EVALUATION OF YEARS 2000 THROUGH 2013 IRRIGATION WITH ALLUVIAL GROUND WATER

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Grants Reclamation Project
Evaluation of Years 2000 Through 2013
Irrigation with Alluvial Ground Water

For:

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Executive Summary

This report characterizes changes in uranium and selenium concentrations in four hay fields supplied with irrigation water from ground water with elevated levels of uranium and selenium. From 2000 through 2012, 100 to 394 acres were irrigated with this water. In 2013, no irrigation took place. Uranium and selenium concentrations have been measured in the applied irrigation water and affected soils each year since 2000.

The irrigation project is being conducted by Homestake Mining Company of California (HMC) as part of the Homestake Grants Reclamation Project. The project plan established an upper limit for the uranium concentration in irrigation water at the U.S. Nuclear Regulatory Commission effluent standard of 0.44 milligrams per liter (mg/l). Selenium was set at a site-specific State of New Mexico Water Quality Control Commission standard of 0.12 mg/l. These limits have been reduced during the 2010 through 2012 limited irrigation.

The fields subject to irrigation are located in Sections 28, 33, and 34 in Township 12 North, Range 10 West near Grants, New Mexico. Figure 1-1 shows the locations of the four irrigations fields. Fields in Sections 28 and 33 were irrigated using a center pivot irrigation system. The field in Section 34 and an additional portion of Section 33 was irrigated by flooding. The total amount of irrigation water applied to the fields from 2000 to 2012 was 9551 acre feet (ac-ft), ranging from 201 to 1054 ac-ft annually.

The background concentrations of uranium and selenium in the soil are averages of these constituents in samples collected in the fields prior to the irrigation program, and outside of the irrigated area for background comparisons. The background concentrations are compared to the concentration in each 1-foot (ft) interval of the upper five feet of soil in treated areas and each two foot interval below five feet starting in 2009. The difference between the treated soil and background concentration is the quantity of constituent added from the irrigation. The quantity of a constituent in the soil is then compared to that added over the course of irrigation. No additional background samples were collected after 2010 and therefore the 2013 mean background concentrations are unchanged.

The mean background concentrations of uranium and selenium are similar in Sections 28 and 33 (center pivot areas). The concentrations in Section 34 are generally higher than in other fields, presumably because of their association with clay soils.

Mean background concentrations of uranium, in descending 1-ft layers (0-1 ft, 1-2 ft, 2-3 ft) are:

- Section 28: 0.60, 0.52, and 0.51 milligrams per kilogram (mg/kg), then 0.41 to 0.81 for footages to 17 feet.

- Section 33: 0.80, 0.69, and 0.73 mg/kg, then 0.55 to 0.90 down to 17 feet.

- Section 34: 2.00, 1.54, and 1.12 mg/kg, then 0.55 to 1.12 down to 13 feet.

The data collected in the 24 acre flood irrigated area of Section 33 are insufficient to show trends and are not presented further in this summary, although they are presented in the report. Lysimeters installed within the soil profile in irrigation areas in Sections 28, 33 and 34 were sampled to evaluate constituent of concern (COC) concentration in soil moisture. Sampling of the lysimeters has revealed that most of the mass of uranium and selenium applied to the fields is retained within the upper ten feet of the soil profile. In the case of the Section 34 flood area, the bulk of the TDS, sulfate and chloride also remains within the upper ten feet of the soil profile, while the sandier soils in Section 28 allows movement of the TDS, sulfate and chloride to greater depth within the profile. Soil moisture instruments were added in the upper soil profile in 2012.

An evaluation of uranium and selenium movement in the soil moisture predicts that these constituents will not reach the ground water at rates that will significantly increase concentrations in the ground water. A calculation of the future mixing of the soil moisture with the ground water beneath the irrigation area indicates that background site water quality standards for all COCs will not be exceeded with continuing migration of the soil moisture long after the irrigation is discontinued. The mixing calculations utilized measured soil moisture concentrations of COCs from recent lysimeter sampling and estimates of long-term ground-water recharge rates to predict COC concentrations in ground water beneath the irrigation areas that is mixed with the small rate of drainage/recharge from the soil profile.

Less than one percent of the mass of uranium and selenium applied to the fields to date has been detected in samples of vegetation and hay.

In terms of risk to human health, uranium levels are currently acceptable. The dose to man by way of the ingestion of beef is negligible, as indicated by food web uptake calculations.

Potential radiation doses to the public were evaluated for:

- Residents eating beef that were fed hay grown on the irrigated areas.
- An assumed resident farmer, living on and farming the Section 34 irrigated area.
- Current residents living near the irrigated areas of Sections 28 and 33 during crop irrigation activities.

Each analysis shows that the radiological dose to existing or future occupants of the land on and near the irrigation areas is extremely small (less than one percent) compared to the average dose that the population receives from natural background and medical exposures.

Selenium uptake in hay is below the recommended upper limit for animal feed.

The monitoring of concentrations of uranium and selenium will continue as part of the ongoing irrigation program.

1.0 Introduction

This report characterizes changes in uranium and selenium concentrations in fields supplied with irrigation water from impacted ground-water sources near the Homestake Grants Reclamation Project. The irrigation project is being conducted by Homestake Mining Company of California (HMC).

Four fields have been irrigated with water containing elevated concentrations of uranium and selenium. Figure 1-1 shows the locations of the four irrigations fields and the locations of the associated fresh water injection used to aid ground-water restoration in the off-site areas. Ground water from wells adjacent to the Grants Reclamation Project was applied to fields situated in portions of Section 33 pivot (150 acres) during the 2000 through 2009 growing seasons, Section 34 flood (120 acres) during the 2000 through 2010 and 2012 and to a field in Section 28 (60 acres) during the 2002, 2003 and 2004 growing seasons. The field in Section 28 was expanded to 100 acres prior to the 2005 season and irrigated from 2005 to 2009 and in 2011 and 2012. Only the Section 34 area was irrigated in 2010 and the Section 28 area was the only one irrigated in 2011. Only the Section 28 and 34 fields were irrigated in 2012. No irrigation was done in 2013. Fields in Sections 33 and 28 were irrigated using a center pivot irrigation system, whereas the field in Section 34 was irrigated by flooding. An additional 24 acres were flood irrigated in Section 33 in 2004, 2005, 2008 and 2009, but not in 2006 and 2007. All sections discussed in this report are located in Township 12 North, Range 10 West.

Uranium and selenium concentrations were measured in the applied irrigation water, affected soils (see Figure 1-1 for water application locations) and vegetation to determine constituent source terms and transfer to or accumulation in soils and vegetation. The measured results for the first growing season (2000) were compared to predictions made in 1999, which were based on published media transfer factors and other assumptions (ERG and HYDRO, 1999). The results from the first year of operation were reported previously (ERG and HYDRO, 2001). The report was updated for the 2001-2003 growing seasons in ERG and HYDRO, 2004 and updated again to include the 2004 through 2012 growing seasons (see ERG and HYDRO, 2005, 2006, 2007, 2008, 2009, 2010, 2011, 2012, and 2013).

