205
	Uranium-238	13-Jul-99	pCi/L	0.47±0.164	0.0408
	Uranium-238	14-Sep-99	pCi/L	0.544±0.158	0.0485
	Uranium-238	24-Nov-99	pCi/L	0.386±0.108	0.0148
	Gross Alpha	11-Mar-98	pCi/L	1.93±1.45	1.58
	Gross Alpha	17-Sep-98	pCi/L	0.727±0.471	0.415
	Gross Alpha	03-Dec-98	pCi/L	2.78±1.89	1.52
	Gross Alpha	10-Mar-99	pCi/L	4.18±1.77	1.25
	Gross Alpha	14-Sep-99	pCi/L	1.63±1.91	1.39
	Gross Beta	03-Dec-98	pCi/L	2.32±2.88	2.23
	Uranium-234	03-Dec-98	pCi/L	0.95±0.139	0.0243
	Uranium-235	03-Dec-98	pCi/L	0.102±0.039	0.0207
	Uranium-238	03-Dec-98	pCi/L	0.443±0.0852	0.0201
TA1-W-04	Gross Beta	14-Dec-98	pCi/L	18.6±2.09	1.21
	Gross Beta	17-Mar-99	pCi/L	9.27±1.24	0.926
	Gross Beta	30-Jun-99	pCi/L	5.62±0.789	0.529
	Gross Beta	22-Sep-99	pCi/L	6.52±0.859	0.677
	Uranium-234	14-Dec-98	pCi/L	3.3±0.427	0.0223
	Uranium-234	17-Mar-99	pCi/L	2.77±0.527	0.0859
	Uranium-234	30-Jun-99	pCi/L	2.56±0.53	0.0749
	Uranium-234	22-Sep-99	pCi/L	2.98±0.627	0.0899
	Uranium-234	08-Dec-99	pCi/L	2.59±0.436	0.0575

Refer to footnotes at end of table.

Table F.4-1 (Continued)
Tijeras Arroyo Groundwater Investigation—
Radionuclide Analytical Results (Detections Only)

Well ID	Radionuclide	Sample Date	Units	Activity □□□	MDA
TA1-W-04 (cont.)	Uranium-235	14-Dec-98	pCi/L	0.065±0.0428	0.0129
	Uranium-235	17-Mar-99	pCi/L	0.0507±0.0588	0.0281
	Uranium-235	22-Sep-99	pCi/L	0.182±0.13	0.0534
	Uranium-238	14-Dec-98	pCi/L	1.23±0.212	0.0163
	Uranium-238	17-Mar-99	pCi/L	0.944±0.272	0.0485
	Uranium-238	30-Jun-99	pCi/L	1.28±0.349	0.0573
	Uranium-238	22-Sep-99	pCi/L	1.07±0.335	0.0652
	Uranium-238	08-Dec-99	pCi/L	1.13±0.254	0.0379
	Gross Alpha	14-Dec-98	pCi/L	3.62±1.68	0.946
	Gross Alpha	17-Mar-99	pCi/L	6.48±1.39	0.61
	Gross Alpha	30-Jun-99	pCi/L	5.26±0.933	0.4
	Gross Alpha	22-Sep-99	pCi/L	6.01±1.21	0.581
	Gross Alpha	08-Dec-99	pCi/L	4.77±1.15	0.718
	Gross Beta	08-Dec-99	pCi/L	6.04±1.61	1.19
TA1-W-05	Gross Beta	16-Dec-98	pCi/L	3.16±1.32	1.22
	Gross Beta	19-Mar-99	pCi/L	2.65±0.977	0.836
	Gross Beta	17-Jun-99	pCi/L	2.79±0.645	0.497
	Gross Beta	22-Sep-99	pCi/L	2.92±0.779	0.628
	Radium-226	29-May-00	pCi/L	8.65±8.44	3.75
	Radium-228	29-May-00	pCi/L	0.657±0.734	0.672
	Uranium-234	16-Dec-98	pCi/L	2.19±0.32	0.0298
	Uranium-234	19-Mar-99	pCi/L	2.28±0.486	0.0911
	Uranium-234	17-Jun-99	pCi/L	2.37±0.429	0.0757
	Uranium-234	22-Sep-99	pCi/L	2.22±0.506	0.0868
	Uranium-234	29-May-00	pCi/L	2.08±0.536	0.123
	Uranium-234	07-Dec-99	pCi/L	2.27±0.304	0.0116
	Uranium-235	16-Dec-98	pCi/L	0.0481±0.0382	0.0133
	Uranium-235	19-Mar-99	pCi/L	0.0559±0.0648	0.0295
	Uranium-235	17-Jun-99	pCi/L	0.0304±0.0435	0.0138
	Uranium-235	22-Sep-99	pCi/L	0.276±0.165	0.0633
	Uranium-236	07-Dec-99	pCi/L	0.0548±0.0333	0.00623
	Uranium-238	16-Dec-98	pCi/L	1.09±0.199	0.0167
	Uranium-238	19-Mar-99	pCi/L	1.01±0.297	0.0552
	Uranium-238	17-Jun-99	pCi/L	1.37±0.298	0.0663
	Uranium-238	22-Sep-99	pCi/L	1.48±0.395	0.0665
	Uranium-238	07-Dec-99	pCi/L	1±0.168	0.0155
	Uranium-238	29-May-00	pCi/L	0.874±0.328	0.0735

Refer to footnotes at end of table.

Table F.4-1 (Continued)
Tijeras Arroyo Groundwater Investigation—
Radionuclide Analytical Results (Detections Only)

Well ID	Radionuclide	Sample Date	Units	Activity	MDA
TA1-W-05 (cont.)	Gross Alpha	16-Dec-98	pCi/L	4.22±1.54	0.766
	Gross Alpha	19-Mar-99	pCi/L	3.64±1.03	0.301
	Gross Alpha	17-Jun-99	pCi/L	5.56±1.03	0.406
	Gross Alpha	22-Sep-99	pCi/L	4.57±1.02	0.533
	Gross Alpha	07-Dec-99	pCi/L	4.87±1.14	0.703
	Gross Alpha	29-May-00	pCi/L	0.68±0.541	0.619
	Gross Beta	07-Dec-99	pCi/L	4.88±1.66	1.16
TA1-W-06	Gross Beta	24-Mar-98	pCi/L	1.54±0.736	0.606
	Gross Beta	18-Jun-98	pCi/L	2.07±1.72	1.55
	Gross Beta	21-Sep-98	pCi/L	1.79±0.591	0.565
	Gross Beta	03-Dec-98	pCi/L	1.93±0.809	0.59
	Gross Beta	15-Mar-99	pCi/L	1.96±1.37	1.14
	Gross Beta	27-Jul-99	pCi/L	3.4±0.713	0.52
	Gross Beta	10-Sep-99	pCi/L	2.59±0.721	0.605
	Uranium-234	24-Mar-98	pCi/L	0.77±0.168	0.0349
	Uranium-234	18-Jun-98	pCi/L	0.764±0.185	0.0428
	Uranium-234	21-Sep-98	pCi/L	0.796±0.153	0.0409
	Uranium-234	03-Dec-98	pCi/L	0.893±0.131	0.0237
	Uranium-234	15-Mar-99	pCi/L	0.967±0.221	0.0188
	Uranium-234	27-Jul-99	pCi/L	0.826±0.211	0.0275
	Uranium-234	10-Sep-99	pCi/L	0.908±0.22	0.0481
	Uranium-234	22-Nov-99	pCi/L	0.839±0.264	0.0494
	Uranium-235	24-Mar-98	pCi/L	0.0498±0.0418	0.0207
	Uranium-235	18-Jun-98	pCi/L	0.0783±0.0571	0.0311
	Uranium-235	21-Sep-98	pCi/L	0.0743±0.0404	0.0158
	Uranium-235	03-Dec-98	pCi/L	0.0535±0.0302	0.0208
	Uranium-235	27-Jul-99	pCi/L	0.0218±0.0303	0.0165
	Uranium-235	10-Sep-99	pCi/L	0.0358±0.042	0.0116
	Uranium-238	24-Mar-98	pCi/L	0.351±0.109	0.0279
	Uranium-238	18-Jun-98	pCi/L	0.373±0.126	0.0371
	Uranium-238	21-Sep-98	pCi/L	0.309±0.0879	0.0133
	Uranium-238	03-Dec-98	pCi/L	0.457±0.0842	0.0174
	Uranium-238	15-Mar-99	pCi/L	0.37±0.127	0.0325
	Uranium-238	27-Jul-99	pCi/L	0.33±0.118	0.0187
	Uranium-238	10-Sep-99	pCi/L	0.32±0.127	0.0568
	Uranium-238	22-Nov-99	pCi/L	0.342±0.162	0.0423
	Gross Alpha	24-Mar-98	pCi/L	1.06±0.615	0.432
	Gross Alpha	18-Jun-98	pCi/L	3.04±1.88	1.24

Refer to footnotes at end of table.

Table F.4-1 (Continued)
Tijeras Arroyo Groundwater Investigation—
Radionuclide Analytical Results (Detections Only)

Well ID	Radionuclide	Sample Date	Units	Activity □□□	MDA
TA1-W-06 (cont.)	Gross Alpha	21-Sep-98	pCi/L	0.959±0.61	0.548
	Gross Alpha	03-Dec-98	pCi/L	1.93±0.789	0.538
	Gross Alpha	15-Mar-99	pCi/L	3.12±1.18	0.727
	Gross Alpha	27-Jul-99	pCi/L	1.82±0.64	0.352
	Gross Alpha	10-Sep-99	pCi/L	1.65±0.767	0.536
	Gross Alpha	22-Nov-99	pCi/L	2.2±1.26	1.42
TA1-W-07	Gross Beta	16-Dec-98	pCi/L	3.62±1.47	1.19
	Gross Beta	10-Mar-99	pCi/L	2.92±1.26	1.07
	Gross Beta	21-Jul-99	pCi/L	4.17±1.32	1.01
	Uranium-234	16-Dec-98	pCi/L	1.13±0.207	0.0249
	Uranium-234	10-Mar-99	pCi/L	1.11±0.221	0.0279
	Uranium-234	21-Jul-99	pCi/L	1.09±0.247	0.0199
	Uranium-234	16-Sep-99	pCi/L	0.903±0.206	0.0261
	Uranium-234	06-Dec-99	pCi/L	0.909±0.154	0.0161
	Uranium-235	10-Mar-99	pCi/L	0.0239±0.034	0.0181
	Uranium-235	21-Jul-99	pCi/L	0.0618±0.0501	0.0199
	Uranium-235	16-Sep-99	pCi/L	0.0564±0.0496	0.0125
	Uranium-236	06-Dec-99	pCi/L	0.0421±0.0326	0.0116
	Uranium-238	16-Dec-98	pCi/L	0.573±0.137	0.0172
	Uranium-238	10-Mar-99	pCi/L	0.51±0.138	0.0213
	Uranium-238	21-Jul-99	pCi/L	0.451±0.139	0.0199
	Uranium-238	16-Sep-99	pCi/L	0.546±0.151	0.0355
	Uranium-238	06-Dec-99	pCi/L	0.414±0.0939	0.017
	Gross Alpha	16-Dec-98	pCi/L	1.87±1.51	1.03
	Gross Alpha	10-Mar-99	pCi/L	4.89±1.23	0.663
	Gross Alpha	21-Jul-99	pCi/L	4.2±1.27	0.652
	Gross Alpha	16-Sep-99	pCi/L	2.67±1.6	1.12
	Gross Alpha	06-Dec-99	pCi/L	1.99±1.49	1.29
	Gross Beta	06-Dec-99	pCi/L	6.08±2.72	2.4
TA2-NW1-325	Americium-241	20-Jun-95	pCi/L	0±10	5.9
	Cesium-134	20-Jun-95	pCi/L	0.8±4	2.9
	Cesium-137	20-Jun-95	pCi/L	2.1±4.7	3.7
	Gross Beta	04-Jun-97	pCi/L	2.9±0.745	0.541

Refer to footnotes at end of table.

Table F.4-1 (Continued)
Tijeras Arroyo Groundwater Investigation—
Radionuclide Analytical Results (Detections Only)

Well ID	Radionuclide	Sample Date	Units	Activity	MDA
TA2-NW1-325 (cont.)	Gross Beta	26-Sep-97	pCi/L	3.79±1.09	1.06
	Gross Beta	08-Dec-97	pCi/L	3.88±0.831	0.564
	Gross Beta	09-Mar-98	pCi/L	2.07±0.974	0.812
	Gross Beta	16-Jun-98	pCi/L	3.62±0.818	0.62
	Gross Beta	15-Sep-98	pCi/L	1.58±0.638	0.611
	Gross Beta	30-Nov-98	pCi/L	3.08±0.98	0.774
	Gross Beta	08-Mar-99	pCi/L	1.86±0.881	0.86
	Gross Beta	15-Jun-99	pCi/L	2.49±0.685	0.521
	Gross Beta	15-Sep-99	pCi/L	2.93±0.872	0.744
	Plutonium-238	09-Mar-93	pCi/L	0.001±0.016	0.032
	Plutonium-238	13-Oct-94	pCi/L	0±999.9999	0.006
	Plutonium-239/240	09-Mar-93	pCi/L	0.02±0.028	0.024
	Plutonium-239/240	13-Oct-94	pCi/L	0.007±999.9999	0.006
	Tritium	09-Mar-93	pCi/L	86±240	390
	Tritium	31-Mar-93	pCi/L	280±250	390
	Tritium	06-Jan-94	pCi/L	76±150	250
	Tritium	18-Jul-94	pCi/L	230±150	220
	Tritium	25-Jan-96	pCi/L	140±140	72
	Uranium-233	20-Jun-95	pCi/L	0.48±0.12	0.038
	Uranium-234	09-Mar-93	pCi/L	0.2±0.088	0.011
	Uranium-234	31-Mar-93	pCi/L	0.2±0.086	0.035
	Uranium-234	04-Jun-97	pCi/L	0.922±0.207	0.0448
	Uranium-234	26-Sep-97	pCi/L	0.704±0.123	0.0151
	Uranium-234	08-Dec-97	pCi/L	0.684±0.188	0.0451
	Uranium-234	09-Mar-98	pCi/L	0.802±0.154	0.035
	Uranium-234	16-Jun-98	pCi/L	0.752±0.185	0.0363
	Uranium-234	15-Sep-98	pCi/L	0.615±0.128	0.0235
	Uranium-234	30-Nov-98	pCi/L	0.672±0.116	0.0255
	Uranium-234	08-Mar-99	pCi/L	0.773±0.169	0.026
	Uranium-234	15-Jun-99	pCi/L	0.68±0.188	0.069
	Uranium-234	15-Sep-99	pCi/L	0.849±0.206	0.0332
	Uranium-234	17-Nov-99	pCi/L	0.816±0.217	0.0579
	Uranium-234	13-Oct-94	pCi/L	1.31±999.9999	0.18
	Uranium-235	09-Mar-93	pCi/L	0.005±0.018	0.028
	Uranium-235	31-Mar-93	pCi/L	0.009±0.018	0.01
	Uranium-235	20-Jun-95	pCi/L	4±27	15

Refer to footnotes at end of table.

