

Summary of 2014 Sandia National Laboratories – New Mexico (SNL) Annual Groundwater Monitoring Report
Regarding Groundwater Impacts At Tijeras Arroyo, Tech Area V And Burn Site Areas of Concern

January 20, 2016

By

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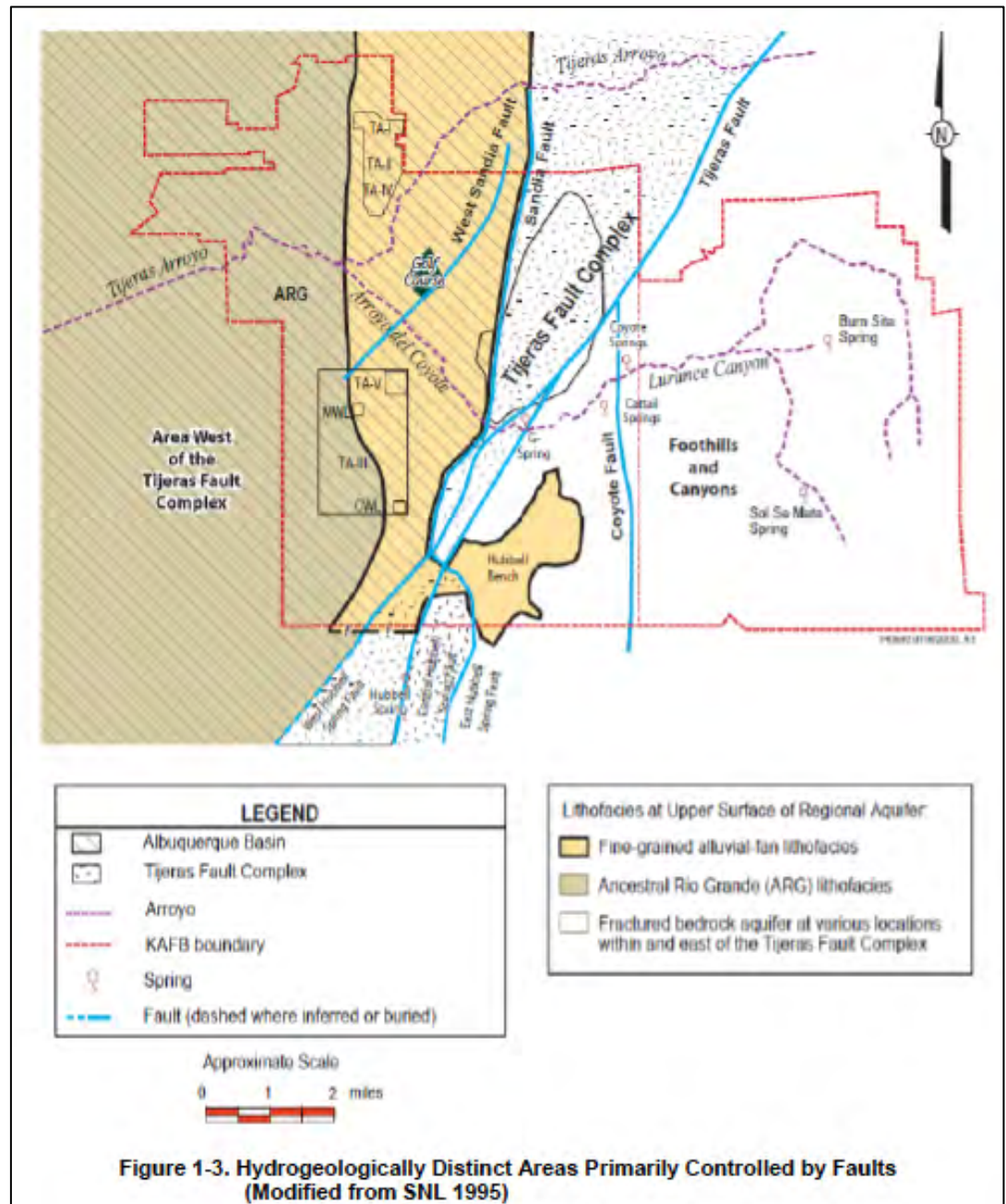
Research Director

Southwest Research and Information Center

Albuquerque, NM 87106

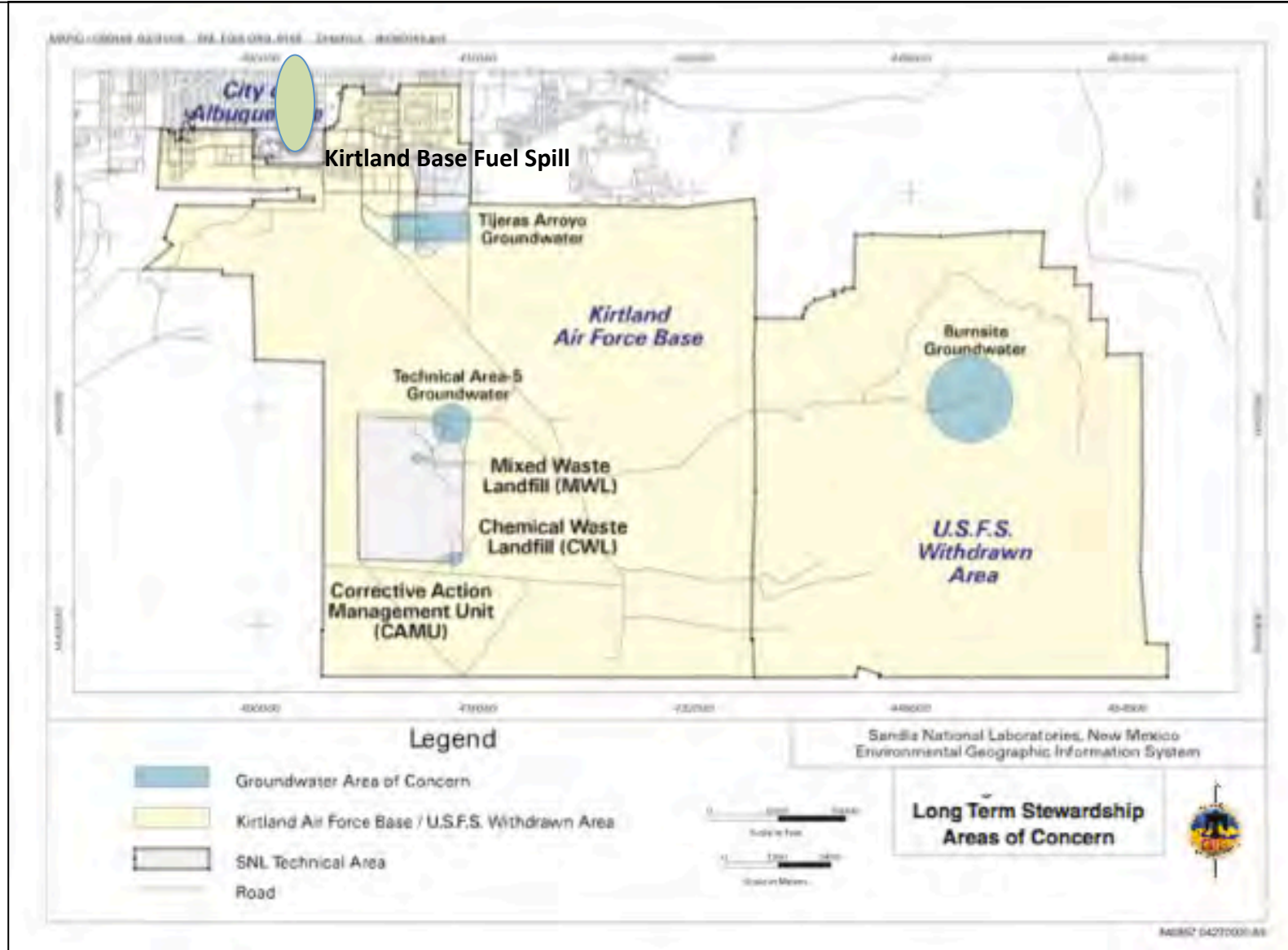
2014 SNL Annual Groundwater Monitoring Report at

http://www.sandia.gov/news/publications/environmental_reports/assets/documents/Annual_GW_Monitoring_Rpt_CY14_Final_Printed_June_2015_SAND2015_4261R.pdf

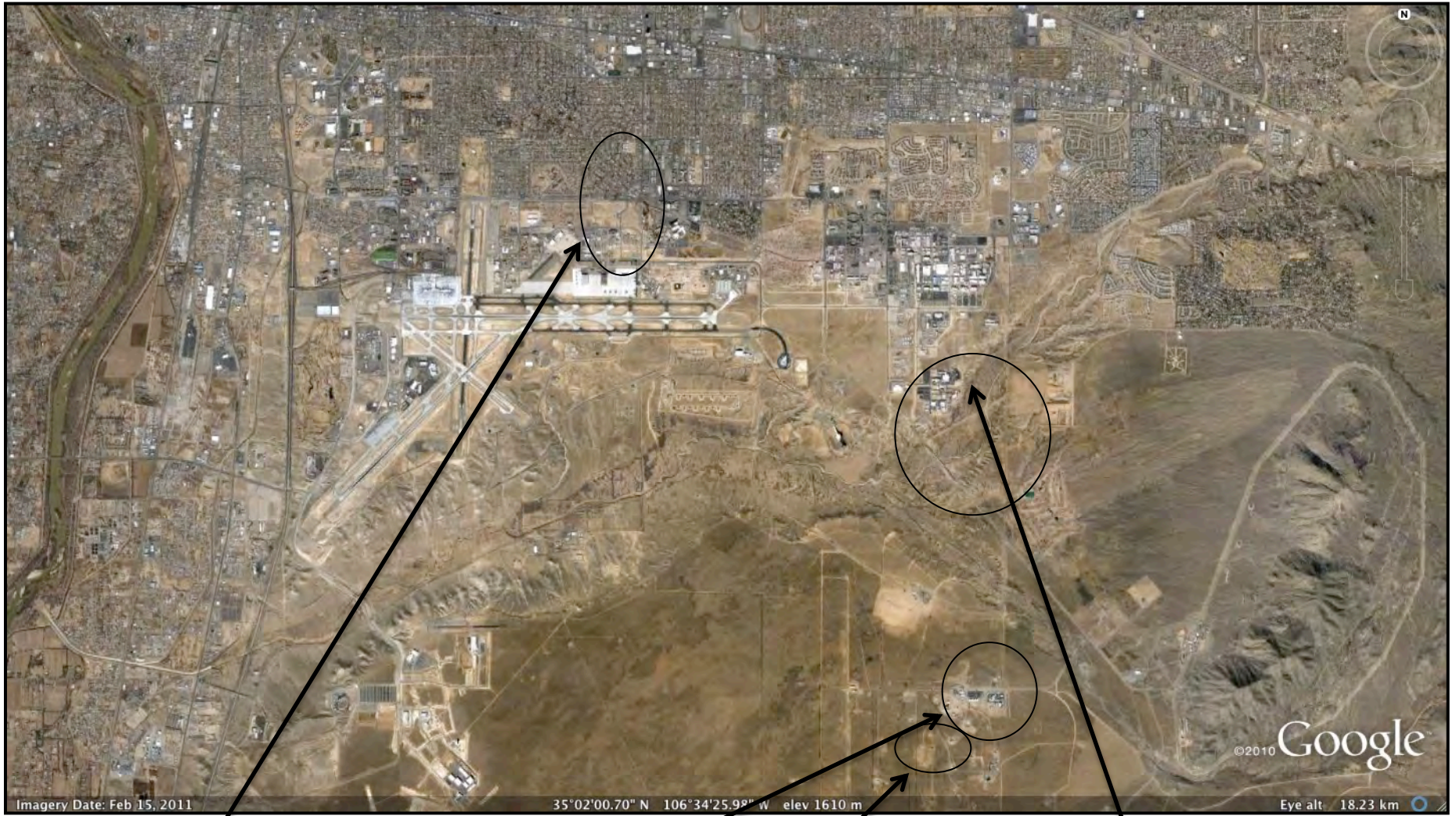


PREVIOUS WORK

Overview of Groundwater Contamination Sites at Sandia National Laboratories and Kirtland Air Force Base, Albuquerque, New Mexico



