DOE/NV/25946--2733

NEVADA NATIONAL SECURITY SITE

2015 DATA REPORT: GROUNDWATER MONITORING PROGRAM AREA 5 RADIOACTIVE WASTE MANAGEMENT SITE

February 2016

Prepared for:

U.S. Department of Energy
National Nuclear Security Administration
Nevada Field Office

Prepared by:

National Security Technologies, LLC
Las Vegas, Nevada

DISCLAIMER

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LIST OF ACRONYMS, ABBREVIATIONS, AND SYMBOLS

ac	acre
AMSL	above mean sea level
BN	Bechtel Nevada
°C	degrees Celsius
Ca	calcium
CFR	Code of Federal Regulations
Cl	chloride
cm	centimeter(s)
DOE	U.S. Department of Energy
E	easting
°F	degrees Fahrenheit
F	fluoride
Fe	iron
ft	foot
GW	groundwater
ha	hectare
HCO_3	bicarbonate
HDPE	high-density polyethylene
IL	investigation level
in.	inch(es)
K	potassium
L	liter(s)
LCA	lower carbonate aquifer
m	meter(s)
MDA	minimum detectable activity
MDC	minimum detectable concentration
MDL	method detection limit
Mg	magnesium
mg/L	milligram(s) per liter
mmhos/cm	millimhos per centimeter
Mn	manganese
N	northing
Na	sodium
NDEP	Nevada Division of Environmental Protection
NNSS	Nevada National Security Site
NSTec	National Security Technologies, LLC
PCB	polychlorinated biphenyl
pCi/L	picocurie per liter
QL	quantification limit
RCRA	Resource Conservation and Recovery Act
REECo	Reynolds Electrical and Engineering Company, Inc.
RWMS	Radioactive Waste Management Site
SC	specific conductance
SiO_2	silicate
SO_4	sulfate
TOC	total organic carbon
TOX	total organic halides
µg/L	microgram per liter

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EXECUTIVE SUMMARY

This report is a compilation of the groundwater sampling results from the Area 5 Radioactive Waste Management Site (RWMS) at the Nevada National Security Site, Nye County, Nevada. Groundwater samples from the aquifer immediately below the Area 5 RWMS have been collected and analyzed and static water levels have been measured in this aquifer since 1993. This report updates these data to include the 2015 results. Analysis results for leachate contaminants collected from the mixed-waste cell at the Area 5 RWMS (Cell 18) are also included.

During 2015, groundwater samples were collected and static water levels were measured at three wells surrounding the Area 5 RWMS. Groundwater samples were collected at wells UE5PW-1 and UE5PW-3 on March 17 and August 11, 2015, and at UE5PW-2 on March 17 and September 1, 2015. Static water levels were measured at each of these wells on March 6, June 8, August 10, and October 20, 2015. Groundwater samples were analyzed for the following indicators of contamination: pH, specific conductance, total organic carbon, total organic halides, and tritium. General water chemistry (cations and anions) was also measured. Results from samples collected in 2015 are within the limits established by agreement with the Nevada Division of Environmental Protection for each analyte. The data from the shallow aquifer indicate that there has been no measurable impact to the uppermost aquifer from the Area 5 RWMS, and there were no significant changes in measured groundwater parameters compared to previous years.

Leachate from above the primary liner of Cell 18 drains into a sump and is collected in a tank at the ground surface. Cell 18 began receiving waste in January 2011. Samples were collected from the tank when the leachate volume approached the 3,000-gallon tank capacity. Leachate samples have been collected 21 times since January 2011. During 2015, samples were collected on January 28, March 31, June 9, October 28, and December 1. Each leachate sample was analyzed for toxicity characteristic contaminants and polychlorinated biphenyls (PCB). Beginning with the sample from July 31, 2013, pH and specific conductance were also measured. Leachate analysis results are below the reporting limits identified in Resource Conservation and Recovery Act Permit NEV HW0101. Results for toxicity characteristic contaminants are all below regulatory levels and analysis quantification limits. No quantifiable PCB levels were detected in any sample. Results for pH and specific conductance are also within expected ranges. After analysis, leachate was pumped from the collection tank and used in Cell 18 for dust control.

The report contains an updated cumulative chronology for the Area 5 RWMS Groundwater Monitoring Program and a brief description of the site hydrogeology.

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1.0 INTRODUCTION

1.1 PURPOSE AND SCOPE

This report is a compilation of groundwater and leachate sampling results collected from the Area 5 Radioactive Waste Management Site (RWMS) at the Nevada National Security Site (NNSS) in Nye County, Nevada. Groundwater samples were collected from three monitoring wells surrounding the Area 5 RWMS, and leachate samples were collected from the lined mixed-waste disposal cell inside the Area 5 RWMS. Data collected during calendar year 2015 are included along with previous data.

The NNSS is an approximately 3,536 square kilometer (1,360 square mile) restricted-access federal facility located approximately 105 kilometers (65 miles) northwest of Las Vegas, Nevada (Figure 1-1). The three Pilot Wells, UE5PW-1, UE5PW-2, and UE5PW-3, are located just outside the Area 5 RWMS. These wells are used to monitor groundwater in the upper aquifer below the Area 5 RWMS. The mixed-waste disposal cell (Cell 18) and leachate collection tank are located in the northeast corner of the Area 5 RWMS (Figure 1-2). In addition to groundwater and leachate monitoring results, this report includes information regarding site hydrogeology, well construction, sample collection, and meteorological data measured at the Area 5 RWMS.

The disposal of low-level radioactive waste and mixed low-level radioactive waste at the Area 5 RWMS is regulated by U.S. Department of Energy (DOE) Order DOE O 435.1, “Radioactive Waste Management” (DOE 2001). The disposal of mixed low-level radioactive waste is also regulated by the State of Nevada under the Resource Conservation and Recovery Act (RCRA) regulation Title 40 Code of Federal Regulations (CFR) Part 265, “Interim Status Standards for Owners and Operators of Hazardous Waste Treatment, Storage, and Disposal Facilities” (CFR 1999). The format of this report was requested by the Nevada Division of Environmental Protection (NDEP) in a letter dated August 12, 1997. The appearance and arrangement of this document have been modified slightly since that date to provide additional information, to facilitate the readability of the document, and to include the leachate monitoring results. The objective of this report is to satisfy any Area 5 RWMS groundwater monitoring reporting agreements between DOE and NDEP.

1.2 SITE HYDROGEOLOGY

The Area 5 RWMS is located in northern Frenchman Flat in the southeast portion of the NNSS. Frenchman Flat is a topographically closed basin. Erosion of surrounding mountains has resulted in accumulation of thick, unsaturated, alluvial deposits above volcanic rocks within the basin (Bright et al. 2001). Alluvial and volcanic aquifers are present beneath the Area 5 RWMS and are believed to extend throughout much of the Frenchman Flat basin (Bechtel Nevada [BN] 2005). In this south-central portion of the NNSS, a moderately thick volcanic confining unit, consisting of altered volcanic rocks, separates the shallow alluvial and volcanic aquifers from the underlying regional lower carbonate aquifer (LCA) (BN 2005; Laczniak et al. 1996).

The groundwater type from the three monitoring wells (UE5PW-1, UE5PW-2, and UE5PW-3) is sodium-bicarbonate. This type of groundwater is common in the upper aquifers in Frenchman Flat. UE5PW-1 and UE5PW-2 are completed in an alluvial aquifer, and UE5PW-3 is completed in a volcanic aquifer. Similar groundwater chemistry and water table elevations in UE5PW-1, UE5PW-2, and UE5PW-3 indicate that the alluvial and volcanic aquifers are locally connected near the Area 5 RWMS.

Some vertical groundwater flow occurs between the uppermost aquifers in Frenchman Flat and the underlying regional LCA (Navarro Nevada Environmental Services 2010). Based on measured groundwater elevations above mean sea level (AMSL) (Figure 1-3), the lateral hydraulic gradient in the upper Frenchman Flat aquifer is very small. Lateral groundwater movement beneath Frenchman Flat primarily occurs within the deep carbonate aquifer and is generally from the northeast to southwest. It eventually discharges in Amargosa Valley and Ash Meadows in southwest Nevada and Death Valley in California (Figure 1-4) (Laczniak et al. 1996).

For more detailed descriptions of Area 5 RWMS site characteristics, refer to the report *Revised Area 5 Radioactive Waste Management Site, Outline of a Comprehensive Groundwater Monitoring Program* (BN 1998).

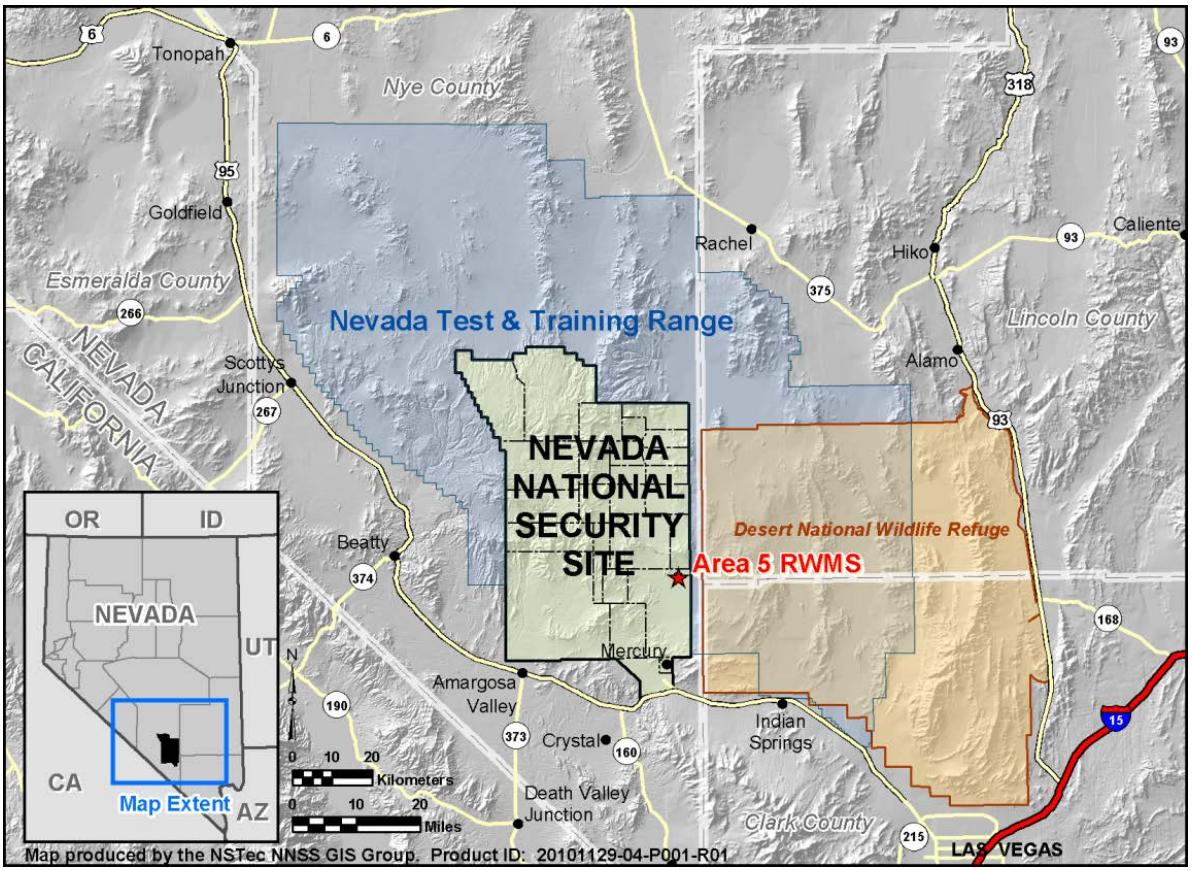

Figure 1-1. Location of Area 5 RWMS and Nevada National Security Site within Nevada

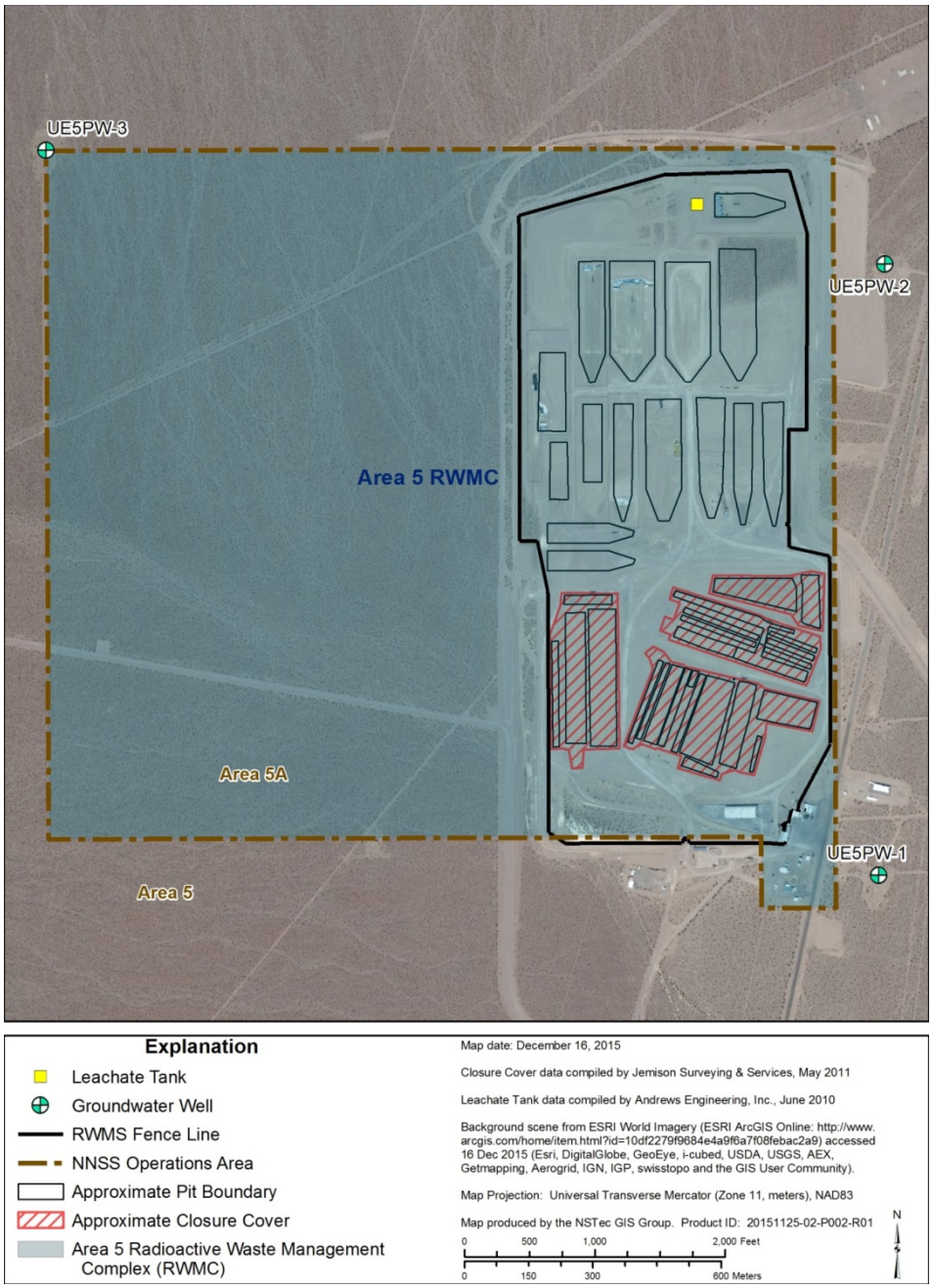

Figure 1-2. Location of Pilot Wells and Leachate Collection Tank at Area 5 RWMS

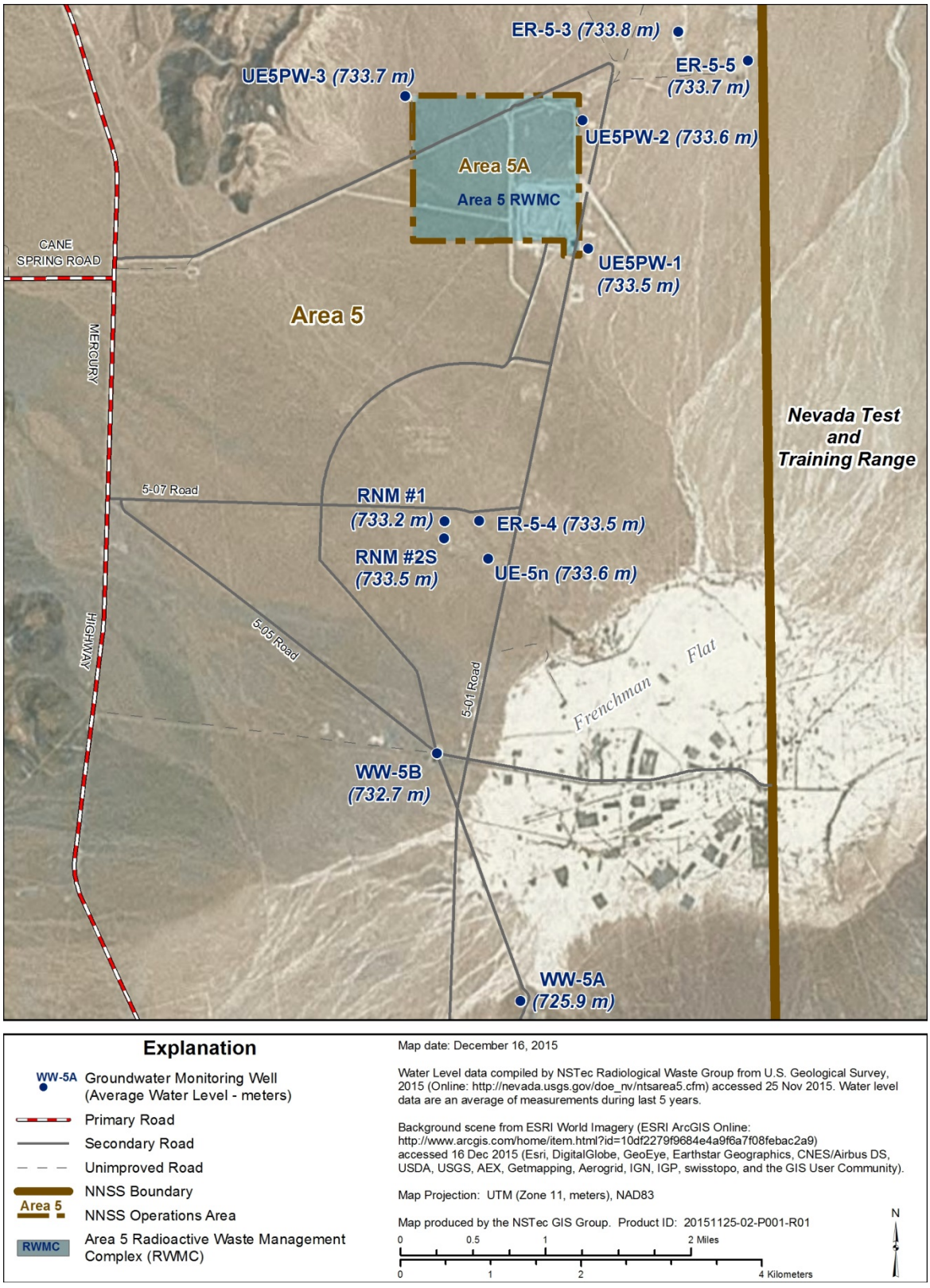

Figure 1-3. Average Water-Level Elevation at Groundwater Monitoring Wells in the vicinity of the Area 5 RWMS (U.S. Geological Survey [USGS], 2015)