Table F.4-1 (Continued)
Tijeras Arroyo Groundwater Investigation—
Radionuclide Analytical Results (Detections Only)

Well ID	Radionuclide	Sample Date	Units	Activity ± □□□	MDA
TA2-NW1-325 (cont.)	Uranium-235	20-Jun-95	pCi/L	0.02±0.026	0.014
	Uranium-235	04-Jun-97	pCi/L	0.068±0.0493	0.0313
	Uranium-235	26-Sep-97	pCi/L	0.0198±0.0199	0.0152
	Uranium-235	08-Dec-97	pCi/L	0.0234±0.039	0.023
	Uranium-235	09-Mar-98	pCi/L	0.0301±0.0401	0.0288
	Uranium-235	16-Jun-98	pCi/L	0.167±0.087	0.0359
	Uranium-235	15-Sep-98	pCi/L	0.0407±0.0341	0.0167
	Uranium-235	30-Nov-98	pCi/L	0.0301±0.0233	0.0213
	Uranium-235	08-Mar-99	pCi/L	0.0853±0.053	0.0165
	Uranium-235	15-Sep-99	pCi/L	0.0434±0.0507	0.0188
	Uranium-238	09-Mar-93	pCi/L	0.21±0.092	0.028
	Uranium-238	31-Mar-93	pCi/L	0.22±0.09	0.01
	Uranium-238	13-Oct-94	pCi/L	0.34±999.9999	0.16
	Uranium-238	20-Jun-95	pCi/L	0.238±0.086	0.036
	Uranium-238	04-Jun-97	pCi/L	0.359±0.127	0.0364
	Uranium-238	26-Sep-97	pCi/L	0.339±0.0809	0.0192
	Uranium-238	08-Dec-97	pCi/L	0.145±0.0814	0.0353
	Uranium-238	09-Mar-98	pCi/L	0.32±0.0917	0.0255
	Uranium-238	16-Jun-98	pCi/L	0.264±0.111	0.0404
	Uranium-238	15-Sep-98	pCi/L	0.216±0.0712	0.0132
	Uranium-238	30-Nov-98	pCi/L	0.269±0.0654	0.0188
	Uranium-238	08-Mar-99	pCi/L	0.362±0.109	0.0232
	Uranium-238	15-Jun-99	pCi/L	0.33±0.128	0.065
	Uranium-238	15-Sep-99	pCi/L	0.338±0.122	0.0411
	Uranium-238	17-Nov-99	pCi/L	0.227±0.12	0.0474
	Gross Alpha	09-Mar-93	pCi/L	1.5±1	0.89
	Gross Alpha	31-Mar-93	pCi/L	0.05±0.47	0.74
	Gross Alpha	06-Jan-94	pCi/L	4.1±2.5	2.4
	Gross Alpha	11-Apr-94	pCi/L	4.8±1.2	1
	Gross Alpha	18-Jul-94	pCi/L	1±1.7	2.9
	Gross Alpha	27-Sep-95	pCi/L	1±2.2	5.1
	Gross Alpha	25-Jan-96	pCi/L	6.4±3.6	1.7
	Gross Alpha	04-Jun-97	pCi/L	2.07±0.871	0.515
	Gross Alpha	26-Sep-97	pCi/L	2.1±1.15	0.893
	Gross Alpha	08-Dec-97	pCi/L	3.44±0.845	0.42

Refer to footnotes at end of table.

Table F.4-1 (Continued)
Tijeras Arroyo Groundwater Investigation—
Radionuclide Analytical Results (Detections Only)

Well ID	Radionuclide	Sample Date	Units	Activity □□□	MDA
TA2-NW1-325 (cont.)	Gross Alpha	16-Jun-98	pCi/L	1.79±0.843	0.505
	Gross Alpha	15-Sep-98	pCi/L	1.81±0.755	0.414
	Gross Alpha	30-Nov-98	pCi/L	1.57±0.81	0.587
	Gross Alpha	08-Mar-99	pCi/L	1.03±0.796	0.558
	Gross Alpha	15-Jun-99	pCi/L	3.73±1.01	0.494
	Gross Alpha	15-Sep-99	pCi/L	2.73±1.25	0.818
	Gross Alpha	17-Nov-99	pCi/L	2.44±0.879	0.774
	Gross Beta	09-Mar-93	pCi/L	1.8±1.5	2.3
	Gross Beta	31-Mar-93	pCi/L	0.09±1.3	2.1
	Gross Beta	06-Jan-94	pCi/L	3.1±1.6	2.4
	Gross Beta	11-Apr-94	pCi/L	5.3±0.78	1
	Gross Beta	18-Jul-94	pCi/L	4.3±1.6	2.1
	Gross Beta	27-Sep-95	pCi/L	1.7±2.5	4.2
	Gross Beta	25-Jan-96	pCi/L	3.9±3.3	2.6
	Tritium	18-Jul-94	pCi/L	400±150	220
	Tritium	13-Oct-94	pCi/L	20±999.9999	180
	Gross Alpha	11-Apr-94	pCi/L	4.7±1.1	0.84
	Gross Alpha	18-Jul-94	pCi/L	3.4±2.4	2.8
	Gross Beta	11-Apr-94	pCi/L	5±0.76	1
	Gross Beta	18-Jul-94	pCi/L	2.9±1.7	2.5
TA2-NW1-595	Gross Beta	10-Jun-97	pCi/L	5.04±0.583	0.388
	Gross Beta	30-Sep-97	pCi/L	2.96±0.73	0.747
	Gross Beta	15-Dec-97	pCi/L	2.16±1.12	0.964
	Gross Beta	09-Mar-98	pCi/L	3.4±0.931	0.757
	Gross Beta	17-Jun-98	pCi/L	3.29±1.66	1.49
	Gross Beta	15-Sep-98	pCi/L	1.78±0.619	0.582
	Gross Beta	30-Nov-98	pCi/L	2.52±0.698	0.537
	Gross Beta	08-Mar-99	pCi/L	2.04±0.907	0.91
	Gross Beta	15-Jun-99	pCi/L	1.97±0.694	0.53
	Gross Beta	15-Sep-99	pCi/L	3.93±0.965	0.77
	Tritium	28-May-93	pCi/L	15±220	360
	Uranium-234	10-Jun-97	pCi/L	1.8±0.32	0.052
	Uranium-234	30-Sep-97	pCi/L	1.78±0.244	0.0216
	Uranium-234	15-Dec-97	pCi/L	1.87±0.261	0.0289
	Uranium-234	09-Mar-98	pCi/L	1.76±0.263	0.0346
	Uranium-234	17-Jun-98	pCi/L	1.56±0.256	0.0293
	Uranium-234	15-Sep-98	pCi/L	1.76±0.271	0.0261
	Uranium-234	30-Nov-98	pCi/L	1.92±0.231	0.0279

Refer to footnotes at end of table.

Table F.4-1 (Continued)
Tijeras Arroyo Groundwater Investigation—
Radionuclide Analytical Results (Detections Only)

Well ID	Radionuclide	Sample Date	Units	Activity ± □□□	MDA
TA2-NW1-595 (cont.)	Uranium-234	08-Mar-99	pCi/L	1.29±0.223	0.0205
	Uranium-234	15-Jun-99	pCi/L	1.86±0.359	0.0773
	Uranium-234	15-Sep-99	pCi/L	2.12±0.339	0.0236
	Uranium-234	18-Nov-99	pCi/L	2.05±0.351	0.0422
	Uranium-235	10-Jun-97	pCi/L	0.0888±0.0522	0.0402
	Uranium-235	30-Sep-97	pCi/L	0.0519±0.032	0.0162
	Uranium-235	15-Dec-97	pCi/L	0.0481±0.0399	0.0189
	Uranium-235	09-Mar-98	pCi/L	0.18±0.0676	0.0237
	Uranium-235	17-Jun-98	pCi/L	0.0786±0.0485	0.0257
	Uranium-235	15-Sep-98	pCi/L	0.0482±0.0375	0.0162
	Uranium-235	30-Nov-98	pCi/L	0.0609±0.0344	0.0221
	Uranium-235	08-Mar-99	pCi/L	0.197±0.0747	0.0134
	Uranium-235	15-Jun-99	pCi/L	0.0232±0.0329	0
	Uranium-235	15-Sep-99	pCi/L	0.0568±0.0558	0.0223
	Uranium-235	18-Nov-99	pCi/L	0.0455±0.0531	0.04
	Uranium-238	10-Jun-97	pCi/L	0.966±0.251	0.0541
	Uranium-238	30-Sep-97	pCi/L	0.822±0.142	0.0174
	Uranium-238	15-Dec-97	pCi/L	0.797±0.147	0.0241
	Uranium-238	09-Mar-98	pCi/L	0.802±0.155	0.022
	Uranium-238	17-Jun-98	pCi/L	0.74±0.16	0.0256
	Uranium-238	15-Sep-98	pCi/L	0.86±0.168	0.0134
	Uranium-238	30-Nov-98	pCi/L	0.852±0.126	0.0174
	Uranium-238	08-Mar-99	pCi/L	0.759±0.159	0.0219
	Uranium-238	15-Jun-99	pCi/L	0.844±0.219	0.0662
	Uranium-238	15-Sep-99	pCi/L	0.835±0.187	0.0386
	Uranium-238	18-Nov-99	pCi/L	0.741±0.189	0.0314
	Gross Alpha	28-May-93	pCi/L	0.69±0.78	0.79
	Gross Alpha	10-Jun-97	pCi/L	2.38±0.778	0.516
	Gross Alpha	30-Sep-97	pCi/L	4.76±1.04	0.597
	Gross Alpha	15-Dec-97	pCi/L	3.09±1.4	0.704
	Gross Alpha	09-Mar-98	pCi/L	3.97±1.23	0.854
	Gross Alpha	17-Jun-98	pCi/L	2.98±1.29	0.795
	Gross Alpha	15-Sep-98	pCi/L	1.79±0.769	0.432
	Gross Alpha	30-Nov-98	pCi/L	3.54±0.985	0.511
	Gross Alpha	08-Mar-99	pCi/L	4.94±1.32	0.605
	Gross Alpha	15-Jun-99	pCi/L	3.88±0.893	0.4
	Gross Alpha	15-Sep-99	pCi/L	4.99±1.25	0.695
	Gross Alpha	18-Nov-99	pCi/L	3.72±1.04	0.804
	Gross Beta	28-May-93	pCi/L	0.56±2.2	3.6

Refer to footnotes at end of table.

Table F.4-1 (Continued)
Tijeras Arroyo Groundwater Investigation—
Radionuclide Analytical Results (Detections Only)

Well ID	Radionuclide	Sample Date	Units	Activity ±□□□	MDA
TA2-W-01	Americium-241	20-Jun-95	pCi/L	2.9±8.9	5.4
	Gross Beta	06-Jun-97	pCi/L	2.33±0.773	0.561
	Gross Beta	02-Oct-97	pCi/L	4.83±0.883	0.815
	Gross Beta	08-Dec-97	pCi/L	2.06±0.428	0.292
	Gross Beta	13-Mar-98	pCi/L	2.24±0.867	0.746
	Gross Beta	24-Jun-98	pCi/L	2.96±0.823	0.64
	Gross Beta	18-Sep-98	pCi/L	2.44±0.713	0.62
	Gross Beta	30-Nov-98	pCi/L	1.6±0.909	0.763
	Gross Beta	09-Mar-99	pCi/L	0.874±0.862	0.866
	Gross Beta	28-Jul-99	pCi/L	2.64±0.707	0.519
	Gross Beta	15-Sep-99	pCi/L	2.92±0.774	0.722
	Plutonium-238	20-Jun-95	pCi/L	0.003±0.071	0.071
	Plutonium-239/240	14-Oct-94	pCi/L	0.019±999.9999	0.018
	Radium-226	20-Jun-95	pCi/L	50±120	54
	Tritium	20-Jul-94	pCi/L	360±160	240
	Tritium	14-Oct-94	pCi/L	2±999.9999	174
	Tritium	27-Sep-95	pCi/L	10±200	120
	Uranium-233	20-Jun-95	pCi/L	0.69±0.16	0.042
	Uranium-234	06-Jun-97	pCi/L	0.728±0.253	0.103
	Uranium-234	02-Oct-97	pCi/L	0.948±0.159	0.0287
	Uranium-234	08-Dec-97	pCi/L	0.361±0.131	0.0424
	Uranium-234	13-Mar-98	pCi/L	0.499±0.115	0.0288
	Uranium-234	24-Jun-98	pCi/L	0.606±0.185	0.0397
	Uranium-234	18-Sep-98	pCi/L	0.548±0.12	0.0261
	Uranium-234	30-Nov-98	pCi/L	0.582±0.0983	0.0227
	Uranium-234	09-Mar-99	pCi/L	0.605±0.14	0.0292
	Uranium-234	28-Jul-99	pCi/L	0.483±0.232	0.0464
	Uranium-234	15-Sep-99	pCi/L	0.569±0.153	0.0244
	Uranium-234	14-Oct-94	pCi/L	0.69±999.9999	0.43
	Uranium-234	02-Dec-99	pCi/L	0.531±0.113	0.0189
	Uranium-235	20-Jun-95	pCi/L	0±26	17
	Uranium-235	20-Jun-95	pCi/L	0.128±0.066	0.018
	Uranium-235	24-Jun-98	pCi/L	0.0507±0.0622	0.0371
	Uranium-235	30-Nov-98	pCi/L	0.0487±0.0302	0.0211

Refer to footnotes at end of table.

Table F.4-1 (Continued)
Tijeras Arroyo Groundwater Investigation—
Radionuclide Analytical Results (Detections Only)

Well ID	Radionuclide	Sample Date	Units	Activity □□□	MDA
TA2-W-01 (cont.)	Uranium-235	09-Mar-99	pCi/L	0.0817±0.0461	0.0109
	Uranium-235	28-Jul-99	pCi/L	0.0358±0.0687	0.0268
	Uranium-235	15-Sep-99	pCi/L	0.0498±0.041	0
	Uranium-236	02-Dec-99	pCi/L	0.0314±0.0308	0.0123
	Uranium-238	14-Oct-94	pCi/L	0.8±999.9999	0.28
	Uranium-238	20-Jun-95	pCi/L	0.49±0.13	0.045
	Uranium-238	06-Jun-97	pCi/L	0.237±0.14	0.0791
	Uranium-238	02-Oct-97	pCi/L	0.851±0.148	0.0274
	Uranium-238	08-Dec-97	pCi/L	0.22±0.0988	0.0345
	Uranium-238	13-Mar-98	pCi/L	0.173±0.0661	0.0212
	Uranium-238	24-Jun-98	pCi/L	0.268±0.119	0.0477
	Uranium-238	18-Sep-98	pCi/L	0.287±0.0828	0.0144
	Uranium-238	30-Nov-98	pCi/L	0.216±0.0554	0.0186
	Uranium-238	09-Mar-99	pCi/L	0.232±0.0811	0.0215
	Uranium-238	28-Jul-99	pCi/L	0.253±0.16	0.0458
	Uranium-238	15-Sep-99	pCi/L	0.277±0.103	0.0379
	Uranium-238	02-Dec-99	pCi/L	0.173±0.0586	0.0154
	Gross Alpha	20-Jul-94	pCi/L	16±6.1	2.6
	Gross Alpha	27-Sep-95	pCi/L	1.3±2	3.9
	Gross Alpha	06-Jun-97	pCi/L	1.84±0.647	0.388
	Gross Alpha	02-Oct-97	pCi/L	4.15±0.996	0.618
	Gross Alpha	08-Dec-97	pCi/L	1.29±0.48	0.275
	Gross Alpha	13-Mar-98	pCi/L	1.14±0.691	0.662
	Gross Alpha	24-Jun-98	pCi/L	2.4±0.881	0.595
	Gross Alpha	18-Sep-98	pCi/L	1.14±0.751	0.623
	Gross Alpha	30-Nov-98	pCi/L	1.41±0.961	0.677
	Gross Alpha	09-Mar-99	pCi/L	1.16±0.742	0.507
	Gross Alpha	28-Jul-99	pCi/L	1.64±0.567	0.307
	Gross Alpha	15-Sep-99	pCi/L	2.85±0.856	0.557
	Gross Alpha	02-Dec-99	pCi/L	1.13±0.953	0.847
	Gross Beta	20-Jul-94	pCi/L	14±4.3	5.1
	Gross Beta	27-Sep-95	pCi/L	1.4±2	3.3
	Gross Beta	26-Jan-96	pCi/L	3.4±1.7	1.2
	Gross Beta	02-Dec-99	pCi/L	2.77±1.23	0.968
	Tritium	27-Sep-95	pCi/L	60±200	120
	Gross Alpha	27-Sep-95	pCi/L	1±1.9	4.1
	Gross Beta	27-Sep-95	pCi/L	2.8±2.2	3.6

Refer to footnotes at end of table.