The remainder of this report is organized as follows. Section 2 presents concentration data for several constituents in the irrigation water. Section 3 presents data on these same constituents in soil for background and irrigated areas, concentrations in the soil moisture, soil moisture content, model prediction of the movement of the soil moisture and a discussion of soil health. Section 4 presents the ground-water quality for the alluvial aquifer in the area of the irrigation fields. Section 5 discusses the potential affects from the irrigation on the ground-water quality. Section 6 addresses the constituent uptake in the vegetation. In Section 7, quantities of uranium and selenium ingested by beef-cattle and the resulting radiation dose to humans consuming this beef are calculated. This section presents additional exposure potential from the irrigation program. The report ends with conclusions and references. The water quality laboratory analytical sheets for 2013 monitoring are presented in Appendix F.

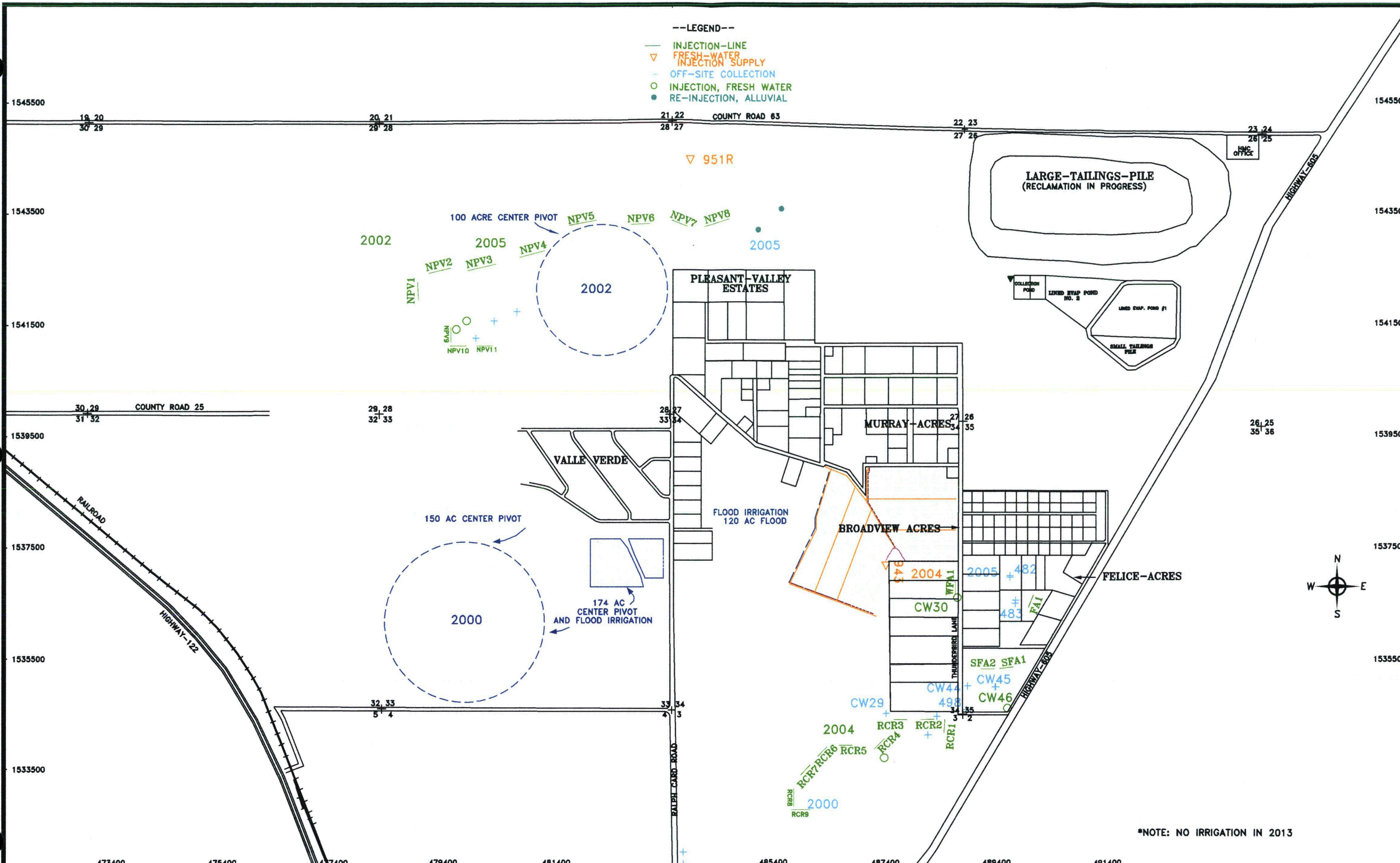

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FIGURE 1-1. LOCATION OF PRESENT INJECTION AND COLLECTION SYSTEMS IN THE IRRIGATION PROGRAM

2.0 Irrigation Water Concentrations and Usage

The project plan (ERG and HYDRO, 1999) established an upper limit for the uranium concentration in irrigation water at the NRC effluent standard of 0.44 milligrams per liter (mg/l). The maximum allowable concentration of selenium in the irrigation supply was set at a State of New Mexico Water Quality Control Commission standard of 0.12 mg/l. With five exceptions, measured uranium and selenium concentrations have been below these limits since inception of the irrigation program through 2009. Lower upper limits were set for the limited irrigation in 2010 through 2012. As identified, adjustments were made in the irrigation supply well configuration and production rates to insure that season averages met established limits. Yearly data and averages are discussed in the following sections.

2.1 Sections 33 and 34 Irrigation

A common pipe connecting 13 wells supplied the irrigation water for Sections 33 and 34 from 2000 through 2002(see Figures 2-1 through 2-3). Three wells were added and one well was dropped in 2003 (see Figure 2-4), while five wells were added in 2004 (see Figure 2-5). Four wells were added and three dropped in 2005 (see Figure 2-6). Eight additional wells added in 2006 bringing the total active wells to 29 (see Figure 2-7). Three additional wells were added in 2007 and the use of two previous supply wells was discontinued (see Figure 2-8). In 2008 and 2009 no wells were added and the pipeline supplied water to one of the three fields at a time (see Figures 2-9 and 2-10). In the 2004 and 2005 growing seasons, irrigation of the 24 flooded acres in Section 33 occurred only in conjunction with the irrigation of the Section 34 field and at a limited rate to maintain concentrations below the limits described in Section 2.0. The Section 33 flood field was irrigated at higher rates and application depths in 2008 and 2009, with all of the water being supplied to this field during its irrigation. Figures 2-1 through 2-14 show the Sections 33 and 34 irrigation supply well locations and supply lines for Years 2000 to 2013. Only the Section 34 area was irrigated in 2010 with Figure 2-11 showing which wells were used. No irrigation took place in Sections 33 and 34 during 2011 as shown in Figure 2-12. The flood area in Section 34 was irrigated using the wells shown in Figure 2-13 in 2012 while none of the Section 33 areas were irrigated. Figure 2-14 shows the wells that were used for off-site collection in 2013. No irrigation was done in Section 33 or 34.