Compiled February 2012 by Paul Robinson sricpaul@earthlink.net



Kirtland Aviation Fuel Leak

TA-V

MWL

TAG

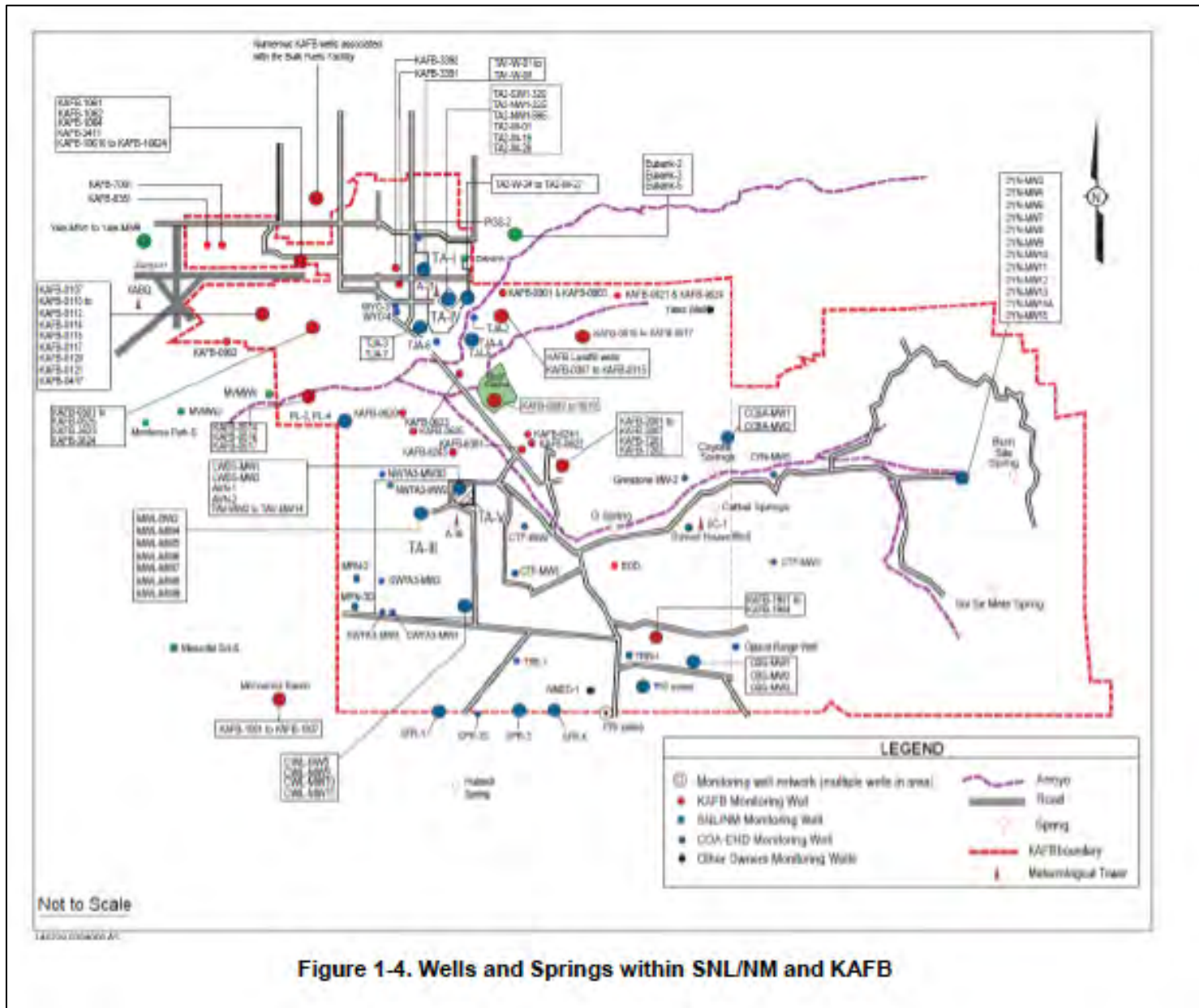
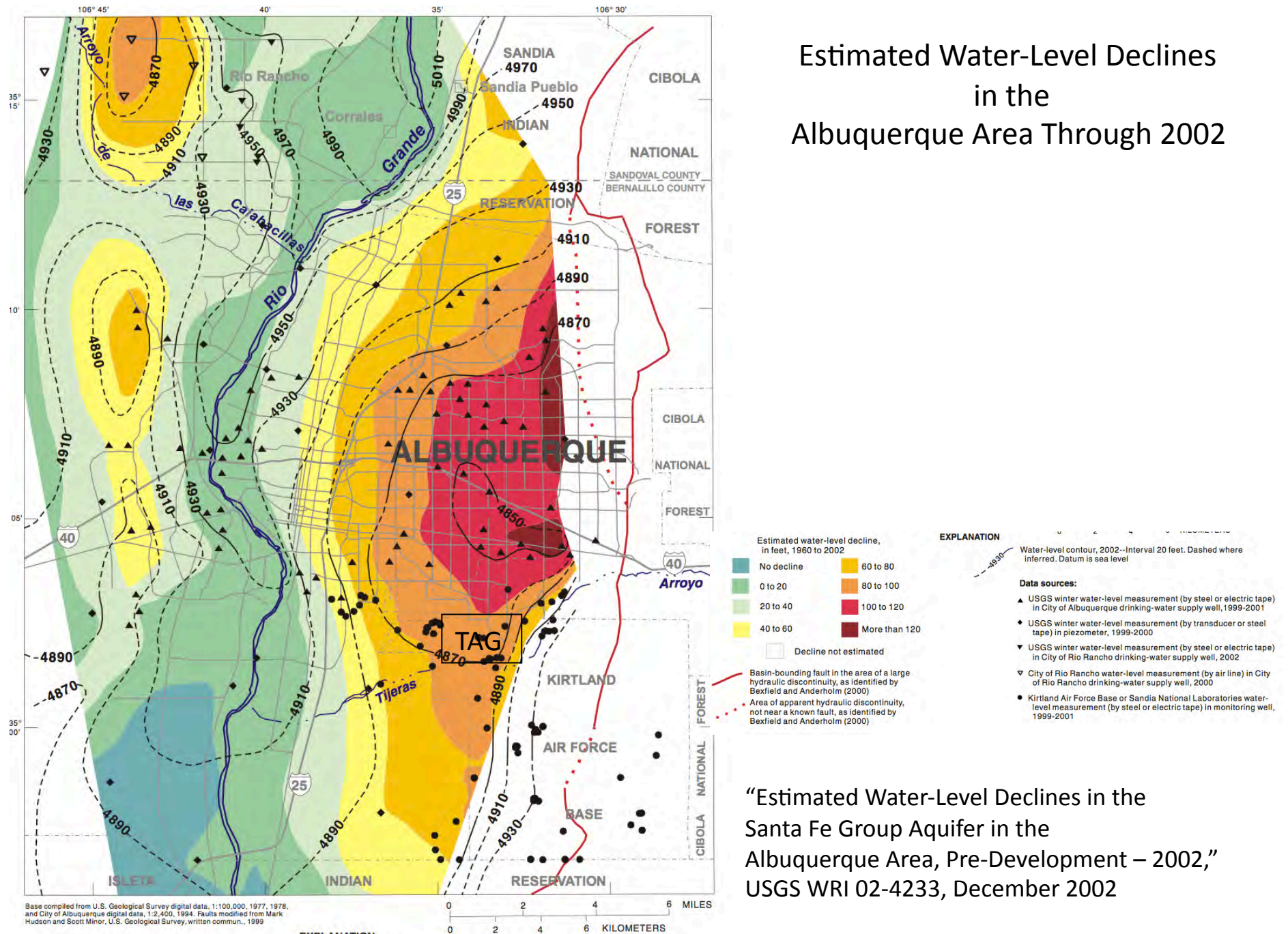
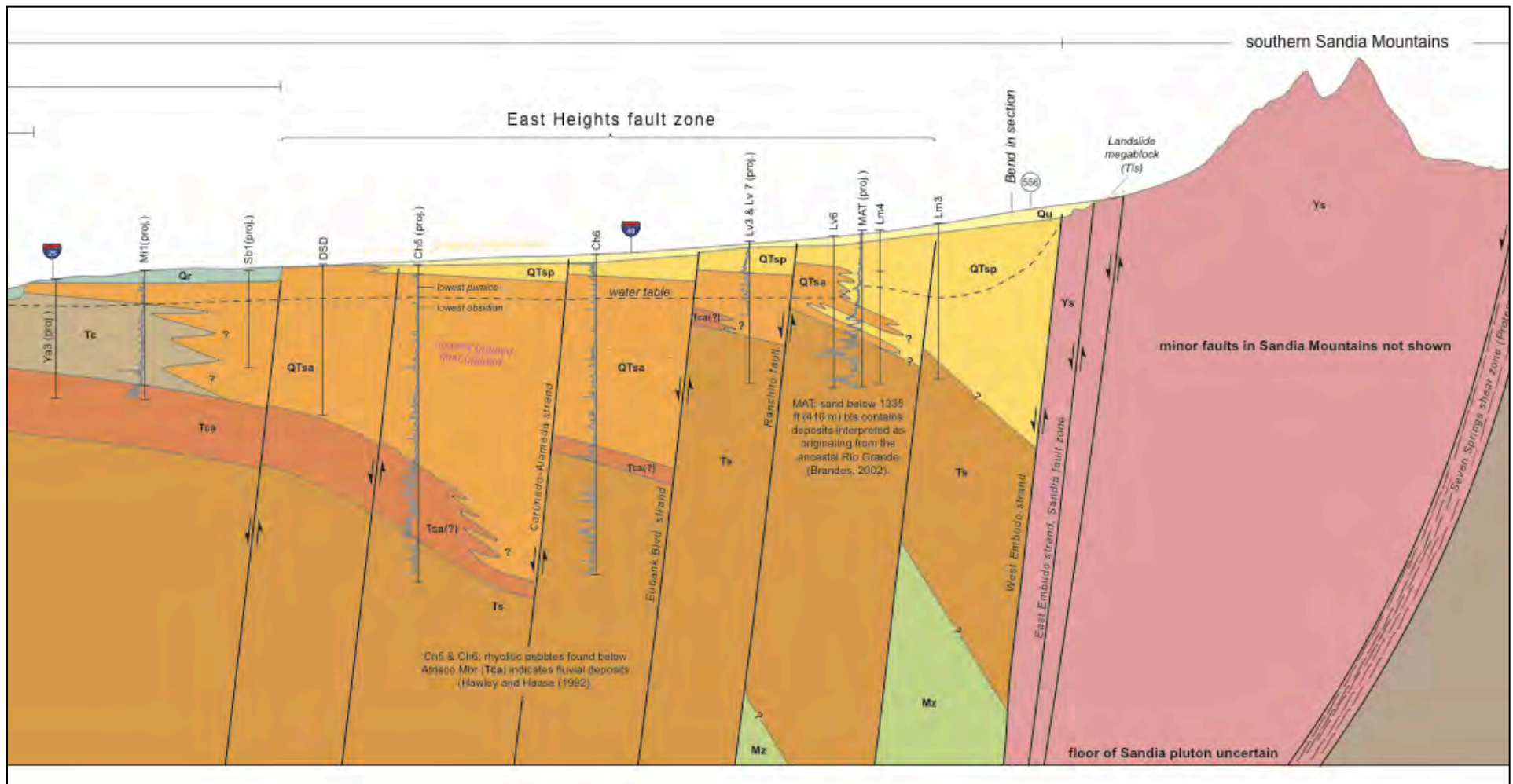


Figure 1-4. Wells and Springs within SNL/NM and KAFB

Estimated Water-Level Declines in the Albuquerque Area Through 2002



“Estimated Water-Level Declines in the Santa Fe Group Aquifer in the Albuquerque Area, Pre-Development – 2002,” USGS WRI 02-4233, December 2002



Cross-section of Albuquerque Aquifer between I-25 and the Sandia Mountains

(From: Connell, S. D., et al, 2006, NMBMMR OFR 496

<http://geoinfo.nmt.edu/publications/openfile/downloads/OFR400-499/476-499/496/ReadMe.html>)

From 2014 SNL Annual Groundwater Monitoring Report:

Tijeras Arroyo Groundwater Area of Concern

Trichloroethene (TCE) and nitrate have been identified as constituents of concern (COCs) in groundwater at the Tijeras Arroyo Groundwater (TAG) Area of Concern (AOC) based on historical groundwater monitoring results. Detections of these two COCs exceed the U.S. Environmental Protection Agency (EPA) maximum contaminant levels (MCLs) in groundwater samples collected from the TAG AOC monitoring wells. Since August 1996, the historical maximum TCE concentration detected at the site has been 10.5 micrograms per liter ($\mu\text{g/L}$), and the maximum nitrate detection has been 49 milligrams per liter (mg/L). The EPA MCLs and State of New Mexico drinking water standards for TCE and nitrate are 5 $\mu\text{g/L}$ and 10 mg/L (as nitrogen), respectively.