Table F.4-1 (Continued)
Tijeras Arroyo Groundwater Investigation—
Radionuclide Analytical Results (Detections Only)

Well ID	Radionuclide	Sample Date	Units	Activity □□□	MDA
TA2-W-19	Gross Beta	10-Jun-97	pCi/L	1.89±0.505	0.395
	Gross Beta	29-Sep-97	pCi/L	3.96±1.11	1.06
	Gross Beta	10-Dec-97	pCi/L	2.27±1.09	0.947
	Gross Beta	06-Mar-98	pCi/L	1.99±0.93	0.808
	Gross Beta	15-Jun-98	pCi/L	1.68±0.736	0.64
	Gross Beta	16-Sep-98	pCi/L	1.97±0.666	0.611
	Gross Beta	02-Dec-98	pCi/L	2.67±0.846	0.691
	Gross Beta	09-Mar-99	pCi/L	2.51±0.971	0.907
	Gross Beta	16-Jun-99	pCi/L	2.27±0.632	0.515
	Gross Beta	24-Sep-99	pCi/L	2.8±1.45	1.25
	Gross Beta	30-Nov-99	pCi/L	1.99±0.817	0.685
	Uranium-234	10-Jun-97	pCi/L	1.2±0.241	0.0507
	Uranium-234	29-Sep-97	pCi/L	1.13±0.171	0.0175
	Uranium-234	10-Dec-97	pCi/L	1.14±0.189	0.0285
	Uranium-234	06-Mar-98	pCi/L	1.04±0.179	0.032
	Uranium-234	15-Jun-98	pCi/L	0.911±0.194	0.0319
	Uranium-234	16-Sep-98	pCi/L	0.952±0.172	0.0236
	Uranium-234	02-Dec-98	pCi/L	1.05±0.147	0.0215
	Uranium-234	09-Mar-99	pCi/L	1.76±0.289	0.0355
	Uranium-234	16-Jun-99	pCi/L	1.04±0.245	0.0725
	Uranium-234	24-Sep-99	pCi/L	1.07±0.242	0.0197
	Uranium-234	30-Nov-99	pCi/L	1.01±0.202	0.0266
	Uranium-235	10-Jun-97	pCi/L	0.0631±0.0458	0.0413
	Uranium-235	29-Sep-97	pCi/L	0.017±0.0215	0.0165
	Uranium-235	10-Dec-97	pCi/L	0.0442±0.038	0.018
	Uranium-235	06-Mar-98	pCi/L	0.068±0.0383	0.0208
	Uranium-235	02-Dec-98	pCi/L	0.0559±0.028	0.0197
	Uranium-235	09-Mar-99	pCi/L	0.09±0.0666	0.0304
	Uranium-235	16-Jun-99	pCi/L	0.0286±0.0486	0.0221
	Uranium-235	30-Nov-99	pCi/L	0.0349±0.0359	0.0116
	Uranium-238	10-Jun-97	pCi/L	0.748±0.206	0.0514
	Uranium-238	29-Sep-97	pCi/L	0.492±0.101	0.0195
	Uranium-238	10-Dec-97	pCi/L	0.375±0.101	0.0313
	Uranium-238	06-Mar-98	pCi/L	0.379±0.0976	0.0213
	Uranium-238	15-Jun-98	pCi/L	0.349±0.112	0.0281
	Uranium-238	16-Sep-98	pCi/L	0.415±0.105	0.0139
	Uranium-238	02-Dec-98	pCi/L	0.4±0.0783	0.0183
	Uranium-238	09-Mar-99	pCi/L	0.869±0.184	0.0301

Refer to footnotes at end of table.

Table F.4-1 (Continued)
Tijeras Arroyo Groundwater Investigation—
Radionuclide Analytical Results (Detections Only)

Well ID	Radionuclide	Sample Date	Units	Activity □□□	MDA
TA2-W-19 (cont.)	Uranium-238	16-Jun-99	pCi/L	0.458±0.154	0.065
	Uranium-238	24-Sep-99	pCi/L	0.346±0.125	0.0301
	Uranium-238	30-Nov-99	pCi/L	0.425±0.122	0.0229
	Gross Alpha	24-Jan-96	pCi/L	9.5±4.7	2
	Gross Alpha	10-Jun-97	pCi/L	0.925±0.476	0.457
	Gross Alpha	29-Sep-97	pCi/L	4.19±1.02	0.568
	Gross Alpha	10-Dec-97	pCi/L	2.24±1.18	0.642
	Gross Alpha	06-Mar-98	pCi/L	1.1±0.786	0.77
	Gross Alpha	15-Jun-98	pCi/L	1.93±0.861	0.5
	Gross Alpha	16-Sep-98	pCi/L	1.77±0.824	0.566
	Gross Alpha	02-Dec-98	pCi/L	1.76±0.725	0.487
	Gross Alpha	09-Mar-99	pCi/L	1.92±0.861	0.524
	Gross Alpha	16-Jun-99	pCi/L	4.45±1.21	0.543
	Gross Alpha	24-Sep-99	pCi/L	1.86±1.52	1.17
	Gross Alpha	30-Nov-99	pCi/L	1.9±0.861	0.468
	Gross Beta	24-Jan-96	pCi/L	14.8±4.1	2.7
	Gross Beta	24-Apr-96	pCi/L	5.8±2.5	1.8
	Gross Beta	15-Jun-98	pCi/L	2.4±0.744	0.614
	Gross Beta	16-Sep-98	pCi/L	3.65±0.813	0.64
	Gross Beta	02-Dec-98	pCi/L	2.23±0.856	0.721
	Uranium-234	15-Jun-98	pCi/L	1.02±0.208	0.0367
	Uranium-234	16-Sep-98	pCi/L	0.907±0.171	0.0235
	Uranium-234	02-Dec-98	pCi/L	0.929±0.136	0.0273
	Uranium-235	15-Jun-98	pCi/L	0.151±0.0759	0.0322
	Uranium-235	02-Dec-98	pCi/L	0.059±0.0263	0.0185
	Uranium-238	15-Jun-98	pCi/L	0.427±0.125	0.0293
	Uranium-238	16-Sep-98	pCi/L	0.376±0.101	0.0111
	Uranium-238	02-Dec-98	pCi/L	0.42±0.0789	0.0171
	Gross Alpha	24-Jan-96	pCi/L	5.9±3.8	1.9
	Gross Alpha	15-Jun-98	pCi/L	2.42±0.927	0.5
	Gross Alpha	16-Sep-98	pCi/L	1.44±1.02	0.772
	Gross Alpha	02-Dec-98	pCi/L	1.23±0.767	0.572
	Gross Beta	24-Jan-96	pCi/L	8.7±3	2.1
TA2-W-24	Gross Beta	19-Mar-98	pCi/L	13±1.48	0.906
	Gross Beta	23-Jun-98	pCi/L	10.2±1.05	0.65
	Gross Beta	24-Sep-98	pCi/L	9.62±1.15	0.679
	Gross Beta	03-Dec-98	pCi/L	8.38±1.25	0.834
	Gross Beta	11-Mar-99	pCi/L	6.96±1.07	0.818

Refer to footnotes at end of table.

Table F.4-1 (Continued)
Tijeras Arroyo Groundwater Investigation—
Radionuclide Analytical Results (Detections Only)

Well ID	Radionuclide	Sample Date	Units	Activity □□□	MDA
TA2-W-24 (cont.)	Gross Beta	29-Jun-99	pCi/L	8.11±0.76	0.478
	Gross Beta	23-Nov-99	pCi/L	1.49±0.292	1.09
	Tritium	24-Sep-98	pCi/L	211±237	200
	Uranium-234	19-Mar-98	pCi/L	2.24±1.44	0.323
	Uranium-234	23-Jun-98	pCi/L	2.73±0.458	0.0454
	Uranium-234	24-Sep-98	pCi/L	2.31±0.291	0.0253
	Uranium-234	03-Dec-98	pCi/L	2.78±0.315	0.0249
	Uranium-234	11-Mar-99	pCi/L	2.31±0.397	0.0295
	Uranium-234	29-Jun-99	pCi/L	2.76±0.416	0.0289
	Uranium-234	23-Nov-99	pCi/L	2.47±0.364	0.0236
	Uranium-235	23-Jun-98	pCi/L	0.161±0.092	0.0313
	Uranium-235	24-Sep-98	pCi/L	0.0561±0.032	0.0152
	Uranium-235	03-Dec-98	pCi/L	0.134±0.0452	0.0211
	Uranium-235	11-Mar-99	pCi/L	0.0865±0.0602	0.0174
	Uranium-235	29-Jun-99	pCi/L	0.0237±0.0275	0.0138
	Uranium-235	23-Nov-99	pCi/L	0.0475±0.0368	0.00741
	Uranium-238	19-Mar-98	pCi/L	0.342±0.563	0.22
	Uranium-238	23-Jun-98	pCi/L	1.13±0.261	0.0505
	Uranium-238	24-Sep-98	pCi/L	0.859±0.143	0.00683
	Uranium-238	03-Dec-98	pCi/L	1±0.145	0.0189
	Uranium-238	11-Mar-99	pCi/L	1.03±0.232	0.0329
	Uranium-238	29-Jun-99	pCi/L	1.03±0.211	0.0214
	Uranium-238	23-Nov-99	pCi/L	1.16±0.212	0.0149
	Gross Alpha	19-Mar-98	pCi/L	8.24±1.73	0.731
	Gross Alpha	23-Jun-98	pCi/L	4.84±1.06	0.608
	Gross Alpha	24-Sep-98	pCi/L	3.56±1.18	0.615
	Gross Alpha	03-Dec-98	pCi/L	4.63±1.23	0.651
	Gross Alpha	11-Mar-99	pCi/L	3.3±1.12	0.606
	Gross Alpha	29-Jun-99	pCi/L	5.71±0.873	0.321
	Gross Alpha	23-Nov-99	pCi/L	4.74±1.1	0.75
TA2-W-25	Gross Beta	12-Dec-97	pCi/L	3.21±0.983	0.754
	Gross Beta	10-Mar-98	pCi/L	2.63±0.834	0.709
	Gross Beta	22-Jun-98	pCi/L	2.17±0.821	0.667
	Gross Beta	23-Sep-98	pCi/L	2.3±0.679	0.614
	Gross Beta	14-Dec-98	pCi/L	2.46±1.17	1.16
	Gross Beta	16-Mar-99	pCi/L	2.19±0.904	0.908
	Gross Beta	29-Jun-99	pCi/L	2.94±0.732	0.534
	Gross Beta	13-Sep-99	pCi/L	2.62±0.763	0.624

Refer to footnotes at end of table.

Table F.4-1 (Continued)
Tijeras Arroyo Groundwater Investigation—
Radionuclide Analytical Results (Detections Only)

Well ID	Radionuclide	Sample Date	Units	Activity ±□□□	MDA
TA2-W-25 (cont.)	Tritium	13-Sep-99	pCi/L	168±141	113
	Uranium-234	12-Dec-97	pCi/L	2.08±0.311	0.0353
	Uranium-234	10-Mar-98	pCi/L	2.36±0.322	0.0164
	Uranium-234	22-Jun-98	pCi/L	2.55±0.381	0.033
	Uranium-234	23-Sep-98	pCi/L	1.95±0.264	0.0357
	Uranium-234	14-Dec-98	pCi/L	2.24±0.313	0.0265
	Uranium-234	16-Mar-99	pCi/L	2.47±0.381	0.0393
	Uranium-234	29-Jun-99	pCi/L	2.45±0.385	0.0279
	Uranium-234	13-Sep-99	pCi/L	2.36±0.41	0.0421
	Uranium-234	24-Nov-99	pCi/L	2.07±0.317	0.0283
	Uranium-235	12-Dec-97	pCi/L	0.135±0.0672	0.0216
	Uranium-235	10-Mar-98	pCi/L	0.0661±0.0398	0.0089
	Uranium-235	22-Jun-98	pCi/L	0.139±0.0692	0.0279
	Uranium-235	23-Sep-98	pCi/L	0.0869±0.041	0.0154
	Uranium-235	14-Dec-98	pCi/L	0.0592±0.0431	0.0165
	Uranium-235	16-Mar-99	pCi/L	0.0865±0.053	0.0136
	Uranium-235	29-Jun-99	pCi/L	0.033±0.0383	0.0238
	Uranium-235	13-Sep-99	pCi/L	0.0866±0.062	0
	Uranium-235	24-Nov-99	pCi/L	0.0432±0.0394	0.0145
	Uranium-238	12-Dec-97	pCi/L	1.12±0.204	0.0298
	Uranium-238	10-Mar-98	pCi/L	1.04±0.179	0.0107
	Uranium-238	22-Jun-98	pCi/L	1.53±0.267	0.0263
	Uranium-238	23-Sep-98	pCi/L	0.783±0.14	0.0072
	Uranium-238	14-Dec-98	pCi/L	1.07±0.188	0.0136
	Uranium-238	16-Mar-99	pCi/L	1.07±0.215	0.0234
	Uranium-238	29-Jun-99	pCi/L	1.02±0.212	0.0198
	Uranium-238	13-Sep-99	pCi/L	1.09±0.249	0.0525
	Uranium-238	24-Nov-99	pCi/L	0.804±0.166	0.0163
	Gross Alpha	12-Dec-97	pCi/L	4.43±1.17	0.478
	Gross Alpha	10-Mar-98	pCi/L	4.83±1.12	0.671
	Gross Alpha	22-Jun-98	pCi/L	3.74±0.913	0.57
	Gross Alpha	23-Sep-98	pCi/L	2.98±0.943	0.514
	Gross Alpha	14-Dec-98	pCi/L	2.68±1.23	0.706
	Gross Alpha	16-Mar-99	pCi/L	5.35±1.23	0.575
	Gross Alpha	29-Jun-99	pCi/L	4.13±0.739	0.304
	Gross Alpha	13-Sep-99	pCi/L	4.85±1.04	0.494
	Gross Alpha	24-Nov-99	pCi/L	3.48±1.02	0.754

Refer to footnotes at end of table.

Table F.4-1 (Continued)
Tijeras Arroyo Groundwater Investigation—
Radionuclide Analytical Results (Detections Only)

Well ID	Radionuclide	Sample Date	Units	Activity □□□	MDA
TA2-W-26	Gross Beta	17-Mar-98	pCi/L	2.47±0.888	0.706
	Gross Beta	22-Jun-98	pCi/L	2.44±0.868	0.686
	Gross Beta	25-Sep-98	pCi/L	2.27±0.844	0.715
	Gross Beta	14-Dec-98	pCi/L	1.83±0.689	0.575
	Gross Beta	16-Mar-99	pCi/L	3.19±0.992	0.93
	Gross Beta	07-Jul-99	pCi/L	1.92±0.856	0.827
	Gross Beta	09-Sep-99	pCi/L	2.9±0.832	0.656
	Radium-226	26-May-00	pCi/L	0.653±0.551	0.316
	Radium-228	26-May-00	pCi/L	1.3±0.85	0.766
	Tritium	14-Dec-98	pCi/L	128±139	118
	Uranium-234	17-Mar-98	pCi/L	0.975±0.163	0.0151
	Uranium-234	22-Jun-98	pCi/L	1.1±0.215	0.0312
	Uranium-234	25-Sep-98	pCi/L	0.908±0.181	0.04
	Uranium-234	14-Dec-98	pCi/L	1.09±0.199	0.0244
	Uranium-234	16-Mar-99	pCi/L	1.11±0.267	0.0531
	Uranium-234	07-Jul-99	pCi/L	1.05±0.349	0.061
	Uranium-234	09-Sep-99	pCi/L	1.18±0.262	0.0469
	Uranium-234	26-May-00	pCi/L	0.731±0.317	0.12
	Uranium-234	02-Dec-99	pCi/L	1.26±0.25	0.0295
	Uranium-235	17-Mar-98	pCi/L	0.0435±0.0327	0.011
	Uranium-235	22-Jun-98	pCi/L	0.0617±0.048	0.0289
	Uranium-235	25-Sep-98	pCi/L	0.085±0.0531	0.0215
	Uranium-235	14-Dec-98	pCi/L	0.0548±0.0406	0.0134
	Uranium-235	09-Sep-99	pCi/L	0.0434±0.0504	0.0173
	Uranium-238	17-Mar-98	pCi/L	0.399±0.0942	0.0148
	Uranium-238	22-Jun-98	pCi/L	0.496±0.134	0.0274
	Uranium-238	25-Sep-98	pCi/L	0.503±0.125	0.0238
	Uranium-238	14-Dec-98	pCi/L	0.523±0.127	0.0144
	Uranium-238	16-Mar-99	pCi/L	0.533±0.175	0.035
	Uranium-238	07-Jul-99	pCi/L	0.397±0.204	0.0569
	Uranium-238	09-Sep-99	pCi/L	0.794±0.208	0.0576
	Uranium-238	02-Dec-99	pCi/L	0.431±0.135	0.0338
	Uranium-238	26-May-00	pCi/L	0.411±0.234	0.0778
	Gross Alpha	17-Mar-98	pCi/L	2.75±0.942	0.534
	Gross Alpha	22-Jun-98	pCi/L	0.75±0.814	0.715
	Gross Alpha	25-Sep-98	pCi/L	1.9±1.02	0.721
	Gross Alpha	14-Dec-98	pCi/L	1.51±0.766	0.5
	Gross Alpha	16-Mar-99	pCi/L	2.71±1.19	0.791

Refer to footnotes at end of table.