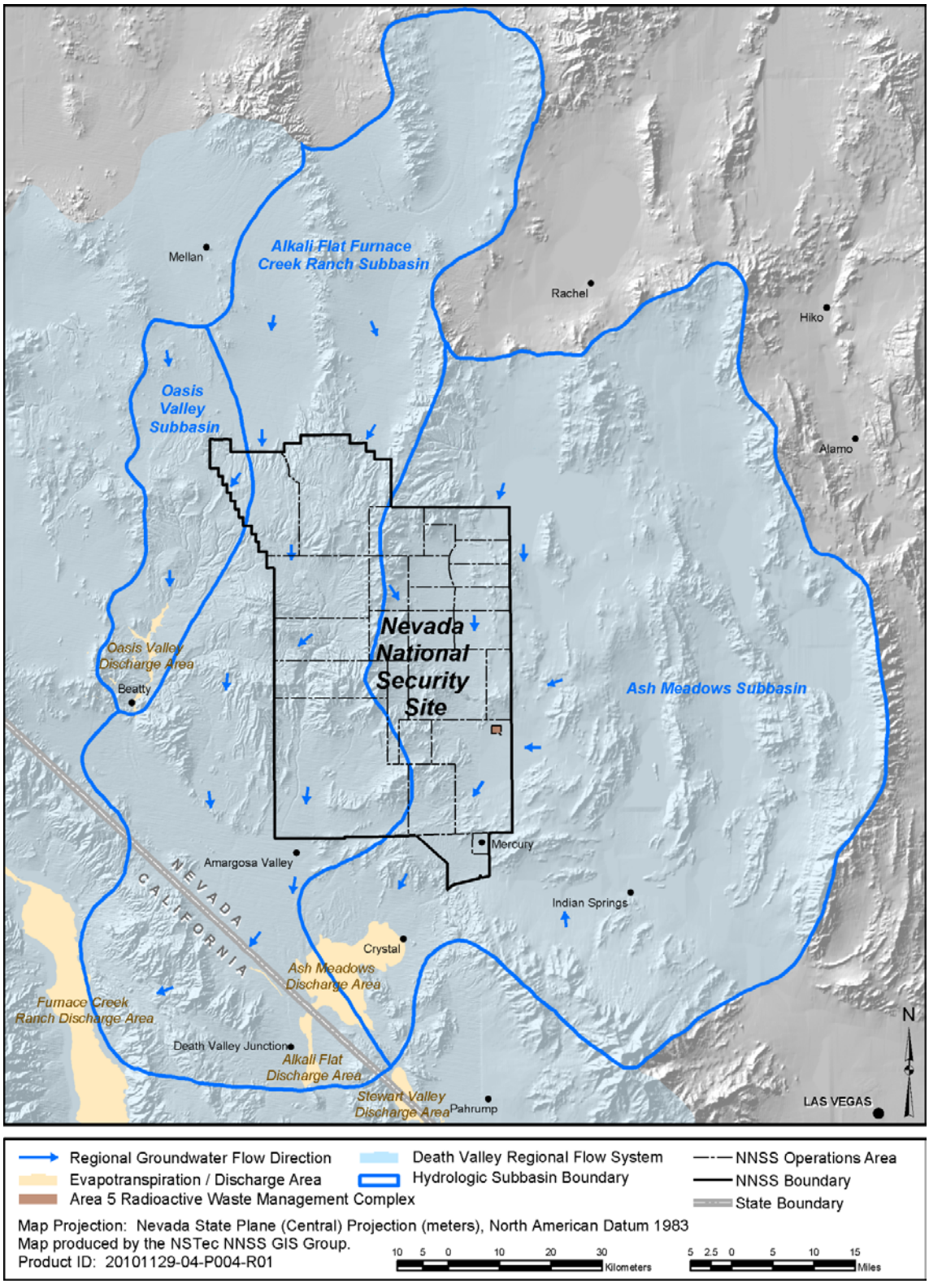

Figure 1-4. Groundwater Sub-basins and Flow in the Vicinity of the Area 5 RWMS

1.3 MONITORING WELL DESCRIPTIONS

Pilot Wells UE5PW-1, UE5PW-2, and UE5PW-3 were drilled between March and November 1992, and the groundwater has been monitored since 1993. All three wells were drilled using a casing-advance underreaming drilling system with air as the only drilling fluid. UE5PW-1 drilling started on March 19, 1992, and completed on June 16, 1992; UE5PW-2 drilling started on June 18, 1992, and completed on September 4, 1992; and UE5PW-3 drilling started on September 16, 1992, and completed on November 9, 1992. Drilled borehole diameters ranged from 30.6 centimeter (cm) (12.0 inch [in.]) at ground level to 23.7 cm (9.33 in.) at the bottom of UE5PW-1 and UE5PW-2 and 20.0 cm (7.87 in.) at the bottom of UE5PW-3. UE5PW-1 is drilled in alluvium from ground level to 256 meter (m) (839 foot [ft]); UEPW-2 is drilled in alluvium from ground level to 280 m (920 ft); and UE5PW-3 is drilled in alluvium from ground level to 188 m (618 ft), welded tuff to 280 m (918 ft) and bedded tuff to 291 m (955 ft) (Reynolds Electrical and Engineering Company, Inc. [REECo], 1994).

Each well is completed with a centralized 6.35-cm (2.50-in.) diameter stainless steel casing with an 18.3-m (60-ft) dual-screen filter pack attached to the bottom of the casing. The borehole annulus below and around the screen is filled with 6/12 coarse mesh sand (REECo, 1994). Well locations around the Area 5 RWMS are shown in Figure 1-2. After the 2013 version of this report, survey location coordinates and elevations for the Pilot Wells provided in REECo (1994) were replaced with location coordinates and elevations from more recent surveys provided by the U.S. Geological Survey (USGS, 2015). UE5PW-1 and UE5PW-3 were surveyed by National Security Technologies, LLC (NSTec), during September 2013, and UE5PW-2 was surveyed by BN during March and April 2001. Approximate water levels below land surface are 235 m (771 ft) at UE5PW-1, 256 m (839 ft) at UE5PW-2, and 271 m (888 ft) at UE5PW-3. Current locations, elevations, and well information are summarized in Table 1-1.

Table 1-1. Pilot Well Locations

	UE5PW-1 (m [ft])	UE5PW-2 (m [ft])	UE5PW-3 (m [ft])
Northing[1]	233,386.53 (765,702.32)	234,817.22 (770,396.15)	235,089.98 (771,291.03)
Easting[1]	216,357.39 (709,832.53)	216,376.16 (709,894.12	214,415.13 (703,460.32)
Measuring Point/Top of Casing Elevation[2]	969.38 (3,180.37)	990.09 (3,248.34)	1,005.29 (3,298.20)
Ground Level Elevation[2]	968.77 (3178.39)	989.41 (3246.11)	1004.51 (3295.63)
Borehole Total Depth[3]	256 (839)	280 (920)	291 (955)
Well Depth[3]	251 (822)	271 (890)	286 (938)
Approximate Water Level Depth[3]	235 (771)	256 (839)	271 (888)
Well Deviation at Water Table	0.08 (0.27)	0.21 (0.68)	0.02 (0.06)

[1] Nevada State Plan Central Zone 1927 North American Datum
[2] 1929 National Geodetic Vertical Datum
[3] Measured from Ground level

Groundwater samples are collected from each well twice per year. A dedicated, removable pump is used for each well. The pumps are stainless steel, air-powered, submersible piston pumps. Flexible polypropylene tubing for air supply, air exhaust, and water discharge are bundled together and mounted on electric-powered reels. Pumping rates from the wells range from 0.15 to 0.50 gallons per minute. Static water levels at each well are measured using an electronic polyethylene tape four times per year. Water levels are measured with the sample pumps removed from the wells.

1.4 LEACHATE COLLECTION DESCRIPTION

Cell 18 is a lined, mixed-waste disposal cell located in the northeastern corner of the Area 5 RWMS (Figure 1-2). Cell 18 was constructed during 2010 and began receiving waste in January 2011. The Cell 18 liner is a RCRA-compliant double liner with a leachate collection and leak detection system placed over a geosynthetic clay liner. The double liner is covered by approximately 61 cm (24 in.) of compacted soil on the cell side slopes and by approximately 76 cm (30 in.) of compacted soil on the cell floor. The primary liner is 80 mil. textured high-density polyethylene (HDPE), and the secondary liner is 60 mil. textured HDPE. The primary liner is directly below a 160-mil. double-sided geocomposite drainage layer, and a second 160-mil. double-sided geocomposite drainage layer separates the primary liner from the secondary liner.

Any precipitation or other water applied to the 1.35 hectare (ha) area (3.33 acres [ac]) covered by the liner that is not removed by evapotranspiration eventually infiltrates into the soil above the liner, percolates through the soil to the primary liner, and eventually drains into the primary sump in the floor of Cell 18. Any water leaking through the primary liner would percolate to the secondary liner and eventually drain into the secondary sump in the floor of Cell 18. Water collected in the primary sump is pumped from the sump to a 3,000-gallon tank on the surface above the cell. When the tank approaches its capacity, leachate samples are collected from the tank and analyzed for toxicity characteristic contaminants, polychlorinated biphenyls (PCBs), specific conductance, and pH. Through 2015, no regulatory limits for toxicity characteristic contaminants have been exceeded, and no PCBs have been detected in the leachate samples. After leachate analysis results are evaluated, the leachate is pumped from the collection tank and used for dust control in Cell 18.

1.5 SITE METEOROLOGY

Meteorological data are also measured at the Area 5 RWMS. These data include temperature, relative humidity, barometric pressure, wind speed and direction, solar radiation, and precipitation. During 2015 the average daily temperature at 3 m height was 16.9 degrees Celsius (°C) (62.4 degrees Fahrenheit [°F]). The maximum observed temperature at 3 m height was 42.6°C (108.7°F) on June 20, 2015, and the minimum observed temperature at 3 m was −10.7°C (12.7°F) on January 2, 2015. The maximum observed wind gust at 3 m was 21.5 meters per second (48.1 miles per hour) on April 14, 2015. The average annual precipitation measured at the Area 5 RWMS from 1994 through 2015 was 12.2 cm per year (4.80 in. per year). The Area 5 RWMS had 15.4 cm (6.06 in.) of precipitation during 2015. During the 22-year measurement period, 2015 was the sixth wettest year. There were 42 days of measurable precipitation in 2015 at the Area 5 RWMS. The wettest month in 2015 was September, which had approximately 39 percent of the 2015 precipitation. Monthly precipitation at the Area 5 RWMS from January 1994 through December 2015 is provided in Figure 1-5.

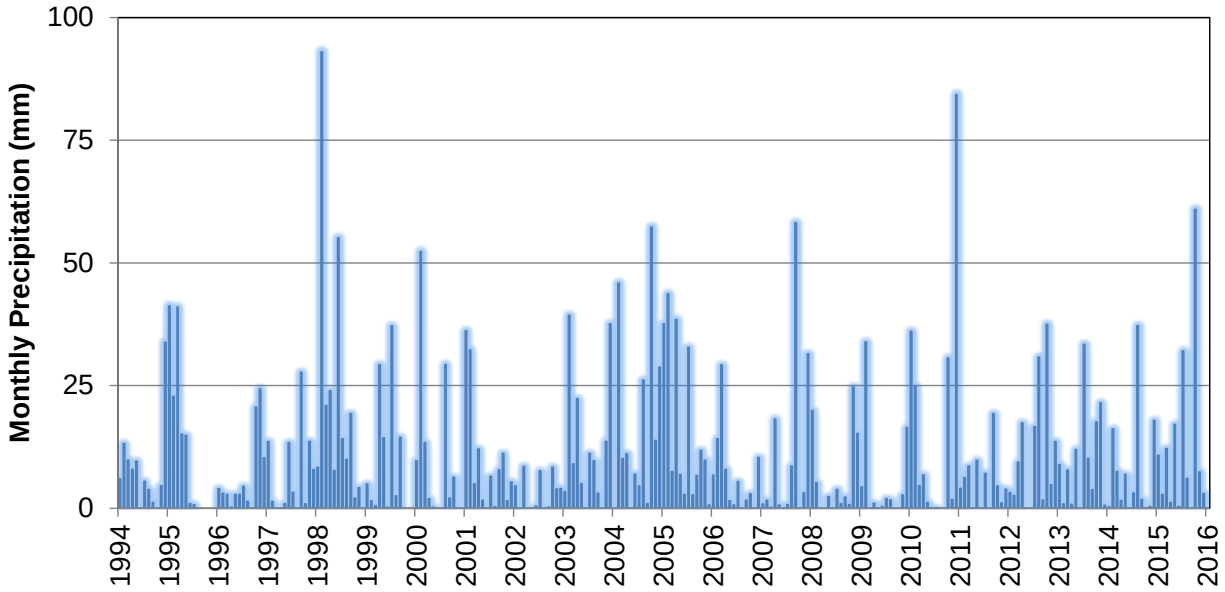

Figure 1-5. Area 5 RWMS Monthly Precipitation from 1994 through 2015

2.0 GROUNDWATER MONITORING METHODS AND RESULTS

The groundwater at the Area 5 RWMS pilot wells has been monitored since 1993 (see Appendix A- Cumulative Chronology for the Area 5 Radioactive Waste Management Site Groundwater Monitoring Program). The Groundwater Monitoring Program has transitioned from monitoring all parameters required by 40 CFR 265 to a program that monitors parameters applicable to the Area 5 RWMS. The current monitoring program is modeled after the 40 CFR 265 Detection Monitoring Program.

2.1 METHODS

This section describes sample collection and measurement methods used at the pilot wells. The current groundwater sampling procedure (NSTec, 2014a) was followed.

2.1.1 Water Level

Groundwater elevations in UE5PW-1, UE5PW-2, and UE5PW-3 are measured quarterly using an electronic water-level tape. Water-level measurements are collected before the sample pump is put into the well and before any water is pumped from the well. During 2015, water levels were measured at the three pilot wells on March 16, June 8, August 10, and October 20, 2015.

Upon completion of the water-level measurement at each well, a pneumatic, air-powered, sample pump was put into the well, and the well was purged. At least three well volumes were purged from each well before groundwater sampling started. Three well volumes are approximately 950 liters (L) (250 gallons [gal.]). During 2015, purge rates ranged from 0.8 to 1.6 L/minute (0.22 to 0.41 gal./minute) and the total purge volume at each well ranged from 1140 to 2200 L (300 to 580 gal.).

2.1.2 Groundwater Sampling and Analysis

Groundwater samples are collected and tested semiannually for the analytes listed below. The analytes are divided into groups representing indicators of contamination and general water chemistry parameters.

Indicators of contamination:

- pH
- Specific conductance (SC)
- Total organic carbon (TOC)
- Total organic halides (TOX)
- Tritium

General water chemistry parameters:

- Cations: calcium (Ca), iron (Fe), magnesium (Mg), manganese (Mn), potassium (K), sodium (Na)
- Anions: bicarbonate (HCO_3), sulfate (SO_4), chloride (Cl), fluoride (F)
- Silicate (SiO_2)

Investigation levels (ILs) for each analyte identified as an indicator of contamination were established by DOE and NDEP in 1998 (Table 2-1). Further groundwater analyses are required if the IL is exceeded (BN 1998; Liebendorfer 2000). The ILs for pH and SC are based on the distributions of data collected from 1993 through 1996. Historic analyses for TOC, TOX, and tritium typically have concentration levels less than the method detection limit (MDL) or the minimum detectable concentration (MDC); therefore, the ILs for TOC and TOX are set slightly above their MDLs or MDCs, and the tritium IL is set at 2,000 picocuries per liter (pCi/L), which is 10 percent of the National Primary Drinking Water Standard of 20,000 pCi/L.

Table 2-1. Investigation Levels of Indicator Parameters

Parameter	Investigation Level (IL)
pH	<7.6 or >9.2
SC	0.440 mmhos/cm[a]
TOC	1 mg/L[b]
TOX	50 µg/L[c]
Tritium	2,000 pCi/L

[a] mmhos/cm = millimhos per centimeter
[b] mg/L = milligrams per liter
[c] µg/L = micrograms per liter

During 2015, groundwater samples were collected at UE5PW-1 and UE5PW-3 on March 17 and August 11, 2015, and at UE5PW-2 on March 17 and September 1, 2015. Field measurements of pH and SC were collected using a handheld meter from the pump outflow just prior to sampling. Groundwater samples were collected from the pump outflow in new, certified clean, sample bottles. Required preservatives were added to samples prior to sealing the bottles. Sealed samples were cooled in ice for shipment from the well to contract laboratories for analysis.

Three replicate water samples were collected consecutively from each well for TOC and TOX analysis. Replicate samples provide additional data in case any sample result is above the analyte IL. Well re-sampling is required if all three replicate water samples are above the IL. False detections of these analytes above the ILs and subsequent re-sampling of the wells have occurred in the past. No resampling was done in 2015.

Prior to 2014 all tritium samples were enriched prior to shipment to a contract laboratory for analysis. Tritium enrichment provides a tritium minimum detection activity (MDA) of approximately 25 pCi/l compared to a tritium MDA of approximately 250 pCi/l for samples that are not enriched. No tritium samples were enriched during 2015.

All analyses during 2015 were done by GEL Laboratories.

2.2 RESULTS

This section lists the results for each of the five indicators of contamination, the general water chemistry parameters, and the groundwater elevation. Beginning with this report, all results are compiled in - Groundwater Data C.

2.2.1 pH

The measured pH at each well remained within the ILs of 7.6 and 9.2 during 2015. These measurements are the stable pH measured at each well just prior to sampling. The 2015 measured pH values ranged from 8.19 to 8.38. The 2015 average measured pH values are 8.32 at UE5PW-1, 8.32 at UE5PW-2, and 8.22 at UE5PW-3.

Measurements of pH began in 1993 and have continued through 2015. All pH measurements are provided in Appendix Table C-1, and these data are summarized in Table 2-2. Measured pH has remained relatively stable throughout the entire monitoring period (Figure 2-1). No groundwater contamination is indicated by the pH monitoring results.