Water samples collected at the end of the pipeline at the flood outlet or center pivot are composite samples from the group of supply wells. Table 2-1 presents the concentrations of uranium, selenium, total dissolved solids (TDS), sulfate, molybdenum and chloride observed in the 2000-2012 irrigation water. Yearly averages are also presented in the table.

Average uranium and selenium concentrations were approximately 0.26 and 0.08 mg/l, respectively, over the first ten growing seasons. The May 14, 2003 and the May 7, 2008 results for uranium (0.03 and 0.05 mg/l) are not included in the uranium average, because they are one order of magnitude lower than all other observations. Thus, they are assumed to be laboratory artifacts. The average concentrations for the 2012 irrigation were 0.116 and 0.041 mg/l for uranium and selenium. Upper limits of 0.16 and 0.10 mg/l were given in the temporary permission from the NMED for uranium and selenium in 2012. Table 2-1 also presents the low levels of Ra-226, Ra-228, V and Th-230 measured for the Section 34 irrigation water in 2012.

With one exception, the average concentrations of TDS and molybdenum were essentially constant from 2000 to 2012. With the exception of the June 2006 measurement, TDS concentrations have ranged from 1390 to 1800 mg/l. Molybdenum concentrations were less than the 0.03 or 0.05 mg/l Method Detection Limits (MDLs), with the exception of five samples. Concentrations in these five samples (0.06, 0.05, 0.07, 0.41 and 0.11 mg/l) exceeded MDLs. The result of 0.41 mg/l is one order of magnitude higher than all other molybdenum results and attributed to laboratory error. The sulfate concentrations ranged from 561 to 1020 mg/l. Chloride levels have been increasing slowly, and in 2012 were approximately 50 percent greater than initial measurements. Chloride concentrations have ranged from 94 to 247 mg/l in the twelve years of monitoring.

Table 2-1. 2000 through 2012 Sections 33/34 Irrigation Supply Concentrations

		Parameter (mg/l)					
Year	Date	Uranium	Selenium	TDS	Sulfate	Chloride	Molybdenum
2000	8/6/2000	0.26	0.12	1530	650	105	<0.03
	8/15/2000	0.26	0.12	1550	660	106	<0.03
	8/18/2000	0.28	0.12	1570	623	115	<0.03
	8/19/2000	0.27	0.12	1550	612	109	<0.03
	8/24/2000	0.27	0.11	1530	608	106	<0.03
	8/27/2000	0.26	0.11	1530	601	103	<0.03
	8/29/2000	0.3	0.11	1580	624	109	<0.03
	9/2/2000	0.28	0.11	1550	615	104	<0.03
	Average	0.27	0.12	1549	624	107	<0.03
2001	4/20/2001	0.28	0.11	1620	693	120	<0.03
	4/27/2001	0.27	0.12	1590	688	120	<0.03
	5/6/2001	0.3	0.11	1630	597	108	0.06
	5/10/2001	0.25	0.09	1590	580	103	<0.03
	5/19/2001	0.28	0.1	1590	660	118	<0.03
	5/24/2001	0.24	0.11	1500	664	116	<0.03
	6/3/2001	0.27	0.1	1610	665	118	<0.03
	6/10/2001	0.27	0.1	1570	659	113	<0.03
	6/28/2001	0.27	0.11	1530	661	104	<0.03
	7/5/2001	0.22	0.1	1480	655	94	<0.03
	7/24/2001	0.21	0.09	1460	650	120	<0.03
	8/29/2001	0.28	0.1	1600	693	114	0.41
	9/1/2001	0.27	0.1	1610	573	128	<0.03
	9/1/2001	0.21	0.1	1570	561	121	<0.03
	9/17/2001	0.29	0.13	1600	634	100	<0.03
	Average	0.26	0.1	1570	642	113	0.04
2002	4/15/2002	0.21	0.09	1510	708	125	<0.03
	4/16/2002	0.25	0.1	1580	704	129	<0.03
	5/8/2002	0.25	0.11	1600	678	----	----
	5/8/2002	0.26	0.1	1580	737	----	----
	5/14/2002	0.25	0.09	1560	741	120	<0.03
	7/3/2002	0.23	0.1	1560	694	135	0.05
	7/31/2002	0.23	0.1	1580	678	123	<0.05
	10/2/2002	0.21	0.1	1570	703	----	----
	Average	0.23	0.1	1564	705	126	<0.03
2003	5/14/2003	*0.03	0.05	1390	663	98.5	<0.03
	9/18/2003	0.22	0.08	1600	732	----	----
	Average	0.22	0.08	1600	732	----	----
2004	5/4/2004	0.28	0.11	1550	703	130	<0.03
	5/27/2004	0.25	0.08	1570	690	130	<0.03
	8/18/2004	0.27	0.08	1530	693	----	----
	10/6/2004	0.23	0.08	1560	629	133	<0.03
	Average	0.26	0.09	1553	679	131	<0.03
2005	4/19/2005	0.25	0.06	1520	1020	247	<0.03
	4/20/2005	0.25	0.06	1510	996	235	<0.03
	5/25/2005	0.23	0.06	1580	603	131	<0.03
	6/1/2005	0.24	0.06	1520	661	129	<0.03
	8/8/2005	0.27	0.06	1500	621	----	----
	9/26/2005	0.3	0.07	1550	659	124	<0.03
	10/11/2005	0.29	0.07	1580	612	125	<0.03
	10/24/2005	0.35	0.08	1610	683	144	<0.03
	Average	0.27	0.06	1546	732	162	<0.03

Table 2-1. 2000 through 2012 Sections 33/34 Irrigation Supply Concentrations (concluded)