Table F.4-1 (Continued)
Tijeras Arroyo Groundwater Investigation—
Radionuclide Analytical Results (Detections Only)

Well ID	Radionuclide	Sample Date	Units	Activity	MDA
TA2-W-26 (cont.)	Gross Alpha	07-Jul-99	pCi/L	1.88±1.25	0.833
	Gross Alpha	09-Sep-99	pCi/L	1.92±0.7	0.479
	Gross Alpha	02-Dec-99	pCi/L	1.76±1.18	0.8
	Gross Alpha	26-May-00	pCi/L	2.28±0.978	0.787
	Gross Beta	02-Dec-99	pCi/L	3.27±1.16	0.946
	Gross Beta	26-May-00	pCi/L	3.41±1.86	1.67
	Gross Beta	17-Mar-98	pCi/L	2.69±0.876	0.697
	Gross Beta	09-Sep-99	pCi/L	1.44±0.784	0.652
	Uranium-234	17-Mar-98	pCi/L	1.08±0.176	0.0143
	Uranium-234	09-Sep-99	pCi/L	1.34±0.274	0.0389
	Uranium-235	17-Mar-98	pCi/L	0.0274±0.0225	0
	Uranium-235	09-Sep-99	pCi/L	0.0305±0.0353	0
	Uranium-238	17-Mar-98	pCi/L	0.443±0.1	0.0115
	Uranium-238	09-Sep-99	pCi/L	1.05±0.235	0.0493
	Gross Alpha	17-Mar-98	pCi/L	3.25±0.996	0.535
	Gross Alpha	09-Sep-99	pCi/L	1.61±0.724	0.509
TA2-W-27	Gross Beta	19-Mar-98	pCi/L	3.22±1.04	0.838
	Gross Beta	23-Jun-98	pCi/L	3.22±0.855	0.663
	Gross Beta	24-Sep-98	pCi/L	2.8±0.832	0.685
	Gross Beta	03-Dec-98	pCi/L	3.07±0.905	0.75
	Gross Beta	11-Mar-99	pCi/L	3.32±0.896	0.819
	Gross Beta	08-Jul-99	pCi/L	3.03±0.908	0.834
	Gross Beta	09-Sep-99	pCi/L	2.45±1.44	1.21
	Uranium-234	19-Mar-98	pCi/L	0.636±0.409	0.198
	Uranium-234	23-Jun-98	pCi/L	0.918±0.229	0.0339
	Uranium-234	24-Sep-98	pCi/L	1.01±0.167	0.0282
	Uranium-234	03-Dec-98	pCi/L	1.01±0.144	0.0228
	Uranium-234	11-Mar-99	pCi/L	0.887±0.21	0.0265
	Uranium-234	08-Jul-99	pCi/L	0.894±0.215	0.0314
	Uranium-234	09-Sep-99	pCi/L	1.07±0.243	0.043
	Uranium-234	23-Nov-99	pCi/L	0.857±0.17	0.0253
	Uranium-235	23-Jun-98	pCi/L	0.0752±0.0636	0.0308
	Uranium-235	24-Sep-98	pCi/L	0.0761±0.0408	0.0179
	Uranium-235	03-Dec-98	pCi/L	0.112±0.0391	0.0197
	Uranium-235	11-Mar-99	pCi/L	0.0218±0.0341	0.0203
	Uranium-235	09-Sep-99	pCi/L	0.0419±0.0422	0
	Uranium-235	23-Nov-99	pCi/L	0.038±0.035	0.0119
	Uranium-238	19-Mar-98	pCi/L	0.65±0.409	0.131

Refer to footnotes at end of table.

Table F.4-1 (Continued)
Tijeras Arroyo Groundwater Investigation—
Radionuclide Analytical Results (Detections Only)

Well ID	Radionuclide	Sample Date	Units	Activity	MDA
TA2-W-27 (cont.)	Uranium-238	23-Jun-98	pCi/L	0.446±0.156	0.0497
	Uranium-238	24-Sep-98	pCi/L	0.38±0.0907	0.0103
	Uranium-238	03-Dec-98	pCi/L	0.393±0.0776	0.0176
	Uranium-238	11-Mar-99	pCi/L	0.405±0.133	0.0323
	Uranium-238	08-Jul-99	pCi/L	0.477±0.148	0.031
	Uranium-238	09-Sep-99	pCi/L	0.518±0.16	0.0529
	Uranium-238	23-Nov-99	pCi/L	0.433±0.111	0.0141
	Gross Alpha	19-Mar-98	pCi/L	2.92±1.16	0.693
	Gross Alpha	23-Jun-98	pCi/L	2.34±0.89	0.687
	Gross Alpha	24-Sep-98	pCi/L	0.969±0.789	0.65
	Gross Alpha	03-Dec-98	pCi/L	3.64±1.07	0.578
	Gross Alpha	11-Mar-99	pCi/L	1.59±1.04	0.709
	Gross Alpha	08-Jul-99	pCi/L	0.96±1.03	0.806
	Gross Alpha	09-Sep-99	pCi/L	2.47±1.25	0.891
	Gross Alpha	23-Nov-99	pCi/L	1.5±0.949	0.917
	Gross Beta	09-Sep-99	pCi/L	2.04±0.799	0.651
	Uranium-234	09-Sep-99	pCi/L	0.901±0.214	0.0431
	Uranium-235	09-Sep-99	pCi/L	0.0202±0.037	0.016
	Uranium-238	09-Sep-99	pCi/L	0.43±0.139	0.0487
	Gross Alpha	09-Sep-99	pCi/L	1.53±0.768	0.542
TJA-2	Gross Beta	12-Jun-97	pCi/L	1.18±0.559	0.455
	Gross Beta	29-Sep-97	pCi/L	2.82±0.376	0.305
	Gross Beta	16-Dec-97	pCi/L	1.83±0.686	0.505
	Gross Beta	10-Mar-98	pCi/L	2.13±0.832	0.725
	Gross Beta	24-Jun-98	pCi/L	2.19±0.792	0.631
	Gross Beta	16-Sep-98	pCi/L	2.03±0.742	0.654
	Gross Beta	02-Dec-98	pCi/L	1.89±0.965	0.778
	Gross Beta	04-Mar-99	pCi/L	2.53±0.653	0.586
	Gross Beta	16-Jun-99	pCi/L	2.08±0.637	0.519
	Gross Beta	13-Sep-99	pCi/L	2.3±0.778	0.671
	Gross Beta	30-Nov-99	pCi/L	3.03±0.851	0.682
	Tritium	10-Mar-98	pCi/L	85.7±103	83.8
	Tritium	13-Sep-99	pCi/L	137±138	110
	Uranium-234	12-Jun-97	pCi/L	1.01±0.205	0.0504
	Uranium-234	29-Sep-97	pCi/L	1.1±0.166	0.0151
	Uranium-234	16-Dec-97	pCi/L	1.1±0.187	0.0291
	Uranium-234	10-Mar-98	pCi/L	1.1±0.18	0.0175
	Uranium-234	24-Jun-98	pCi/L	1.08±0.253	0.037

Refer to footnotes at end of table.

Table F.4-1 (Continued)
Tijeras Arroyo Groundwater Investigation—
Radionuclide Analytical Results (Detections Only)

Well ID	Radionuclide	Sample Date	Units	Activity ±□□□	MDA
TJA-2 (cont.)	Uranium-234	16-Sep-98	pCi/L	1.24±0.211	0.0281
	Uranium-234	02-Dec-98	pCi/L	1.11±0.154	0.0218
	Uranium-234	04-Mar-99	pCi/L	1.16±0.335	0.0757
	Uranium-234	16-Jun-99	pCi/L	1.04±0.25	0.0731
	Uranium-234	13-Sep-99	pCi/L	1.25±0.269	0.042
	Uranium-234	30-Nov-99	pCi/L	1.28±0.32	0.0545
	Uranium-235	29-Sep-97	pCi/L	0.0535±0.029	0.014
	Uranium-235	16-Dec-97	pCi/L	0.0278±0.0281	0.0144
	Uranium-235	10-Mar-98	pCi/L	0.0282±0.0232	0
	Uranium-235	24-Jun-98	pCi/L	0.114±0.0863	0.0398
	Uranium-235	16-Sep-98	pCi/L	0.0262±0.0305	0.0172
	Uranium-235	02-Dec-98	pCi/L	0.0698±0.0298	0.0192
	Uranium-235	04-Mar-99	pCi/L	0.154±0.119	0.0549
	Uranium-235	16-Jun-99	pCi/L	0.0178±0.035	0.0133
	Uranium-235	13-Sep-99	pCi/L	0.0539±0.0485	0
	Uranium-238	12-Jun-97	pCi/L	0.628±0.176	0.05
	Uranium-238	29-Sep-97	pCi/L	0.564±0.107	0.0163
	Uranium-238	16-Dec-97	pCi/L	0.432±0.106	0.0264
	Uranium-238	10-Mar-98	pCi/L	0.396±0.0969	0.0174
	Uranium-238	24-Jun-98	pCi/L	0.527±0.176	0.0576
	Uranium-238	16-Sep-98	pCi/L	0.419±0.108	0.0131
	Uranium-238	02-Dec-98	pCi/L	0.493±0.0897	0.0178
	Uranium-238	04-Mar-99	pCi/L	0.505±0.209	0.0566
	Uranium-238	16-Jun-99	pCi/L	0.624±0.187	0.0678
	Uranium-238	13-Sep-99	pCi/L	0.591±0.172	0.0494
	Uranium-238	30-Nov-99	pCi/L	0.509±0.19	0.0347
	Gross Alpha	24-Jan-96	pCi/L	1.6±1.9	1.2
	Gross Alpha	12-Jun-97	pCi/L	1.38±0.504	0.399
	Gross Alpha	29-Sep-97	pCi/L	1.6±0.478	0.308
	Gross Alpha	16-Dec-97	pCi/L	2.18±0.682	0.344
	Gross Alpha	10-Mar-98	pCi/L	2.32±0.965	0.725
	Gross Alpha	24-Jun-98	pCi/L	2.06±0.792	0.568
	Gross Alpha	16-Sep-98	pCi/L	2.03±0.926	0.645
	Gross Alpha	02-Dec-98	pCi/L	2.95±1.24	0.768
	Gross Alpha	04-Mar-99	pCi/L	2.28±0.835	0.451
	Gross Alpha	16-Jun-99	pCi/L	3.28±0.991	0.445
	Gross Alpha	13-Sep-99	pCi/L	2.7±1.06	0.669
	Gross Alpha	30-Nov-99	pCi/L	1.82±0.877	0.489

Refer to footnotes at end of table.

Table F.4-1 (Continued)
Tijeras Arroyo Groundwater Investigation—
Radionuclide Analytical Results (Detections Only)

Well ID	Radionuclide	Sample Date	Units	Activity	MDA
TJA-3	Gross Beta	15-Dec-98	pCi/L	2.73±1.15	1.02
	Gross Beta	08-Mar-99	pCi/L	2.19±0.899	0.884
	Gross Beta	16-Jun-99	pCi/L	2.26±0.584	0.483
	Gross Beta	20-Sep-99	pCi/L	2.88±0.946	0.801
	Gross Beta	29-Nov-99	pCi/L	2.25±0.796	0.672
	Uranium-234	15-Dec-98	pCi/L	1.77±0.275	0.0244
	Uranium-234	08-Mar-99	pCi/L	1.63±0.295	0.0345
	Uranium-234	16-Jun-99	pCi/L	1.77±0.344	0.0734
	Uranium-234	20-Sep-99	pCi/L	1.97±0.323	0.0281
	Uranium-234	29-Nov-99	pCi/L	1.71±0.285	0.0271
	Uranium-235	15-Dec-98	pCi/L	0.0418±0.0361	0.0134
	Uranium-235	08-Mar-99	pCi/L	0.0815±0.0594	0.021
	Uranium-235	16-Jun-99	pCi/L	0.0631±0.0575	0.013
	Uranium-235	20-Sep-99	pCi/L	0.0269±0.049	0.0247
	Uranium-235	29-Nov-99	pCi/L	0.0337±0.0347	0.0112
	Uranium-238	15-Dec-98	pCi/L	0.735±0.156	0.0144
	Uranium-238	08-Mar-99	pCi/L	0.818±0.191	0.0275
	Uranium-238	16-Jun-99	pCi/L	0.832±0.215	0.0631
	Uranium-238	20-Sep-99	pCi/L	0.865±0.19	0.0384
	Uranium-238	29-Nov-99	pCi/L	0.872±0.181	0.0175
	Gross Alpha	15-Dec-98	pCi/L	5.36±1.36	0.613
	Gross Alpha	08-Mar-99	pCi/L	3.67±1.09	0.524
	Gross Alpha	16-Jun-99	pCi/L	5.42±1.17	0.41
	Gross Alpha	20-Sep-99	pCi/L	5.88±1.26	0.629
	Gross Alpha	29-Nov-99	pCi/L	3.93±1.08	0.421
TJA-4	Gross Beta	15-Dec-98	pCi/L	4.71±0.807	0.594
	Gross Beta	04-Mar-99	pCi/L	3.92±0.728	0.584
	Gross Beta	12-Jul-99	pCi/L	4.61±0.899	0.771
	Gross Beta	20-Sep-99	pCi/L	3.94±0.972	0.806
	Gross Beta	29-Nov-99	pCi/L	3.71±0.846	0.658
	Tritium	15-Dec-98	pCi/L	163±146	124
	Uranium-234	15-Dec-98	pCi/L	2.49±0.357	0.0282
	Uranium-234	04-Mar-99	pCi/L	1.93±0.411	0.0661
	Uranium-234	12-Jul-99	pCi/L	2.19±0.388	0.0272
	Uranium-234	20-Sep-99	pCi/L	1.88±0.314	0.0262
	Uranium-234	29-Nov-99	pCi/L	1.96±0.307	0.0248
	Uranium-235	15-Dec-98	pCi/L	0.0416±0.0342	0.0105
	Uranium-235	04-Mar-99	pCi/L	0.137±0.099	0.0471

Refer to footnotes at end of table.

Table F.4-1 (Continued)
Tijeras Arroyo Groundwater Investigation—
Radionuclide Analytical Results (Detections Only)

Well ID	Radionuclide	Sample Date	Units	Activity	MDA
TJA-4 (cont.)	Uranium-235	12-Jul-99	pCi/L	0.0359±0.0425	0.0198
	Uranium-235	20-Sep-99	pCi/L	0.0366±0.0428	0.0159
	Uranium-235	29-Nov-99	pCi/L	0.0825±0.0466	0
	Uranium-238	15-Dec-98	pCi/L	1.12±0.208	0.0174
	Uranium-238	04-Mar-99	pCi/L	0.821±0.244	0.0495
	Uranium-238	12-Jul-99	pCi/L	0.901±0.219	0.0357
	Uranium-238	20-Sep-99	pCi/L	1.21±0.234	0.0388
	Uranium-238	29-Nov-99	pCi/L	0.873±0.176	0.0149
	Gross Alpha	15-Dec-98	pCi/L	4.62±0.76	0.333
	Gross Alpha	04-Mar-99	pCi/L	4.09±1.02	0.401
	Gross Alpha	12-Jul-99	pCi/L	4.02±1.25	0.642
	Gross Alpha	20-Sep-99	pCi/L	5.69±1.2	0.575
	Gross Alpha	29-Nov-99	pCi/L	3.6±1.04	0.424
	Gross Beta	04-Mar-99	pCi/L	4.16±0.788	0.615
	Gross Beta	12-Jul-99	pCi/L	3.18±0.948	0.832
	Gross Beta	29-Nov-99	pCi/L	3.56±0.857	0.663
	Tritium	29-Nov-99	pCi/L	148±119	101
	Uranium-234	04-Mar-99	pCi/L	2.14±0.414	0.061
	Uranium-234	12-Jul-99	pCi/L	2.03±0.359	0.0263
	Uranium-234	29-Nov-99	pCi/L	2.14±0.337	0.0276
	Uranium-235	04-Mar-99	pCi/L	0.118±0.0796	0.0376
	Uranium-235	12-Jul-99	pCi/L	0.043±0.0442	0.0189
	Uranium-235	29-Nov-99	pCi/L	0.0414±0.0382	0.0114
	Uranium-238	04-Mar-99	pCi/L	0.568±0.185	0.0506
	Uranium-238	12-Jul-99	pCi/L	0.812±0.198	0.0304
	Uranium-238	29-Nov-99	pCi/L	0.835±0.177	0.0111
	Gross Alpha	04-Mar-99	pCi/L	3.21±0.987	0.486
	Gross Alpha	12-Jul-99	pCi/L	3.41±1.14	0.607
	Gross Alpha	29-Nov-99	pCi/L	2.84±0.976	0.474
TJA-5	Gross Beta	15-Dec-98	pCi/L	9.21±0.868	0.57
	Gross Beta	04-Mar-99	pCi/L	7.22±0.626	0.392
	Gross Beta	28-Jun-99	pCi/L	3.45±0.737	0.526
	Gross Beta	14-Sep-99	pCi/L	3.46±0.751	0.545
	Gross Beta	29-Nov-99	pCi/L	4.24±0.838	0.639
	Uranium-234	15-Dec-98	pCi/L	2.22±0.322	0.0243
	Uranium-234	04-Mar-99	pCi/L	1.87±0.443	0.0949
	Uranium-234	28-Jun-99	pCi/L	1.7±0.302	0.0316
	Uranium-234	14-Sep-99	pCi/L	1.79±0.333	0.0441

Refer to footnotes at end of table.