Table 2-2. Summary of Pilot Well pH Values

	UE5PW-1	UE5PW-2	UE5PW-3
Number	56	57	58
Average	8.319	8.267	8.268
Standard Deviation	0.145	0.195	0.196
Maximum	8.630	8.810	8.870
Minimum	7.910	7.850	7.800
Start Date	03/31/1993	03/24/1993	04/14/1993
Last Date	08/11/2015	09/01/2015	08/11/2015

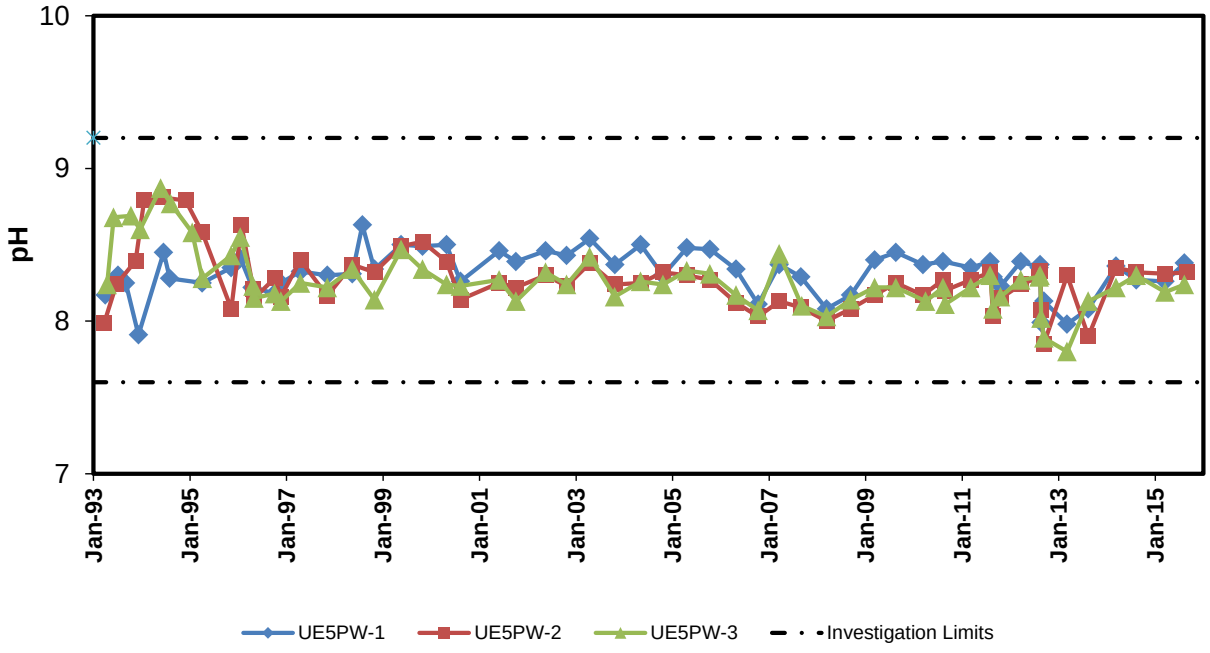

Figure 2-1. Time Series Plot of Pilot Well pH

2.2.2 Specific Conductance

The measured SC at each well remained below the IL of 0.440 millimhos per centimeter (mmhos/cm) during 2015. These measurements are the stable SC measured at each well just prior to sampling. The 2015 measured SC values ranged from 0.360 to 0.382 mmhos/cm. The 2015 average SC values are 0.379 mmhos/cm at UE5PW-1, 0.361 mmhos/cm at UE5PW-2, and 0.376 mmhos/cm at UE5PW-3.

SC measurements began in 1993 and have continued through 2015. All SC measurements are provided in Appendix Table C-1, and these data are summarized in Table 2-3. SC values from each well have remained relatively stable throughout the entire monitoring period (Figure 2-2). No groundwater contamination is indicated by the SC monitoring results.

Table 2-3. Summary of Pilot Well SC Values in mmhos/cm

	UE5PW-1	UE5PW-2	UE5PW-3
Number	56	56	56
Average	0.376	0.358	0.369
Standard Deviation	0.011	0.013	0.011
Maximum	0.401	0.411	0.386
Minimum	0.320	0.325	0.332
Start Date	03/31/1993	03/24/1993	04/14/1993
Last Date	08/11/2015	09/01/2015	08/11/2015

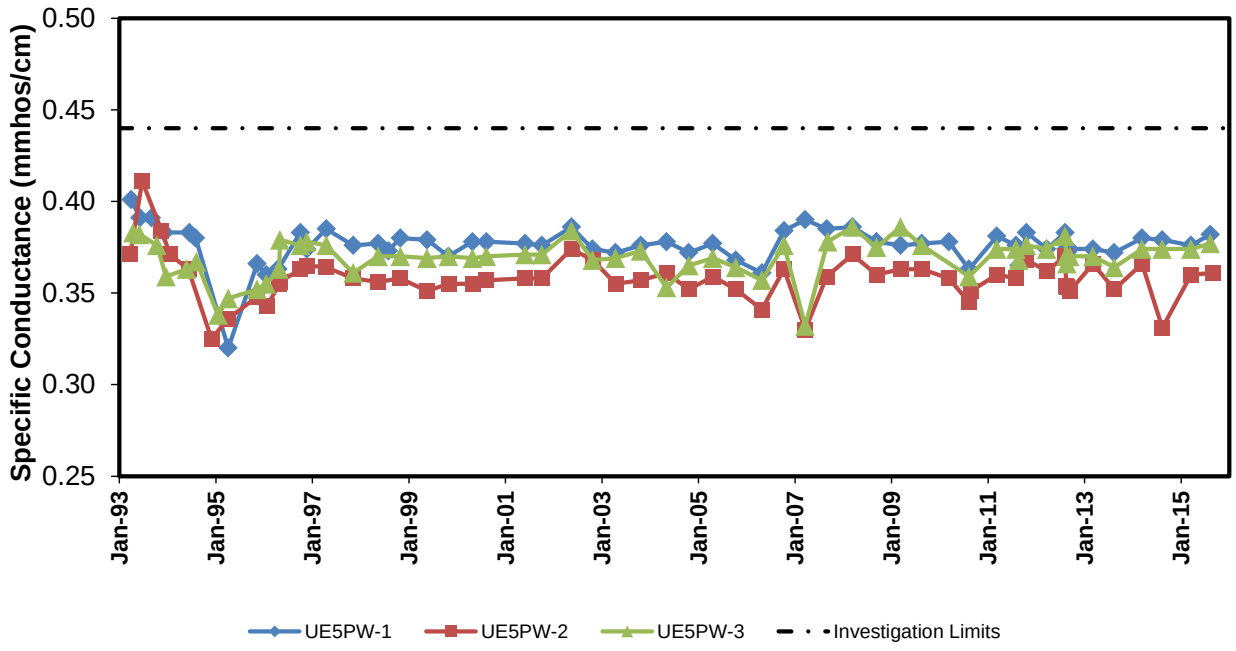

Figure 2-2. Time Series Plot of Pilot Well SC

2.2.3 Total Organic Carbon

All TOC measurements during 2015 remained below the IL of 1 mg/l. Beginning in 2001 and continuing to the present, three samples were collected consecutively from each well on each sampling date for TOC analysis. On prior sampling dates, the number of replicate samples at each well on each sampling date varied from one to four. The 2015 TOC values ranged from <0.33 to 0.60 mg/l. The 2015 average TOX values are 0.44 mg/l at UE5PW-1, 0.41 mg/l at UE5PW-2, and 0.43 mg/l at UE5PW-3. When sample TOC values fell below the sample's MDL, the MDL value was used to calculate the average.

TOC measurements began in 1993 and have continued through 2015. All TOC measurements are provided in Appendix Table C-2, and these data are summarized in Table 2-4. TOC values have remained relatively low and stable throughout the monitoring period (Figure 2-3). Most variation in TOC values is the result of variation in the MDL. No groundwater contamination is indicated by the TOC monitoring results.

Table 2-4. Summary of Pilot Well TOC Values

	UE5PW-1	UE5PW-2	UE5PW-3
Measurements	149	155	150
Sample Dates	48	50	48
Average	0.59	0.65	0.61
Standard Deviation	0.27	0.33	0.28
Maximum	1.40	2.30	1.50
Start Date	03/31/1993	03/24/1993	04/14/1993
Last Date	08/11/2015	09/01/2015	08/11/2015

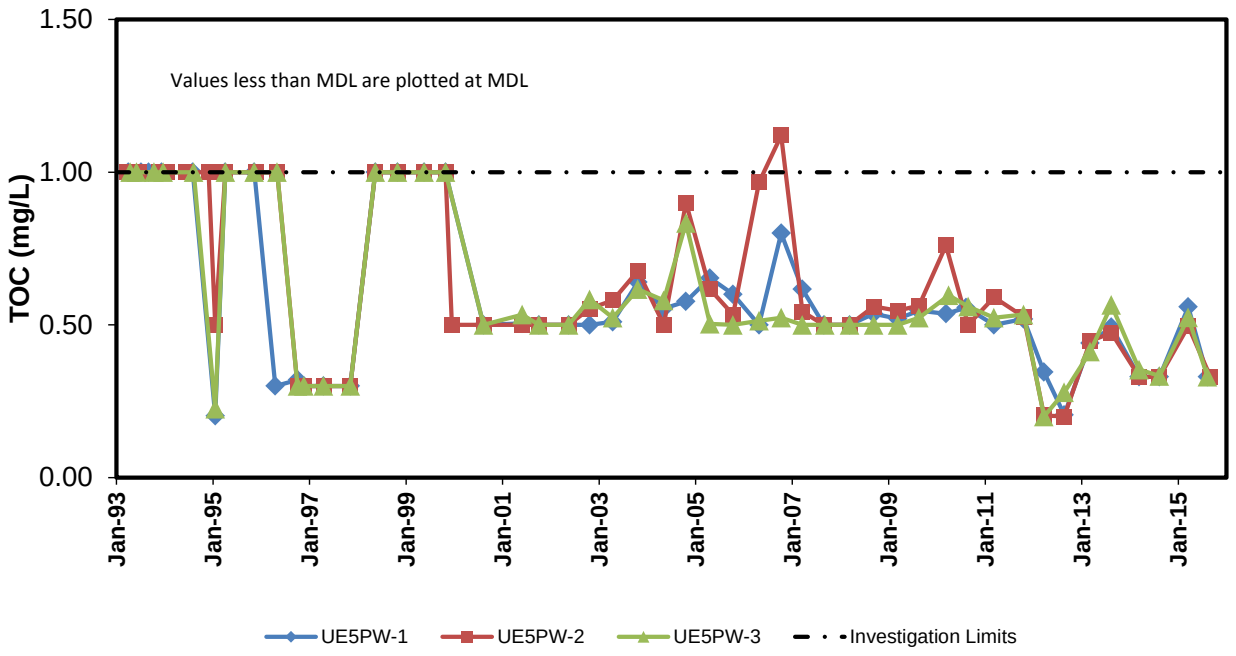

Figure 2-3. Time Series Plot of Pilot Well TOC

2.2.4 Total Organic Halides

All TOX measurements during 2015 remained below the IL of 50 µg/l. Beginning in 2001 and continuing to the present, three samples were collected consecutively from each well on each sampling date for TOX analysis. On prior sampling dates, the number of replicate samples at each well on each sampling date varied from one to four. During 2015, all TOX measurements were less than the MDL for TOX of 3.33 µg/L.

TOX measurements began in 1993 and have continued through 2015. All TOX measurements are provided in Appendix Table C-3, and these data are summarized in Table 2-5. TOX values have remained relatively stable and below the IL throughout the monitoring period (Figure 2-4). Most variation in TOX values is the result of variation in the MDL. No groundwater contamination is indicated by the TOX results.

Table 2-5. Summary of Pilot Well TOX Values in µg/L

	UE5PW-1	UE5PW-2	UE5PW-3
Measurements	153	151	149
Sample Dates	48	48	47
Average	10.23	10.67	10.43
Standard Deviation	9.30	9.24	9.62
Maximum	46.20	40.00	50.70
Start Date	03/31/1993	03/24/1993	04/14/1993
Last Date	08/11/2015	09/01/2015	08/11/2015

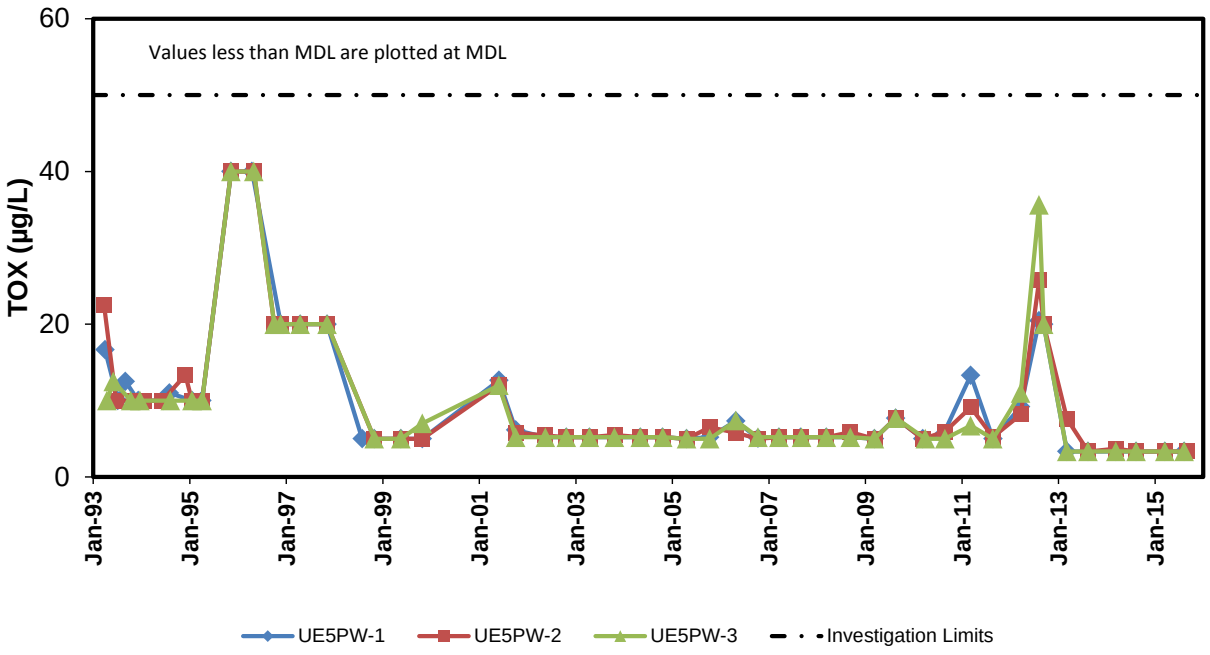

Figure 2-4. Time Series Plot of Pilot Well TOX

2.2.5 Tritium

All tritium results from 2015 groundwater samples were below the IL of 2,000 pCi/L and below the laboratory MDC for tritium. During 2015, three replicate samples were collected consecutively at each well on each sample date for tritium analysis. Tritium was not enriched in these samples before the tritium activity was measured. Prior to 2015, most tritium samples were enriched before tritium activity measurement, and typically two replicate samples were collected consecutively at each well on each sample date. All tritium results are provided in Appendix Table C-4 and Table C-5, and these data are summarized in Table 2-6. Negative tritium results indicate the measured activity is less than the measured laboratory background activity.

The average 2015 tritium result for all three Pilot Wells is -39.5 pCi/L with an average detection limit of 119 pCi/L. Tritium values have remained relatively stable and below the IL and MDC throughout the monitoring period (Figure 2-5). No groundwater contamination is indicated by the tritium results.

Table 2-6. Summary of Pilot Well Tritium Values in pCi/L

	UE5PW-1		UE5PW-2		UE5PW-3	
	Enriched Tritium	Tritium	Enriched Tritium	Tritium	Enriched Tritium	Tritium
Measurements	71	8	71	9	71	8
Average	-0.82	34.4	-0.91	38.7	-1.62	45.8
Standard Deviation	7.77	85.4	9.74	78.1	7.48	78.8
Maximum	18.1	156	36.3	195	15.7	161
Minimum	-23.7	-91.2	-31.2	-33.4	-25.5	-56.1
Start Date	03/31/1993	03/11/2014	03/24/1993	11/15/1993	04/14/1993	03/11/2014
Last Date	08/12/2014	08/11/2015	08/12/2014	09/01/2015	08/12/2014	08/11/2015

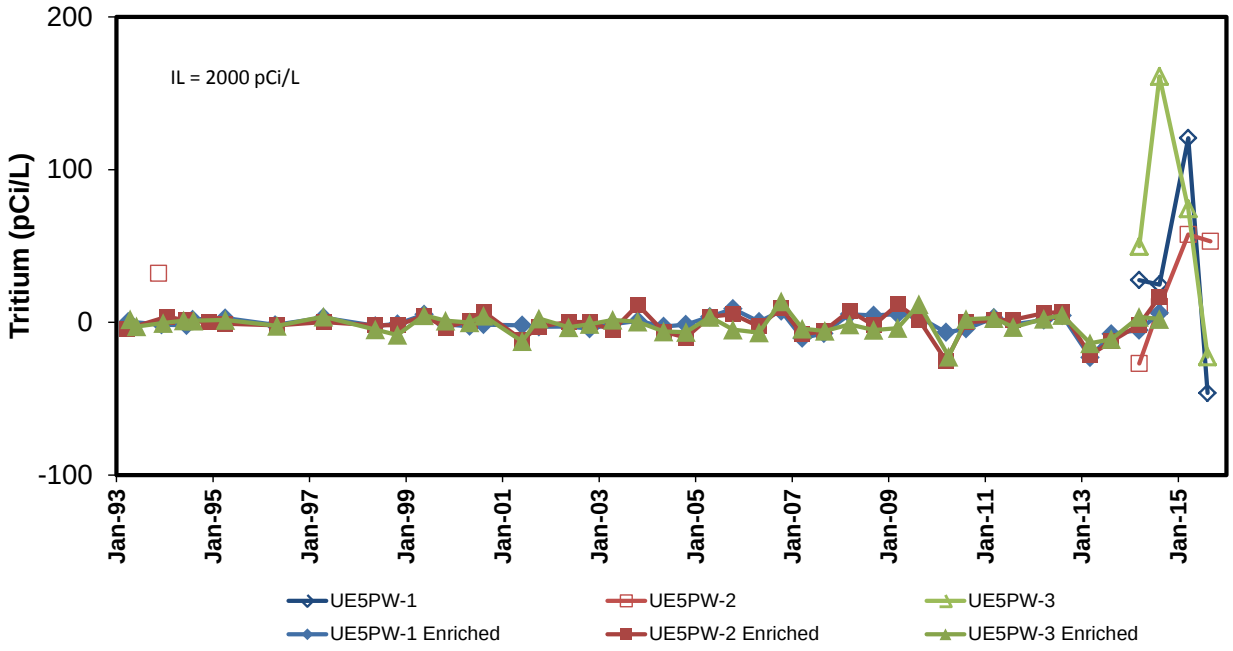

Figure 2-5. Time Series Plot of Pilot Well Tritium

2.2.6 General Water Chemistry Parameters

General water chemistry analyses during 2015 for cations (Ca, Mg, Na, K, Fe), anions (Cl, F, SO4, HCO3), and SiO2 indicate similar groundwater in all three wells and no changes in groundwater chemistry (Appendix Table C-6, Table C-7, and Table C-8). Stiff plots for 2015 also indicate similar groundwater chemistry for all three wells (Figure 2-6). A piper diagram for the same water chemistry data from 2011 through 2015 indicates that the groundwater is a sodium-bicarbonate type (Figure 2-7).