		Parameter (mg/l)					
Year	Date	Uranium	Selenium	TDS	Sulfate	Chloride	Molybdenum
2006	4/10/2006	0.24	0.05	1520	654	134	<0.03
	6/26/2006	0.37	0.1	2000	875	192	0.07
	8/14/2006	0.27	0.07	1580	696	----	----
	10/10/2006	0.29	0.07	1500	639	128	<0.03
	Average	0.29	0.07	1650	716	151	0.04
2007	4/12/2007	0.28	0.06	1630	668	136	<0.03
	4/30/2007	0.27	0.06	1580	670	132	<0.03
	6/4/2007	0.23	0.06	1540	654	125	<0.03
	8/21/2007	0.3	0.05	1600	678	----	----
	10/22/2007	0.31	0.06	1570	661	143	<0.03
	Average	0.28	0.06	1584	666	134	<0.03
2008	4/7/2008	*0.0521	0.073	1430	687	160	<0.03
	4/21/2008	0.262	0.042	1560	728	99	<0.03
	6/2/2008	0.254	0.048	1550	683	142	<0.03
	9/24/2008	0.213	0.049	1660	710	148	<0.03
	Average	0.24	0.05	1550	702	137	<0.03
2009	5/6/2009	0.262	0.048	1560	669	----	<0.03
	6/16/2009	0.213	0.047	1660	717	178	<0.03
	7/24/2009	0.239	0.047	1700	694	146	<0.03
	9/28/2009	0.232	0.059	1770	754	160	<0.03
	Average	0.24	0.05	1673	709	161	<0.03
2010	8/30/2010	0.129	0.044	1610	716	158	<0.03
	9/8/2010	0.129	0.045	1660	709	154	<0.03
	9/15/2010	0.118	0.048	1700	731	162	<0.03
	9/22/2010	0.119	0.044	1700	735	170	<0.03
	10/1/2010	0.143	0.044	1750	756	174	<0.03
	10/6/2010	0.159	0.048	1660	754	171	0.11
	10/13/2010	0.156	0.044	1760	754	170	<0.03
	10/27/2010	0.144	0.045	1760	751	173	<0.03
	11/1/2010	0.128	0.045	1800	745	168	<0.03
	Average	0.136	0.045	1711	739	167	<0.03
2012	8/22/2012	0.115	0.036	1690	666	155	<0.03
	8/31/2012	0.119	0.041	1710	707	164	<0.03
	9/5/2012	0.118	0.038	1690	711	165	<0.03
	9/21/2012	0.109	0.05	1690	681	158	<0.03
	9/25/2012	0.111	0.037	1680	677	158	<0.03
	10/11/2012	0.115	0.037	1670	686	161	<0.03
	10/17/2012	0.122	0.045	1700	698	167	<0.03
	Average	0.116	0.041	1690	689	161	<0.03

		Parameter			
Year	Date	Ra-226 (pCi/l)	Ra-228 (pCi/l)	V (mg/l)	Th-230 (pCi/l)
2010	11/1/2010	-0.02	0.7	<0.01	0.04
2012	10/11/2012	0.38	1.4	<0.01	0.03

2.2 Section 28 Irrigation

Section 28 was irrigated in 2002 through 2009, 2011 and 2012. Figures 2-15 and 2-16 show the locations of the four wells installed to supply water to the center pivot system in the first two years. Figures 2-17, 2-18 and 2-19 show that well 886 was added in 2004 and wells M9, MO, MQ, MR, and MS were added in 2005 and 2006. Alluvial well M16 was added in 2007 and wells M9 and MQ were not used in 2007, 2008 and 2009 (see Figures 2-20, 2-21 and 2-22). Figure 2-23 shows the Section 28 irrigation area even though it was not irrigated in 2010. Wells 951, 890, 634, 659, 886, and MS were used for irrigation supply in 2011 as shown in Figure 2-24. The wells shown in red on Figure 2-25 were used for irrigation supply in 2012. Figure 2-26 shows the wells that were used for off-site collection in 2013 in red. No irrigation took place in Section 28 for 2013. Table 2-2 presents TDS, sulfate, chloride, molybdenum, uranium, and selenium concentrations obtained in the Section 28 irrigation water. This table also presents the low levels of Ra-226, Ra-228, V and Th-230 measured for the Section 28 irrigation water. One sample of irrigation water was collected during the first two irrigation seasons. Four and eight samples were collected in 2004 and 2005, respectively. Five samples were collected in both 2006 and 2007 while three samples were collected in 2008 and four samples were collected in 2009. Seventeen and thirteen samples were collected during 2011 and 2012, respectively. Chloride and molybdenum were omitted as analytes in 2002 and from one sample in 2004, 2006, 2007, 2009, and 2011.

The concentrations of TDS and sulfate were essentially constant from 2002 through 2009. The TDS concentration was 2,070 mg/l in 2002 and 2003 and averaged 2115, 2109, 1986, 2122, 1917 and 2030 mg/l in 2004, 2005, 2006, 2007, 2008 and 2009, respectively. The annual average sulfate concentrations ranged from 608 to 936 mg/l. The annual average concentrations of chloride and molybdenum ranged from 133 to 185 mg/l and less than 0.03 to 0.05 mg/l, respectively. The 2011 and 2012 TDS and sulfate upper limits given in the temporary permission from NMED were 2000 and 900 mg/l respectively. The average TDS concentration was 1409 mg/l while the sulfate average was 608 mg/l in 2011, while the 2012 averages were 1846 mg/l and 756 mg/l.

Uranium concentrations have increased gradually in Section 28 irrigation water: 0.23 mg/l in 2002, 0.24 mg/l in 2003, and 0.27 mg/l in 2004. Uranium concentrations stabilized from 2005 through 2008 at 0.35 to 0.36 mg/l. A small increase to 0.39 mg/l occurred in 2009. The upper limit in the temporary permission for 2011 and 2012 was set at 0.16 mg/l. The average for 2011 was 0.14 mg/l. That average remained the same for the 2012 irrigation season.

The ten-year (2002-2009 and 2011-2012) average uranium concentration of 0.28 mg/l is calculated as the average of the reported mean concentrations for the ten years, (0.23, 0.24, 0.27, 0.35, 0.35, 0.36, 0.36, 0.39, 0.14 and 0.14 mg/l).

Selenium concentrations were 0.08 mg/l in 2002 and less than 0.005 mg/l in 2003. The latter result is questionable because the concentration in each of the four supply wells was measured at

0.04 or 0.05 mg/l and no other water was introduced to the supply line (see HMC's 2003 Annual Report for individual well results). The average 2004 through 2009 selenium concentrations were similar to the 2002 value. The average selenium value for 2011 was 0.03 mg/l while the temporary permission limit was 0.10 mg/l. The average selenium value for 2012 was similar at 0.04 mg/l. The temporary permission limit of 0.10 mg/l remained the same in 2012. The ten-year average selenium concentration is 0.07 mg/l.