Characteristics of the TAG AOC include concentrations of TCE below to just above the MCL at scattered locations in the perched groundwater system (PGWS) and concentrations of nitrate above **the** MCL at scattered locations in both the PGWS and the regional aquifer.

The maximum historical concentration of TCE in the PGWS is 10.5 $\mu\text{g/L}$, which was collected from monitoring well WYO-4 in November 2014. The results for groundwater samples from only three TAG AOC monitoring wells (TA2-W-19, TA2-W-26, and WYO-4) have exceeded the MCL for TCE (5 $\mu\text{g/L}$).

Wastewater Disposal History at SNL Locations of "High Concern" as Potential Sources of Release at TAG (SNL 2009b p. 6-20)

Source	Contaminant of Concern	Period of Operation	Estimated Volume of Release in gallons	SWMU Number
TA-I Old Acid Waste Line Outfall	TCE, Nitrate	1948-1974	1.3 billion	46 (connected to SWMU 226)
TA-II Bldg. 901 Septic System	TCE, Nitrate	1948 - 1992	No estimate identified	165
TA-I Sanitary Sewer System	Nitrate	1948 - Present (as of 2005)	No estimate identified	187

Technical Area-V Groundwater Area of Concern

5.1 Introduction

Trichloroethene (TCE) and nitrate have been identified as constituents of concern (COCs) in groundwater at the Technical Area-V Groundwater (TAVG) Area of Concern (AOC) based on detections above the U.S. Environmental Protection Agency (EPA) maximum contaminant levels (MCLs) in samples collected from monitoring wells. Since 1993, the maximum concentrations detected in groundwater at the TAVG AOC have been 26 micrograms per liter (mg/L) of TCE and 19 milligrams per liter (mg/L) of nitrate (as nitrogen). The EPA MCLs and State of New **Mexico** drinking water standards for TCE and nitrate are 5 mg/L and 10 mg/L (as nitrogen), respectively. Unique features of the TAVG AOC include low concentrations of TCE and nitrate in an alluvial aquifer that is approximately 500 feet (ft) below ground surface (bgs).

SNL investigations have identified three Solid Waste Management Units (SWMUs), sources of release for 50 - 70 million gallons of wastewater, as the primary sources of the groundwater contamination at TA-V. These are:

Wastewater Disposal History at potential Sources of Contaminants at TA-V (SNL 2009b, p. 5-15)

Disposal Site	Period of Operation	Estimated Volume of Release - gallons	SWMU Number
TA-V Seepage Pits	1960s - 1992	30 - 50 million	275
Liquid Waste Disposal System (LWDS) Drain Field	1962 - 1967	6.5 million	5
Liquid Waste Disposal System Surface Impoundments	1967 - 1972	12 million	4

Burn Site Groundwater Area of Concern

7.1 Introduction

Unique features of the Burn Site Groundwater (BSG) Area of Concern (AOC) (previously Burn Site Groundwater Study Area), located in the Manzanita Mountains (Figure 7-1), include low concentrations of nitrate in a fractured bedrock aquifer. Nitrate has been identified as a constituent of concern (COC) in groundwater at the study area based on detections above the U.S. Environmental Protection Agency (EPA) maximum contaminant level (MCL) in samples collected from monitoring wells. Since August 1998, the maximum concentration of nitrate detected in the study area has been 41.9 milligrams per liter (mg/L). The EPA MCL and State of New Mexico drinking water standard for nitrate is 10 mg/L (as nitrogen).

Perchlorate has been detected in only one groundwater monitoring well in the BSG AOC. Currently there is no EPA MCL or State of New Mexico drinking water standard for perchlorate.

Table 1-3. Summary of Exceedances for SNL/NM Groundwater Monitoring Wells Sampled During Calendar Year 2014

Analyte	Well (Relevant Chapter)	Exceedance	Date
Arsenic MCL = 0.010 mg/L	CTF-MW2 (Ch. 13)	0.0365 mg/L	March 2014
		0.0365 mg/L*	
		0.0341 mg/L	June 2014
		0.0261 mg/L*	
	0.0458 mg/L	September 2014	
	0.0398 mg/L*		
CTF-MW2 (Duplicate) (Ch. 13)	0.0355 mg/L	March 2014	
Beryllium MCL = 0.004 mg/L	Coyote Springs (Ch. 2)	0.00737 mg/L	January 2014
Fluoride MCL = 4 mg/L	CCBA-MW1 (Ch. 8)	4.68 mg/L	January 2014
		4.97 mg/L	April 2014
		4.99 mg/L	July 2014
		4.81 mg/L	October 2014
	CCBA-MW1 (Duplicate) (Ch. 8)	4.74 mg/L	January 2014
	5.02 mg/L	July 2014	
Nitrate plus Nitrite (as Nitrogen) MCL = 10.0 mg/L	AVN-1 (Ch. 5)	10.8 mg/L	October 2014
	CYN-MW9 (Ch. 7)	41.7 mg/L	June 2014
		39.9 mg/L	December 2014
	CYN-MW9 (Duplicate) (Ch. 7)	40.6 mg/L	December 2014
	CYN-MW10 (Ch. 7)	14.0 mg/L	December 2014
	CYN-MW10 (Reanalysis) (Ch. 7)	13.6 mg/L	
	CYN-MW10 (Duplicate) (Ch. 7)	10.7 mg/L	
	CYN-MW10 (Duplicate Reanalysis) (Ch. 7)	13.6 mg/L	
	CYN-MW11 (Ch. 7)	17.8 mg/L	December 2014
	CYN-MW11 (Reanalysis) (Ch. 7)	17.9 mg/L	
	CYN-MW12 (Ch. 7)	16.5 mg/L	June 2014
	CYN-MW12 (Duplicate) (Ch. 7)	14.7 mg/L	December 2014
	CYN-MW12 (Duplicate) (Ch. 7)	15.2 mg/L	June 2014
	CYN-MW13 (Ch. 7)	39.5 mg/L	June 2014
	CYN-MW14A (Ch. 7)	14.8 mg/L	December 2014
	CYN-MW15 (Ch. 7)	18.7 mg/L	December 2014
	LWDS-MW1 (Ch. 5)	12.3 mg/L	March 2014
		11.9 mg/L	May 2014
		11.5 mg/L	August 2014
		12.7 mg/L	November 2014
	LWDS-MW1 (Duplicate) (Ch. 5)	12.3 mg/L	November 2014
	TA2-SW1-320 (Ch. 6)	21.7 mg/L	March 2014
		22.3 mg/L	June 2014
		19.6 mg/L	August 2014
	TA2-W-19 (Ch. 6)	10.8 mg/L	March 2014
		11.7 mg/L	August 2014
		10.9 mg/L	November 2014
	TA2-W-28 (Ch. 6)	21.8 mg/L	December 2014
		10.9 mg/L	March 2014
	TJA-2 (Ch. 6)	11.2 mg/L	June 2014
		10.9 mg/L	September 2014
		12.0 mg/L	November 2014

Refer to footnotes on page 1-14

Table 1-3. Summary of Exceedances for SNL/NM Groundwater Monitoring Wells Sampled During Calendar Year 2014 (Concluded)

Analyte	Well (Relevant Chapter)	Exceedance	Date
Nitrate plus Nitrite (as Nitrogen) MCL = 10.0 mg/L	TJA-4 (Ch. 6)	28.4 mg/L	March 2014
		31.2 mg/L	June 2014
		32.8 mg/L	September 2014
		31.0 mg/L	November 2014
	TJA-7 (Ch. 6)	24.8 mg/L	March 2014
		22.9 mg/L	June 2014
		20.8 mg/L	September 2014
		22.4 mg/L	December 2014
	TJA-7 (Duplicate) (Ch. 6)	24.6 mg/L	December 2014
	TAV-MW10 (Ch. 5)	12.0 mg/L	March 2014
		12.0 mg/L	May 2014
		14.6 mg/L	August 2014
		13.1 mg/L	November 2014
	TAV-MW10 (Duplicate) (Ch. 5)	13.1 mg/L	March 2014
LWDS-MW1 (Ch. 5)	22.4 µg/L	March 2014	
	17.7 µg/L	May 2014	
	16.0 µg/L	August 2014	
	16.9 µg/L	November 2014	
	LWDS-MW1 (Duplicate) (Ch. 5)	17.5 µg/L	November 2014
	TAV-MW6 (Ch. 5)	18.8 µg/L	March 2014
14.3 µg/L		May 2014	
13.1 µg/L		August 2014	
TAV-MW10 (Ch. 5)	16.8 µg/L	March 2014	
	14.1 µg/L	May 2014	
	13.0 µg/L	August 2014	
	12.9 µg/L	November 2014	
TAV-MW10 (Duplicate) (Ch. 5)	17.5 µg/L	March 2014	
	11.9 µg/L	March 2014	
	9.40 µg/L	May 2014	
TAV-MW12 (Ch. 5)	6.43 µg/L	August 2014	
	9.05 µg/L	November 2014	
	8.43 µg/L	February 2014	
TAV-MW14 (Ch. 5)	6.94 µg/L	May 2014	
	6.43 µg/L	November 2014	
	7.11 µg/L	May 2014	
TAV-MW14 (Duplicate) (Ch. 5)	6.53 µg/L	November 2014	
	9.85 µg/L	March 2014	
	6.75 µg/L	June 2014	
WYO-4 (Ch. 6)	10.5 µg/L	November 2014	
	6.85 µg/L	June 2014	
WYO-4 (Duplicate) (Ch. 6)	6.85 µg/L	June 2014	

NOTES:

*Analytical result for filtered groundwater sample. All other analytical results are for unfiltered groundwater samples.