Table F.4-1 (Continued)
Tijeras Arroyo Groundwater Investigation—
Radionuclide Analytical Results (Detections Only)

Well ID	Radionuclide	Sample Date	Units	Activity	MDA
TJA-5 (cont.)	Uranium-234	29-Nov-99	pCi/L	1.74±0.284	0.0203
	Uranium-235	15-Dec-98	pCi/L	0.0418±0.0359	0.0134
	Uranium-235	04-Mar-99	pCi/L	0.162±0.116	0.0604
	Uranium-235	28-Jun-99	pCi/L	0.0258±0.036	0.0198
	Uranium-235	14-Sep-99	pCi/L	0.0317±0.0502	0.0235
	Uranium-235	29-Nov-99	pCi/L	0.0393±0.0324	0
	Uranium-238	15-Dec-98	pCi/L	0.905±0.177	0.0168
	Uranium-238	04-Mar-99	pCi/L	0.729±0.256	0.0602
	Uranium-238	28-Jun-99	pCi/L	0.539±0.149	0.0262
	Uranium-238	14-Sep-99	pCi/L	0.872±0.211	0.0483
	Uranium-238	29-Nov-99	pCi/L	0.614±0.145	0.0187
	Gross Alpha	15-Dec-98	pCi/L	5.46±0.887	0.378
	Gross Alpha	04-Mar-99	pCi/L	4.67±0.698	0.268
	Gross Alpha	28-Jun-99	pCi/L	2.78±0.64	0.317
	Gross Alpha	14-Sep-99	pCi/L	2.71±0.852	0.492
	Gross Alpha	29-Nov-99	pCi/L	2.44±0.936	0.463
	Gross Beta	04-Mar-99	pCi/L	4.1±0.801	0.631
	Gross Beta	28-Jun-99	pCi/L	3.24±0.75	0.532
	Gross Beta	29-Nov-99	pCi/L	3.35±0.873	0.685
	Uranium-234	04-Mar-99	pCi/L	1.94±0.386	0.0606
	Uranium-234	28-Jun-99	pCi/L	1.73±0.317	0.0317
	Uranium-234	29-Nov-99	pCi/L	1.57±0.262	0.0278
	Uranium-235	04-Mar-99	pCi/L	0.136±0.0881	0.0402
	Uranium-235	28-Jun-99	pCi/L	0.0513±0.0468	0.0183
	Uranium-235	29-Nov-99	pCi/L	0.0378±0.0382	0.0148
	Uranium-238	04-Mar-99	pCi/L	0.749±0.214	0.0481
	Uranium-238	28-Jun-99	pCi/L	0.728±0.183	0.0236
	Uranium-238	29-Nov-99	pCi/L	0.69±0.151	0.0129
	Gross Alpha	04-Mar-99	pCi/L	3.98±1.04	0.428
	Gross Alpha	28-Jun-99	pCi/L	3.95±0.842	0.397
	Gross Alpha	29-Nov-99	pCi/L	3.56±1.01	0.39
WYO-1	Gross Beta	05-Jun-97	pCi/L	3.85±0.737	0.519
	Gross Beta	01-Oct-97	pCi/L	2.9±0.77	0.783
	Gross Beta	09-Dec-97	pCi/L	2.55±1.65	1.53
	Gross Beta	05-Mar-98	pCi/L	1.93±0.981	0.841
	Gross Beta	10-Jun-98	pCi/L	1.89±0.678	0.606
	Gross Beta	14-Sep-98	pCi/L	2.03±0.678	0.614
	Gross Beta	01-Dec-98	pCi/L	1.61±0.994	0.804

Refer to footnotes at end of table.

Table F.4-1 (Continued)
Tijeras Arroyo Groundwater Investigation—
Radionuclide Analytical Results (Detections Only)

Well ID	Radionuclide	Sample Date	Units	Activity	MDA
WYO-1 (cont.)	Gross Beta	05-Mar-99	pCi/L	2.05±0.782	0.723
	Gross Beta	14-Jul-99	pCi/L	1.09±0.655	0.505
	Gross Beta	16-Sep-99	pCi/L	1.95±0.786	0.717
	Gross Beta	01-Dec-99	pCi/L	3.94±1.24	1
	Radium-226	01-Jun-00	pCi/L	0.551±0.505	0.3
	Radium-228	01-Jun-00	pCi/L	0.463±0.509	0.506
	Uranium-234	05-Jun-97	pCi/L	0.776±0.14	0.0342
	Uranium-234	01-Oct-97	pCi/L	0.795±0.141	0.0216
	Uranium-234	09-Dec-97	pCi/L	0.683±0.132	0.0308
	Uranium-234	05-Mar-98	pCi/L	0.731±0.142	0.0328
	Uranium-234	10-Jun-98	pCi/L	0.766±0.137	0.0211
	Uranium-234	14-Sep-98	pCi/L	0.815±0.15	0.0229
	Uranium-234	01-Dec-98	pCi/L	0.76±0.119	0.0229
	Uranium-234	05-Mar-99	pCi/L	0.773±0.234	0.0682
	Uranium-234	14-Jul-99	pCi/L	0.756±0.186	0.0353
	Uranium-234	16-Sep-99	pCi/L	0.919±0.202	0.029
	Uranium-234	01-Dec-99	pCi/L	0.783±0.17	0.0306
	Uranium-234	01-Jun-00	pCi/L	0.932±0.419	0.175
	Uranium-235	05-Jun-97	pCi/L	0.0525±0.0374	0.022
	Uranium-235	01-Oct-97	pCi/L	0.0362±0.0311	0.0185
	Uranium-235	05-Mar-98	pCi/L	0.0337±0.0302	0.0225
	Uranium-235	01-Dec-98	pCi/L	0.0654±0.0302	0.0198
	Uranium-235	05-Mar-99	pCi/L	0.0866±0.079	0.0456
	Uranium-235	01-Dec-99	pCi/L	0.0229±0.0271	0.00766
	Uranium-238	05-Jun-97	pCi/L	0.486±0.124	0.0241
	Uranium-238	01-Oct-97	pCi/L	0.311±0.0792	0.0174
	Uranium-238	09-Dec-97	pCi/L	0.273±0.0786	0.026
	Uranium-238	05-Mar-98	pCi/L	0.275±0.0824	0.0239
	Uranium-238	10-Jun-98	pCi/L	0.354±0.0861	0.0315
	Uranium-238	14-Sep-98	pCi/L	0.322±0.0861	0.0114
	Uranium-238	01-Dec-98	pCi/L	0.397±0.0783	0.0184
	Uranium-238	05-Mar-99	pCi/L	0.301±0.14	0.0508
	Uranium-238	14-Jul-99	pCi/L	0.352±0.118	0.0307
	Uranium-238	16-Sep-99	pCi/L	0.252±0.0995	0.0393
	Uranium-238	01-Dec-99	pCi/L	0.366±0.107	0.0153
	Uranium-238	01-Jun-00	pCi/L	0.526±0.28	0.0831
	Gross Alpha	25-Jan-96	pCi/L	6.7±4	2
	Gross Alpha	05-Jun-97	pCi/L	4.58±0.832	0.375

Refer to footnotes at end of table.

Table F.4-1 (Continued)
Tijeras Arroyo Groundwater Investigation—
Radionuclide Analytical Results (Detections Only)

Well ID	Radionuclide	Sample Date	Units	Activity ±□□□	MDA
WYO-1 (cont.)	Gross Alpha	01-Oct-97	pCi/L	2.38±0.931	0.722
	Gross Alpha	09-Dec-97	pCi/L	2.63±1.42	0.892
	Gross Alpha	05-Mar-98	pCi/L	2.74±1.03	0.829
	Gross Alpha	10-Jun-98	pCi/L	1.37±0.792	0.523
	Gross Alpha	14-Sep-98	pCi/L	1.17±0.872	0.615
	Gross Alpha	01-Dec-98	pCi/L	2.37±0.992	0.643
	Gross Alpha	05-Mar-99	pCi/L	1.48±0.868	0.582
	Gross Alpha	14-Jul-99	pCi/L	1.62±0.624	0.337
	Gross Alpha	16-Sep-99	pCi/L	1.38±0.907	0.667
	Gross Alpha	01-Dec-99	pCi/L	3.21±1.46	0.657
	Gross Alpha	01-Jun-00	pCi/L	2.8±1.06	0.75
	Gross Beta	25-Jan-96	pCi/L	4.6±3	2.2
	Gross Beta	01-Jun-00	pCi/L	3.86±1.52	1.25
	Gross Beta	05-Jun-97	pCi/L	2.97±0.695	0.513
	Uranium-234	05-Jun-97	pCi/L	0.758±0.136	0.031
	Uranium-238	05-Jun-97	pCi/L	0.433±0.113	0.023
	Gross Alpha	05-Jun-97	pCi/L	3.08±0.795	0.438
WYO-2	Gross Beta	05-Jun-97	pCi/L	2.81±0.709	0.523
	Gross Beta	01-Oct-97	pCi/L	2.82±0.761	0.782
	Gross Beta	09-Dec-97	pCi/L	2.22±0.877	0.613
	Gross Beta	06-Mar-98	pCi/L	2.61±0.985	0.833
	Gross Beta	10-Jun-98	pCi/L	2.45±0.662	0.593
	Gross Beta	14-Sep-98	pCi/L	2.18±0.697	0.612
	Gross Beta	01-Dec-98	pCi/L	1.78±0.899	0.749
	Gross Beta	05-Mar-99	pCi/L	1.91±0.727	0.693
	Gross Beta	19-Jul-99	pCi/L	2.37±0.71	0.513
	Gross Beta	16-Sep-99	pCi/L	2.32±0.833	0.741
	Gross Beta	01-Dec-99	pCi/L	1.78±0.798	0.686
	Uranium-234	05-Jun-97	pCi/L	0.761±0.135	0.0308
	Uranium-234	01-Oct-97	pCi/L	0.952±0.147	0.0192
	Uranium-234	09-Dec-97	pCi/L	0.807±0.149	0.0321
	Uranium-234	06-Mar-98	pCi/L	0.572±0.121	0.033
	Uranium-234	10-Jun-98	pCi/L	0.902±0.148	0.0222
	Uranium-234	14-Sep-98	pCi/L	0.875±0.167	0.0281
	Uranium-234	01-Dec-98	pCi/L	0.833±0.116	0.0225
	Uranium-234	05-Mar-99	pCi/L	0.839±0.249	0.0624
	Uranium-234	19-Jul-99	pCi/L	0.781±0.206	0.0339
	Uranium-234	16-Sep-99	pCi/L	0.78±0.187	0.034

Refer to footnotes at end of table.

Table F.4-1 (Concluded)
Tijeras Arroyo Groundwater Investigation—
Radionuclide Analytical Results (Detections Only)

Well ID	Radionuclide	Sample Date	Units	Activity ±	MDA
WYO-2 (cont.)	Uranium-234	01-Dec-99	pCi/L	0.791±0.168	0.0241
	Uranium-235	05-Jun-97	pCi/L	0.0204±0.0232	0.0186
	Uranium-235	01-Oct-97	pCi/L	0.026±0.0243	0.0161
	Uranium-235	06-Mar-98	pCi/L	0.0288±0.0293	0.0227
	Uranium-235	10-Jun-98	pCi/L	0.0497±0.033	0.0223
	Uranium-235	01-Dec-98	pCi/L	0.0714±0.0271	0.017
	Uranium-235	05-Mar-99	pCi/L	0.14±0.095	0.041
	Uranium-235	16-Sep-99	pCi/L	0.0276±0.0359	0.0117
	Uranium-235	01-Dec-99	pCi/L	0.0487±0.0377	0.0076
	Uranium-238	05-Jun-97	pCi/L	0.577±0.14	0.0231
	Uranium-238	01-Oct-97	pCi/L	0.426±0.0868	0.0155
	Uranium-238	09-Dec-97	pCi/L	0.3±0.0849	0.027
	Uranium-238	06-Mar-98	pCi/L	0.281±0.08	0.0212
	Uranium-238	10-Jun-98	pCi/L	0.361±0.0868	0.0329
	Uranium-238	14-Sep-98	pCi/L	0.368±0.0986	0.0126
	Uranium-238	01-Dec-98	pCi/L	0.378±0.0675	0.0151
	Uranium-238	05-Mar-99	pCi/L	0.334±0.152	0.0504
	Uranium-238	19-Jul-99	pCi/L	0.292±0.111	0.0207
	Uranium-238	16-Sep-99	pCi/L	0.435±0.133	0.0399
	Uranium-238	01-Dec-99	pCi/L	0.327±0.0993	0.0132
	Gross Alpha	24-Jan-96	pCi/L	21±8.3	3
	Gross Alpha	05-Jun-97	pCi/L	3.34±0.779	0.413
	Gross Alpha	01-Oct-97	pCi/L	2.09±0.845	0.657
	Gross Alpha	09-Dec-97	pCi/L	1.54±0.748	0.456
	Gross Alpha	06-Mar-98	pCi/L	1.16±0.775	0.813
	Gross Alpha	10-Jun-98	pCi/L	1.55±0.897	0.587
	Gross Alpha	14-Sep-98	pCi/L	1.25±0.727	0.478
	Gross Alpha	01-Dec-98	pCi/L	2.13±0.862	0.544
	Gross Alpha	05-Mar-99	pCi/L	1.62±0.879	0.564
	Gross Alpha	19-Jul-99	pCi/L	1.88±0.601	0.304
	Gross Alpha	16-Sep-99	pCi/L	2.57±0.963	0.609
	Gross Alpha	01-Dec-99	pCi/L	1.38±0.765	0.455
	Gross Beta	24-Jan-96	pCi/L	19±5.8	3.8
	Gross Beta	01-Oct-97	pCi/L	2.61±0.705	0.754
	Uranium-234	01-Oct-97	pCi/L	0.846±0.144	0.0171
	Uranium-235	01-Oct-97	pCi/L	0.0298±0.0356	0.0223
	Uranium-238	01-Oct-97	pCi/L	0.403±0.0917	0.0183
	Gross Alpha	01-Oct-97	pCi/L	2.75±0.842	0.594

ID = Identification.
MDA = Minimum detectable activity.
pCi/L = Picocurie(s) per liter.

ANNEX G
Tijeras Arroyo Groundwater Investigation—Chloride Concentrations over Time, Table and Graphs

Table G.1-1
Tijeras Arroyo Groundwater Investigation—
Chloride Concentrations (mg/L) over Time, Table and Graphs

Well Location	Sample Date	Amount Detected		Notes
PGS-2	26-Jan-96	150		
	26-Jan-96	160		duplicate
	11-Jun-97	55		
	22-Sep-97	44		
	22-Sep-97	50.3		duplicate
	16-Dec-97	39		
	16-Mar-98	39		
	11-Jun-98	37		
	22-Sep-98	12		
	8-Dec-98	14		
	12-Mar-99	16		
	30-Jun-99	11		
	23-Sep-99	7.9		
	3-Dec-99	9.8		
	12-Apr-00	18		
	15-Jan-01	13		
TA1-W-01	15-Dec-97	12		
	15-Dec-97	13.8		duplicate
	12-Mar-98	14		
	11-Jun-98	14		
	21-Aug-98	13.7		
	17-Sep-98	9.7		
	8-Dec-98	9.5		
	10-Mar-99	10		
	22-Jul-99	8.3		
	16-Sep-99	6		
	9-Dec-99	6.8		
	16-Mar-00	5.6		
	10-Jan-01	13		
TA1-W-02	24-Mar-98	30		
	18-Jun-98	15		
	18-Jun-98	14.8		split
	21-Sep-98	9		
	3-Dec-98	9.6		
	15-Mar-99	10		
	27-Jul-99	8.2		
	10-Sep-99	8.1		
	22-Nov-99	3.8		
	17-Mar-00	4.5		
	9-Jan-01	13		

Refer to footnotes at end of table.