Table 2-2. 2002 through 2012 Section 28 Irrigation Supply Concentration

Year	Sampling Date	Uranium	Selenium	TDS	Sulfate	Chloride	Molybdenum
		Parameter					
2002	10/2/2002	0.23	0.08	2070	881	—	—
2003	5/14/2003	0.24	<0.005	2070	936	184	<0.03
2004	5/4/2004	0.23	0.07	2120	933	190	<0.03
	5/27/2004	0.29	0.07	2110	950	170	<0.03
	8/18/2004	0.27	0.06	2140	956	—	—
	10/6/2004	0.27	0.06	2090	838	194	<0.03
	Average	0.27	0.07	2115	919	185	<0.03
2005	4/12/2005	0.48	0.11	2220	955	176	0.09
	5/6/2005	0.51	0.12	2230	1010	192	0.11
	5/20/2005	0.33	0.08	2120	916	194	<0.03
	5/27/2005	0.26	0.06	2050	907	176	<0.03
	6/3/2005	0.33	0.08	2040	926	182	<0.03
	6/10/2005	0.33	0.07	2000	943	186	<0.03
	6/17/2005	0.31	0.08	2100	899	167	<0.03
	10/11/2005	0.28	0.06	2110	863	170	<0.03
	Average	0.35	0.08	2109	927	180	0.04
2006	3/1/2006	0.35	0.08	2230	926	197	0.04
	4/10/2006	0.35	0.09	2150	985	185	0.05
	6/26/2006	0.3	0.07	1550	645	158	<0.03
	8/14/2006	0.36	0.09	1980	928	—	—
	10/2/2006	0.38	0.09	2020	925	161	0.07
	Average	0.35	0.08	1986	882	175	0.04
2007	4/1/2007	0.32	0.08	2130	904	173	<0.03
	4/30/2007	0.41	0.09	2240	980	164	0.04
	6/26/2007	0.32	0.08	2010	856	163	<0.03
	8/17/2007	0.38	0.08	2130	978	—	—
	10/10/2007	0.39	0.09	2100	885	184	0.04
	Average	0.36	0.08	2122	921	171	0.04
2008	4/1/2008	0.465	0.083	2050	1020	90	0.05
	6/2/2008	0.285	0.059	1750	893	152	<0.03
	9/24/2008	0.318	0.056	1950	867	157	<0.03
	Average	0.36	0.07	1917	927	133	0.04
2009	4/20/2009	0.388	0.065	2035	913	171	0.05
	6/2/2009	0.308	0.064	1980	871	174	0.03
	7/24/2009	0.369	0.061	2020	852	—	—
	9/28/2009	0.45	0.079	2080	940	177	0.07
	Average	0.39	0.07	2029	894	174	0.05
2011	6/17/2011	0.198	0.042	1490	672	135	<0.03
	6/23/2011	0.251	0.043	1570	685	138	<0.03
	6/29/2011	0.222	0.049	1490	676	138	<0.03
	7/7/2011	0.113	0.028	1290	532	110	<0.03
	7/15/2011	0.0837	0.015	1160	455	87	<0.03
	7/19/2011	0.155	0.028	1360	559	109	<0.03
	7/28/2011	0.13	0.021	1270	523	104	<0.03
	8/3/2011	0.132	0.022	1230	522	103	<0.03
	8/18/2011	0.0944	0.024	1450	682	118	<0.03
	8/24/2011	0.114	0.027	1460	629	—	—
	8/30/2011	0.107	0.025	1390	604	114	<0.03
	9/6/2011	0.124	0.027	1420	612	127	<0.03
	9/13/2011	0.104	0.026	1410	607	125	<0.03
	9/20/2011	0.128	0.033	1470	626	130	<0.03
	9/27/2011	0.128	0.034	1530	676	138	<0.03
	10/7/2011	0.127	0.029	1490	639	133	<0.03
	10/12/2011	0.122	0.032	1470	636	132	<0.03
	Average	0.14	0.03	1409	608	121	<0.03

Table 2-2. 2002 through 2012 Section 28 Irrigation Supply Concentration (continued)

Year	Sampling Date	Uranium	Selenium	TDS	Sulfate	Chloride	Molybdenum
		Parameter					
2012	8/7/2012	0.149	0.033	1750	744	187	<0.03
	8/15/2012	0.176	0.039	2010	857	198	<0.03
	8/22/2012	0.146	0.034	1830	738	183	<0.03
	8/28/2012	0.135	0.031	1760	719	181	<0.03
	9/5/2012	0.123	0.030	1770	706	180	<0.03
	9/12/2012	0.158	0.038	1860	744	186	0.05
	9/18/2012	0.147	0.033	1800	755	184	<0.03
	9/25/2012	0.132	0.034	1810	672	170	<0.03
	10/2/2012	0.145	0.035	1830	768	195	<0.03
	10/11/2012	0.129	0.038	1860	741	189	0.03
	10/17/2012	0.131	0.044	1880	770	200	<0.03
	10/24/2012	0.132	0.035	1920	796	200	<0.03
	10/31/2012	0.133	0.038	1920	814	206	<0.03
	Average	0.14	0.036	1846	756	189	<0.03

Year	Date	Ra-226 (pCi/l)	Ra-228 (pCi/l)	V (mg/l)	Th-230 (pCi/l)
		Parameter			
2011	10/12/2011	0.39	-0.4	<0.01	0.05
2012	10/2/2012	0.08	0.1	<0.01	0.05

2.3 Irrigation Water Usage

Water usage, which is tabulated below, has varied from 201 acre-feet (ac-ft) in 2010 applied to the 120 acres (Section 34) to 1054 ac-ft in 2008 applied to the 394 acres (Sections 28, 33 and 34). Water applied in 2012 was 310 ac-ft of water to the Section 28 and 34 areas. No water was applied in 2013.

YEAR	WATER USAGE (AC-FT)	IRRIGATED AREA (AC)	AREA IRRIGATED
2000	715	270	Sections 33 and 34
2001	695	270	Sections 33 and 34
2002	995	330	Sections 28, 33 and 34
2003	949	330	Sections 28, 33 and 34
2004	1028	354	Sections 28, 33 and 34
2005	1034	394	Sections 28, 33 and 34
2006	837	370	Sections 28, 33 and 34
2007	789	370	Sections 28, 33 and 34
2008	1054	394	Sections 28, 33 and 34
2009	731	394	Sections 28, 33 and 34
2010	201	120	Section 34
2011	213	100	Section 28
2012	310	220	Section 28 and 34
2013	0	0	N/A

2.4 Mass Removal

Table 2-3 presents the mass removal of uranium, selenium, and sulfate through the irrigation program. This table shows that a total of 3.1 billion gallons of water has been pumped from the irrigation supply from 2000 through 2013 while the on-site volume of collection of ground water is 4.9 billion gallons from 1978 through 2013. The irrigation volume has been a significant portion of the Grants collection of ground water with elevated concentrations. Figure 2-27 shows yearly gallons of water used in the irrigation program in blue, which shows a large reduction in 2010 through 2013 due to the limited permission for irrigation. The volume of water in 2013 was from the South Collection wells which was pumped to the On-Site area.

The mass of uranium removed from the ground water by the irrigation programs has been 6,704 pounds. Figure 2-27 also shows the pounds of uranium removed from the ground water each year in green. The uranium removed from the ground water in 2010 and 2011 is only slightly larger than ten percent of the average removed for prior years. The uranium removed in 2012 is slightly larger than the previous two years but still only slightly larger than twenty percent of least productive year (2001) prior to the restrictions. The restriction of irrigation in that time frame (2010-2012) has limited the quantity of uranium removed and the progress on ground water restoration in the off-site area. The off-site collection in 2013 was used for a zeolite pilot test and injected into the tailings pile, thus the uranium removed was not calculated.