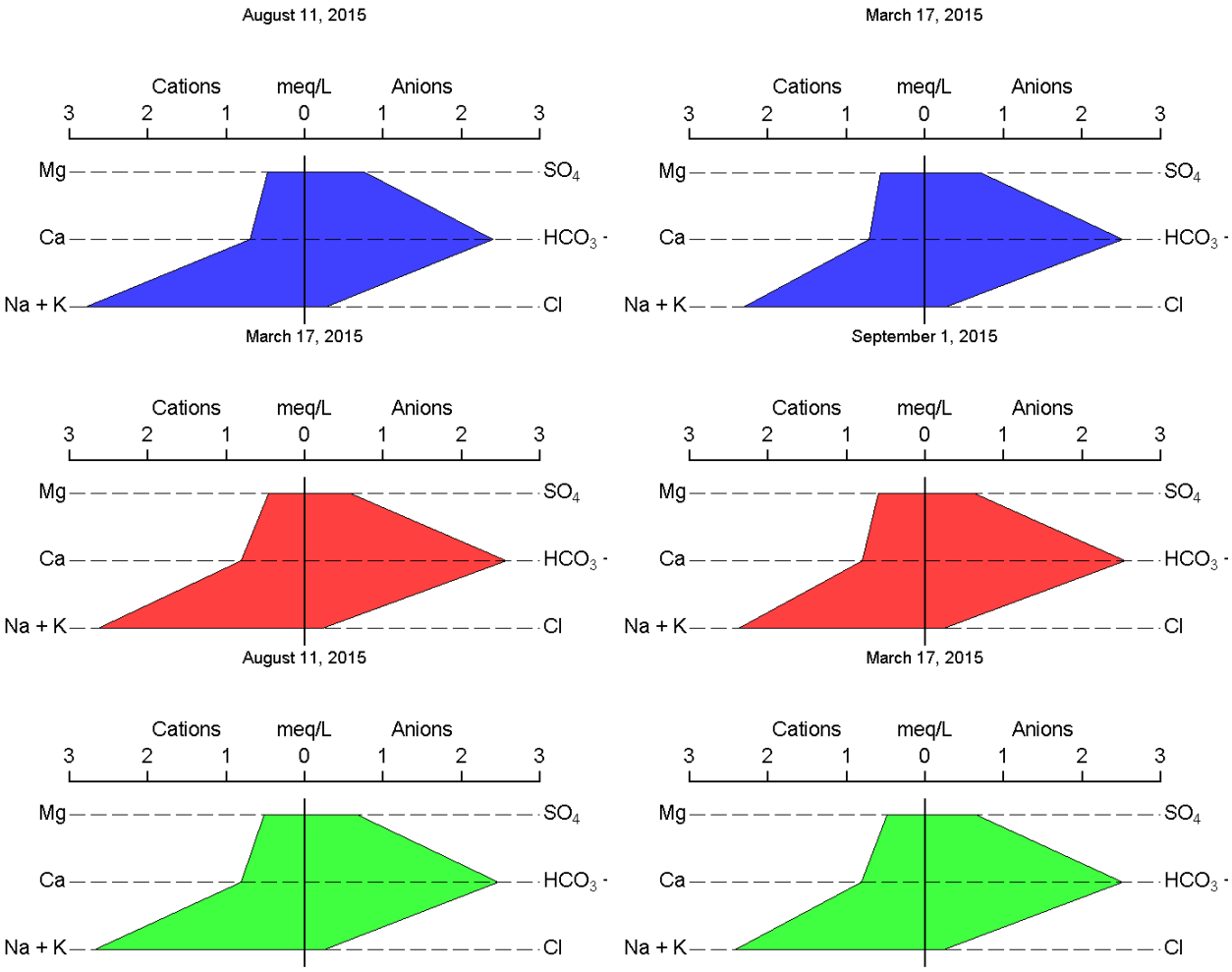

Figure 2-6. Stiff Diagrams for Pilot Well Samples Collected in 2015

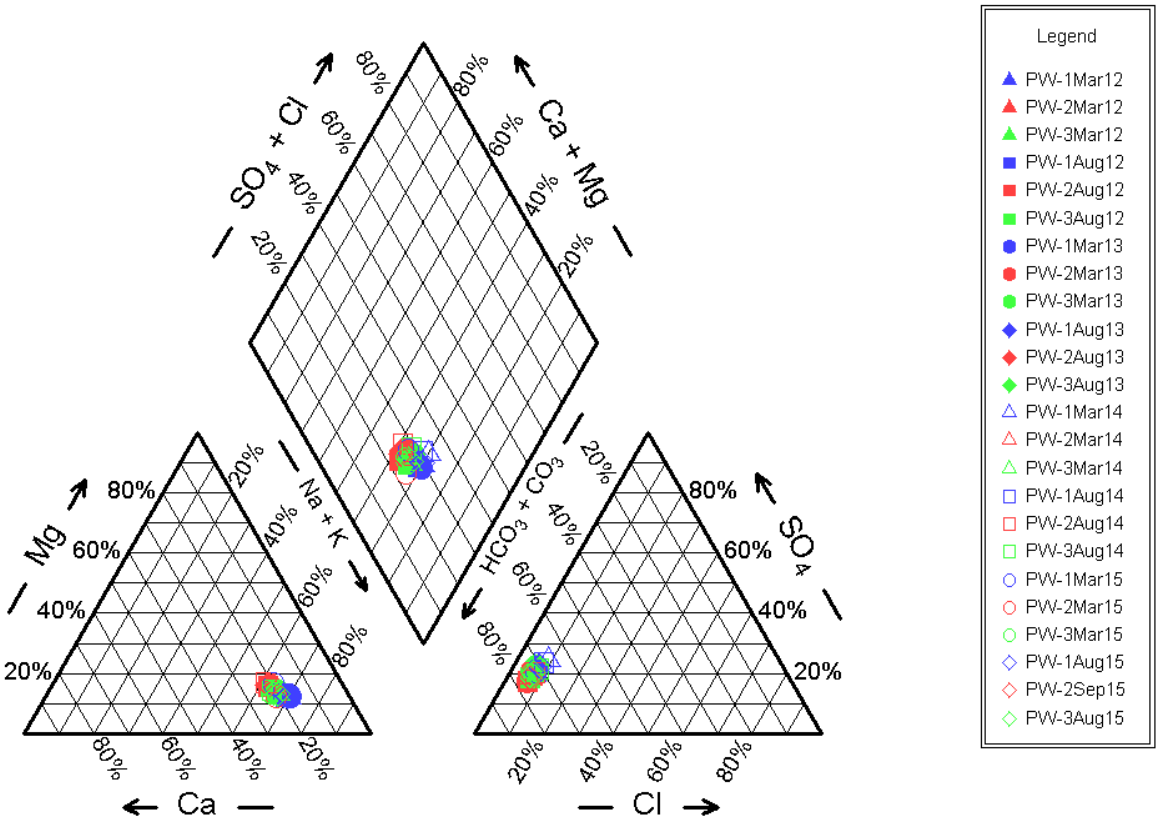

Figure 2-7. Piper Diagram for Pilot Wells from 2011 through 2015

2.2.7 Groundwater Elevation

Groundwater elevations in UE5PW-1, UE5PW-2, and UE5PW-3 are measured quarterly using an electronic water-level tape (Appendix Table C-9). These measurements are corrected for borehole deviation (REECo, 1994). The 2015 average depths to water from the top of casing are 235.89 m (773.92 ft), 256.48 m (841.48 ft), and 271.59 m (891.05 ft) for UE5PW-1, UE5PW-2, and UE5PW-3, respectively. These average depths correspond to average water table elevations AMSL of 733.49 m (2406.47 ft) at UE5PW-1, 733.61 m (2406.85 ft) at UE5PW-2, and 733.70 m (2407.14 ft) at UE5PW-3. Groundwater elevations have remained relatively stable throughout the monitoring period and appear to be slightly decreasing (Figure 2-8).

Based on the similar groundwater elevations, the groundwater table is essentially flat with little or no flow. Groundwater gradient, velocity, and flow direction are calculated from the groundwater elevations, borehole locations, and aquifer hydraulic properties (Table 2-7 and Appendix B). The average calculated flow velocity during 2015 was 0.08 meters per year and the flow direction was southeast. The very low calculated flow velocities and the fluctuating flow directions indicate little or no groundwater movement.

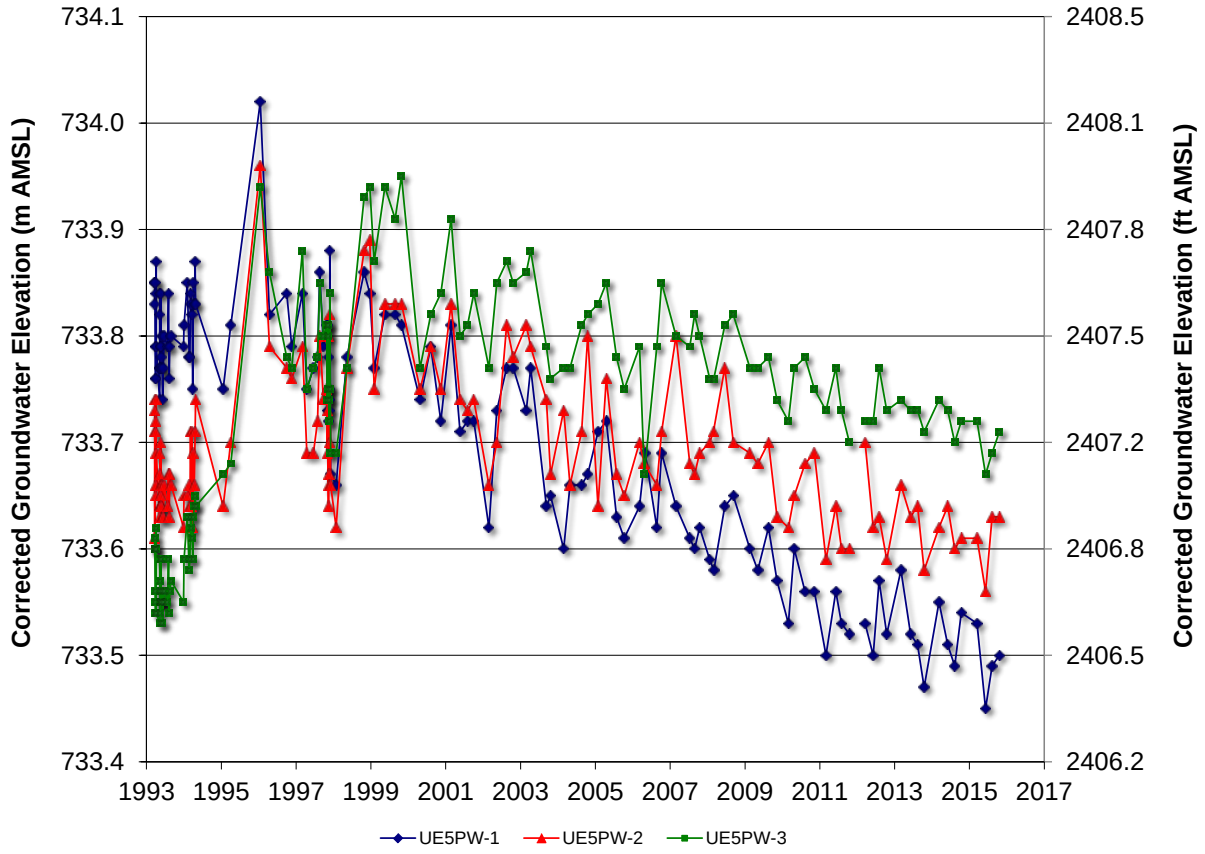

Figure 2-8. Time Series Plot of Pilot Well Groundwater Elevations

Table 2-7. Area 5 RWMS Groundwater Flow Calculations for 2015

Hydraulic Conductivity = 1.12E-03 cm/second (3.67E-05ft/second)[a] **Effective Porosity = 0.38[a]**			
Date	**Hydraulic Gradient (m/m)**	**Velocity (m/yr)**	**Flow direction (degrees East of North)**
03/16/2015	7.43E-05	0.069	140
06/08/2015	8.98E-05	0.083	150
08/10/2015	9.95E-05	0.093	170
10/20/2015	9.55E-05	0.089	163

[a] Source: REECo (1994)

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3.0 LEACHATE MONITORING METHODS AND RESULTS

The leachate from Cell 18 has been monitored since the cell opened and began receiving waste in January 2011.

3.1 METHODS

Leachate samples were collected and analyzed when the leachate collection tank approached its 3,000-gallon capacity. The current leachate tank sampling procedure (NSTec, 2014b) was followed. The RCRA permit for Cell 18 (NDEP, 2011) requires groundwater monitoring at the Pilot Wells. These results are reported in Section 2.0 of this report. In addition to groundwater monitoring, the leachate samples are analyzed for the toxicity characteristic contaminants listed in Table 1 of 40 CFR 261.24 (CFR 2003), PCBs, pH, and SC. These results for the leachate are reported in this section of the report.

Indicators of contamination monitored for leachate:

- Toxicity characteristic contaminants
    - Metals – arsenic, barium, cadmium, chromium, lead, selenium, silver
    - Mercury
    - Semi-volatiles – o-cresol, m-cresol, p-cresol, 1,4-dichlorobenzene, 2,4-dinitrotoluene, hexachlorobenzene, hexachlorobutadiene, hexachloroethane, nitrobenzene, pentachlorophenol, pyridine, 2,4,5-trichlorophenol, 2,4,6-trichlorophenol
    - Volatiles – benzene, carbon tetrachloride, chlorobenzene, chloroform, 1,2-Dichloroethane, 1,1-Dichloroethylene, methyl ethyl ketone, tetrachloroethylene, trichloroethylene, vinyl chloride
    - Organochlorine pesticides – chlordane, endrin, heptachlor (and its epoxide), lindane, methoxychlor, toxaphene
    - Chlorinated herbicides – 2,4-D, 2,4,5-TP (Silvex)
- PCBs
- pH
- SC

Leachate volume is measured with a totalizing flow meter when the contents of the primary sump at Cell P18 are pumped into the leachate collection tank. The flow meter measurement is recorded at an interval of approximately one week. Leachate drains into the primary sump from above the primary liner. No leachate has ever been pumped from the secondary sump, which collects leachate from between the primary and secondary liner.

The total volume pumped from the primary sump into the leachate collection tank from January 2011 through December 2015 is 183,255 liters (48,411 gallons). From January 2011 through December 2015, there was 56.3 cm (22.2 in.) of precipitation at the Area 5 RWMS. The equivalent depth of the collected leachate distributed over the 1.35 ha (3.33 ac) covered by the Cell 18 liner is 1.36 cm (0.54 in.). Neglecting additional water applied to Cell 18 for dust control, leachate is approximately 2.4 percent of the precipitation.

The total volume pumped from the primary sump into the leachate collection tank in 2015 is 41,083 liters (10,853 gallons). In 2015 there was 15.4 cm (6.06 in.) of precipitation at the Area 5 RWMS. The equivalent depth of the yearly collected leachate distributed over the 1.35 ha (3.33 ac) covered by the Cell 18 liner is 0.30 cm (0.12 in.). Neglecting additional water applied to Cell 18 for dust control, leachate is approximately 2.0 percent of the 2015 precipitation.

3.2 RESULTS

This section provides analysis results for leachate samples.

3.2.1 Toxicity Characteristic Contaminants

All leachate analysis results for toxicity characteristic contaminants and the regulatory limits for each contaminant are provided in Appendix Table C-10 through Table C-13. There is no evidence for leachate contamination indicated by analysis for the toxicity characteristic contaminants.

3.2.2 Polychlorinated Biphenyls

All leachate analysis results for PCBs are provided in Appendix Table C-14. None of the PCB analysis results are above the analysis method QL. There is no evidence for leachate contamination indicated by analysis for PCBs.

3.2.3 Specific Conductance and pH

Field measurements of SC and pH were taken for leachate samples collected since October 3, 2013. The results are provided in Appendix Table C-15. The measurements are within expected ranges. SC values are above the ILs for groundwater (Table 2-1), but this is expected due to evaporation. Since measurements began in 2013, the average SC has been 2.72 mmhos/cm, with the average SC during 2015 being 2.77 mmhos/cm.

The pH results are sometimes outside the IL range for groundwater (Table 2-1). Since measurements began in 2013, the average pH has been 7.57, with the average pH during 2015 being 7.57.

4.0 SUMMARY

The hydrologic conditions in the uppermost aquifer beneath the Area 5 RWMS remain stable and are not affected by the Area 5 RWMS. Groundwater flow in this uppermost aquifer is negligible. No significant changes were detected in the water chemistry, and all indicator parameters remain within the established ILs.

Cell 18 leachate analysis results are all below the reporting limits identified in the RCRA permit for Cell 18 (NDEP, 2011).

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5.0 CONCLUSION

There is no measurable impact to the uppermost aquifer from the Area 5 RWMS. Cell 18 leachate analysis results are below the reporting limits identified in the RCRA permit for Cell 18 (NDEP 2011), so the leachate is suitable to use for dust control on Cell 18.

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Appendix A - Cumulative Chronology for the Area 5 Radioactive Waste Management Site Groundwater Monitoring Program

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Cumulative Chronology for the Area 5 Radioactive Waste Management Site (RWMS) Groundwater (GW) Monitoring Program					
Date	**UE5PW-1**	**Date**	**UE5PW-2**	**Date**	**UE5PW-3**
03/20/1990	DOE letter requesting installation of monitoring wells near the Area 5 RWMS				
03/13/1992	Drilling begins	06/18/1992	Drilling begins	09/16/1992	Drilling begins
06/16/1992	Drilling ends	09/04/1992	Drilling ends	11/09/1992	Drilling ends
09/11/1992	Well developed	03/30/1993	Well developed	04/04/1993	Well developed
03/31/1993	GW Sampling	03/24/1993	GW Sampling	04/14/1993	GW Sampling
06/06/1993	GW Sampling	06/22/1993	GW Sampling	06/02/1993	GW Sampling
09/01/1993	GW Sampling			10/12/1993	GW Sampling
12/07/1993	GW Sampling	11/15/1993	GW Sampling	12/20/1993	GW Sampling
12/17/1993	DOE letter to Nevada Division of Environmental Protection (NDEP) requesting to establish pilot wells located near the Area 5 RWMS as Resource Conservation and Recovery Act (RCRA) GW monitoring wells				
02/24/1994	NDEP letter stating that the pilot wells appear to meet the applicable design, construction, and development criteria for RCRA GW monitoring wells				
06/15/1994	GW Sampling	06/07/1994	GW Sampling	05/24/1994	GW Sampling
08/01/1994	GW Sampling	11/29/1994	GW Sampling	08/08/1994	GW Sampling
09/30/1994	DOE submits 1993 GW monitoring results from quarterly sampling effort				
01/18/1995	UE5PW-3 GW resampling for 08/01/1994 total organic carbon (TOC) hit				
02/23/1995	DOE transmits to NDEP GW Monitoring Program Outline				
03/01/1995	1994 GW Monitoring Report submitted to NDEP				
04/04/1995	GW Sampling				
11/09/1995	GW Sampling				
11/09/1995	UE5PW-1 pump snagged in hole, resulting in a bent shaft on the reel				
01/18/1996	GW Sampling	01/25/1996	GW Sampling	01/18/1996	GW Sampling
01/22/1996	Bennett pump seals replaced at all three wells				
03/01/1996	DOE submits to NDEP the 1995 GW Monitoring Report				
04/16/1996	GW Sampling	04/23/1996	GW Sampling		
		04/30/1996	GW Sampling		
10/02/1996	GW Sampling				
10/25/1996	NDEP requests clarifications/changes in the GW Monitoring Report				
11/20/1996	GW Sampling				
03/01/1997	DOE submits 1996 GW Monitoring Report and revised GW Monitoring Program Outline				