Table G.1-1 (Continued)
Tijeras Arroyo Groundwater Investigation—
Chloride Concentrations (mg/L) over Time, Table and Graphs

Well Location	Sample Date	Amount Detected		Notes
TA1-W-03	11-Mar-98	310		
	17-Jun-98	270		
	17-Sep-98	240		
	17-Sep-98	259		
	10-Mar-99	270		
	13-Jul-99	250		
	14-Sep-99	250		
	24-Nov-99	230		
	10-Apr-00	270		
	5-Jan-01	240	E	
TA1-W-04	14-Dec-98	29		
	17-Mar-99	14		
	30-Jun-99	10		
	22-Sep-99	6.3		
	8-Dec-99	5.7		
	10-Apr-00	16		
	15-Jan-01	15		
TA1-W-05	16-Dec-98	12		
	19-Mar-99	9.8		
	17-Jun-99	5.8		
	22-Sep-99	2.2	J	
	7-Dec-99	1.9	J	
	29-May-00	12.1		
	16-Jan-01	15		
TA1-W-06	24-Mar-98	110		
	18-Jun-98	99		
	18-Jun-98	98.6		split
	21-Sep-98	96		
	3-Dec-98	98		
	15-Mar-99	97		
	27-Jul-99	90		
	10-Sep-99	88		
	22-Nov-99	87		
	22-Nov-99	86		duplicate
	22-Nov-99	98.1		split
	17-Mar-00	91		
	9-Jan-01	95	E	
TA1-W-07	16-Dec-98	100		
	10-Mar-99	110		

Refer to footnotes at end of table.

Table G.1-1 (Continued)
Tijeras Arroyo Groundwater Investigation—
Chloride Concentrations (mg/L) over Time, Table and Graphs

Well Location	Sample Date	Amount Detected		Notes
TA1-W-07 (cont.)	10-Mar-99	113		split
	21-Jul-99	95		
	16-Sep-99	96		
	6-Dec-99	76		
	15-Mar-00	96		
	10-Jan-01	120	E	
TA2-NW1-325	26-Mar-93	98.9		
	6-Jan-94	120		
	11-Apr-94	130		
	11-Apr-94	120		duplicate
	18-Jul-94	140		
	18-Jul-94	130		duplicate
	13-Oct-94	120		
	20-Jun-95	150		
	27-Sep-95	150		
	25-Jan-96	155		
	25-Jan-96	170		duplicate
	9-Jun-97	140		
	26-Sep-97	140		
	8-Dec-97	160		
	9-Mar-98	140	B	
	16-Jun-98	140		
	15-Sep-98	140		
	30-Nov-98	140		
	8-Mar-99	130		
	15-Jun-99	110		
	15-Sep-99	120		
	17-Nov-99	120		
	21-Apr-00	110		
	11-Jan-01	93	E	
TA2-NW1-595	28-May-93	109		
	1-Jun-93	25.5		
	10-Jun-93	14.8		
	13-Jun-93	15.1		
	24-Jun-93	15.6		
	7-Oct-93	39		
	10-Jun-97	78		
	30-Sep-97	72		
	30-Sep-97	74		duplicate

Refer to footnotes at end of table.

Table G.1-1 (Continued)
Tijeras Arroyo Groundwater Investigation—
Chloride Concentrations (mg/L) over Time, Table and Graphs

Well Location	Sample Date	Amount Detected		Notes
TA2-NW1-595 (cont.)	15-Dec-97	71		
	9-Mar-98	80	B	
	17-Jun-98	78		
	15-Sep-98	79		
	30-Nov-98	84		
	8-Mar-99	92		
	15-Jun-99	79		
	15-Sep-99	79		
	18-Nov-99	81		
	11-Jan-01	91	E	
TA2-SW1-320	5-Jan-94	30		
	7-Apr-94	30		
	15-Jul-94	32		
	12-Oct-94	33		
	12-Oct-94	34		duplicate
	20-Jun-95	26		
	20-Jun-95	26		duplicate
	27-Sep-95	27		
	25-Jan-96	29.3		
	25-Jan-96	29		duplicate
	9-Jun-97	28		
	6-Mar-98	26	B	
	15-Jun-98	27		
	10-Sep-98	26		
	30-Nov-98	26		
	20-Jul-99	25		
	13-Sep-99	25		
	19-Nov-99	24		
	12-Apr-00	27		
	12-Jan-01	26		
TA2-W-01	20-Jul-94	78		
	14-Oct-94	86		
	20-Jun-95	89		
	27-Sep-95	94		
	27-Sep-95	94		duplicate
	26-Jan-96	99.3		
	26-Jan-96	83		duplicate
	6-Jun-97	100		
	2-Oct-97	99		

Refer to footnotes at end of table.

Table G.1-1 (Continued)
Tijeras Arroyo Groundwater Investigation—
Chloride Concentrations (mg/L) over Time, Table and Graphs

Well Location	Sample Date	Amount Detected		Notes
TA2-W-01 (cont.)	8-Dec-97	98		
	13-Mar-98	110		
	24-Jun-98	100		
	18-Sep-98	110		
	30-Nov-98	110		
	9-Mar-99	110		
	28-Jul-99	120		
	15-Sep-99	120		
	2-Dec-99	120		
	11-Apr-00	110		
	17-Jan-01	100		
TA2-W-19	24-Jan-96	83		
	24-Jan-96	92		split
	24-Jan-96	83.4		duplicate
	24-Apr-96	69		
	10-Jun-97	71		
	29-Sep-97	77		
	10-Dec-97	72		
	6-Mar-98	74	B	
	15-Jun-98	75		
	15-Jun-98	78		duplicate
	16-Sep-98	81		
	16-Sep-98	78		duplicate
	2-Dec-98	79		
	2-Dec-98	80		duplicate
	9-Mar-99	75		
	16-Jun-99	75		
	24-Sep-99	81		
	30-Nov-99	73		
	15-Mar-00	70		
	4-Jan-01	71		
TA2-W-24	19-Mar-98	92		
	19-Mar-98	77.9		duplicate
	23-Jun-98	48		
	24-Sep-98	32		
	3-Dec-98	38		
	11-Mar-99	33		
	29-Jun-99	31		
	9-Sep-99	29		

Refer to footnotes at end of table.

Table G.1-1 (Continued)
Tijeras Arroyo Groundwater Investigation—
Chloride Concentrations (mg/L) over Time, Table and Graphs

Well Location	Sample Date	Amount Detected		Notes
TA2-W-24 (cont.)	23-Nov-99	30		
	14-Mar-00	28		
	3-Jan-01	28		
TA2-W-25	12-Dec-97	13		
	12-Dec-97	14.7		duplicate
	10-Mar-98	13		
	22-Jun-98	13		
	23-Sep-98	8.7		
	14-Dec-98	9.2		
	16-Mar-99	8.7		
	29-Jun-99	8.6		
	13-Sep-99	7.3		
	24-Nov-99	5.2		
	28-Apr-00	14		
	28-Apr-00	13.5		split
	5-Jan-01	13		
TA2-W-26	17-Mar-98	70		
	17-Mar-98	72		duplicate
	22-Jun-98	71		
	25-Sep-98	57		
	14-Dec-98	61		
	14-Dec-98	63.3		
	16-Mar-99	53		
	7-Jul-99	53		
	9-Sep-99	40		
	9-Sep-99	43		duplicate
	9-Sep-99	43.9		split
	2-Dec-99	32		
	26-May-00	35		
	8-Jan-01	33		
	8-Jan-01	34		duplicate
	8-Jan-01	33.5		split
TA2-W-27	19-Mar-98	150		
	19-Mar-98	150		duplicate
	23-Jun-98	140		
	24-Sep-98	140		
	3-Dec-98	150		
	11-Mar-99	150		
	8-Jul-99	140		

Refer to footnotes at end of table.

Table G.1-1 (Continued)
Tijeras Arroyo Groundwater Investigation—
Chloride Concentrations (mg/L) over Time, Table and Graphs

Well Location	Sample Date	Amount Detected		Notes
TA2-W-27 (cont.)	9-Sep-99	140		
	23-Nov-99	140		
	14-Mar-00	140		
	3-Jan-01	130	E	
TJA-2	24-Jan-96	82		
	24-Jan-96	81		duplicate
	12-Jun-97	68.9		
	12-Jun-97	75		duplicate
	29-Sep-97	72		
	16-Dec-97	69		
	10-Mar-98	74		
	24-Jun-98	74		
	16-Sep-98	75		
	2-Dec-98	74		
	4-Mar-99	76		
	16-Jun-99	71		
	13-Sep-99	72		
	30-Nov-99	70		
	15-Mar-00	74		
	4-Jan-01	66		
TJA-3	15-Dec-98	9.6		
	15-Dec-98	13.8		duplicate
	8-Mar-99	5.9		
	16-Jun-99	8.4		
	20-Sep-99	5.7		
	29-Nov-99	5.7		
	11-Apr-00	14		
	8-Jan-01	14		
TJA-4	15-Dec-98	33		
	4-Mar-99	22		
	4-Mar-99	21		duplicate
	4-Mar-99	22.6		split
	12-Jul-99	19		
	12-Jul-99	19		duplicate
	20-Sep-99	17		
	29-Nov-99	17		
	20-Apr-00	22		
	2-Jan-01	21		
TJA-5	15-Dec-98	18		
	4-Mar-99	14		

Refer to footnotes at end of table.

Table G.1-1 (Continued)
Tijeras Arroyo Groundwater Investigation—
Chloride Concentrations (mg/L) over Time, Table and Graphs

Well Location	Sample Date	Amount Detected		Notes
TJA-5 (cont.)	4-Mar-99	14		duplicate
	28-Jun-99	12		
	28-Jun-99	13		duplicate
	14-Sep-99	9		
	29-Nov-99	12		
	28-Apr-00	32		
	28-Apr-00	32		duplicate
	2-Jan-01	41		
WYO-1	25-Jan-96	130		
	5-Jun-97	115		
	5-Jun-97	113		duplicate
	5-Jun-97	140		
	1-Oct-97	110		
	9-Dec-97	120		
	9-Dec-97	120		duplicate
	5-Mar-98	125		
	10-Jun-98	110		
	14-Sep-98	120		
	1-Dec-98	87		
	5-Mar-99	120		
	14-Jul-99	120		
	14-Jul-99	104		duplicate
	16-Sep-99	120		
	16-Sep-99	110		duplicate
	16-Sep-99	111		split
	1-Dec-99	110		
	1-Jun-00	107		
	12-Jan-01	96	E	
WYO-2	24-Jan-96	130		
	24-Jan-96	140		duplicate
	5-Jun-97	120		
	1-Oct-97	110		
	1-Oct-97	122		split
	1-Oct-97	123		duplicate
	9-Dec-97	120		
	6-Mar-98	120	B	
	10-Jun-98	110		
	14-Sep-98	120		
	1-Dec-98	120		

Refer to footnotes at end of table.

Table G.1-1 (Concluded)
Tijeras Arroyo Groundwater Investigation—
Chloride Concentrations (mg/L) over Time, Table and Graphs

Well Location	Sample Date	Amount Detected		Notes
WYO-2 (cont.)	5-Mar-99	120		
	19-Jul-99	120		
	19-Jul-99	105		duplicate
	16-Sep-99	110		
	1-Dec-99	110		
	1-Dec-99	110		duplicate
	1-Dec-99	108		split
	16-Jan-01	100		
	16-Jan-01	120		split
	16-Jan-01	95.3		duplicate

B = Analyte detected in an associate blank.
E = The final result is greater than the highest calibration level.
J = Estimated value, analyte detected below the MDL.
MDL = Method detection limit.
mg/L = Milligram(s) per liter.