Table 2-3. Quantities of Water and Constituents Removed

YEAR	SYSTEM	TOTAL VOLUME PUMPED (GAL)	URANIUM CONC. (MG/L)	URANIUM MASS (LB)	SELENIUM CONC. (MG/L)	SELENIUM MASS (LB)	SULFATE CONC. (MG/L)	SULFATE MASS (LB)
2000	NORTH							
	SOUTH	233,130,506	0.27	525.4	0.12	233.5	624	1,214,286
	TOTAL	**233,130,506**		**525.4**		**233.5**		**1,214,286**
2001	NORTH							
	SOUTH	226,288,102	0.26	491.1	0.1	188.9	642	1,212,646
	TOTAL	**226,288,102**		**491.1**		**188.9**		**1,212,646**
2002	NORTH	43,009,402	0.23	82.6	0.08	28.7	881	316,284
	SOUTH	280,538,597	0.23	538.6	0.1	234.2	705	1,650,893
	TOTAL	**323,547,999**		**621.2**		**262.9**		**1,967,177**
2003	NORTH	50,242,801	0.24	100.7	*<.005	1.0	936	392,543
	SOUTH	258,642,901	0.22	475.0	0.08	172.7	732	1,580,334
	TOTAL	**308,885,702**		**575.6**		**173.8**		**1,972,877**
2004	NORTH	59,431,173	0.27	133.9	0.07	34.7	919	455,897
	SOUTH	275,436,118	0.26	597.8	0.09	206.9	679	1,561,090
	TOTAL	**334,867,291**		**731.7**		**241.6**		**2,016,987**
2005	NORTH	77,547,254	0.35	226.6	0.08	51.8	927	600,044
	SOUTH	259,444,440	0.27	584.7	0.06	129.9	732	1,585,232
	TOTAL	**336,991,694**		**811.3**		**181.7**		**2,185,276**
2006	NORTH	75,918,110	0.35	221.8	0.08	50.7	882	558,922
	SOUTH	196,865,761	0.29	476.5	0.07	115.0	716	1,176,577
	TOTAL	**272,783,871**		**698.3**		**165.7**		**1,735,499**
2007	NORTH	78,850,570	0.36	236.9	0.08	52.7	921	606,180
	SOUTH	178,098,022	0.28	416.3	0.06	89.2	666	990,081
	TOTAL	**256,948,592**		**653.2**		**141.9**		**1,596,261**
2008	NORTH	89,928,749	0.36	270.2	0.07	52.5	927	695,850
	SOUTH	254,674,307	0.24	510.2	0.05	106.3	702	1,492,312
	TOTAL	**344,603,056**		**780.4**		**158.8**		**2,188,162**
2009	NORTH	60,278,328	0.39	196.2	0.07	35.2	894	449,817
	SOUTH	177,648,378	0.24	355.9	0.05	74.1	709	1,051,344
	TOTAL	**237,926,706**		**552.1**		**109.4**		**1,501,161**
2010	NORTH							
	SOUTH	65,296,092	0.136	74.1	0.045	24.5	739	402,781
	TOTAL	**65,296,092**		**74.1**		**24.5**		**402,781**
2011	NORTH	69,401,534	0.14	81.1	0.03	17.4	597	345,844
	SOUTH							
	TOTAL	**69,401,534**		**81.1**		**17.4**		**345,844**
2012	NORTH	52,137,000	0.14	60.9	0.04	17.4	756	329,007
	SOUTH	48,821,000	0.116	47.3	0.04	16.3	689	280,778
	TOTAL	**100,958,000**		**108.2**		**33.7**		**609,785**
2013	NORTH	0	0	0.0	0	0.0	0	0
	SOUTH	31,082,000	0	0.0	0	0.0	0	0
	TOTAL	**31,082,000**		**0.0**		**0.0**		**0**

NORTH TOTAL	656,744,921	1,610.9	342.2	4,750,389
SOUTH TOTAL	2,485,966,224	5,092.8	1,591.6	14,198,354
COMBINED TOTAL	**3,142,711,145**	**6,703.8**	**1,933.8**	**18,948,743**