- | | | | |
|------|---------------------------------|--------|--|
| µg/L | = Microgram(s) per liter. | MW | = Monitoring well. |
| AVN | = Area V (North). | SNL/NM | = Sandia National Laboratories, New Mexico. |
| CCBA | = Coyote Canyon Blast Area. | SW | = Southwest. |
| Ch. | = Chapter. | TA | = Technical Area. |
| CTF | = Coyote Test Field. | TAV | = Technical Area-V (monitoring well designation only). |
| CYN | = Canyons. | TJA | = Tijeras Arroyo. |
| LWDS | = Liquid Waste Disposal System. | WYO | = Wyoming. |
| MCL | = Maximum contaminant level. | W | = Well. |
| mg/L | = Milligram(s) per liter. | | |

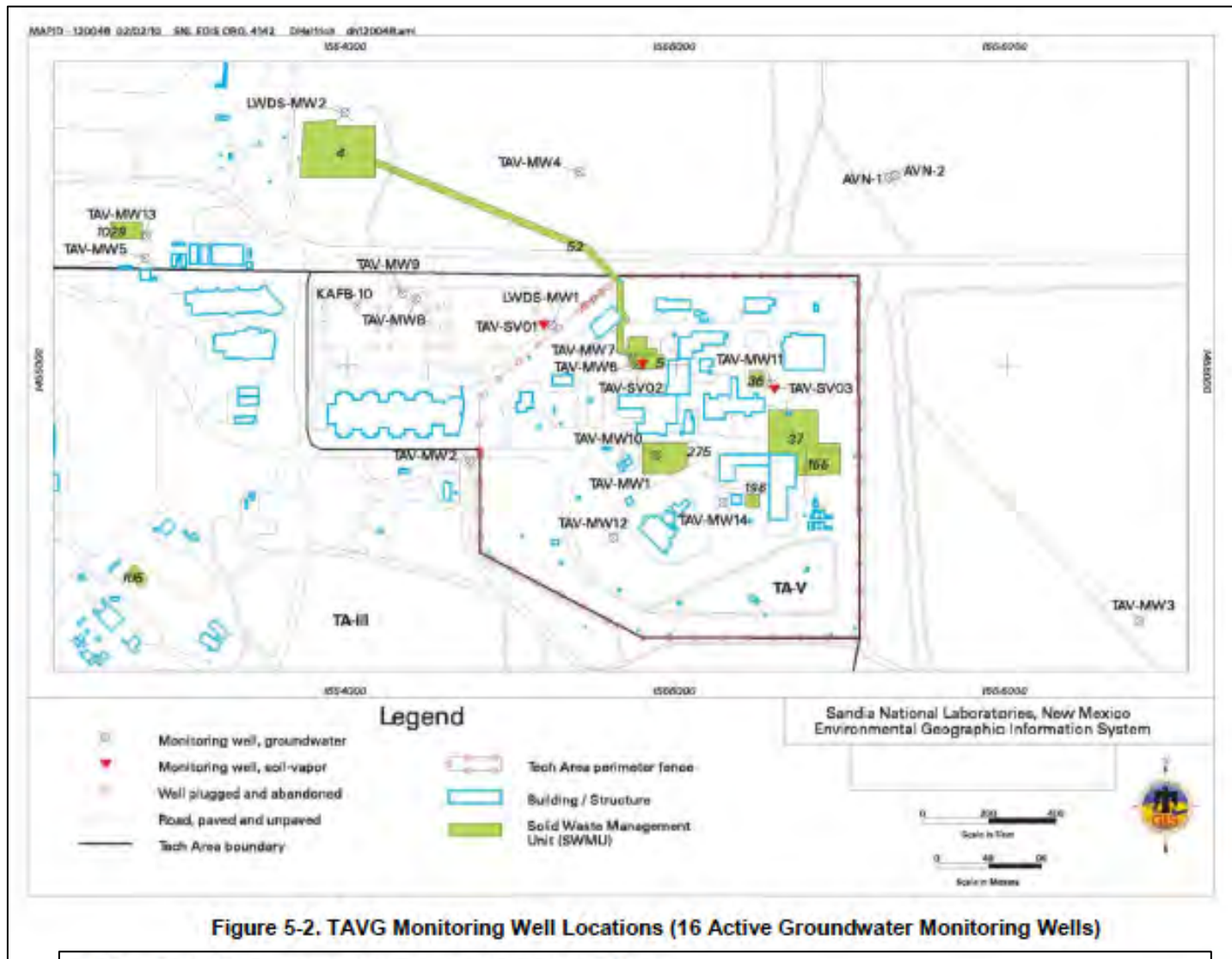


Figure 5-2. TAVG Monitoring Well Locations (16 Active Groundwater Monitoring Wells)

Table 5-3. Wastewater Disposal History at TA-V

Disposal Site	Dates	Estimated Volume of Wastewater (gallons)
SWMU 5 – LWDS Drain Field	1962–1967	6.5 million
SWMU 4 – LWDS Surface Impoundments	1967–1972	12 million
SWMU 275 – TA-V Seepage Pits	1980s–1992	30 to 50 million

NOTES:

- LWDS = Liquid Waste Disposal System.
- SWMU = Solid Waste Management Unit.
- TA-V = Technical Area-V.

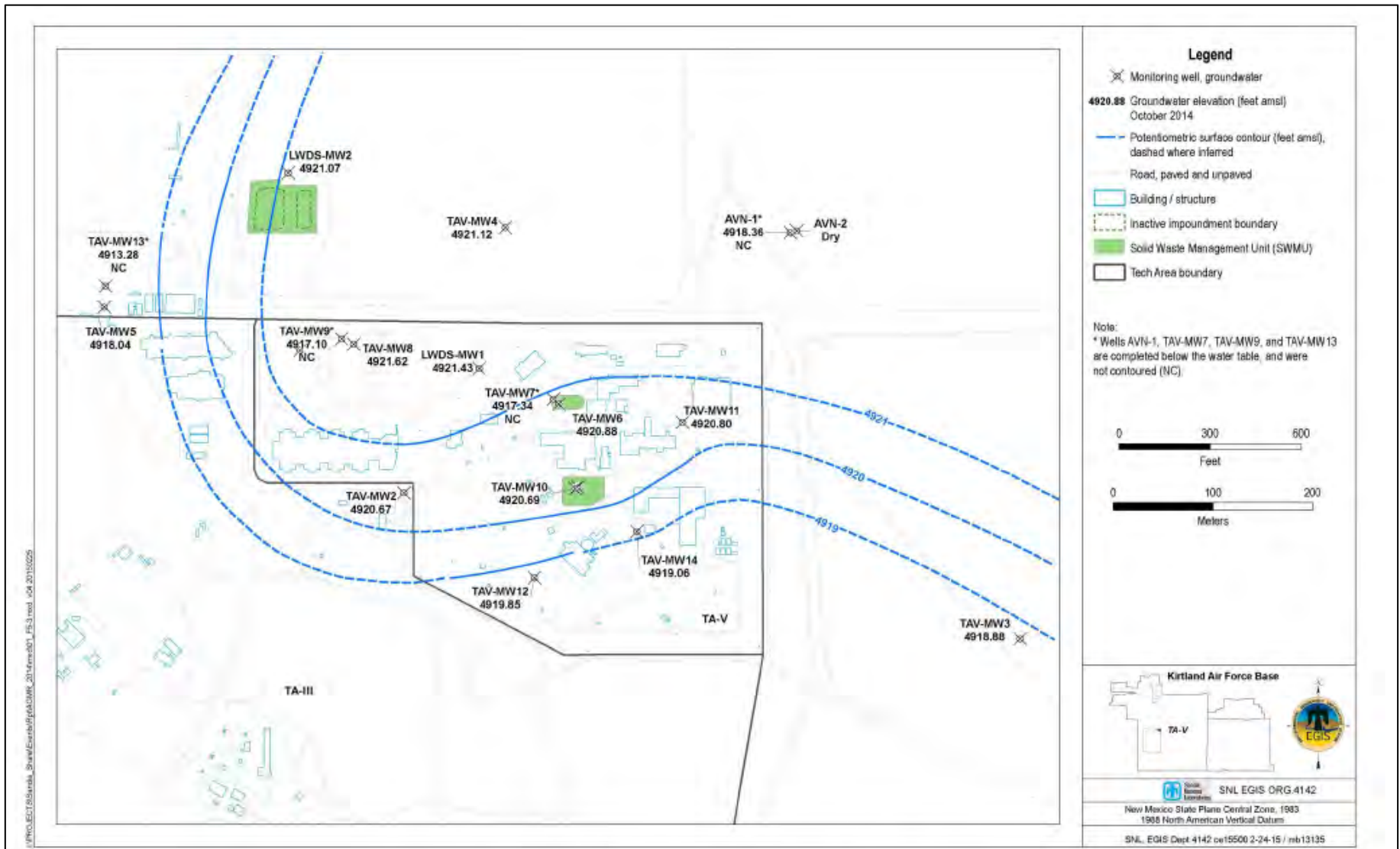


Figure 5-3. TAVG AOC Potentiometric Surface Map (October 2014)

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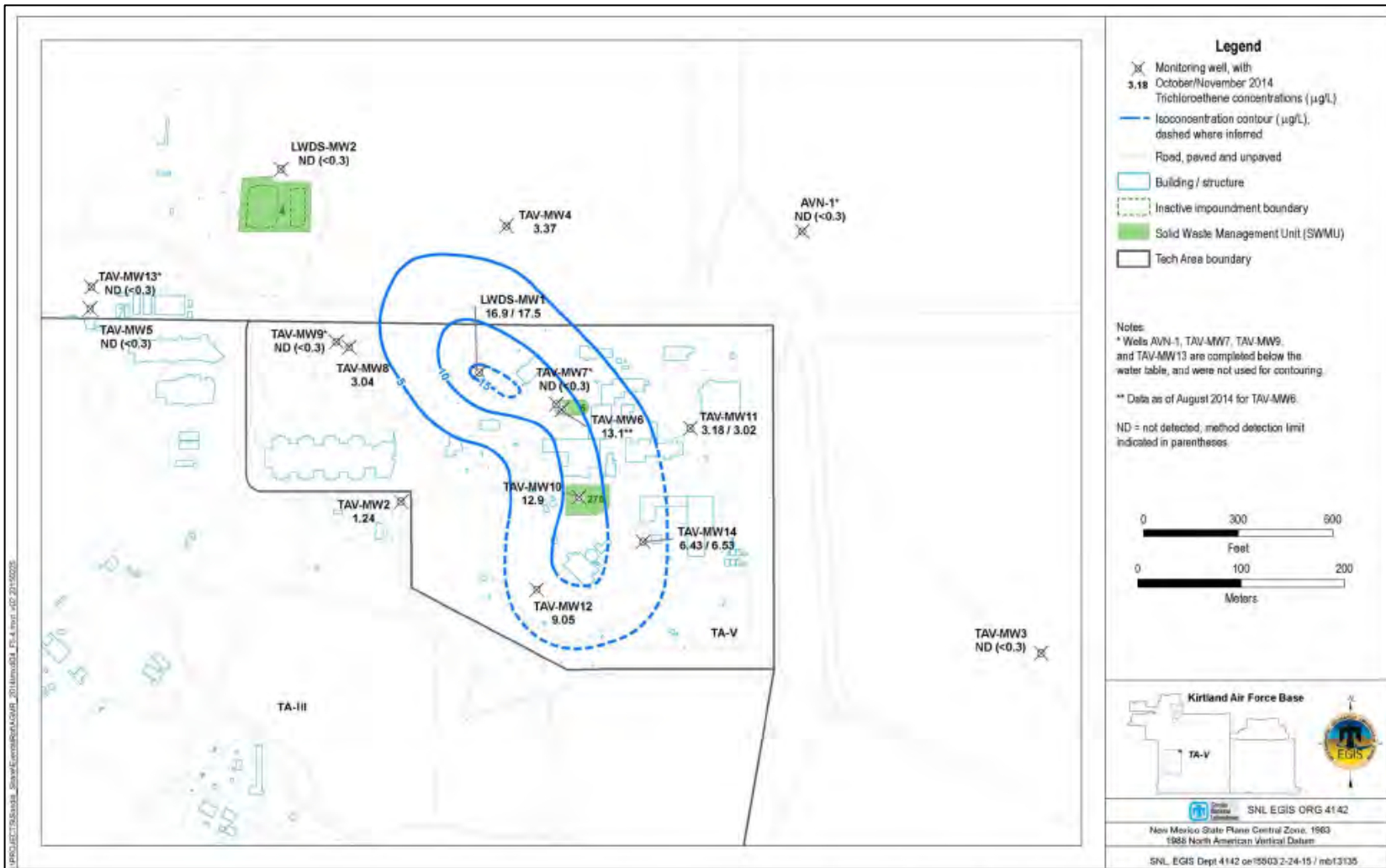


Figure 5-4. Distribution of TCE in Groundwater at TAVG AOC, October/November 2014



Figure 5-5. Distribution of Nitrate plus Nitrite in Groundwater at TAVG AOC, October/November 2014