Cumulative Chronology for the Area 5 Radioactive Waste Management Site (RWMS) Groundwater (GW) Monitoring Program					
Date	**UE5PW-1**	**Date**	**UE5PW-2**	**Date**	**UE5PW-3**
04/16/1997	GW Sampling				
08/12/1997	NDEP comments on 1996 GW Monitoring Report/Proposed Outline				
10/22/1997	Pump and water-level meter lodge in UE5PW-1 during simultaneous operation; retrieved 10/23/1997				
10/22/1997	Larger diameter air lines installed at all three wells				
11/05/1997	GW Sampling				
03/01/1998	DOE submits to NDEP the 1997 GW Monitoring Report and new outline				
03/31/1998	NDEP letter stating that they concur on the indicator parameters and investigation levels submitted in the GW Monitoring Outline				
05/13/1998	GW Sampling				
06/22/1998	Total organic halides (TOX) detected in the 05/13/1998 samples and blanks from all three wells				
07/10/1998	DOE and NDEP agree to resample UE5PW-1 to confirm no TOX				
07/29/1998	GW resampling at UE5PW-1 for 05/13/1998 TOX hits				
09/10/1998	Results from 07/29/1998 resampling are non-detect for TOX. TOX results from the 05/13/1998 sampling event are determined to be false positives.				
09/10/1998	Bennett pumps from three wells and spare pumps are sent to manufacturer for refurbishing				
09/12/1998	Reels from three wells are returned to manufacturer for new tubing bundles				
10/28/1998	GW Sampling				
09/12/1998	UE5PW-1 reel returned to manufacturer for repair of exhaust tube. Spare pump returned to manufacturer for the repair of a leaky seal.				
03/01/1999	DOE submits to NDEP 1998 GW Monitoring Report				
03/31/1999	NDEP requests statistical analysis of data and states that values determined to be false positives through resampling do not need to be presented graphically				
05/19/1999	GW Sampling				
10/27/1999	GW Sampling				
12/13/1999	Resample UE5PW-2 after TOC hit from 10/27/1999				
12/27/1999	Results from the resampling of UE5PW-2 are non-detect for TOC. TOC result from 10/27/1999 is determined to be a false positive.				
02/25/2000	DOE submits to NDEP 1999 GW Monitoring Report				
04/17/2000	NDEP states that future reports do not need to include statistical analyses				
04/26/2000	GW Sampling				

Cumulative Chronology for the Area 5 Radioactive Waste Management Site (RWMS) Groundwater (GW) Monitoring Program					
Date	**UE5PW-1**	**Date**	**UE5PW-2**	**Date**	**UE5PW-3**
06/28/2000	DOE contacts State to report TOX/TOC hits from 04/26/2000. DOE and NDEP agree that the wells will be resampled in August, which would also constitute the Fall sampling event.				
08/09/2000	GW Sampling				
09/20/2000	DOE contacts NDEP to report TOX hits from 08/09/2000 sampling				
11/07/2000	Letter from NDEP stating that DOE does not have a valid data set for TOX and possibly TOC and requests a plan to address contamination concerns prior to next sampling event				
11/20/2000	Video log well			11/27/2000	Video log well
12/20/2000	DOE transmits to NDEP a proposed plan to address contamination issues				
01/31/2001	Letter from NDEP generally concurring that the plan submitted to determine the cause of TOX and TOC hits is sound				
02/21/2001	DOE submits to NDEP 2000 GW Monitoring Report				
03/14/2001	Letter from NDEP stating that the 2000 GW Monitoring Report was received in a timely manner and contains all the data required by Title 40 Code of Federal Regulations Part 265.94. Letter also requests information regarding data in Appendix A of the 2000 GW Monitoring Report (BN 2001).				
04/19/2001	Letter from DOE responding to NDEP's 3/14/2001 request for information regarding presentation of TOX/TOC data in the 2000 report				
04/30/2001	Letter from NDEP concurring with the approach to data presentation as outlined by DOE in the 4/19/2001 correspondence				
05/29/2001	GW Sampling				
10/03/2001	GW Sampling				
03/01/2002	DOE submits to NDEP 2001 GW Monitoring Report				
05/15/2002	GW Sampling				
10/22/2002	GW Sampling				
03/01/2003	DOE submits to NDEP 2002 GW Monitoring Report				
04/15/2003	GW Sampling				
10/22/2003	GW Sampling			10/21/2003	GW Sampling
02/27/2004	DOE submits to NDEP 2003 GW Monitoring Report				
05/04/2004	GW Sampling				
10/19/2004	GW Sampling			10/20/2003	GW Sampling
02/25/2005	DOE submits to NDEP 2004 GW Monitoring Report				
04/19/2005	GW Sampling				
10/11/2005	GW Sampling				

Cumulative Chronology for the Area 5 Radioactive Waste Management Site (RWMS) Groundwater (GW) Monitoring Program					
Date	**UE5PW-1**	**Date**	**UE5PW-2**	**Date**	**UE5PW-3**
02/28/2006	DOE submits to NDEP 2005 GW Monitoring Report				
04/26/2006	GW Sampling				
10/10/2006	GW Sampling				
03/01/2007	DOE submits to NDEP 2006 GW Monitoring Report				
03/19/2007	GW Sampling				
08/29/2007	GW Sampling			09/05/2007	GW Sampling
03/01/2008	DOE submits to NDEP 2007 GW Monitoring Report				
03/11/2008	GW Sampling				
09/10/2008	GW Sampling				
04/22/2009	DOE submits to NDEP 2008 GW Monitoring Report				
03/10/2009	GW Sampling				
08/18/2009	GW Sampling				
03/01/2010	DOE submits to NDEP 2009 GW Monitoring Report				
03/10/2010	GW Sampling			03/31/2010	GW Sampling
08/10/2010	GW Sampling				
03/01/2011	DOE submits to NDEP 2010 GW Monitoring Report				
03/08/2011	GW Sampling				
03/19/2011	Leachate Tank Sampling				
08/02/2011	GW Sampling				
08/24/2011	GW Sampling				
09/28/2011	Leachate Tank Sampling				
10/18/2011	Sample Pumps and Tubing Disinfected				
10/19/2011	GW Sampling				
03/01/2012	DOE submits to NDEP 2011 GW Monitoring Report				
03/21/2012	GW Sampling				
08/08/2012	GW Sampling				
08/21/2012	GW Sampling				
08/23/2012	Leachate Tank Sampling				
09/11/2012	GW Sampling				
09/19/2012	Leachate Tank Sampling				

Cumulative Chronology for the Area 5 Radioactive Waste Management Site (RWMS) Groundwater (GW) Monitoring Program					
Date	**UE5PW-1**	**Date**	**UE5PW-2**	**Date**	**UE5PW-3**
11/27/2012	Leachate Tank Sampling				
03/01/2013	DOE submits to NDEP 2012 GW Monitoring Report				
03/05/2013	GW Sampling				
03/27/2013	Leachate Tank Sampling				
07/31/2013	Leachate Tank Sampling				
08/13/2013	GW sampling				
10/03/2013	Leachate Tank Sampling				
11/06/2013	Leachate Tank Sampling				
12/18/2013	Leachate Tank Sampling				
03/01/2014	DOE submits to NDEP 2013 GW Monitoring Report				
03/05/2014	Leachate Tank Sampling				
03/11/2014	GW Sampling				
05/20/2014	Leachate Tank Sampling				
08/12/2014	Leachate Tank Sampling				
8/12/2014	GW Sampling				
09/06/2014	Leachate Tank Sampling				
11/04/2014	Leachate Tank Sampling				
12/16/2014	Leachate Tank Sampling				
03/17/2014	GW Sampling				
03/31/2015	Leachate Tank Sampling				
06/09/2015	Leachate Tank Sampling				
08/11/2015	GW Sampling	09/01/2015	GW Sampling	08/11/2015	GW Sampling
10/28/2015	Leachate Tank Sampling				
12/01/2015	Leachate Tank Sampling				

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Appendix B - Gradient/Velocity Calculations

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Calculation of Magnitude and Direction of Area 5 Alluvial Aquifer Gradient

Water level elevations measured at three wells near the Area 5 Radioactive Waste Management Site (UE5PW-1, UE5PW-2, and UE5PW-3) are used to calculate the magnitude and direction of the aquifer hydraulic gradient.

The locations of the three wells are given in Nevada State Central Zone coordinates in meters as northing (N) and easting (E) values. The coordinates of each of the three water elevation points define a plane that contains the water level points. The coordinates of the water elevation points are (E_i, N_i, e_i), where:

E_i is the East Coordinate of the i^{th} well (m)
N_i is the North Coordinate of the i^{th} well (m)
e_i is the water level elevation of the i^{th} well (m)

Assuming i=1 for UE5PW-1, i=2 for UE5PW-2, and i=3 for UE5PW-3, the vector **a** connecting the water level at UE5PW-1 to the water level at UE5PW-2 and the vector **b** connecting the water level at UE5PW-1 to the water level at UE5PW-3 are defined by:

$$\mathbf{a} = (E_2 - E_1)\mathbf{i} + (N_2 - N_1)\mathbf{j} + (e_2 - e_1)\mathbf{k}$$
$$\mathbf{b} = (E_3 - E_1)\mathbf{i} + (N_3 - N_1)\mathbf{j} + (e_3 - e_1)\mathbf{k}$$

The aquifer hydraulic gradient is the cross product **a** x **b.**

$$\mathbf{a} \times \mathbf{b} = \mathbf{DET}\begin{bmatrix} i & j & k \\ E_2 - E_1 & N_2 - N_1 & e_2 - e_1 \\ E_3 - E_1 & N_3 - N_1 & e_3 - e_1 \end{bmatrix}$$

$$= [(N_2 - N_1)(e_3 - e_1) - (e_2 - e_1)(N_3 - N_1)]\mathbf{i} +$$
$$[(e_2 - e_1)(E_3 - E_1) - (E_2 - E_1)(e_3 - e_1)]\mathbf{j} +$$
$$[(E_2 - E_1)(N_3 - N_1) - (N_2 - N_1)(E_3 - E_1)]\mathbf{k}$$
$$= A\mathbf{i} + B\mathbf{j} + C\mathbf{k}$$

Where: $A = (N_2 - N_1)(e_3 - e_1) - (e_2 - e_1)(N_3 - N_1)$
$B = (e_2 - e_1)(E_3 - E_1) - (E_2 - E_1)(e_3 - e_1)$
$C = (E_2 - E_1)(N_3 - N_1) - (N_2 - N_1)(E_3 - E_1)$

Dividing hydraulic gradient by C gives the magnitude of the gradient in Easting (**i**) and Northing (**j**) for a unit change in elevation (**k**)

$$(\mathbf{a} \times \mathbf{b})/C = A/C\,\mathbf{i} + B/C\,\mathbf{j} + \mathbf{k}$$

The magnitude of the gradient is:

$$\sqrt{A/C^{2} + B/C^{2}}$$

The direction of the gradient from north (θ) is calculated using the magnitudes of easting (E) and northing (N).

If B > 0, then θ = arctan (a/b)
If B < 0, then θ = 180° + arctan (a/b)
If B = 0 and A > 0, then θ = 90°
If B = 0 and A < 0, then θ = 270°
If B = 0 and A = 0, then the flow is straight down.

Calculation of Mean Groundwater Velocity

Groundwater flux is calculated from Darcy's Law:

$$J = -K\left(\frac{\Delta e}{C}\right)$$

Where: J is groundwater flux (m/s)
K is saturated hydraulic conductivity (m/s)
$\Delta e/C$ is the hydraulic gradient (m/m)

The mean groundwater velocity is calculated from the flux:

$$V = J/\phi$$

Where: V is mean groundwater velocity (m/s)
J is the groundwater flux (m/s)
Φ is porosity (m^3/m^3)

Appendix C - Groundwater Data

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Table C-1. Pilot Well pH and Specific Conductance Values in mmhos/cm

Date	UE5PW-1		UE5PW-2		UE5PW-3	
	pH	SC	pH	SC	pH	SC
03/24/1993	--	--	7.99	0.371	--	--
03/31/1993	8.17	0.401	--	--	--	--
04/14/1993	--	--	--	--	8.24	0.383
06/02/1993	--	--	--	--	8.68	0.382
06/06/1993	--	0.391	--	--	--	--
06/22/1993	--	--	8.24	0.411	--	--
07/06/1993	8.30	--	--	--	--	--
09/01/1993	8.25	0.391	--	--	--	--
10/12/1993	--	--	--	--	8.69	0.376
11/15/1993	--	--	8.40	0.384	--	--
12/07/1993	7.91	0.383	--	--	--	--
12/20/1993	--	--	--	--	8.60	0.359
01/19/1994	--	--	8.79	0.371	--	--
05/24/1994	--	--	--	--	8.87	0.363
06/07/1994	--	--	8.81	0.363	--	--
06/15/1994	8.45	0.383	--	--	--	--
08/01/1994	8.28	0.380	--	--	--	--
08/08/1994	--	--	--	--	8.77	0.367
11/29/1994	--	--	8.79	0.325	--	--
01/18/1995	--	--	--	--	8.58	0.338
04/04/1995	8.25	0.320	8.58	0.336	--	--
04/05/1995	--	--	--	--	8.28	0.347
11/09/1995	8.35	0.366	8.08	0.348	8.43	0.352
01/18/1996	8.41	0.360	--	--	8.55	0.355
01/25/1996	--	--	8.63	0.343	--	--
04/16/1996	8.22	0.363	--	--	--	--
04/23/1996	--	--	8.21	0.355	8.23	0.363
04/30/1996	--	--	8.15	0.356	8.15	0.379
10/02/1996	8.18	0.383	8.28	0.363	8.18	0.376
11/20/1996	8.25	0.374	8.16	0.365	8.13	0.378
04/16/1997	8.33	0.385	8.40	0.364	8.25	0.376
11/05/1997	8.30	0.376	8.17	0.358	8.22	0.361
05/13/1998	8.31	0.377	8.37	0.356	8.34	0.370
07/29/1998	8.63	0.373	--	--	--	--
10/28/1998	8.34	0.380	8.32	0.358	8.14	0.370
05/19/1999	8.50	0.379	8.49	0.351	8.47	0.369
10/27/1999	8.49	0.370	8.52	0.355	8.34	0.370
04/26/2000	8.50	0.378	8.39	0.355	8.24	0.369
08/09/2000	8.26	0.378	8.14	0.357	8.23	0.370
05/29/2001	8.46	0.377	8.25	0.358	8.27	0.371
10/03/2001	8.39	0.376	8.22	0.358	8.13	0.371
05/15/2002	8.46	0.386	8.30	0.374	8.32	0.384
10/22/2002	8.43	0.374	8.23	0.368	8.24	0.368
04/15/2003	8.54	0.372	8.38	0.355	8.42	0.369
10/21/2003	--	--	--	--	8.16	0.373
10/22/2003	8.37	0.376	8.24	0.357	--	--

Table C-1. Pilot Well pH and Specific Conductance Values (continued)

Date	UE5PW-1		UE5PW-2		UE5PW-3	
	pH	SC	pH	SC	pH	SC
05/04/2004	8.50	0.378	8.25	0.361	8.26	0.353
10/19/2004	8.30	0.372	8.32	0.352	--	--
10/20/2004	--	--	--	--	8.24	0.365
04/19/2005	8.48	0.377	8.30	0.359	8.33	0.369
10/11/2005	8.47	0.368	8.27	0.352	8.31	0.364
04/26/2006	8.34	0.361	8.12	0.341	8.17	0.357
10/10/2006	8.11	0.384	8.03	0.363	8.07	0.376
03/19/2007	8.37	0.390	8.13	0.330	8.44	0.332
08/29/2007	8.29	0.385	8.09	0.359	--	--
09/05/2007	--	--	--	--	8.10	0.378
03/11/2008	8.08	0.386	8.00	0.371	8.03	0.386
09/10/2008	8.17	0.378	8.08	0.360	8.14	0.375
03/10/2009	8.40	0.376	8.17	0.363	8.22	0.386
08/18/2009	8.45	0.377	8.25	0.363	8.22	0.376
03/10/2010	8.37	0.378	8.17	0.358	--	--
03/31/2010	--	--	--	--	8.13	--
08/10/2010	8.39	0.363	8.27	0.345	8.22	0.359
08/25/2010	--	--	8.20	0.351	8.11	--
03/08/2011	8.35	0.381	8.27	0.360	8.22	0.374
08/02/2011	8.39	0.376	8.32	0.358	8.30	0.374
08/23/2011	--	--	8.03	--	8.08	0.368
08/24/2011	8.29	0.365	--	--	--	--
10/19/2011	8.23	0.383	8.15	0.368	8.16	0.376
03/21/2012	8.39	0.374	8.24	0.362	8.27	0.374
08/07/2012	8.35	0.383	8.29	0.370	8.29	0.381
08/14/2012	8.37	0.374	8.33	0.354	8.30	0.370
08/21/2012	7.99	0.372	8.07	0.353	8.02	0.366
09/11/2012	8.13	0.374	7.85	0.351	7.89	0.370
03/05/2013	7.98	0.374	8.30	0.366	7.80	0.370
08/13/2013	8.08	0.372	7.90	0.352	8.13	0.364
03/11/2014	8.36	0.380	8.35	0.366	8.22	0.374
08/12/2014	8.27	0.379	8.32	0.331	8.30	0.374
03/17/2015	8.26	0.376	8.31	0.360	8.19	0.374
08/11/2015	8.38	0.382	--	--	8.24	0.377
09/01/2015	--	--	8.32	0.361	--	--

Table C-2. Pilot Well TOC values in mg/L

Date	UE5PW-1				UE5PW-2				UE5PW-3			
	R1	R2	R3	R4	R1	R2	R3	R4	R1	R2	R3	R4
3/24/1993					<1	<1	<1	<1				
3/31/1993	<1	<1	<1	<1								
4/14/1993									<1	<1	<1	<1
6/2/1993									<1	<1	<1	<1
6/22/1993					<1	<1	<1	<1				
7/6/1993	<1	<1	<1	<1								
9/1/1993	<1	<1	<1	<1								
10/12/1993									<1	<1	<1	<1
11/15/1993					<1	<1	<1	<1				
12/7/1993	<1	<1	<1	<1								
12/20/1993									<1	<1	<1	<1
1/19/1994					<1	<1	<1	<1				
6/7/1994	No Sample				<1	<1	<1	<1	No Sample			
8/1/1994	1.0	1.0	1.0									
8/8/1994									<1	<1	<1	<1
11/29/1994					<1	<1	<1	<1				
1/18/1995	0.11	0.2	0.2	0.3	0.7	0.4	0.3	0.6	0.2	0.2	0.3	0.2
4/4/1995	<1	<1	<1	<1	<1	<1	<1	<1				
4/5/1995									<1	<1	<1	<1
11/9/1995	<1	<1	<1	<1					<1	<1	<1	<1
11/20/1995					<1	<1	<1	<1				
4/16/1996	<0.3	<0.3	<0.3	<0.3								
4/30/1996					<1	<1	<1	<1	<1	<1	<1	<1
10/2/1996	0.32				<0.3				<0.3			
11/20/1996	<0.3	<0.3	<0.3	<0.3	<0.3	<0.3	<0.3	<0.3	<0.3	<0.3	<0.3	<0.3
4/16/1997	<0.3	<0.3	<0.3	<0.3	<0.3	<0.3	<0.3	<0.3	<0.3	<0.3	<0.3	<0.3
11/5/1997	<0.3	<0.3	<0.3	<0.3	<0.3	<0.3	<0.3	<0.3	<0.3	<0.3	<0.3	<0.3
5/13/1998	<1	<1			<1	<1			<1	<1	<1	
10/28/1998	<1	<1			<1	<1			<1	<1		
5/19/1999	<1	<1			<1	<1			<1	<1		
10/27/1999	<1	<1			<1	<1			<1	<1		
12/13/1999	No Sample				<0.5	<0.5			No Sample			
8/9/2000	<0.5	<0.5			<0.5	<0.5			<0.5	<0.5		
5/29/2001	<0.5	<0.5	0.52	<0.5	<0.5	<0.5	<0.5		0.60	<0.5	<0.5	
10/3/2001	<0.5	<0.5	<0.5		<0.5	<0.5	<0.5		<0.5	<0.5	<0.5	
5/15/2002	<0.5	<0.5	<0.5		<0.5	<0.5	<0.5		<0.5	<0.5	<0.5	
10/22/2002	<0.5	<0.5	<0.5		0.66	<0.5	<0.5		<0.5	<0.5	0.75	
4/15/2003	<0.5	<0.53	<0.5		0.74	<0.5	<0.5		0.57	<0.5	<0.5	
10/21/2003									0.51	0.84	<0.5	
10/22/2003	0.59	0.83	<0.5		0.62	0.75	0.66					
5/4/2004	0.66	<0.5	<0.5		<0.5	<0.5	<0.5		0.65	0.59	<0.5	
10/19/2004	0.73	<0.5	<0.5		1.70	<0.5	<0.5					
10/20/2004									<0.5	1.50	<0.5	
4/19/2005	<0.5	<0.5	0.96		<0.5	0.72	0.63		<0.5	0.51	<0.5	
10/11/2005	<1.29	0.51			0.60	<0.5	<0.5		<0.5	<0.5	<0.5	
4/26/2006	<0.5	<0.5	<0.5		1.90	<0.5	<0.5		0.54	<0.5	<0.5	