NOTE: *= .0025 mg/l used as concentration to calculate load

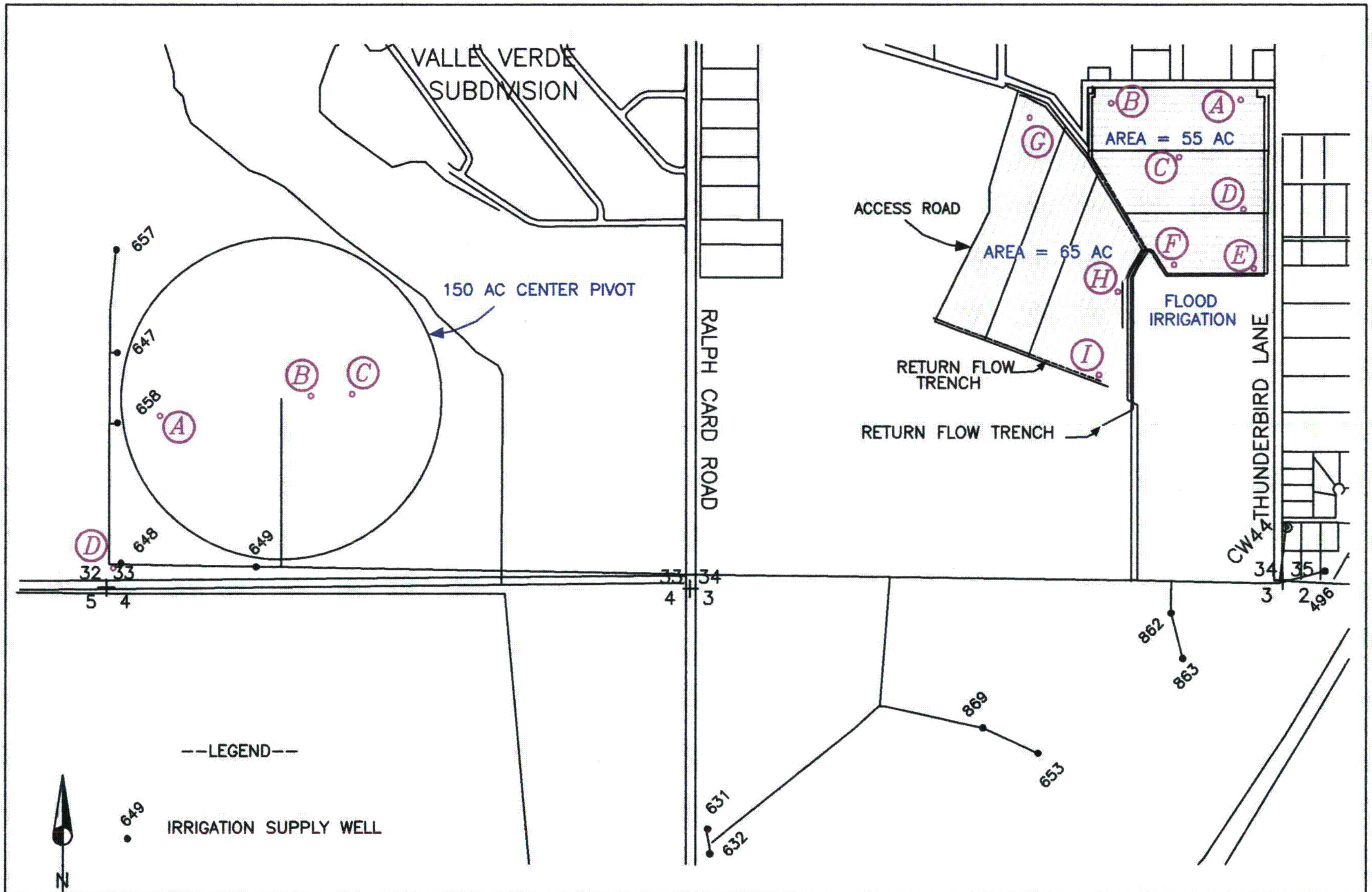

FIGURE 2–1. 1999 AND 2000 IRRIGATION AREAS WITH IRRIGATION WELLS AND SOIL SAMPLE LOCATIONS

SCALE: 1" = 1200'

DATE: 03/12/14

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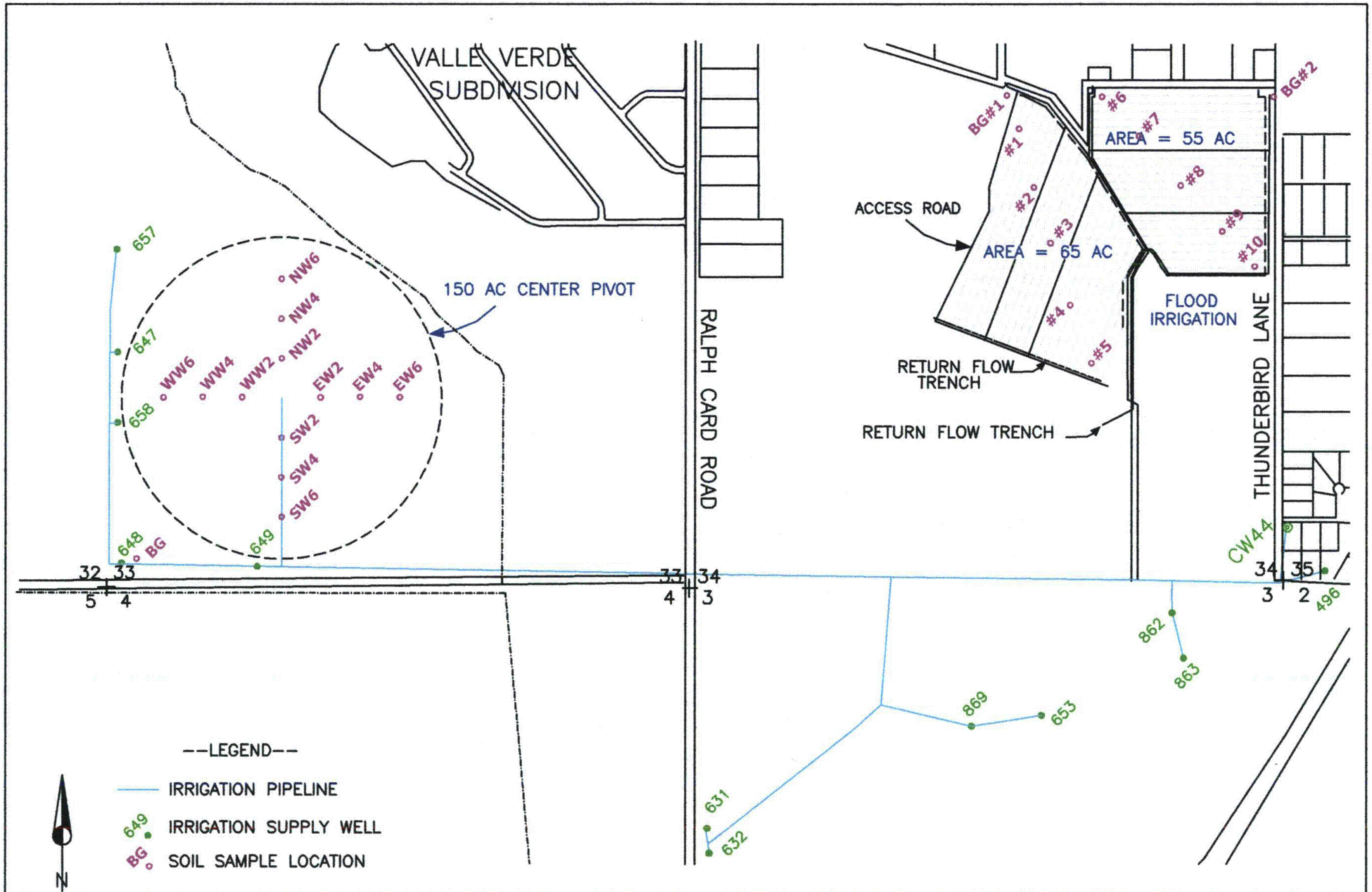

FIGURE 2–2. 2001 IRRIGATION AREAS WITH IRRIGATION WELLS AND SOIL SAMPLE LOCATIONS

SCALE: 1" = 2400'