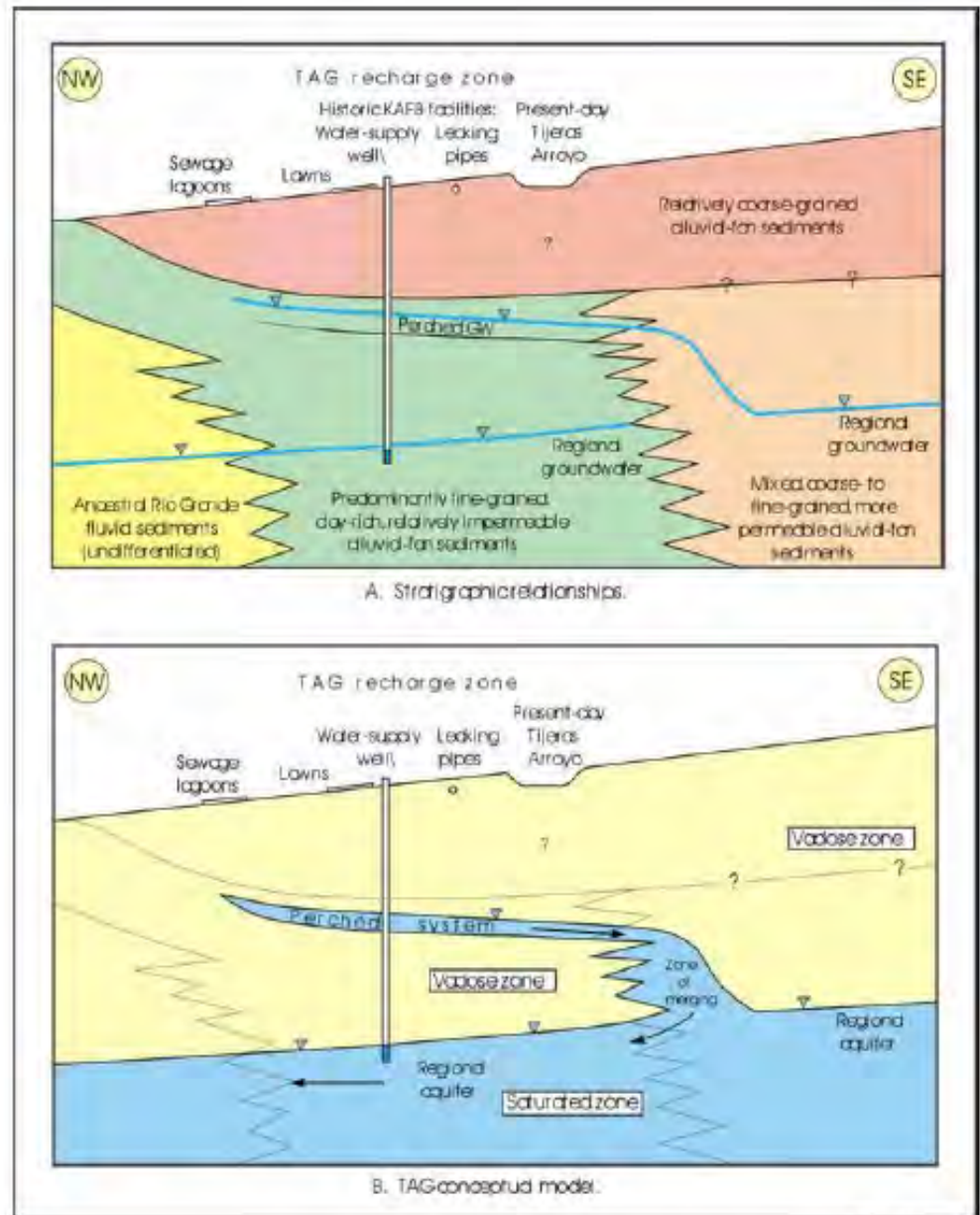
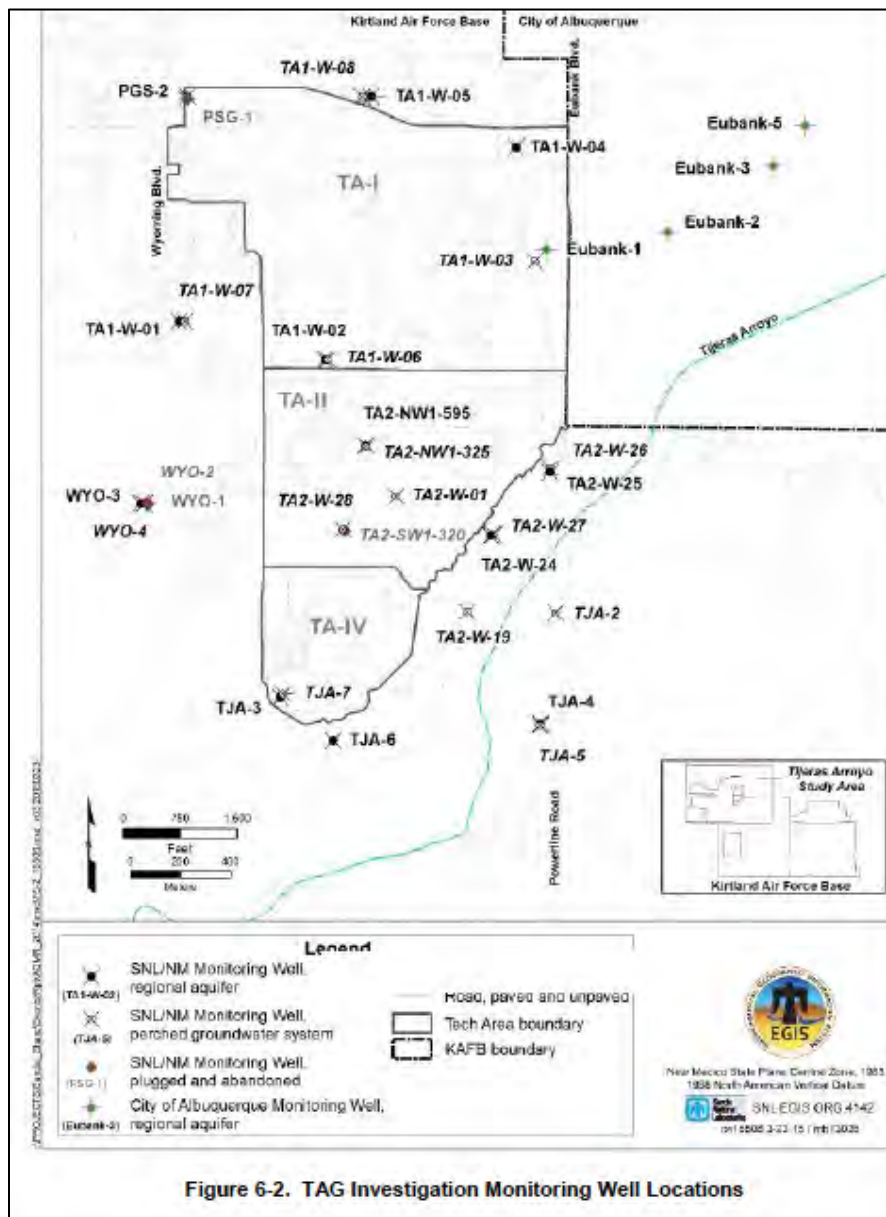


Figure 6-3. TAG Conceptual Model Illustration (Van Hart June 2003)

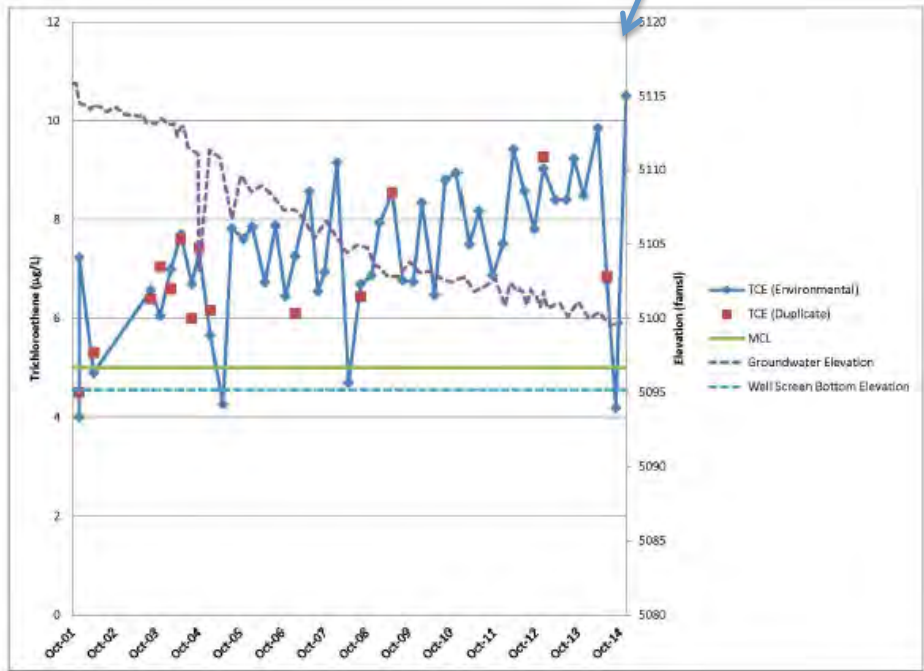
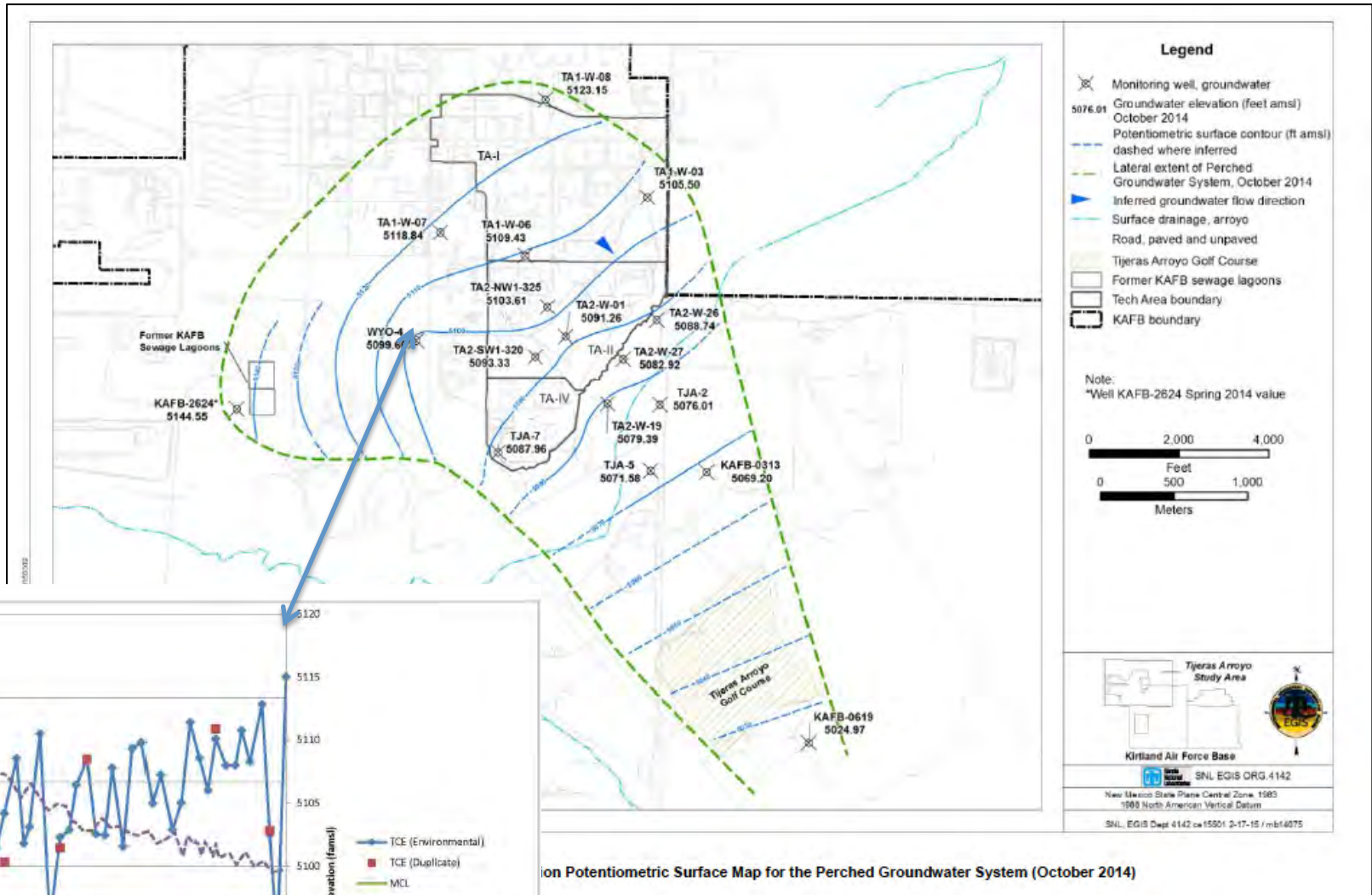