Table C-2. Pilot Well TOC values in mg/L (continued)

Date	UE5PW-1				UE5PW-2				UE5PW-3			
	R1	R2	R3	R4	R1	R2	R3	R4	R1	R2	R3	R4
10/10/2006	<0.5	1.40	<0.5		2.30	0.56	<0.5		0.57	<0.5	<0.5	
3/19/2007	<0.5	0.85	<0.5		0.63	<0.5	<0.5		<0.5	<0.5	<0.5	
8/29/2007	<0.5	<0.5	<0.5		<0.5	<0.5	<0.5					
9/5/2007									<0.5	<0.5	<0.5	
3/11/2008	<0.5	<0.5	<0.5		<0.5	<0.5	<0.5		<0.5	<0.5	<0.5	
9/10/2008	<0.5	<0.5	0.61		<0.5	0.53	0.65		<0.5	<0.5	<0.5	
3/10/2009	<0.5	<0.5	0.56		<0.5	0.52	0.62		<0.5	<0.5	<0.5	
8/18/2009	<0.5	0.59	0.55		<0.5	<0.5	0.69		<0.5	0.57	<0.5	
3/10/2010	0.61	<0.5	<0.5		<0.5	0.63	1.15					
3/31/2010									<0.57	0.64	0.58	
8/10/2010	0.67	<0.5	<0.5									
8/25/2010					<0.5	<0.5	<0.5		0.68	<0.5	<0.5	
3/8/2011	<0.5	<0.5	<0.5		<0.5	0.77	<0.5		<0.5	<0.5	0.57	
10/19/2011	0.56	<0.5	<0.5		<0.5	<0.5	0.58		0.52	<0.5	0.59	
3/21/2012	<0.2	0.60	0.24		<0.2	<0.2	0.21		<0.2	<0.2	<0.2	
8/21/2012	<0.2	0.22	<0.2		<0.2	<0.2	<0.2		<0.2	0.23	0.40	
3/5/2013	0.43	0.48	0.42		0.43	0.37	0.54		0.43	0.39	0.42	
8/13/2013	0.62	0.38	0.48		0.56	0.43	0.43		0.54	0.53	0.63	
3/11/2014	<0.33	<0.33	<0.33		<0.33	<0.33	<0.33		0.40	<0.33	<0.33	
8/12/2014	<0.33	<0.33	<0.33		<0.33	<0.33	<0.33		<0.33	<0.33	0.34	
3/17/2015	0.55	0.53	0.60		0.53	0.46	0.49		0.50	0.55	0.53	
8/11/2015	<0.33	<0.33	<0.33						<0.33	<0.33	<0.33	
9/1/2015					<0.33	<0.33	<0.33					

< indicates the result is less than the provided sample specific MDL

Table C-3. Pilot Well TOX values in µg/L

Date	UE5PW-1				UE5PW-2				UE5PW-3			
	R1	R2	R3	R4	R1	R2	R3	R4	R1	R2	R3	R4
3/24/1993					20	20	30	20				
3/31/1993	20	<10	20									
4/14/1993									<10	<10	<10	<10
6/2/1993									20	10	10	10
6/22/1993					<10	<10	<10	<10				
7/6/1993	<10	<10	<10	<10								
9/1/1993	<10	<10	<10	20								
10/12/1993									<10	<10	<10	<10
11/15/1993					<10	<10	<10	<10				
12/7/1993	<10	<10	<10									
12/20/1993									<10	<10	<10	<10
1/19/1994					10	10	10					
6/7/1994					<10	<10	<10	<10				
6/15/1994	<10	<10	<10	<10					No Sample			
8/1/1994	10	10	14	10								
8/8/1994									<10	<10	<10	<10
11/29/1994					20	10	10					
1/18/1995	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10
4/4/1995	<10	<10	<10	<10	<10	<10	<10	<10				
4/5/1995									<10	<10	<10	<10
11/9/1995	<40	<40	<40	<40	<40	<40	<40	<40	<40	<40	<40	<40
4/16/1996	<40	<40	<40	<40								
4/30/1996					<40	<40	<40	<40	<40	<40	<40	<40
10/2/1996	No Sample				<20				<20			
11/20/1996	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20
4/16/1997	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20
11/5/1997	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20
7/29/1998	<5	<5	<5		No Sample				No Sample			
10/28/1998	<5	<5										
10/29/1998					<5	<5			<5	<5		
5/19/1999	<5	<5			<5	<5			<5	<5		
10/27/1999	<5	<5			<5	<5			9	<5		
5/29/2001	<12	<13.3	<13.3	<12	<12	<12	<12	<12	<12	<12	<12	<12
10/3/2001	<5.2	6	7		<5.8	<5.8	<5.8		<5.2	<5.2	<5.2	
5/15/2002	<5.2	<5.2	<5.2		<5.2	<5.2	6		<5.2	<5.2	<5.2	
10/22/2002	<5.2	<5.2	<5.2		<5.2	<5.2	<5.2		<5.2	<5.2	<5.2	
4/15/2003	<5.2	<5.2	<5.2		<5.2	<5.2	<5.2		<5.2	<5.2	<5.2	
10/21/2003									<5.2	<5.2	<5.2	
10/22/2003	<5.2	<5.2	<5.2		6	<5.2	<5.2					
5/4/2004	<5.2	<5.2	<5.2		<5.2	<5.2	<5.2		<5.2	<5.2	<5.2	
10/19/2004	<5.2	<5.2	<5.2		<5.2	<5.2	<5.2					
10/20/2004									<5.2	<5.2	<5.2	
4/19/2005	<5	<5	<5		<5	<5	<5		<5	<5	<5	
10/11/2005	6	<5	<5		8	7	<5		<5	<5	<5	
4/26/2006	12	<5.2	<5.2		<5.2	5	7		6	7	9	
10/10/2006	<5	<5.2	<5		<5	<5	<5		<5.2	<5.2	<5.2	

Table C-3. Pilot Well TOX values in µg/L (continued)

Date	UE5PW-1				UE5PW-2				UE5PW-3			
	R1	R2	R3	R4	R1	R2	R3	R4	R1	R2	R3	R4
3/19/2007	<5.2	<5.2	<5.2		<5.2	<5.2	<5.2		<5.2	<5.2	<5.2	
8/29/2007	<5.2	<5.2	<5.2		<5.2	<5.2	<5.2					
9/5/2007									<5.2	<5.2	<5.2	
3/11/2008	<5.2	<5.2	<5.2		<5.2	<5.2	<5.2		<5.2	<5.2	<5.2	
9/10/2008	<5.2	<5.2	<5.2		6.0	6.4	<5.2		<5.2	<5.2	<5.2	
3/10/2009	<5	<5	<5		<5	<5	<5		<5	<5	<5	
8/18/2009	<7.7	<7.7	<7.7		<7.7	<7.7	<7.7		<7.7	<7.7	<7.7	
3/10/2010	<5	<5	<5		<5	<5	<5					
3/31/2010									<5	<5	<5	
8/10/2010	<5	5.8	5.7									
8/25/2010					7.8	<5	<5		<5	<5	<5	
3/8/2011	29.6	<5	5.3		<5	8.0	14.3		7.8	<5	7.3	
8/23/2011					5.7	<5	<5		<5	<5	<5	
8/24/2011	<5	<5	<5									
3/21/2012	11.7	6.6	9.3		<5	10.1	9.4		6.2	14.3	12.5	
9/11/2012	<20	<20	<20		<20	<20	<20		<20	<20	<20	
3/5/2013	<3.33	<3.33	<3.33		<3.33	5.4	14.1		<3.33	<3.33	<3.33	
8/13/2013	<3.33	<3.33	<3.33		<3.33	<3.33	<3.33		<3.33	<3.33	<3.33	
3/11/2014	<3.33	<3.33	<3.33		4.4	<3.33	<3.33		3.4	<3.33	<3.33	
8/12/2014	<3.33	<3.33	<3.33		<3.33	<3.33	<3.33		<3.33	<3.33	<3.33	
3/17/2015	<3.33	<3.33	<3.33		<3.33	<3.33	<3.33		<3.33	<3.33	<3.33	
8/11/2015	<3.33	<3.33	<3.33						<3.33	<3.33	<3.33	
9/1/2015					<3.33	<3.33	<3.33					

< indicates the result is less than the provided sample specific MDL

Table C-4. Pilot Well Enriched Tritium in pCi/L

Date	UE5PW-1		UE5PW-2		UE5PW-3	
	R1	R2	R1	R2	R1	R2
3/24/1993			<-4.3			
3/31/1993	<0.4					
4/14/1993					<2.0	
6/2/1993	No Sample		No Sample		<-2.7	
12/7/1993	<-1.6					
12/20/1993					<-0.5	
1/19/1994			<3.7			
5/24/1994					<1.1	
6/7/1994			<1.3			
6/15/1994	<-2.0					
8/1/1994	<1.9					
8/8/1994					<1.0	
11/29/1994			<0.0			
4/4/1995	<2.8		<-0.9			
4/5/1995					<1.5	
4/16/1996	<-1.7					
4/30/1996			<-1.9		<-2.3	
4/16/1997	<3.2		<0.2		<3.7	
5/13/1998	<-2.4		<-2.0		<-4.7	
10/28/1998	<-1.1		<-1.9		<-8.3	
5/19/1999	<2.5	<7.8	<4.0	<4.5	<8.3	<0.9
10/27/1999	<1.0	<-3.7	<1.1	<-7.8	<-3.4	<5.6
4/26/2000	<-3.5	<-1.6	<1.0	<1.3	<-0.4	<0.3
8/9/2000	<-0.4	<-2.6	<5.2	<8.7	<6.4	<2.3
5/29/2001	14.1	<-17.9	<-12.3	<-10.7	<-7.7	<-17.1
10/3/2001	<-4.1	<-1.8	<0.0	<-5.6	<1.9	<3.0
5/15/2002	<-1.8	<-3.9	<2.7	<-2.4	<-2.4	<-4.1
10/22/2002	<2.3	<-10.6	<0.6	<-0.4	<-5.8	<3.4
4/15/2003	<-1.1		<-3.6	<-6.8	<1.6	
10/21/2003					<0.4	
10/22/2003	<2.7	<-0.8	<11.4			
5/4/2004	<-8.1	<2.8	<-8.0	<-4.3	<-4.8	<-7.3
10/19/2004	<0.2	<-3.2	<-7.2	<-12.9		
10/20/2004					<-4.5	<-8.2
4/19/2005	<3.7		<3.8		<3.6	
10/11/2005	<13.8	<3.9	<0.8	<9.7	<4.8	<-14.4
4/26/2006	<-1.2	<2.2	<-5.5	<0.1	<-5.6	<-7.9
10/10/2006	<12.5	<2.3	<7.6	<11.1	<11.8	<15.7
3/19/2007	<-4.7	<-16.0	<-2.6	<-13.3	<-2.9	<-5.4
8/29/2007	<-8.5	<-6.0	<-4.5	<-6.7		
9/5/2007					<-6.5	<-4.8
3/11/2008	<6.8	<3.8	<3.2	<12.1	<-2.5	<-0.3
9/10/2008	<-2.6	<11.7	<-2.2	<-1.9	<0.7	<-10.7
3/10/2009	<-2.7	<13.4	<10.0	<13.6	<-4.4	<-3.2
8/18/2009	<-5.2	<11.9	<-6.2	<9.5	<13.3	<10.5

Table C-4. Pilot Well Enriched Tritium in pCi/L (continued)

Date	UE5PW-1		UE5PW-2		UE5PW-3	
	R1	R2	R1	R2	R1	R2
3/10/2010	<-10.1	<-3.0	<-19.1	<-31.2		
3/31/2010					<-19.6	<-25.5
8/10/2010	<-4.6	<-3.9	<1.6	<-1.5	<1.9	<2.3
3/8/2011	<2.3	<3.6	<5.3	<-2.7	<-0.4	<5.9
8/2/2011	<5.2	<-7.8	<12.2	<-8.9	<-9.9	<3.5
3/21/2012	<-0.3	<3.4	<6.2	<5.9	<-0.1	<4.7
8/7/2012	<-9.4	<18.1	<14.4	<-0.7	<4.1	<5.3
3/5/2013	<-23.7	<-22.2	<-23.8	<-19.1	<-16.2	<-11.3
8/13/2013	<-8.4	<-6.7	<-17.4	<-7.4	<-14.4	<-7.7
3/11/2014	<-2.0	<-8.2	<-0.3	<-2.6	<4.6	<2.5
8/12/2014	<10.7	<1.5	<-2.9	36.30	<0.0	<4.3

< indicates the result is less than the provided sample specific MDA

Table C-5. Pilot Well Tritium in pCi/L

Date	UE5PW-1			UE5PW-2			UE5PW-3		
	R1	R2	R3	R1	R2	R3	R1	R2	R3
11/15/1993				<32.2					
3/11/2014	<27.7			<-26.9			<49.8		
8/12/2014	<24.7			<10.5			<161		
3/17/2015	<156	<135	<70.8	<195	<-33.4	<11.1	<45	<160	<18.2
8/11/2015	<-56.4	<8.9	<-91.2				<12.2	<-56.1	<-23.7
9/1/2015				<128	<61.4	<-30			

< indicates the result is less than the provided sample specific MDA

Table C-6. UE5PW-1 General Water Chemistry values in mg/L

Date	Ca^{+2}	Mg^{+2}	K^{+}	Na^{+}	Mn	Fe	SiO_2	SO_4^{-2}	HCO_3^{-}	Cl^{-}	Fl^{-}
3/31/1993	--	--	--	48	<0.006	0.013	--	32	167	9.2	1.2
6/6/1993	--	--	--	58	<0.001	0.059	--	37	161	9.7	1.4
9/1/1993	--	--	--	56	0.0066	0.027	--	--	157.7	8.4	5.7
12/7/1993	--	--	--	57	<0.0012	0.012	--	36	150	9.9	1.5
6/15/1994	--	--	--	61	<0.004	0.01	--	--	--	--	--
8/1/1994	--	--	--	53	<0.0012	0.021	--	36	--	10	--
4/4/1995	--	--	--	58	<0.01	<0.05	--	34	--	9.9	--
4/16/1996	--	--	--	61	<0.001	0.02	--	34	--	9.9	--
4/16/1997	15.1	5.31	5.9	54.5	<0.001	0.012	--	32.2	156	9.2	1.27
11/5/1997	15.5	5.61	6.44	57.8	--	0.012	--	35.2	151	10.2	1.23
5/13/1998	14	5.36	5.21	55.8	0.0015	0.034	54.2	34.6	151	9.58	1.12
10/28/1998	14.9	5.58	6.87	57.6	0.0015	0.0242	60.5	33.9	160	9.7	1.08
5/19/1999	12.5	5.3	6.85	61	<0.0025	<0.05	68.5	34	146	10	1
10/27/1999	14.5	6	6.6	63.5	<0.005	<0.1	62.0	35	159	8.8	1.1
4/26/2000	12.9	4.87	6.69	53.7	0.001	0.0377	58.4	35.4	165.8	10	1
8/9/2000	15.2	5.01	6.70	52.9	0.0005	0.0164	60.8	37.3	151.2	10.3	1.1
5/29/2001	14.8	4.92	6.03	58.6	0.0018	0.0136	62.5	--	143.9	--	--
10/3/2001	13.8	4.88	6.65	51	0.00017	0.0156	58.6	35.8	145.1	10.1	1
5/15/2002	14	4.92	6.85	53.8	0.00016	0.0145	59.9	36.1	156.1	10.8	1
10/22/2002	14.7	5.18	6.42	50	0.0002	0.0181	61.0	35.5	146.3	10.3	0.98
4/15/2003	13.7	4.98	6.24	58	0.0005	0.011	59.2	32.9	150.0	12.3	0.95
10/22/2003	14	5.04	5.97	58	0.0016	0.0152	61.0	36.5	--	9.4	1
5/4/2004	12.8	4.62	6.53	55.3	0.0021	0.029	52.0	34.5	153.6	9.8	1.1
10/19/2004	13.1	5.15	5.96	56.2	0.0003	0.0279	59.9	37.3	168.3	10.1	1
4/19/2005	13.8	4.79	6.6	55.1	0.0006	0.007	58.6	39.6	148.7	10.5	1
10/11/2005	13.4	5.02	6.1	50.5	0.0002	0.026	61.2	35.7	156.1	9.7	0.96
4/26/2006	14.6	5.26	6.32	60.4	0.0032	0.0054	63.3	35.4	148.7	10.7	1.2
10/10/2006	14	5.2	5.92	58.8	0.0007	0.0048	61.4	33.8	147.5	9.9	0.93

Table C-6. UE5PW-1 General Water Chemistry values in mg/L (continued)

Date	Ca^{+2}	Mg^{+2}	K^{+}	Na^{+}	Mn	Fe	SiO_2	SO_4^{-2}	HCO_3^{-}	Cl^{-}	Fl^{-}
3/19/2007	15.7	5.43	6.02	57.4	0.0036	0.0124	64.0	37.7	151.2	10.5	0.98
8/29/2007	15.4	5.36	6.19	59	0.00046	0.0058	64.6	35.9	147.5	10	1.2
3/11/2008	14	5.39	6.33	60.4	0.00045	0.0066	63.1	37.4	148.7	11.1	1.2
9/10/2008	14.3	5.46	6.44	59.1	0.0009	0.045	62.5	34.7	154.8	11	1.2
3/10/2009	13.4	5.26	6.05	58.1	0.005	0.1	58.6	35.7	174.4	10.1	1.1
8/18/2009	13.4	5.33	6	58.3	0.00113	0.0168	61.8	37.1	159.7	11	1.04
3/10/2010	13.3	5.29	5.98	59.6	0.005	0.1	65.2	38.5	151.2	10.7	0.99
8/10/2010	12.8	5.17	5.86	57.6	0.000543	0.05	44.1	35.7	162.2	11	0.99
3/8/2011	13.6	5.56	6.11	59.6	0.002	0.05	60.1	42.4	173.1	10.5	0.95
8/2/2011	14.2	5.63	6.09	59.2	0.002	0.05	64.4	36.2	162.2	9.14	1.21
3/21/2012	13.2	5.21	5.93	56.8	0.002	0.05	62.5	38	154.8	9.65	1.35
8/7/2012	14.5	5.61	6	58.3	0.002	0.0112	64.4	36.2	162.2	9.97	1.32
3/5/2013	14.2	5.88	6.41	63	0.002	0.03	65.7	35.4	151.2	8.99	1.06
8/13/2013	14.6	5.77	6.31	58.3	0.002	0.03	63.8	36.8	158.5	9.46	1.19
3/11/2014	14.7	5.92	5.7	64.4	0.002	0.123	64.5	34.2	120.5	9.91	1.15
8/12/2014	14.4	5.76	6.08	55.8	0.002	0.03	61.4	36.5	137.8	10.2	1.18
3/17/2015	14.4	6.96	6.31	49.4	0.002	0.03	61.9	34.2	153.6	9.66	1.13
8/11/2015	14.1	5.81	6.08	60.6	0.002	0.03	60.5	36.4	146.3	9.82	1.1

Data through 10/27/1999 from BN, 2001.