Figure G-1: Chloride Concentrations over Time for Monitoring Well PGS-2

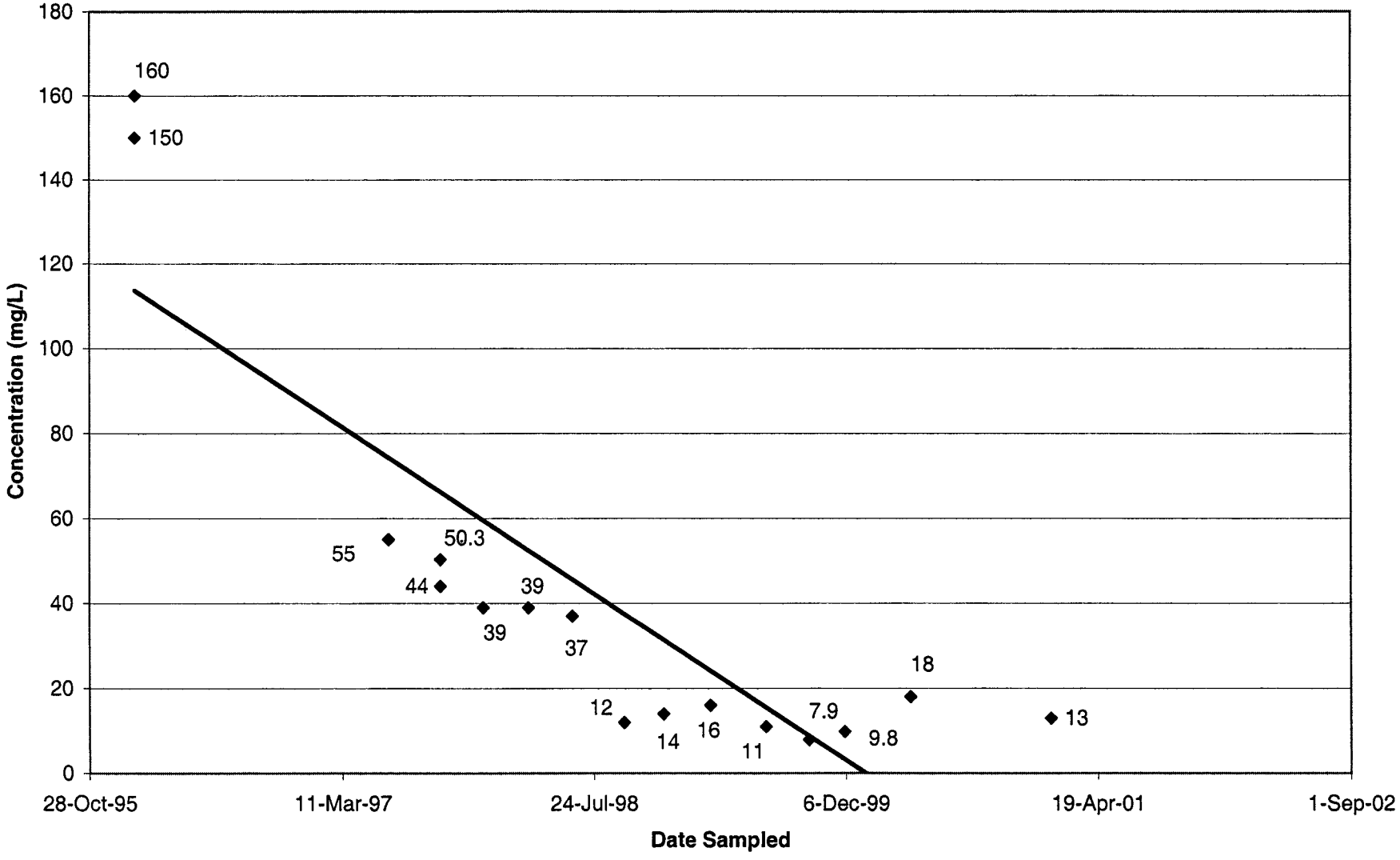


Figure G-2: Chloride Concentrations over Time for Monitoring Well TA1-W-03

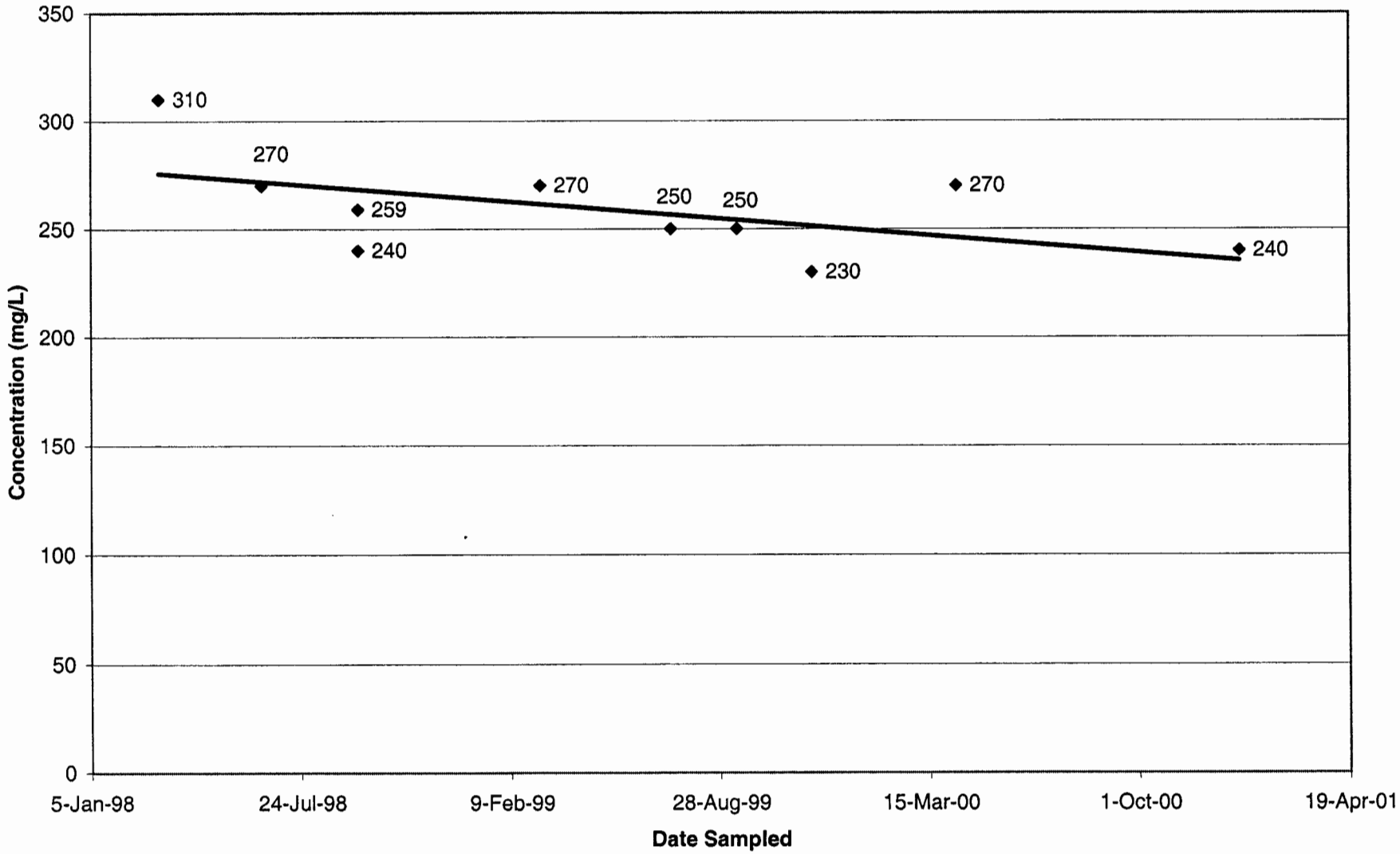


Figure G-3: Chloride Concentrations over Time for Monitoring Well TA1-W-06

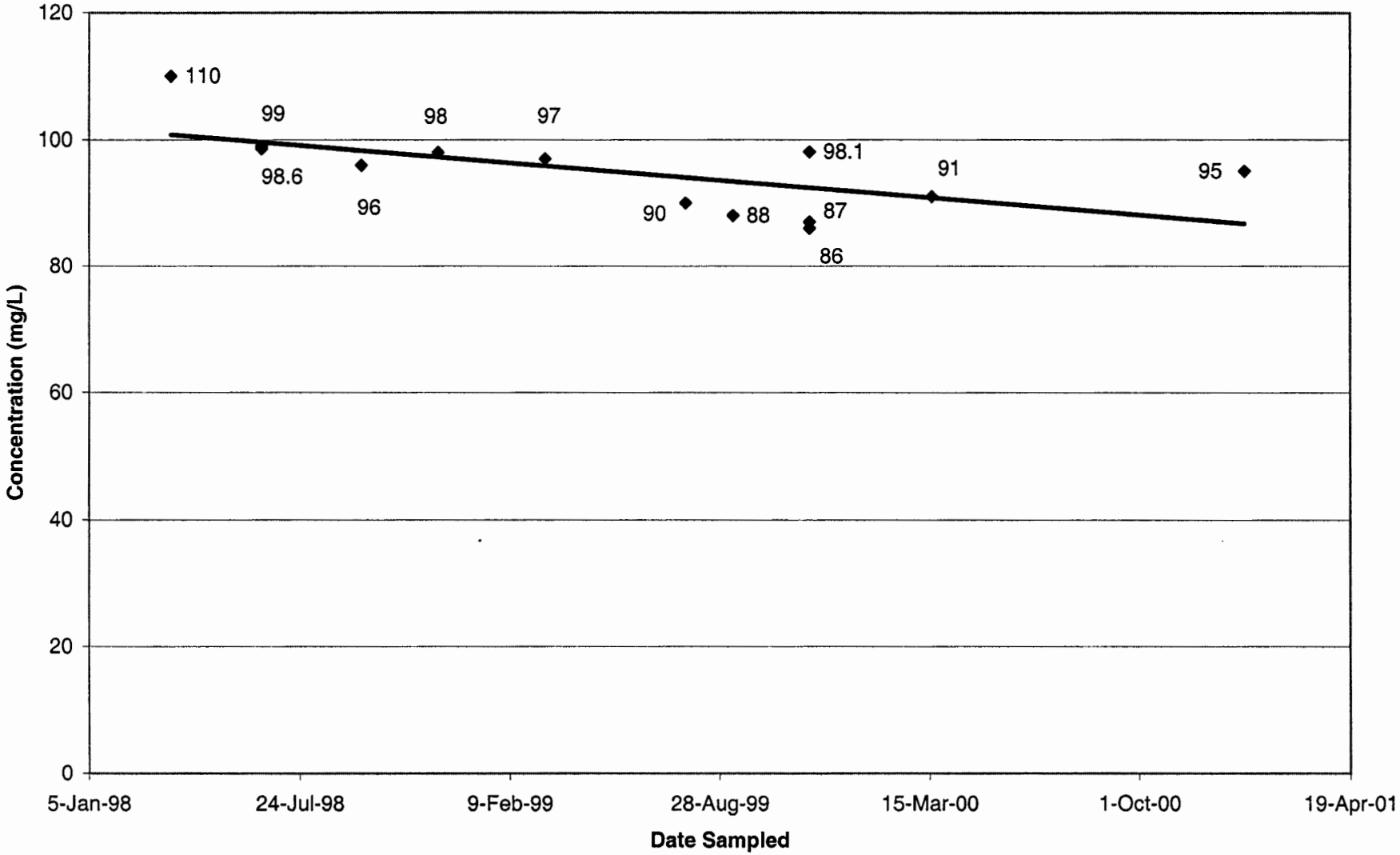


Figure G-4: Chloride Concentrations over Time for Monitoring Well TA1-W-07

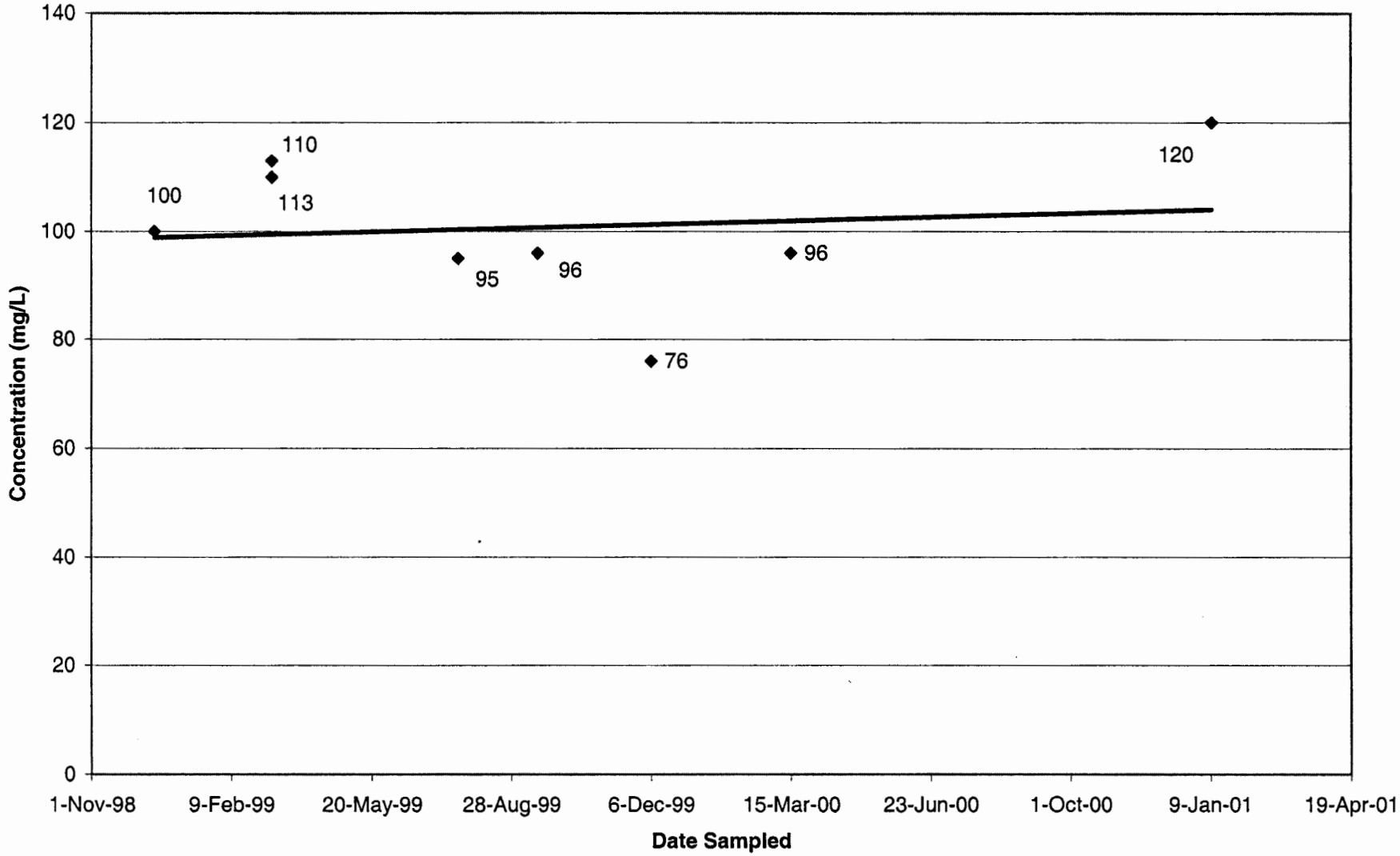


Figure G-5: Chloride Concentrations over Time for Monitoring Well TA2-NW1-325

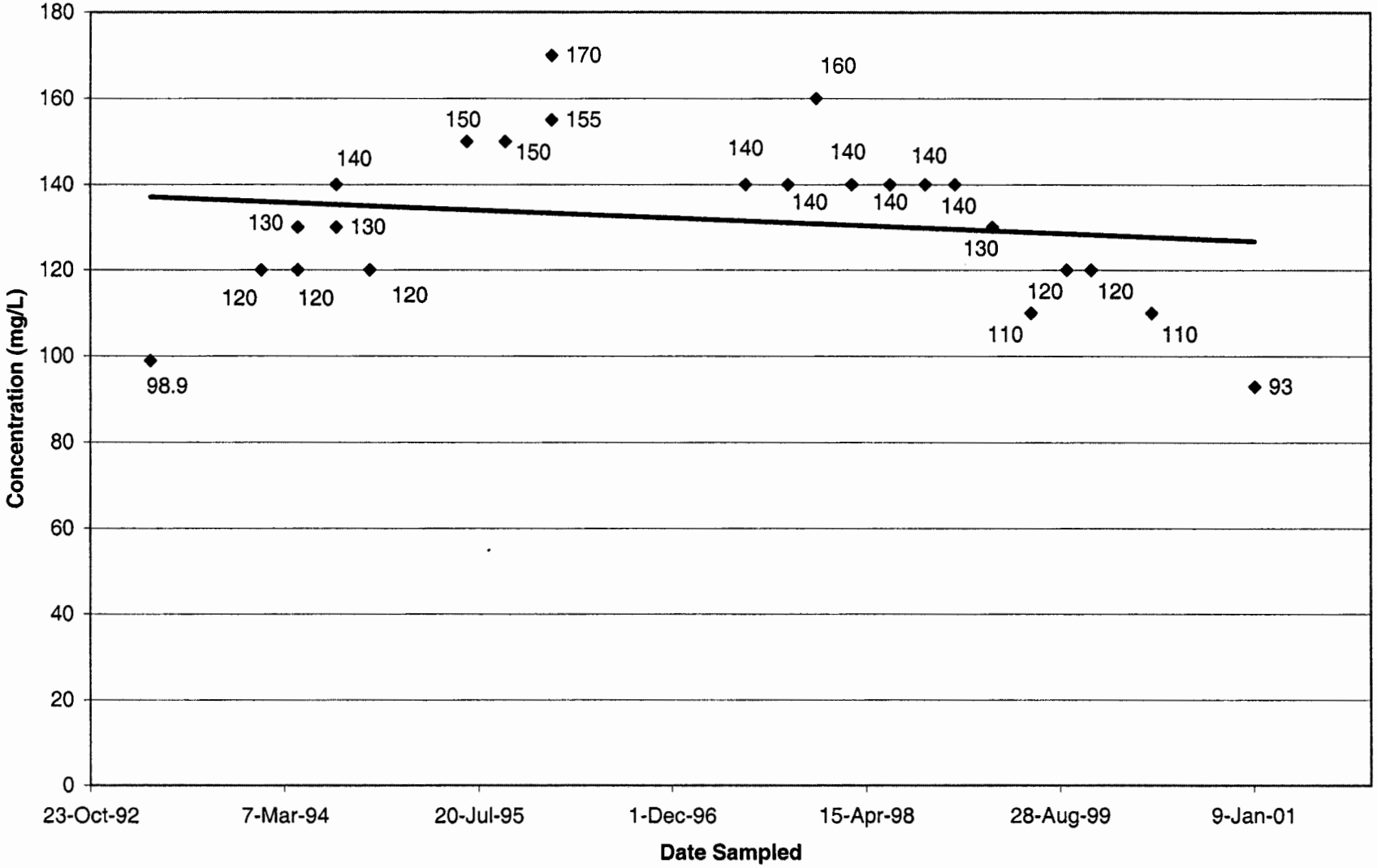