Figure 6B-1. Trichloroethene Concentrations, WYO-4

Potentiometric Surface Map for the Perched Groundwater System (October 2014)

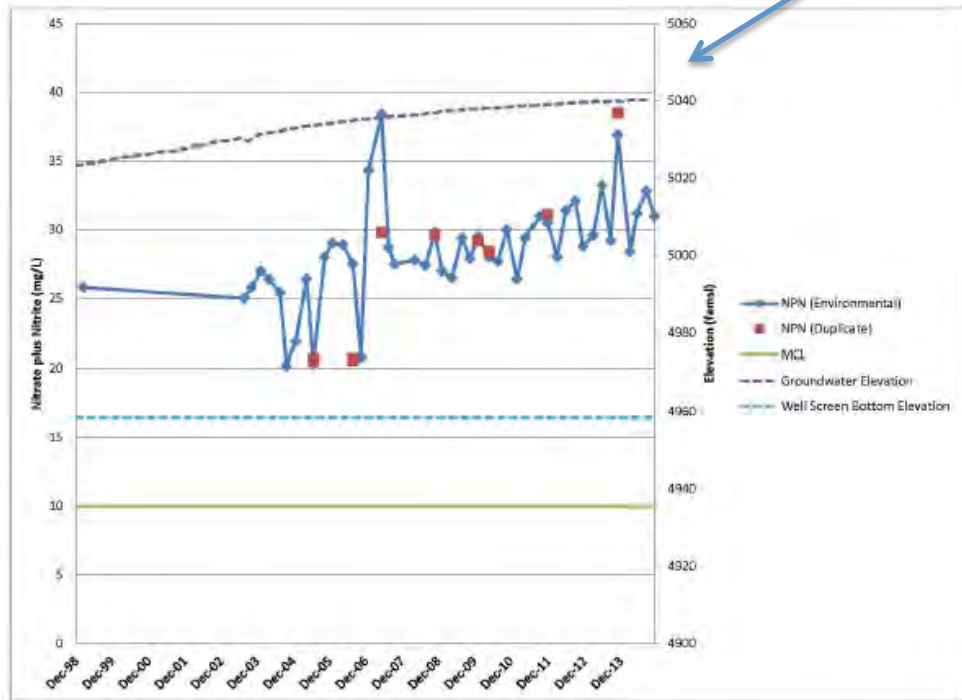
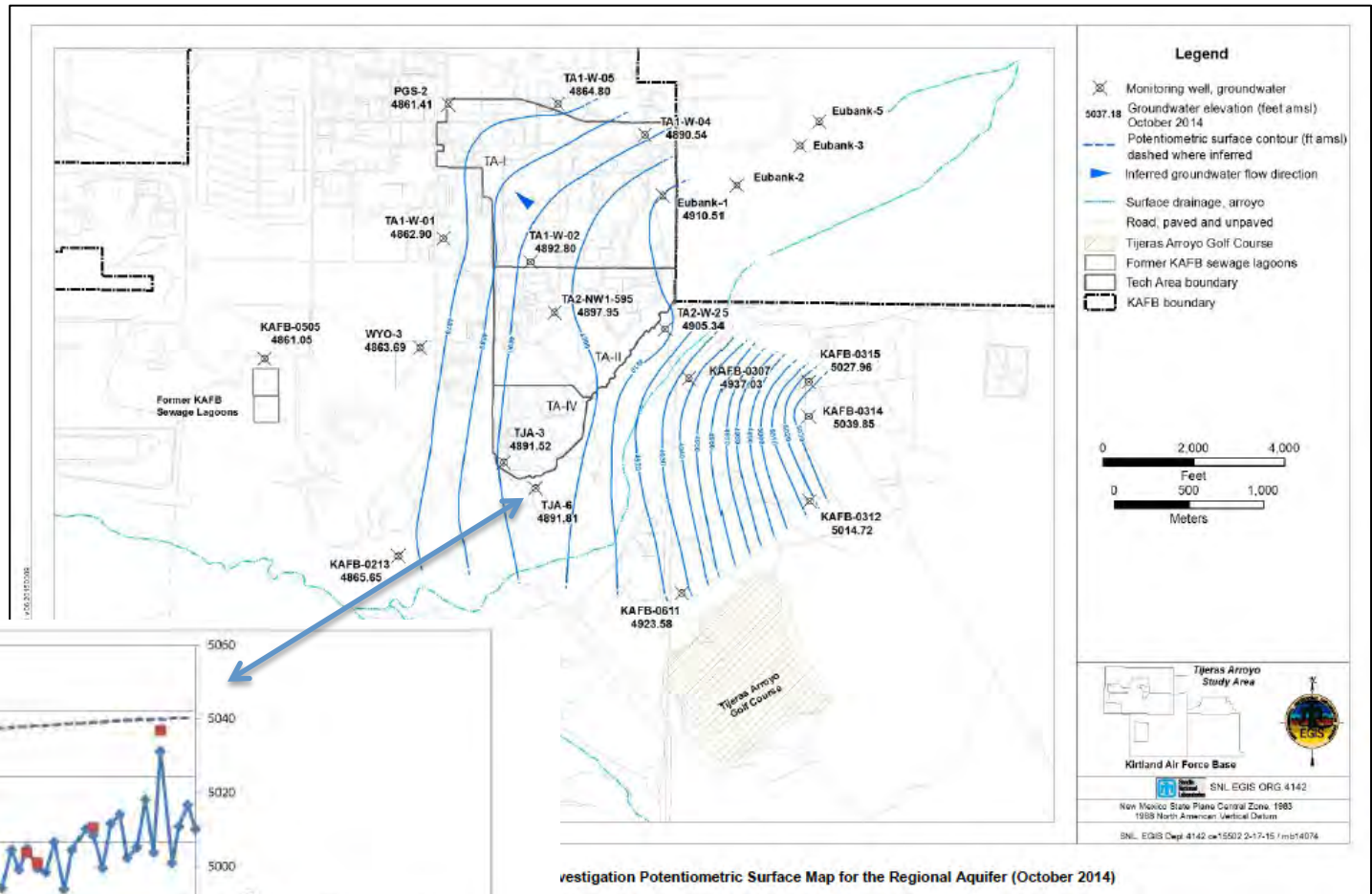


Figure 6B-5. Nitrate plus Nitrite Concentrations, TJA-4

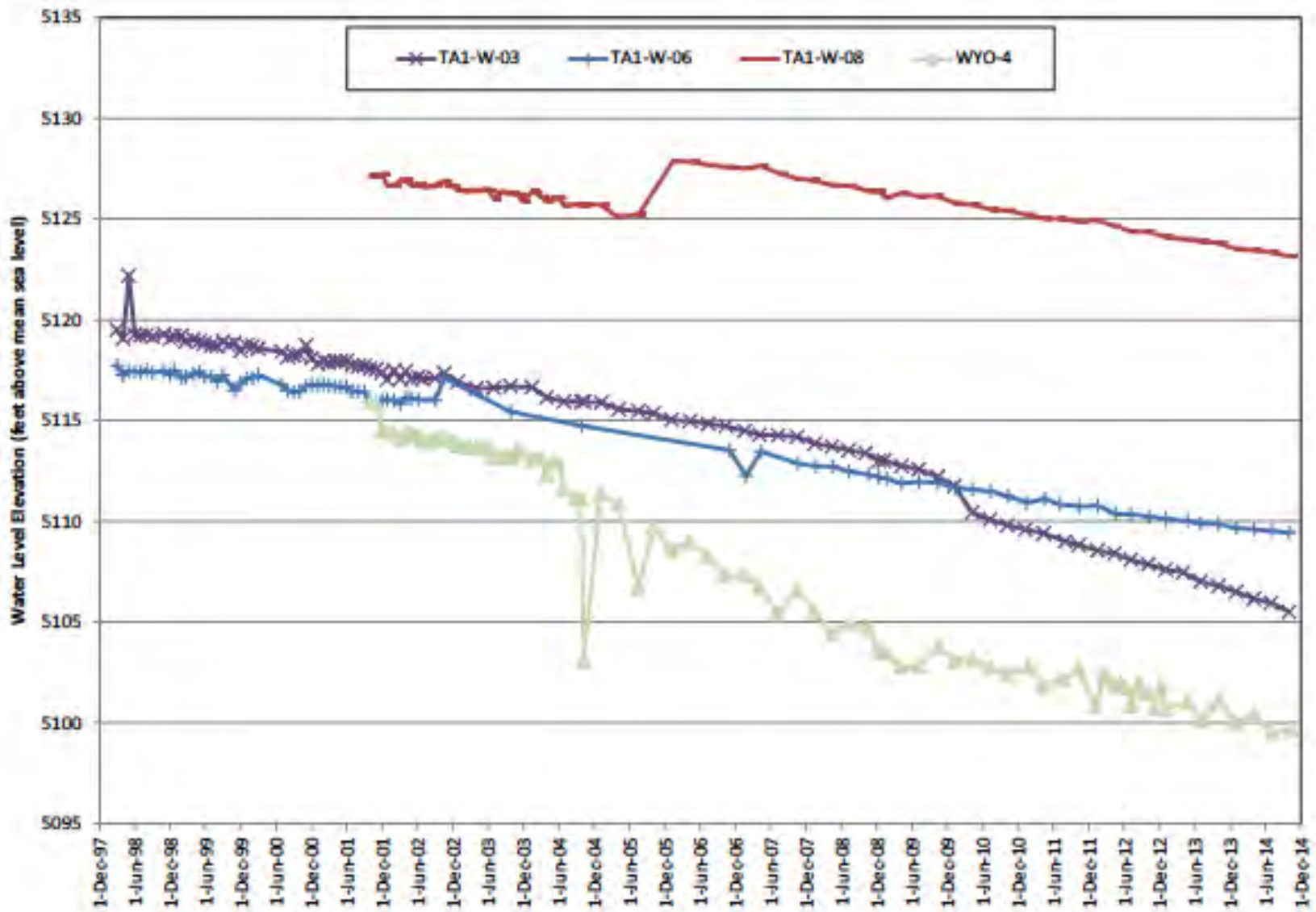


Figure 6C-7. TAG Area of Concern Wells (7 of 7)