Data after 10/27/1999 does not include duplicate measurements

-- indicates no analysis

< indicates the result is less than the provided sample specific MDL

Table C-7. UE5PW-2 General Water Chemistry values in mg/L

Date	Ca^{+2}	Mg^{+2}	K^{+}	Na^{+}	Mn	Fe	SiO_2	SO_4^{-2}	HCO_3^{-}	Cl^{-}	Fl^{-}
3/24/1993	--	--	--	46	0.11	0.062	--	28	159	8.4	1
6/22/1993	--	--	--	54	0.032	0.25	--	30	183	9.7	1.1
11/15/1993	--	--	--	51	<0.004	0.18	--	31	171	9.4	1.3
1/19/1994	--	--	--	45	<0.0012	0.074	--	29	159	--	1.2
6/7/1994	--	--	--	55	<0.004	0.14	--	--	--	--	--
11/29/1994	--	--	--	--	--	--	--	28	--	8	--
4/4/1995	--	--	--	50	<0.01	<0.05	--	28	--	8.5	--
4/30/1996	--	--	--	51	<0.001	0.0127	--	29	--	8.3	--
4/16/1997	15.9	5.98	5.04	47.6	<0.001	0.012	--	26.4	149	7.88	1.21
11/5/1997	17.4	6.83	4.87	50.6	--	0.018	--	28.9	140	8.58	0.91
5/13/1998	14.8	5.68	3.83	45.2	<0.0011	0.066	50.8	28.2	151	8.2	0.99
10/28/1998	15.8	6.18	5.56	47.4	0.0009	0.015	55.9	28.4	157	8.3	0.98
5/19/1999	15	6.3	6.2	52	<0.0025	<0.05	62.0	27.5	134	8.7	0.92
10/27/1999	16	6.7	5.7	52	<0.005	<0.1	55.6	28	152	7.4	0.96
4/26/2000	15.1	6.48	5.59	45.4	0.001	0.0272	55.4	29.1	180.4	8.6	0.84
8/9/2000	17.1	6.61	5.38	44.8	0.0002	0.0164	59.7	28.2	165.8	9.2	0.93
5/29/2001	16.7	6.56	4.8	48.2	0.0018	0.0107	60.3	--	151.2	--	--
10/3/2001	16	6.69	5.45	44.5	0.0001	0.0156	59.0	28.4	151.2	8.6	1
5/15/2002	16.5	6.88	5.59	46.1	0.00053	0.0741	60.3	28.5	156.1	9.4	0.91
10/22/2002	17.7	7.1	5.3	44.4	0.0002	0.0181	63.1	29	148.7	8.6	0.85
4/15/2003	16.4	6.69	5.23	51.1	0.0005	0.0101	60.7	26.7	153.6	9.9	0.81
10/22/2003	16.1	6.62	5.18	49.6	0.0016	0.0618	60.5	29.5	116.0	8.8	0.88
5/4/2004	15.7	6.24	5.36	46.7	0.0007	0.0478	58.4	28.1	159.7	8.2	0.96
10/19/2004	15.7	6.72	5.1	48.6	0.0003	0.0279	59.7	29.6	169.5	8.9	0.85
4/19/2005	16.3	6.28	5.15	44.9	0.0006	0.0115	58.6	31.3	132.9	8.4	0.94
10/11/2005	16	6.75	4.98	44	0.0002	0.027	62.2	29	167.0	8.1	0.9
4/26/2006	16.6	6.74	5.39	51.2	0.0032	0.0612	62.5	28.1	152.4	8.8	1.1
10/10/2006	16.5	6.51	5.19	48	0.0007	0.017	61.2	27.2	156.1	8.6	1.1

Table C-7. UE5PW-2 General Water Chemistry values in mg/L (continued)

Date	Ca^{+2}	Mg^{+2}	K^{+}	Na^{+}	Mn	Fe	SiO_2	SO_4^{-2}	HCO_3^{-}	Cl^{-}	Fl^{-}
3/19/2007	16.8	6.6	5.39	49.8	0.0036	0.0387	62.9	42.2	148.7	11.3	0.86
8/29/2007	16.9	6.72	5.19	50.5	0.00045	0.0098	63.7	27.9	151.2	9	1.1
3/11/2008	16.7	6.7	5.23	50.5	0.00045	0.0159	60.3	30.7	148.7	10	0.95
9/10/2008	16.8	7.02	5.68	52.7	0.002	0.045	60.3	28.7	152.4	9.2	1
3/10/2009	15.9	6.66	5.02	50	0.005	0.1	61.6	28.9	164.6	8.4	1
8/18/2009	15.5	6.81	5.11	50.9	0.00066	0.0123	61.2	29.1	154.8	8.82	0.9
3/10/2010	15.6	6.62	4.98	51.2	0.000519	0.0199	62.2	30.9	156.1	8.9	0.86
8/10/2010	15.2	6.45	4.92	49.9	0.000737	0.0158	47.5	29.8	167.0	8.83	0.86
3/8/2011	15.6	6.72	4.94	49.2	0.002	0.05	55.6	32.4	171.9	8.84	0.84
8/2/2011	16.6	7.1	5.16	51	0.002	0.0118	62.9	29	162.2	8.77	1.08
3/21/2012	15.1	6.22	4.95	49.4	0.002	0.05	60.7	30.6	165.8	9.07	1.25
8/7/2012	15.8	6.68	4.88	49.3	0.002	0.05	60.1	29.1	169.5	8.79	1.19
3/5/2013	17.1	7.52	5.56	55.3	0.002	0.03	66.4	33.7	150.0	7.94	1.01
8/13/2013	16.5	7.23	5.42	51.1	0.002	0.03	61.8	30.8	163.4	8.67	1.05
3/11/2014	16.4	7.44	4.89	55.7	0.002	0.0711	62.9	28.7	150.0	8.18	0.977
8/12/2014	16.4	7.34	5.24	49.3	0.002	0.03	60.5	29.4	137.8	8.55	1.1
3/17/2015	16.4	5.68	5.4	57.4	0.002	0.0436	60.3	27.7	157.3	7.97	0.985
9/1/2015	16.2	7.26	5.29	51.6	0.002	0.03	60.1	29.7	154.8	8.56	1.01

Data through 10/27/1999 from BN, 2001.

Data after 10/27/1999 does not include duplicate measurements

-- indicates no analysis

< indicates the result is less than the provided sample specific MDL

Table C-8. UE5PW-3 General Water Chemistry values in mg/L

Date	Ca^{+2}	Mg^{+2}	K^{+}	Na^{+}	Mn	Fe	SiO_2	SO_4^{-2}	HCO_3^{-}	Cl^{-}	Fl^{-}
4/14/1993	--	--	--	46	0.042	0.024	--	31	157	8.5	1.3
6/2/1993	--	--	--	53	0.009	0.014	--	31	162	9.1	1.2
10/12/1993	--	--	--	57	<0.006	0.11	--	30	156	7.9	1.2
12/20/1993	--	--	--	48	<0.0012	0.1	--	33	156	8.7	1.3
5/24/1994	--	--	--	56	<0.0012	0.02	--	--	--	--	--
8/8/1994	--	--	--	51	<0.0012	<0.009	--	33	--	8.9	--
4/5/1995	--	--	--	55	<0.01	<0.05	--	31	--	8.8	--
4/30/1996	--	--	--	57	<0.001	0.0088	--	32	--	8.7	--
4/16/1997	15.8	5.71	3.95	54.2	<0.001	<0.006	--	29	155	8.39	1.26
11/5/1997	16.8	6.06	4.32	55.5	--	0.0133	--	32.1	140	9.15	1.09
5/13/1998	15.8	5.8	3.33	53.8	<0.0011	0.035	56.6	31	151	8.6	1
10/28/1998	15.6	5.7	4.16	53.7	0.0009	0.009	57.1	31.4	156	8.7	1
5/19/1999	15	5.8	4.8	56	<0.0025	<0.05	66.3	30.5	146	9.2	0.88
10/27/1999	16	6.4	3.75	58.5	<0.005	<0.1	59.9	31	159	7.6	0.94
4/26/2000	15.5	6	4.53	50.1	0.00026	0.0146	59.2	31.7	175.6	9	0.86
8/9/2000	15.8	5.71	4.28	48.2	0.0002	0.0164	57.5	32.4	148.7	9.9	0.96
5/29/2001	16.7	6.03	4.01	55.1	0.0018	0.0107	60.5	--	150.0	--	--
10/3/2001	15.6	5.97	4.48	48.5	0.0001	0.0156	58.0	31.5	151.2	8.9	1
5/15/2002	15.9	6.06	4.52	49.8	0.00026	0.024	58.6	33.3	151.2	9.8	0.89
10/22/2002	17.1	6.13	4.24	47.5	0.0002	0.0181	60.3	32.1	150.0	9.2	0.84
4/15/2003	16	5.87	4.53	54.7	0.00083	0.0195	58.4	29.3	143.9	11.8	0.82
10/21/2003	16.3	5.79	4.12	54.4	0.0016	0.0212	59.5	32.5	131.0	9.2	0.96
5/4/2004	16.4	5.73	4.56	52.9	0.0007	0.0453	58.8	31	154.8	8.7	0.96
10/20/2004	15.6	5.9	3.97	52.3	0.0003	0.0279	58.4	32	165.8	9.4	0.78
4/19/2005	16.2	5.63	4.53	50.9	0.0006	0.0319	57.8	34.4	147.5	8.8	0.9
10/11/2005	16.1	6.08	4.31	48.5	0.0002	0.026	61.4	32.5	156.1	8.5	0.87
4/26/2006	16.6	6.09	4.22	58.1	0.0032	0.0057	61.6	31.6	158.5	9.4	1.2
10/10/2006	15.9	5.49	4.01	49.7	0.0007	0.0114	57.3	30.1	152.4	9	1

Table C-8. UE5PW-3 General Water Chemistry values in mg/L (continued)

Date	Ca^{+2}	Mg^{+2}	K^{+}	Na^{+}	Mn	Fe	SiO_2	SO_4^{-2}	HCO_3^{-}	Cl^{-}	Fl^{-}
3/19/2007	16.8	6.06	4.02	55.5	0.0036	0.0921	61.2	19.9	148.7	9.3	0.76
9/5/2007	16.5	5.92	4.25	54.7	0.0012	0.0041	60.1	32.5	148.7	9.8	1.1
3/11/2008	16.7	6.07	4.16	57.2	0.00045	0.0045	58.8	32.1	143.9	9.9	0.96
9/10/2008	16.4	6.05	4.54	56.4	0.0009	0.045	58.8	35.9	164.6	9.5	1
3/10/2009	15.9	5.98	4.18	55.6	0.005	0.1	59.0	31.7	154.8	9	0.94
8/18/2009	15.4	5.89	4	54.7	0.000624	0.0112	58.4	32.5	152.4	9.4	0.92
3/31/2010	15.5	6.09	4.12	55.9	0.00111	0.0276	56.9	38.3	143.9	11	1.25
8/10/2010	14.9	5.64	4.03	54.6	0.002	0.0154	49.4	31.5	162.2	9.45	0.87
3/8/2011	15.5	5.97	4	54.2	0.000993	0.05	55.6	37.3	171.9	9.42	0.85
8/2/2011	15.8	6.24	4.15	55.7	0.002	0.0231	61.0	32.5	156.1	9.51	1.11
3/21/2012	15	5.69	4.09	54.6	0.002	0.05	59.0	33.2	157.3	9.73	1.25
8/7/2012	15.7	5.96	4.05	54.5	0.002	0.05	59.0	32.1	167.0	9.23	1.19
3/5/2013	16.3	6.64	4.35	59.5	0.002	0.0674	62.8	35.2	150.0	8.11	0.97
8/13/2013	16.9	6.54	4.55	58.2	0.002	0.03	62.2	33	160.9	9.25	1.05
3/11/2014	16.5	6.38	3.89	60.9	0.002	0.122	61.1	31	153.6	8.68	0.991
8/12/2014	15.9	6.22	4.12	52	0.002	0.0367	57.7	32.3	139.0	9.19	1.01
3/17/2015	16.4	5.96	3.95	53.4	0.002	0.03	57.3	30.8	153.6	8.49	1.01
8/11/2015	16.3	6.31	4.21	59.1	0.002	0.03	58.2	32.2	151.2	8.67	0.982

Data through 10/27/1999 from BN, 2001.

Data after 10/27/1999 does not include duplicate measurements

-- indicates no analysis

< indicates the result is less than the provided sample specific MDL

Table C-9. Pilot Well Groundwater Elevation

Well Characteristics[1]	UE5PW-1		UE5PW-2		UE5PW-3	
Northing[2] (m)	233,386.53		234,817.22		235,089.98	
Easting[2] (m)	216,357.39		216,376.16		214,415.13	
Well Casing Elevation[3] (m)	969.38		990.09		1,005.29	
Casing stickup height[4] (m)	0.60		0.68		0.78	
Land Surface Elevation (m)	968.77		989.41		1,004.51	
Borehole Deviation Correction[5] (m)	0.08		0.21		0.02	
Date	**Depth to Water (m below Top of Casing)**	**Water Table Elevation (m)**	**Depth to Water (m below Top of Casing)**	**Water Table Elevation (m)**	**Depth to Water (m below Top of Casing)**	**Water Table Elevation (m)**
03/22/1993	235.55	733.83	256.38	733.71	271.69	733.60
03/23/1993	235.53	733.85	256.48	733.61	271.68	733.61
03/24/1993	235.53	733.85	256.36	733.73	271.69	733.60
03/25/1993	235.53	733.85	256.35	733.74	271.69	733.60
03/29/1993	235.59	733.79	256.38	733.71	271.73	733.56
03/30/1993	235.62	733.76	256.43	733.66	271.75	733.54
03/31/1993	235.62	733.76	256.44	733.65	271.74	733.55
04/01/1993	235.54	733.84	256.37	733.72	271.69	733.60
04/05/1993	235.51	733.87	256.35	733.74	271.67	733.62
04/06/1993	235.59	733.79	256.40	733.69	271.75	733.54
05/10/1993	235.64	733.74	256.46	733.63	271.76	733.53
05/11/1993	235.56	733.82	256.42	733.67	271.70	733.59
05/12/1993	235.54	733.84	256.40	733.69	271.72	733.57
05/13/1993	235.61	733.77	256.45	733.64	271.75	733.54
05/17/1993	235.61	733.77	256.45	733.64	271.74	733.55
05/18/1993	235.59	733.79	256.45	733.64	271.74	733.55
05/19/1993	235.59	733.79	256.44	733.65	271.73	733.56
05/20/1993	235.54	733.84	256.39	733.70	271.70	733.59
05/24/1993	235.60	733.78	256.43	733.66	271.74	733.55
05/25/1993	235.61	733.77	256.45	733.64	271.74	733.55
06/01/1993	235.58	733.80	256.43	733.66	271.73	733.56
06/07/1993	235.64	733.74	256.46	733.63	271.76	733.53
06/14/1993	235.61	733.77	256.46	733.63	271.74	733.55
06/21/1993	235.58	733.80	256.43	733.66	271.73	733.56
07/26/1993	235.59	733.79	256.45	733.64	271.74	733.55
08/03/1993	235.54	733.84	256.42	733.67	271.70	733.59
08/09/1993	235.62	733.76	256.46	733.63	271.75	733.54
08/16/1993	235.59	733.79	256.42	733.67	271.73	733.56
08/30/1993	235.58	733.80	256.43	733.66	271.72	733.57
12/28/1993	235.59	733.79	256.47	733.62	271.74	733.55

Table C-9. Pilot Well Groundwater Elevation (continued)

Date	UE5PW-1		UE5PW-2		UE5PW-3	
	Depth to Water (m below Top of Casing)	Water Table Elevation (m)	Depth to Water (m below Top of Casing)	Water Table Elevation (m)	Depth to Water (m below Top of Casing)	Water Table Elevation (m)
01/03/1994	235.57	733.81	256.44	733.65	271.70	733.59
02/02/1994	235.53	733.85	256.44	733.65	271.66	733.63
02/22/1994	235.60	733.78	256.43	733.66	271.71	733.58
02/28/1994	235.60	733.78	256.45	733.64	271.70	733.59
03/07/1994	235.54	733.84	256.38	733.71	271.66	733.63
03/14/1994	235.55	733.83	256.45	733.64	271.67	733.62
03/21/1994	235.56	733.82	256.38	733.71	271.68	733.61
03/28/1994	235.63	733.75	256.47	733.62	271.70	733.59
04/04/1994	235.53	733.85	256.40	733.69	271.66	733.63
04/13/1994	235.55	733.83	256.43	733.66	271.65	733.64
04/20/1994	235.51	733.87	256.38	733.71	271.64	733.65
04/26/1994	235.55	733.83	256.35	733.74	271.65	733.64
01/18/1995	235.63	733.75	256.45	733.64	271.62	733.67
04/03/1995	235.57	733.81	256.39	733.70	271.61	733.68
01/16/1996	235.36	734.02	256.13	733.96	271.35	733.94
04/15/1996	235.56	733.82	256.30	733.79	271.43	733.86
10/01/1996	235.54	733.84	256.32	733.77	271.51	733.78
11/19/1996	235.59	733.79	256.33	733.76	271.52	733.77
03/03/1997	235.54	733.84	256.30	733.79	271.41	733.88
04/15/1997	235.63	733.75	256.40	733.69	271.54	733.75
06/18/1997	235.61	733.77	256.40	733.69	271.52	733.77
07/28/1997	235.60	733.78	256.37	733.72	271.51	733.78
08/20/1997	235.52	733.86	256.29	733.80	271.44	733.85
09/25/1997	235.59	733.79	256.35	733.74	271.49	733.80
10/27/1997	235.57	733.81	256.34	733.75	271.48	733.81
11/03/1997	235.65	733.73	256.40	733.69	271.55	733.74
11/06/1997	235.57	733.81	256.36	733.73	271.48	733.81
11/12/1997	235.66	733.72	256.45	733.64	271.54	733.75
11/13/1997	235.60	733.78	256.29	733.80	271.49	733.80
11/19/1997	235.63	733.75	256.42	733.67	271.55	733.74
11/20/1997	235.65	733.73	256.43	733.66	271.57	733.72
11/25/1997	235.64	733.74	256.39	733.70	271.54	733.75
11/26/1997	235.50	733.88	256.27	733.82	271.45	733.84
12/03/1997	235.71	733.67	256.43	733.66	271.60	733.69
01/26/1998	235.72	733.66	256.47	733.62	271.60	733.69
05/12/1998	235.60	733.78	256.32	733.77	271.52	733.77
10/27/1998	235.52	733.86	256.21	733.88	271.36	733.93
12/22/1998	235.54	733.84	256.20	733.89	271.35	733.94
02/02/1999	235.61	733.77	256.34	733.75	271.42	733.87
05/18/1999	235.56	733.82	256.26	733.83	271.35	733.94
08/25/1999	235.56	733.82	256.26	733.83	271.38	733.91
10/26/1999	235.57	733.81	256.26	733.83	271.34	733.95
04/24/2000	235.64	733.74	256.34	733.75	271.52	733.77