Figure G-6: Chloride Concentrations over Time for Monitoring Well TA2-NW1-595

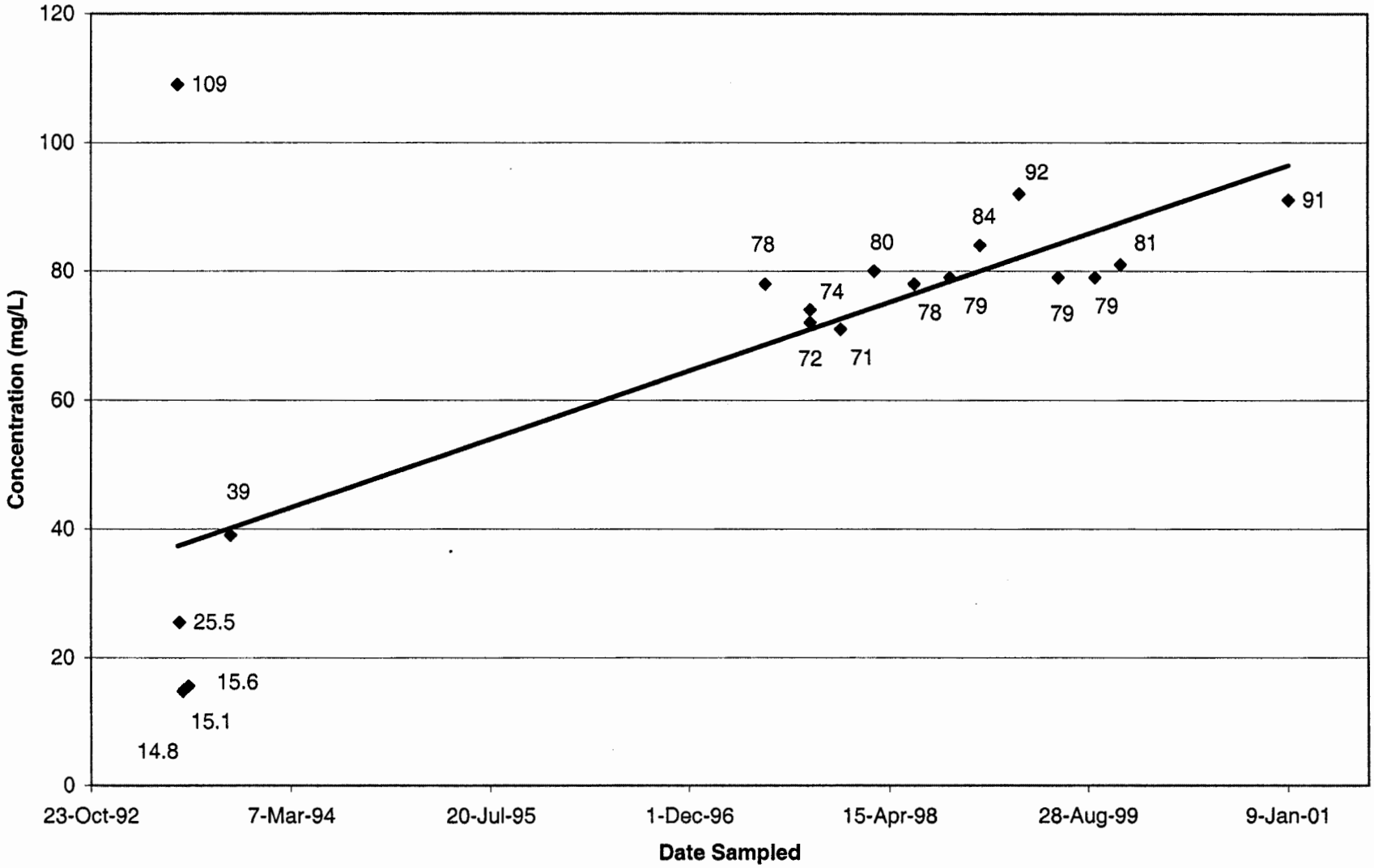


Figure G-7: Chloride Concentrations over Time for Monitoring Well TA2-W-01

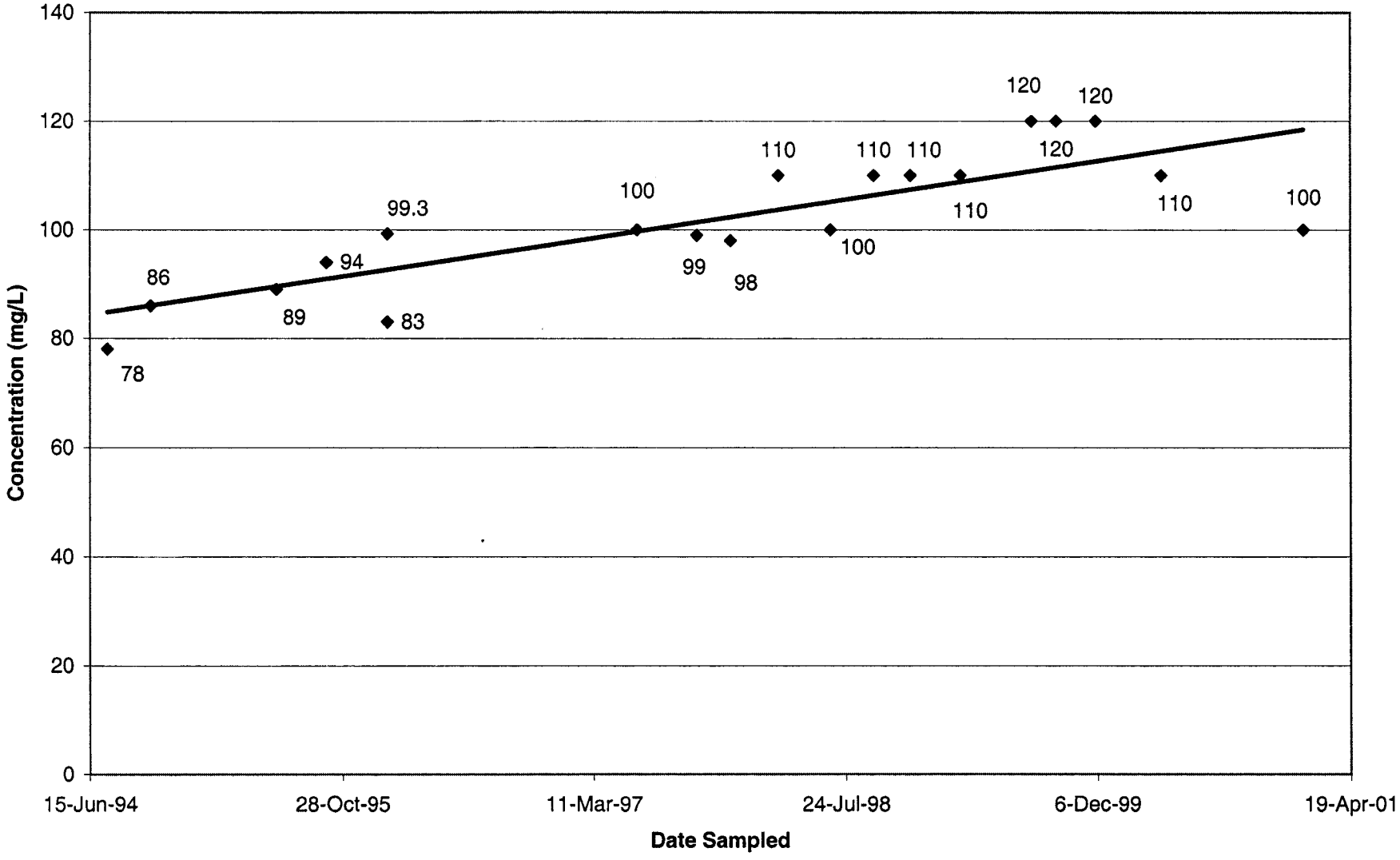


Figure G-8: Chloride Concentrations over Time for Monitoring Well TA2-W-27

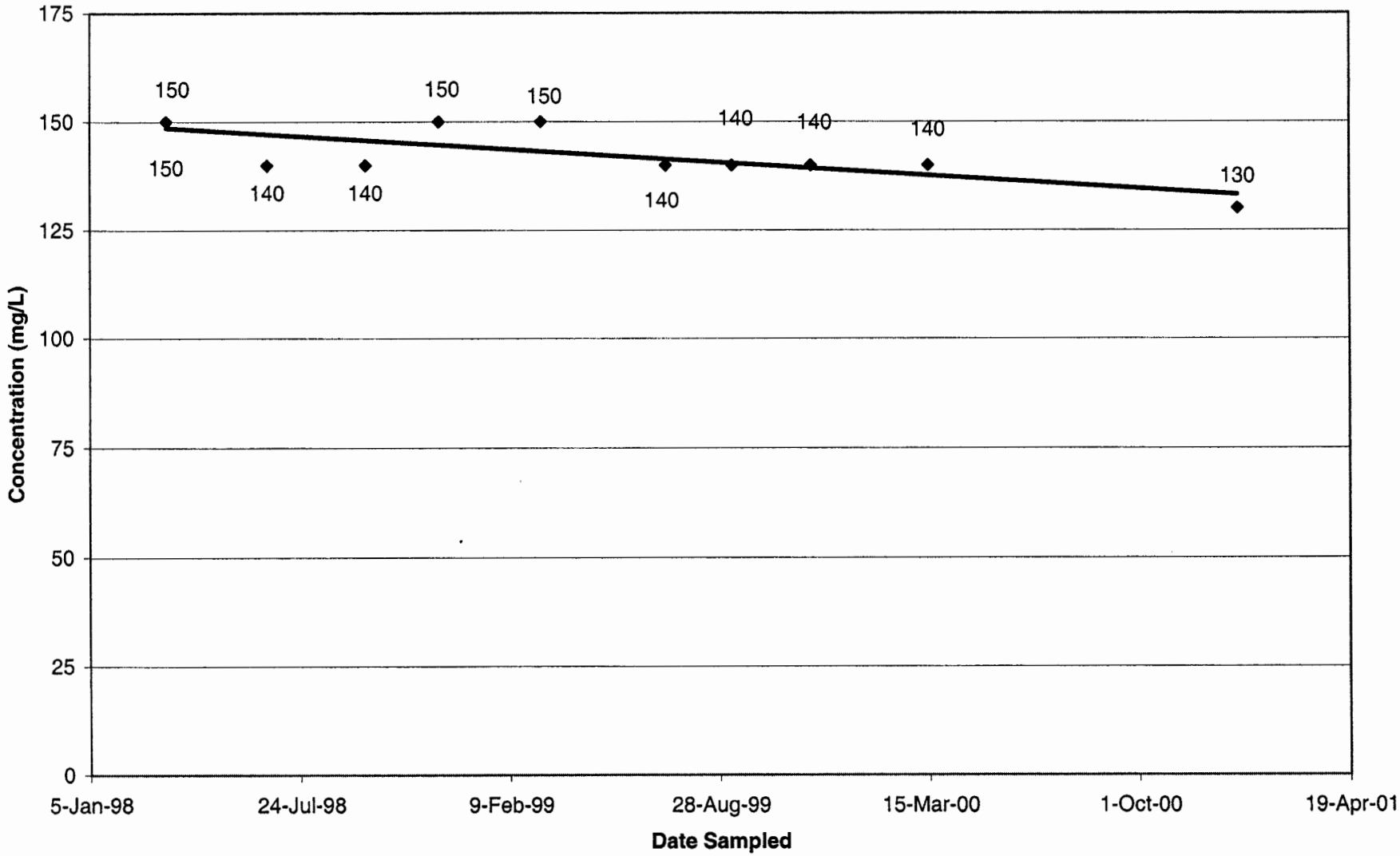


Figure G-9: Chloride Concentrations over Time for Monitoring Well WYO-1

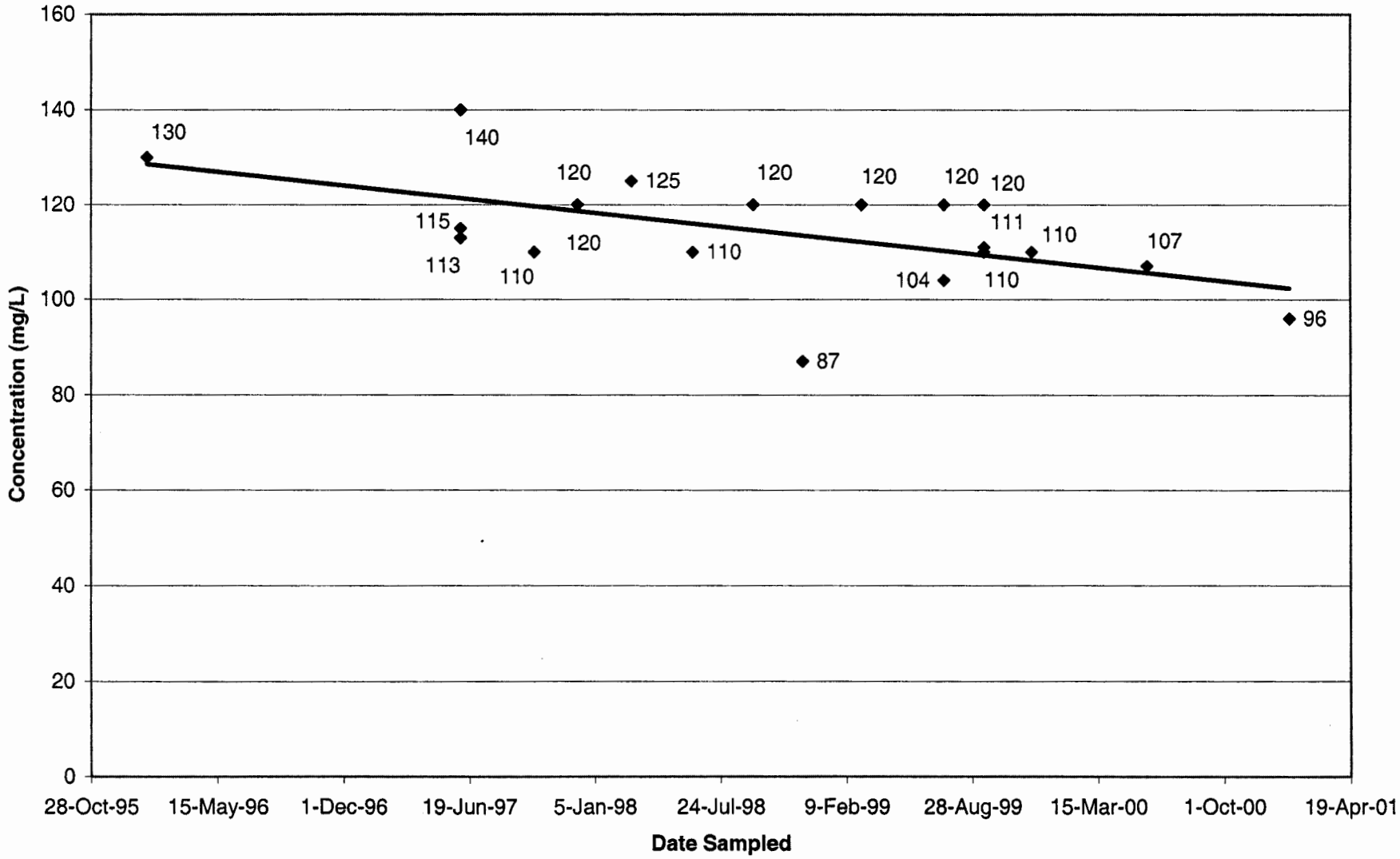
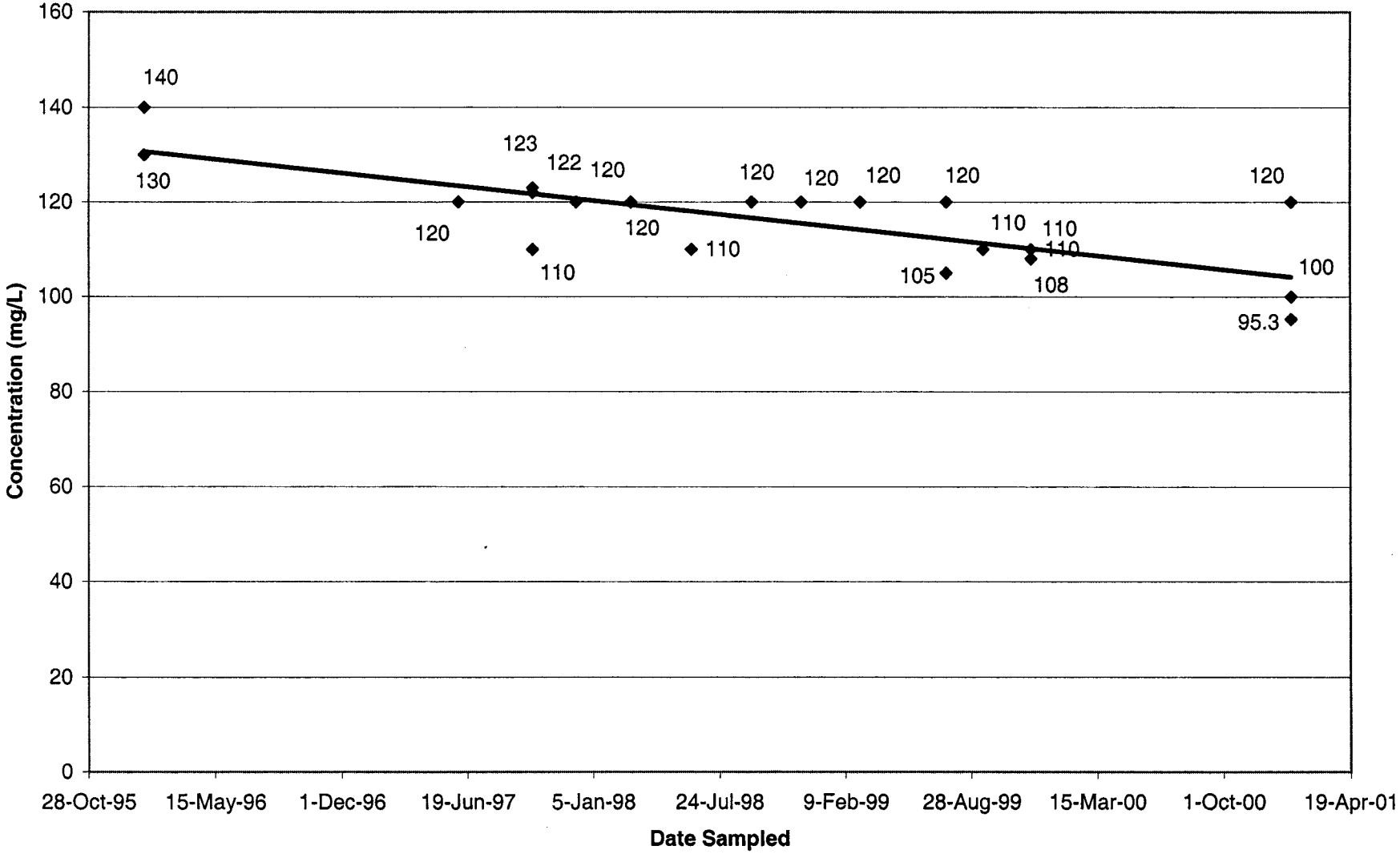



Figure G-10: Chloride Concentrations over Time for Monitoring Well WYO-2