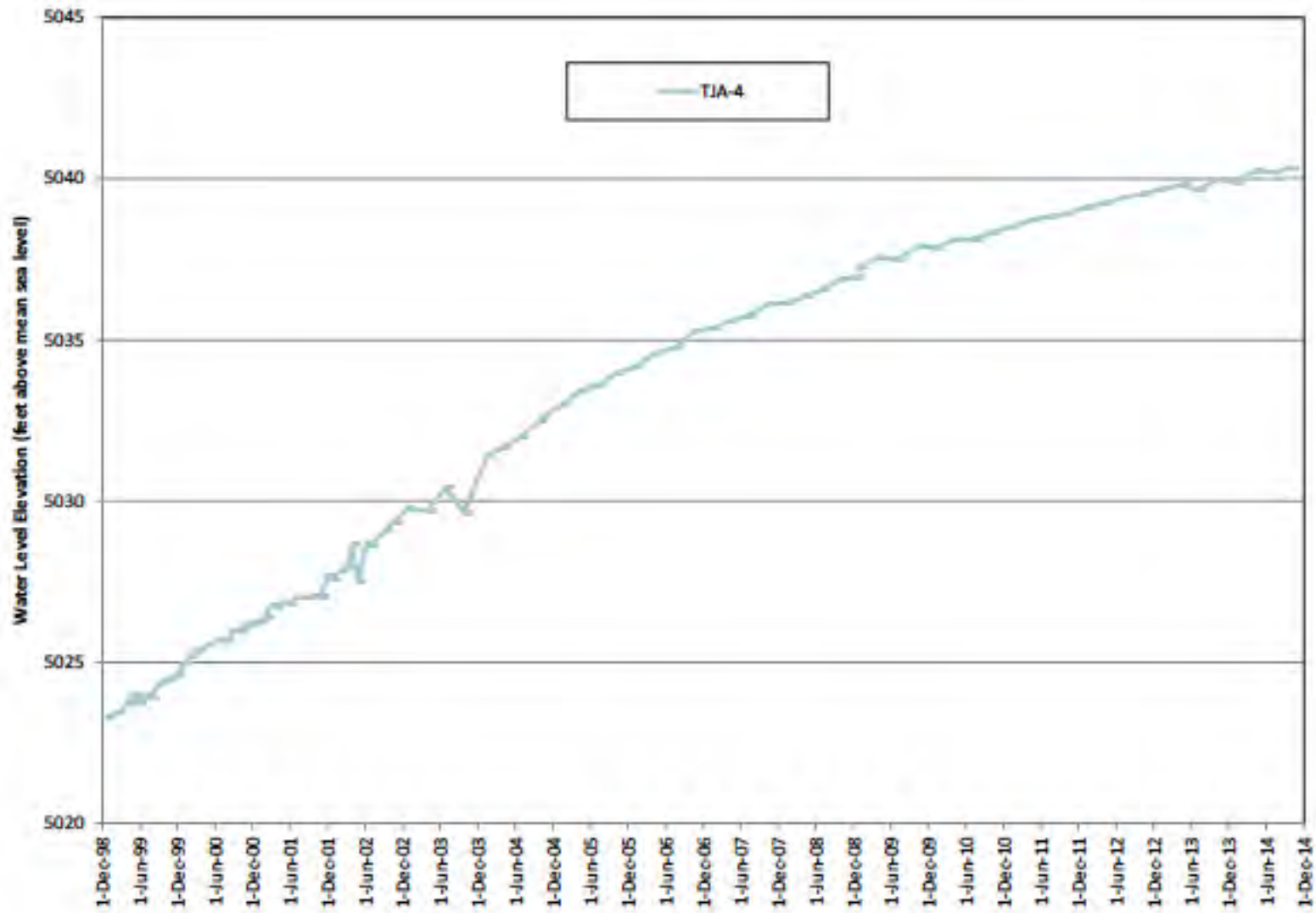


Figure 6C-6. TAG Area of Concern Wells (6 of 7)



Legend

	Production well (non-potable)		Road, unpaved Road
	Monitoring well, groundwater. (Groundwater elevation, foot amal, November 2014, datum NAVD88).		Surface drainage, arroyo
	Potentiometric surface contour, foot amal, dashed where inferred		Ground surface contour, feet amal
	N.M. Not measured		Spring

Sandia National Laboratories, New Mexico
Environmental Geographic Information System

0 400 800 1,600
Feet

0 81.3 176 330
Meters

New Mexico State Plane Central Zone, 1983
1988 North American Vertical Datum

Figure 7-2. Burn Site Groundwater Area of Concern Potentiometric Surface Map (November 2014)

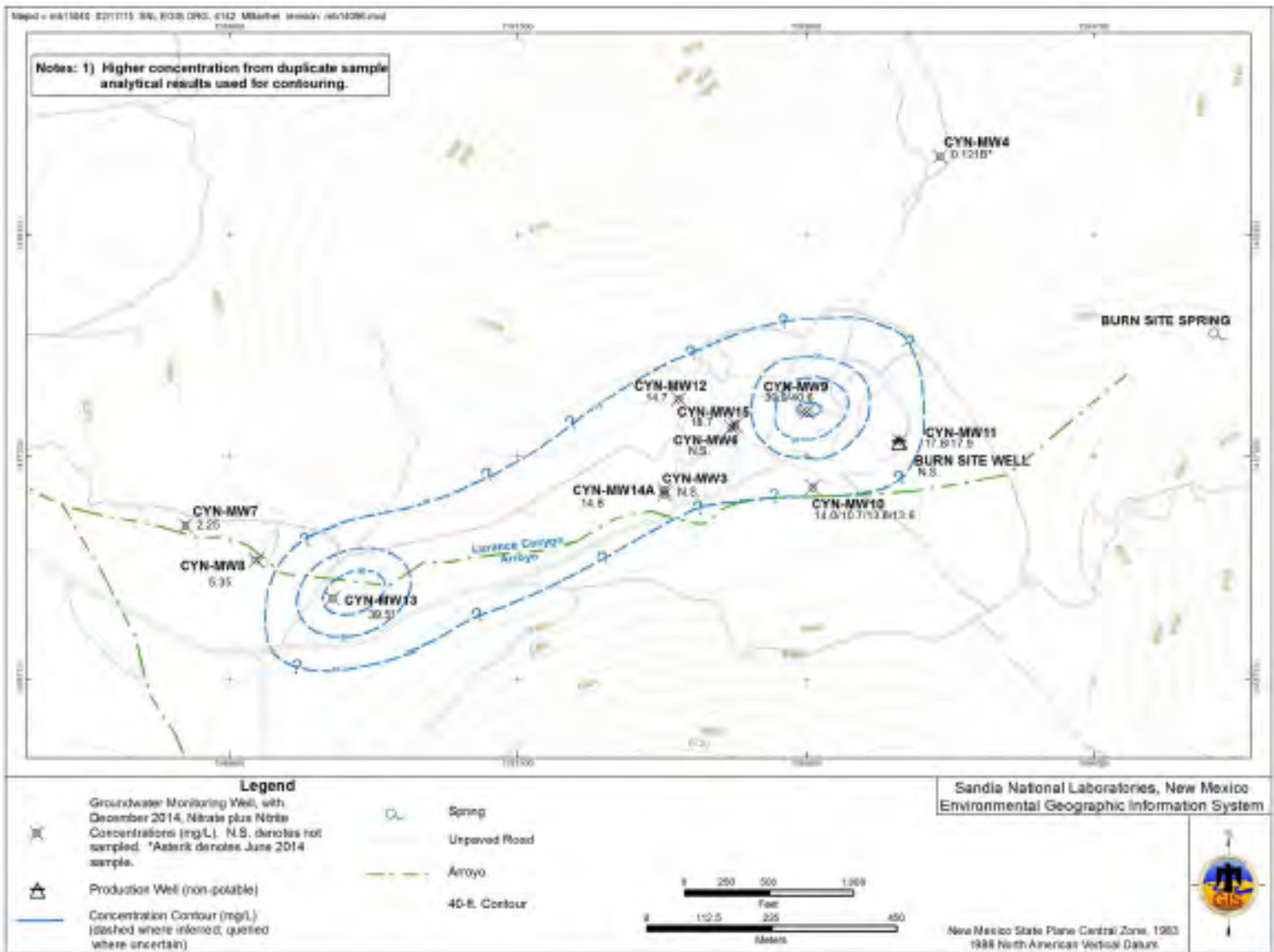


Figure 7-3. Nitrate plus Nitrite Concentration Contour Map for the Burn Site Groundwater Area of Concern