Table C-9. Pilot Well Groundwater Elevation (continued)

Date	UE5PW-1		UE5PW-2		UE5PW-3	
	Depth to Water (m below Top of Casing)	Water Table Elevation (m)	Depth to Water (m below Top of Casing)	Water Table Elevation (m)	Depth to Water (m below Top of Casing)	Water Table Elevation (m)
08/07/2000	235.59	733.79	256.30	733.79	271.47	733.82
11/13/2000	235.66	733.72	256.34	733.75	271.45	733.84
02/22/2001	235.57	733.81	256.26	733.83	271.38	733.91
05/21/2001	235.67	733.71	256.35	733.74	271.49	733.80
08/01/2001	235.66	733.72	256.36	733.73	271.48	733.81
10/01/2001	235.66	733.72	256.35	733.74	271.45	733.84
02/26/2002	235.76	733.62	256.43	733.66	271.52	733.77
05/13/2002	235.65	733.73	256.39	733.70	271.44	733.85
08/19/2002	235.61	733.77	256.28	733.81	271.42	733.87
10/21/2002	235.61	733.77	256.31	733.78	271.44	733.85
02/26/2003	235.65	733.73	256.28	733.81	271.43	733.86
04/10/2003	235.61	733.77	256.30	733.79	271.41	733.88
09/10/2003	235.74	733.64	256.35	733.74	271.50	733.79
10/20/2003	235.73	733.65	256.42	733.67	271.53	733.76
02/25/2004	235.78	733.60	256.36	733.73	271.52	733.77
04/27/2004	235.72	733.66	256.43	733.66	271.52	733.77
08/18/2004	235.72	733.66	256.38	733.71	271.48	733.81
10/18/2004	235.71	733.67	256.29	733.80	271.47	733.82
01/26/2005	235.67	733.71	256.45	733.64	271.46	733.83
04/18/2005	235.66	733.72	256.33	733.76	271.44	733.85
07/27/2005	235.75	733.63	256.42	733.67	271.51	733.78
10/10/2005	235.77	733.61	256.44	733.65	271.54	733.75
03/08/2006	235.74	733.64	256.39	733.70	271.50	733.79
05/03/2006	235.69	733.69	256.41	733.68	271.62	733.67
08/23/2006	235.76	733.62	256.43	733.66	271.50	733.79
10/09/2006	235.69	733.69	256.38	733.71	271.44	733.85
02/28/2007	235.74	733.64	256.29	733.80	271.49	733.80
07/11/2007	235.77	733.61	256.41	733.68	271.50	733.79
08/28/2007	235.78	733.60	256.42	733.67	271.47	733.82
10/15/2007	235.76	733.62	256.40	733.69	271.49	733.80
01/22/2008	235.79	733.59	256.39	733.70	271.53	733.76
03/03/2008	235.80	733.58	256.38	733.71	271.53	733.76
06/16/2008	235.74	733.64	256.32	733.77	271.48	733.81
09/09/2008	235.73	733.65	256.39	733.70	271.47	733.82
02/17/2009	235.78	733.60	256.40	733.69	271.52	733.77
05/06/2009	235.80	733.58	256.41	733.68	271.52	733.77
08/17/2009	235.76	733.62	256.39	733.70	271.51	733.78
11/10/2009	235.81	733.57	256.46	733.63	271.55	733.74
03/01/2010	235.85	733.53	256.47	733.62	271.57	733.72
04/26/2010	235.78	733.60	256.44	733.65	271.52	733.77
08/09/2010	235.82	733.56	256.41	733.68	271.51	733.78
11/09/2010	235.82	733.56	256.40	733.69	271.54	733.75
03/01/2011	235.88	733.50	256.50	733.59	271.56	733.73

Table C-9. Pilot Well Groundwater Elevation (continued)

Date	UE5PW-1		UE5PW-2		UE5PW-3	
	Depth to Water (m below Top of Casing)	Water Table Elevation (m)	Depth to Water (m below Top of Casing)	Water Table Elevation (m)	Depth to Water (m below Top of Casing)	Water Table Elevation (m)
06/07/2011	235.82	733.56	256.45	733.64	271.52	733.77
08/01/2011	235.85	733.53	256.49	733.60	271.56	733.73
10/17/2011	235.86	733.52	256.49	733.60	271.59	733.70
03/19/2012	235.85	733.53	256.39	733.70	271.57	733.72
06/06/2012	235.88	733.50	256.47	733.62	271.57	733.72
08/02/2012	235.81	733.57	256.46	733.63	271.52	733.77
10/15/2012	235.86	733.52	256.50	733.59	271.56	733.73
03/04/2013	235.80	733.58	256.43	733.66	271.55	733.74
06/06/2013	235.86	733.52	256.46	733.63	271.56	733.73
08/12/2013	235.87	733.51	256.45	733.64	271.56	733.73
10/15/2013	235.91	733.47	256.51	733.58	271.58	733.71
03/10/2014	235.83	733.55	256.47	733.62	271.55	733.74
06/02/2014	235.87	733.51	256.45	733.64	271.56	733.73
08/11/2014	235.89	733.49	256.49	733.60	271.59	733.70
10/14/2014	235.84	733.54	256.48	733.61	271.57	733.72
03/16/2015	235.85	733.53	256.48	733.61	271.57	733.72
06/08/2015	235.93	733.45	256.53	733.56	271.62	733.67
08/10/2015	235.89	733.49	256.46	733.63	271.60	733.69
10/20/2015	235.88	733.50	256.46	733.63	271.58	733.71

[1] Source for northings, eastings, well casing elevations, and borehole deviation corrections: USGS, 2014

[2] Coordinates-Nevada State Plan Central Zone Coordinates (1927) Zone 2702, 1927 National Geodetic Datum

[3] Measured from top of well casing

[4] Measured from top of well casing to land surface

[5] Source REECo (1994)

Note: All elevations are m above mean sea level

Table C-10. Cell 18 Results for Toxicity Characteristics Contaminants (Metals)

Regulatory Level (mg/L)	Arsenic	Barium	Cadmium	Chromium	Lead	Selenium	Silver	Mercury
	5.0	100.0	1.0	5.00	5.0	1.0	5.0	0.2
3/9/2011	<0.075	0.0794	<0.015	<0.025	<0.05	<0.1	<0.03	<0.0002
9/28/2011	<0.075	0.09	<0.015	<0.025	<0.05	<0.1	<0.03	<0.0002
8/23/2012	<0.075	0.0565	<0.015	<0.025	<0.05	<0.1	<0.03	<0.0002
9/19/2012	<0.075	0.0388	<0.015	<0.025	<0.05	<0.1	<0.03	<0.0002
11/27/2012	<0.075	0.0277	<0.015	<0.025	<0.05	<0.1	<0.03	<0.0002
3/27/2013	<0.1	<1	<0.05	<0.1	<0.03	<0.05	<0.1	<0.002
7/31/2013	<0.1	<1	<0.05	<0.1	<0.03	<0.05	<0.1	<0.002
10/3/2013	<0.1	<1	<0.05	<0.1	<0.03	0.077	<0.1	<0.002
11/6/2013	<0.1	<1	<0.05	<0.1	<0.03	<0.05	<0.1	<0.002
12/18/2013	<0.1	<1	<0.05	<0.1	<0.03	<0.05	<0.1	<0.002
2/25/2014	<0.1	<1	<0.05	<0.1	<0.03	<0.05	<0.1	<0.002
3/5/2014	<0.1	<1	<0.05	<0.1	<0.03	<0.05	<0.1	<0.002
5/20/2014	<0.1	<1	<0.05	<0.1	<0.03	<0.05	<0.1	<0.002
8/12/2014	<0.1	<1	<0.05	<0.1	<0.03	<0.05	<0.1	<0.002
9/16/2014	<0.1	<1	<0.05	<0.1	<0.03	<0.05	<0.1	<0.002
11/4/2014	<0.1	<1	<0.05	<0.1	<0.03	<0.05	<0.1	<0.002
12/16/2014	<0.1	<1	<0.05	<0.1	<0.03	<0.05	<0.1	<0.002
1/28/2015	<0.1	<1	<0.05	<0.1	<0.03	<0.05	<0.1	<0.002
3/31/2015	<0.1	<1	<0.05	<0.1	<0.03	<0.05	<0.1	<0.002
6/9/2015	<0.1	<1	<0.05	<0.1	<0.03	0.067	<0.1	<0.002
10/28/2015	<0.1	<1	<0.05	<0.1	<0.03	<0.05	<0.1	<0.002
12/1/2015	<0.1	<1	<0.05	<0.1	<0.03	<0.05	<0.1	<0.002

Results are in mg/L

< indicates the result is below the specific analysis QL and are reported as less than the QL

Table C-11. Cell 18 Results for Toxicity Characteristics Contaminants (Semi-volatiles)

Regulatory Level (mg/L)	o-Cresol	m-Cresol	1,4-Dichloro benzene	2,4-Dinitro toluene	Hexa chloro benzene	Hexa chloro butadiene	Hexa chloro ethane	Nitro benzene	Penta chloro phenol	Pyridine	2,4,5-Trichloro phenol	2,4,6-Trichloro phenol
	200.0	200.0	7.5	0.13	0.13	0.5	3.0	2.0	100.0	5.0	400.0	2.0
3/9/2011	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.125	<0.05	<0.05	<0.05
9/28/2011	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.125	<0.05	<0.05	<0.05
8/23/2012	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.125	<0.05	<0.05	<0.05
9/19/2012	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.125	<0.05	<0.05	<0.05
11/27/2012	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.125	<0.05	<0.05	<0.05
3/27/2013	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.2	<0.1	<0.1	<0.1
7/31/2013	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.2	<0.1	<0.1	<0.1
10/3/2013	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.2	<0.1	<0.1	<0.1
11/6/2013	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.2	<0.1	<0.1	<0.1
12/18/2013	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.2	<0.1	<0.1	<0.1
2/25/2014	<0.1	<0.1	<0.001	<0.1	<0.1	<0.1	<0.1	<0.1	<0.2	<0.1	<0.1	<0.1
3/5/2014	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.2	<0.1	<0.1	<0.1
5/20/2014	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.2	<0.1	<0.1	<0.1
8/12/2014	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.2	<0.1	<0.1	<0.1
9/16/2014	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.2	<0.1	<0.1	<0.1
11/4/2014	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.2	<0.1	<0.1	<0.1
12/16/2014	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.2	<0.1	<0.1	<0.1
1/28/2015	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.2	<0.1	<0.1	<0.1
3/31/2015	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.2	<0.1	<0.1	<0.1
6/9/2015	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.2	<0.1	<0.1	<0.1
10/28/2015	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.2	<0.1	<0.1	<0.1
12/1/2015	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.2	<0.1	<0.1	<0.1

Results are in mg/L
< indicates the result is below the specific analysis QL and are reported as less than the QL

Table C-12. Cell 18 Results for Toxicity Characteristics Contaminants (Volatiles)

Regulatory Level (mg/L)	Benzene	Carbon tetra chloride	Chloro benzene	Chloroform	1,2-Dichloro ethane	1,1-Dichloro ethylene	Methyl ethyl ketone	Tetra chloro ethylene	Trichloro ethylene	Vinyl chloride
	0.5	0.5	100.0	6.00	0.50	0.7	200.0	0.7	0.5	0.2
3/9/2011	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.05	<0.02	<0.02	<0.05
9/28/2011	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.05	<0.02	<0.02	<0.05
8/23/2012	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.01	<0.005	<0.005	<0.01
9/19/2012	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.05	<0.02	<0.02	<0.05
11/27/2012	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.05	<0.02	<0.02	<0.05
3/27/2013	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.01	<0.001	<0.001	<0.001
7/31/2013	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.1	<0.01	<0.01	<0.01
10/3/2013	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.01	<0.001	<0.001	<0.001
11/6/2013	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.01	<0.001	0.0014	<0.001
12/18/2013	<0.001	<0.001	<0.001	0.0012	<0.001	<0.001	<0.01	<0.001	0.002	<0.001
2/25/2014	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.01	<0.001	0.0016	<0.001
3/5/2014	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.01	<0.001	0.0014	<0.001
5/20/2014	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.01	<0.001	<0.001	<0.001
8/12/2014	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.01	<0.001	0.0013	<0.001
9/16/2014	<0.001	<0.001	<0.001	0.0014	<0.001	<0.001	<0.01	0.0012	0.0026	<0.001
11/4/2014	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.01	<0.001	0.0013	<0.001
12/16/2014	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.01	0.0011	0.0022	<0.001
1/28/2015	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.01	0.0011	0.002	<0.001
3/31/2015	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.01	0.0011	0.0016	<0.001
6/9/2015	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.01	<0.001	<0.001	<0.001
10/28/2015	<0.001	<0.001	<0.001	0.0014	<0.001	<0.001	<0.01	0.0025	0.0023	<0.001
12/1/2015	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.1	<0.01	<0.01	<0.01

Results are in mg/L

< Indicates the result is below the specific analysis QL and are reported as less than the QL

Table C-13. Cell 18 Results for Toxicity Characteristics Contaminants (Pesticides)

Regulatory Level (mg/L)	Chlordane	Endrin	Heptachlor	Lindane	Methoxychlor	Toxaphene	2,4,5-TP (Silvex)	2,4-D
	0.03	0.02	0.008	0.4	10.0	0.5	1.0	10.0
3/9/2011	<0.001	<0.0005	<0.0005	<0.0005	<0.0005	<0.005	<0.005	<0.005
9/28/2011	<0.001	<0.0005	<0.0005	<0.0005	<0.0005	<0.005	<0.005	<0.005
8/23/2012	<0.001	<0.0005	<0.0005	<0.0005	<0.0005	<0.005	<0.005	<0.005
9/19/2012	<0.001	<0.0005	<0.0005	<0.0005	<0.0005	<0.005	<0.005	<0.005
11/27/2012	<0.001	<0.0005	<0.0005	<0.0005	<0.0005	<0.005	<0.005	<0.005
3/27/2013	<0.01	<0.0005	<0.0005	<0.0005	<0.0025	<0.025	<0.0005	<0.005
7/31/2013	<0.01	<0.0005	<0.0005	<0.0005	<0.0025	<0.025	<0.0005	<0.005
10/3/2013	<0.01	<0.0005	<0.0005	<0.0005	<0.0025	<0.025	<0.0005	<0.005
11/6/2013	<0.01	<0.0005	<0.0005	<0.0005	<0.0025	<0.025	<0.0005	<0.005
12/18/2013	<0.01	<0.0005	<0.0005	<0.0005	<0.0025	<0.025	<0.0005	<0.005
2/25/2014	<0.01	<0.0005	<0.0005	<0.0005	<0.0025	<0.025	<0.0005	<0.005
3/5/2014	<0.01	<0.0005	<0.0005	<0.0005	<0.0025	<0.025	<0.0005	<0.005
5/20/2014	<0.01	<0.0005	<0.0005	<0.0005	<0.0025	<0.025	<0.0005	<0.005
8/12/2014	<0.01	<0.0005	<0.0005	<0.0005	<0.0025	<0.025	<0.0005	<0.005
9/16/2014	<0.01	<0.0005	<0.0005	<0.0005	<0.0025	<0.025	<0.0005	<0.005
11/4/2014	<0.01	<0.0005	<0.0005	<0.0005	<0.0025	<0.025	<0.0005	<0.005
12/16/2014	<0.01	<0.0005	<0.0005	<0.0005	<0.0025	<0.025	<0.0005	<0.005
1/28/2015	<0.01	<0.0005	<0.0005	<0.0005	<0.0025	<0.025	<0.0005	<0.005
3/31/2015	<0.01	<0.0005	<0.0005	<0.0005	<0.0025	<0.025	<0.0005	<0.005
6/9/2015	<0.01	<0.0005	<0.0005	<0.0005	<0.0025	<0.025	<0.0005	<0.005
10/28/2015	<0.01	<0.0005	<0.0005	<0.0005	<0.0025	<0.025	<0.0005	<0.005
12/1/2015	<0.01	<0.0005	<0.0005	<0.0005	<0.0025	<0.025	<0.0005	<0.005

Results are in mg/L
< indicates the result is below the specific analysis QL and are reported as less than the QL

Table C-14. PCB Results for Cell 18 Leachate

Date	AROCLOR 1016	AROCLOR 1221	AROCLOR 1232	AROCLOR 1242	AROCLOR 1248	AROCLOR 1254	AROCLOR 1260	AROCLOR 1262	AROCLOR 1268
3/9/2011	<0.4	<0.4	<0.4	<0.4	<0.4	<0.4	<0.4	<0.4	<0.4
9/28/2011	<0.4	<0.4	<0.4	<0.4	<0.4	<0.4	<0.4	--	--
8/23/2012	<0.4	<0.4	<0.4	<0.4	<0.4	<0.4	<0.4	--	--
9/19/2012	<0.4	<0.4	<0.4	<0.4	<0.4	<0.4	<0.4	<0.4	<0.4
11/27/2012	<0.4	<0.4	<0.4	<0.4	<0.4	<0.4	<0.4	<0.4	<0.4
3/27/2013	<0.47	<0.47	<0.47	<0.47	<0.47	<0.47	<0.47	--	--
7/31/2013	<0.47	<0.47	<0.47	<0.47	<0.47	<0.47	<0.47	--	--
10/3/2013	<0.47	<0.47	<0.47	<0.47	<0.47	<0.47	<0.47	--	--
11/6/2013	<0.48	<0.48	<0.48	<0.48	<0.48	<0.48	<0.48	--	--
12/18/2013	<0.49	<0.49	<0.49	<0.49	<0.49	<0.49	<0.49	--	--
2/25/2014	<0.51	<0.51	<0.51	<0.51	<0.51	<0.51	<0.51	--	--
3/5/2014	<0.53	<0.53	<0.53	<0.53	<0.53	<0.53	<0.53	--	--
5/20/2014	<0.55	<0.55	<0.55	<0.55	<0.55	<0.55	<0.55	--	--
8/12/2014	<0.52	<0.52	<0.52	<0.52	<0.52	<0.52	<0.52	--	--
9/16/2014	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	--	--
11/4/2014	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	--	--
12/16/2014	<0.51	<0.51	<0.51	<0.51	<0.51	<0.51	<0.51	--	--
1/28/2015	<0.47	<0.47	<0.47	<0.47	<0.47	<0.47	<0.47	--	--
3/31/2015	<0.49	<0.49	<0.49	<0.49	<0.49	<0.49	<0.49	--	--
6/9/2015	<0.56	<0.56	<0.56	<0.56	<0.56	<0.56	<0.56	--	--
10/28/2015	<0.52	<0.52	<0.52	<0.52	<0.52	<0.52	<0.52	--	--
12/1/2015	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	--	--

Results are in µg/L

< indicates the result is below the specific analysis QL and are reported as less than the QL

Table C-15. SC and pH Results for Cell 18 Leachate

Date	Specific Conductance	pH
10/3/2013	2.48	7.95
11/6/2013	2.70	7.59
11/19/2013	2.67	7.49
12/18/2013	2.78	7.72
2/25/2014	2.81	7.43
3/5/2014	2.83	7.87
5/20/2014	2.87	8.07
8/12/2014	2.87	7.68
9/16/2014	2.31	7.56
10/21/2014	2.57	7.24
11/4/2014	2.54	7.51
12/16/2014	3.00	7.34
1/28/2015	3.19	7.56
3/31/2015	3.21	7.67
6/9/2015	1.73	8.04
10/28/2015	2.77	7.27
12/1/2015	2.94	7.33

Specific Conductance in mmhos/cm

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