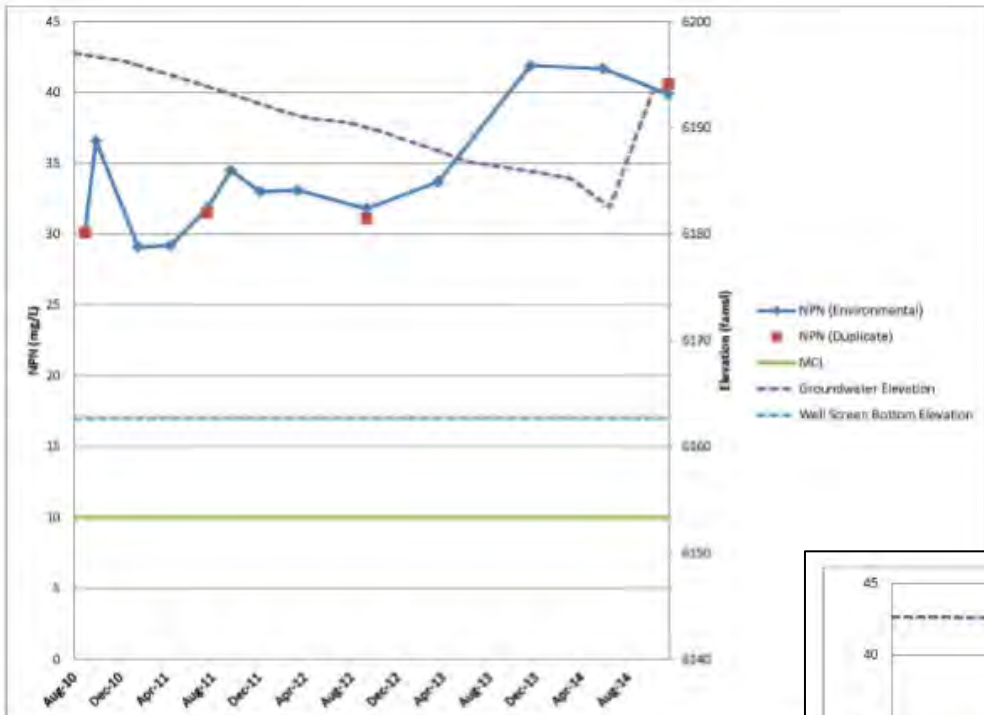


Figure 7B-2. Nitrate plus Nitrite Concentrations, CYN-MW9

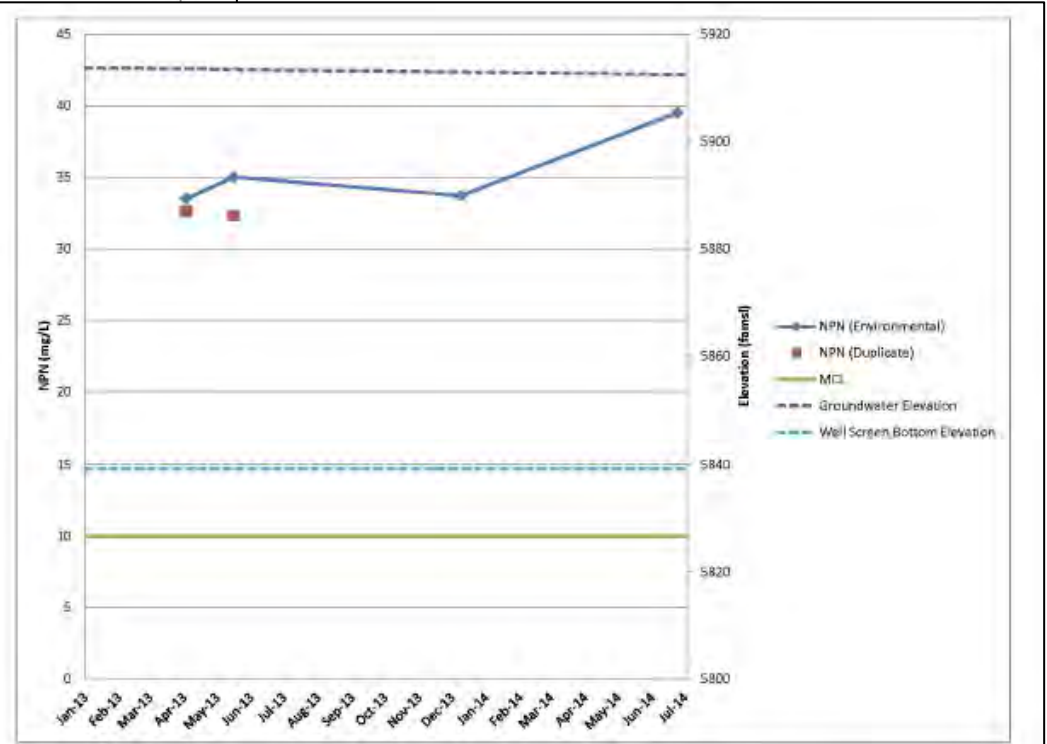
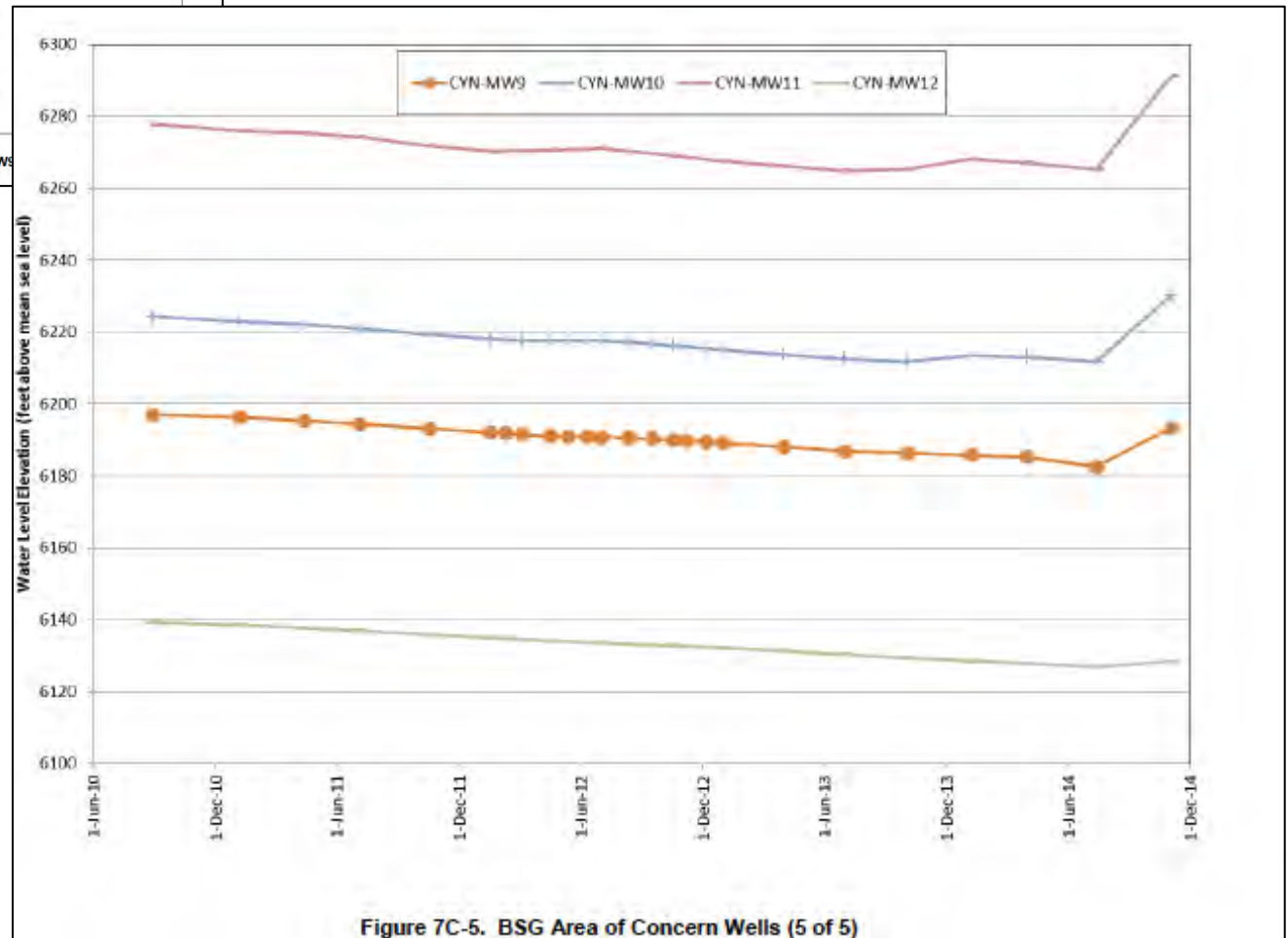
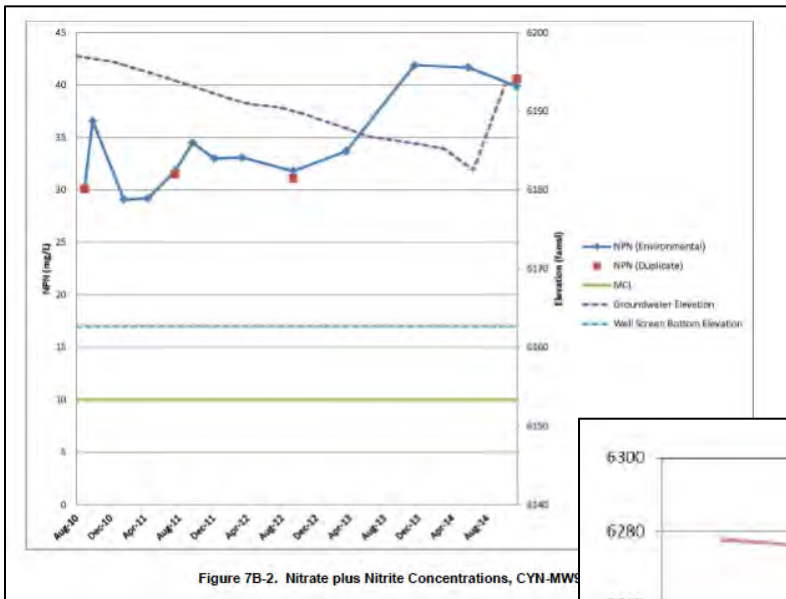


Figure 7B-6. Nitrate plus Nitrite Concentrations, CYN-MW13



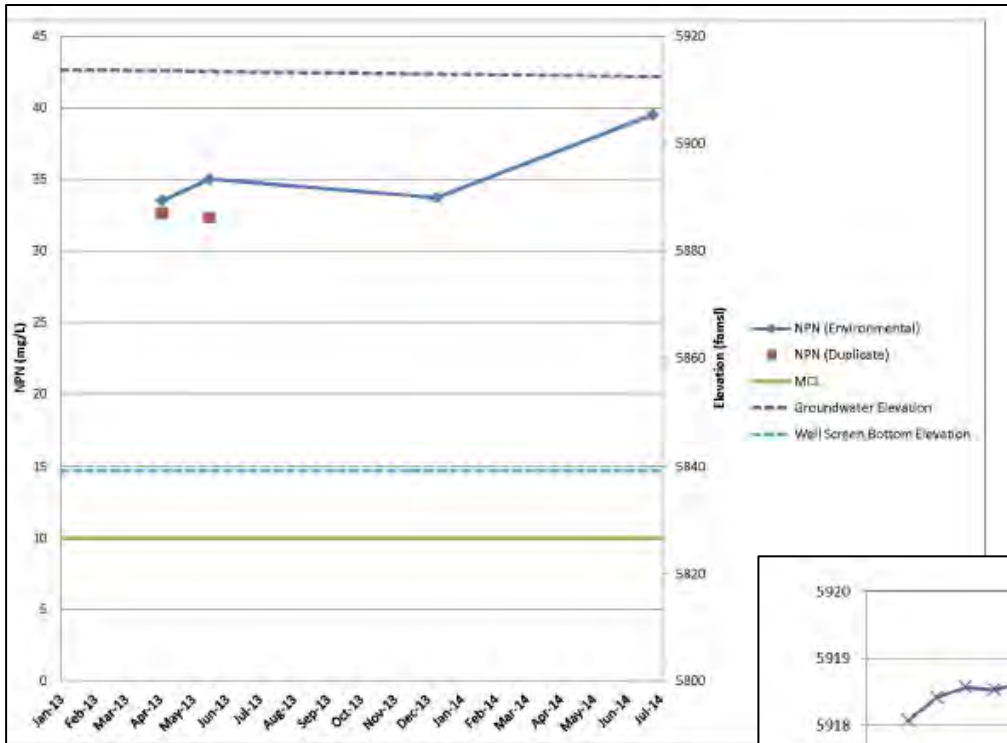


Figure 7B-6. Nitrate plus Nitrite Concentrations, CYN-MW13

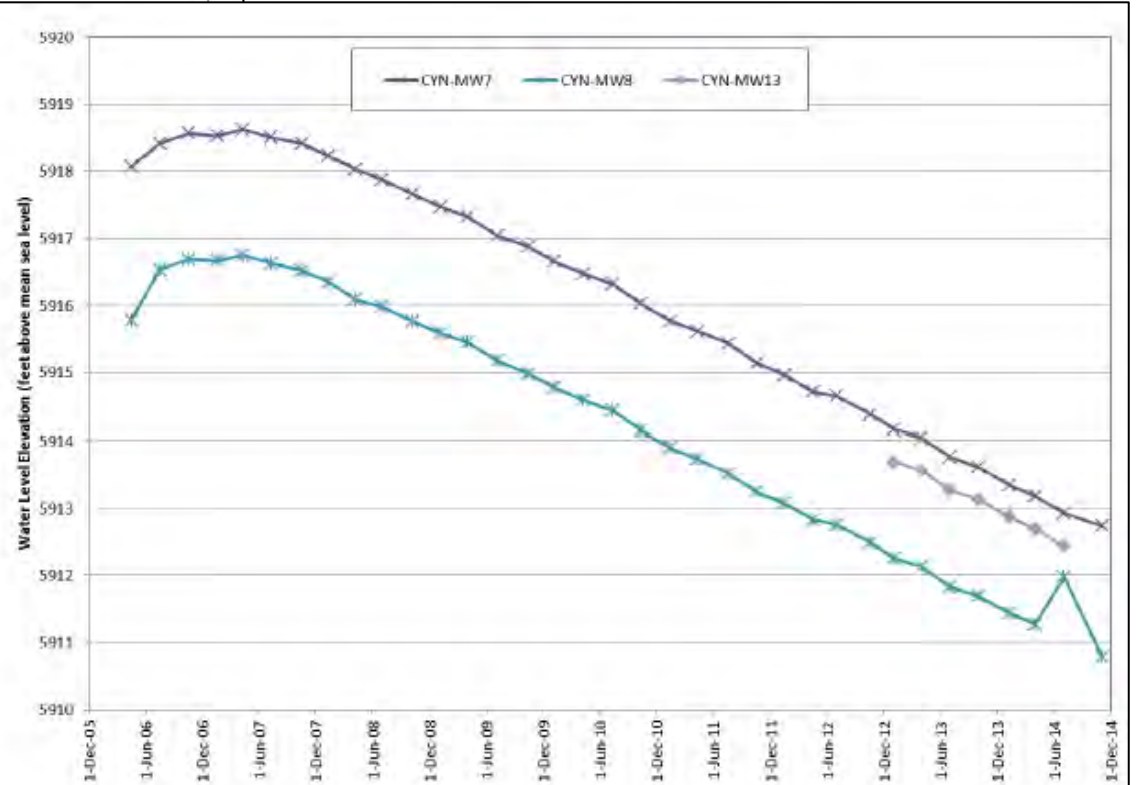


Figure 7C-4. BSG Area of Concern Wells (4 of 5)

Planning Public Meeting with NMED to address these sites.

Current scope of request to NMED –

“We agree that we are interested in, "NMED's progress, current status and future plans with regard to the soil vapor monitoring and groundwater sampling at the TAG, TAVG and BSG at Sandia National Laboratory (SNL)," as well as NMED's progress, status and future plans - including future public involvement opportunities - on the Corrective Action regulatory framework for the three sites that have required the soil vapor and groundwater sampling programs.

In the context of the Corrective Action-related investigations at those sites, it would be appropriate to address the sources of contamination in Tijeras Arroyo that are associated with TAVG, TAG and BGS more than sources of contamination in Tijeras Arroyo upstream or downstream of Kirtland Air Force Base and any Sandia sites off the Base, unless you and your colleagues have identified links between the contamination at KAFB and SNL on the lower portion of Tijeras Arroyo down gradient of the Base and SNL.

We will leave whether or not to involve Surface Water up to you; we would like Rick Shean of the Water Authority to participate. We find him to be a very knowledgeable fellow.

It is not necessary to address the MWL soil vapor monitoring program in this meeting, though the lack of soil vapor and groundwater monitoring data and data analyses in the SNL Consolidated Quarterly Reports prevents reviewers from knowing about the soil and groundwater sampling at the MWL, as well as TAVG, TAG and BGS, and providing the data from MWL as well as the TAVG, TAG and BGS sampling programs would be appreciated.”