DATE: 03/12/14

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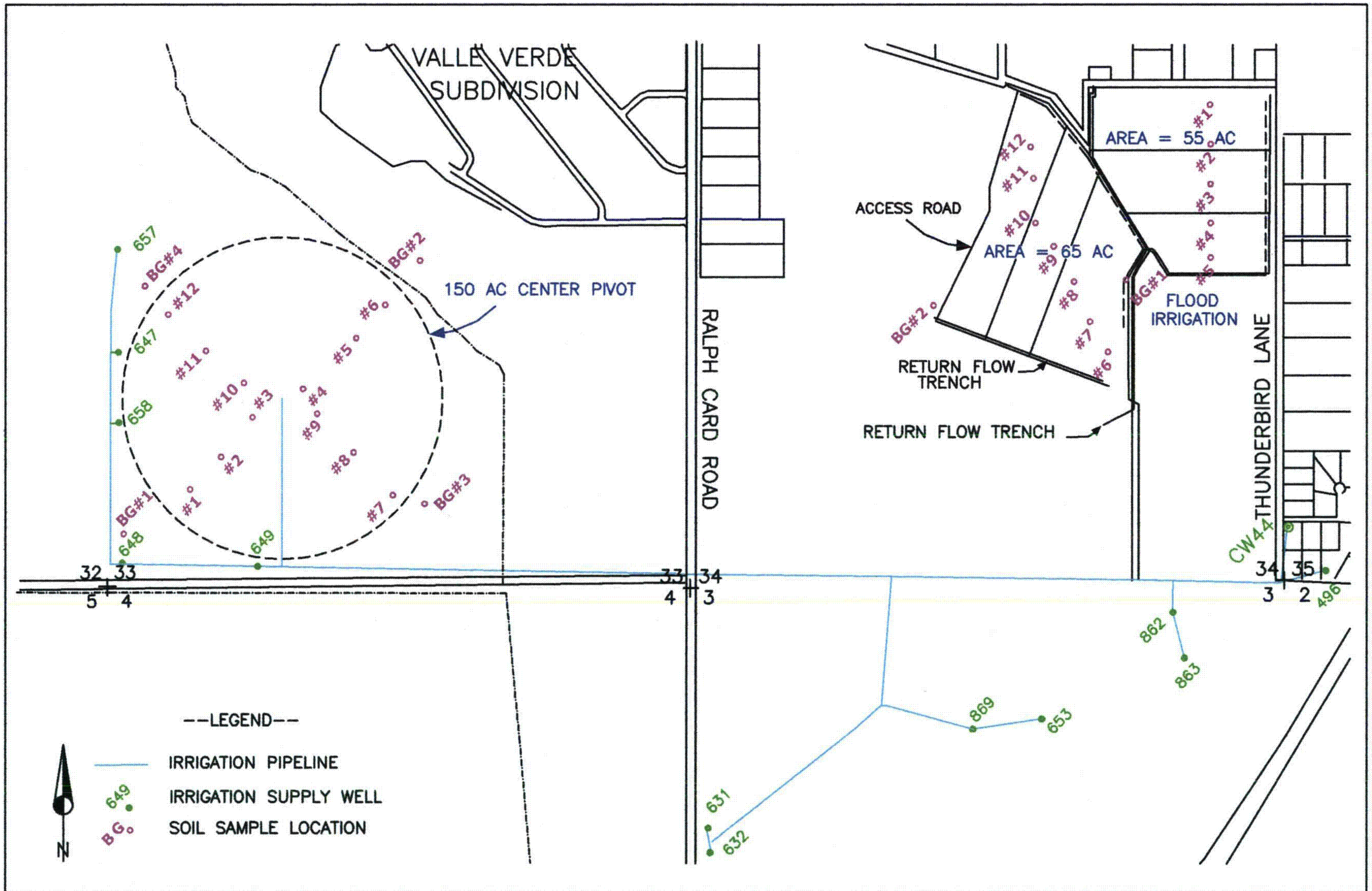

FIGURE 2-3. 2002 SECTIONS 33 AND 34 IRRIGATION AREAS WITH IRRIGATION WELLS AND SOIL SAMPLE LOCATIONS

DATE: 03/12/14

SCALE: 1" = 1200'

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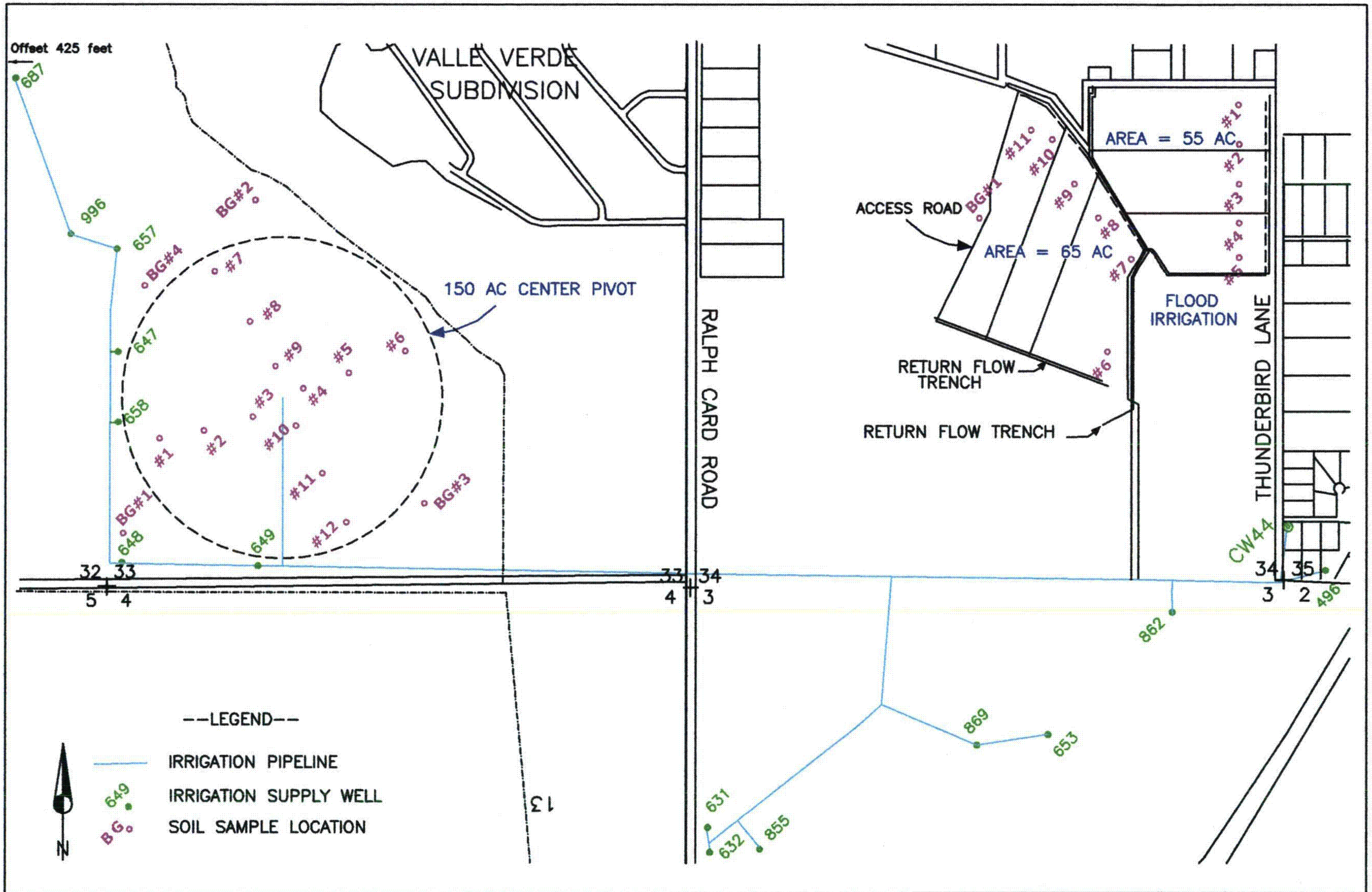

FIGURE 2-4. 2003 SECTIONS 33 AND 34 IRRIGATION AREAS WITH IRRIGATION WELLS AND SOIL SAMPLE LOCATIONS

SCALE: 1" = 1200'

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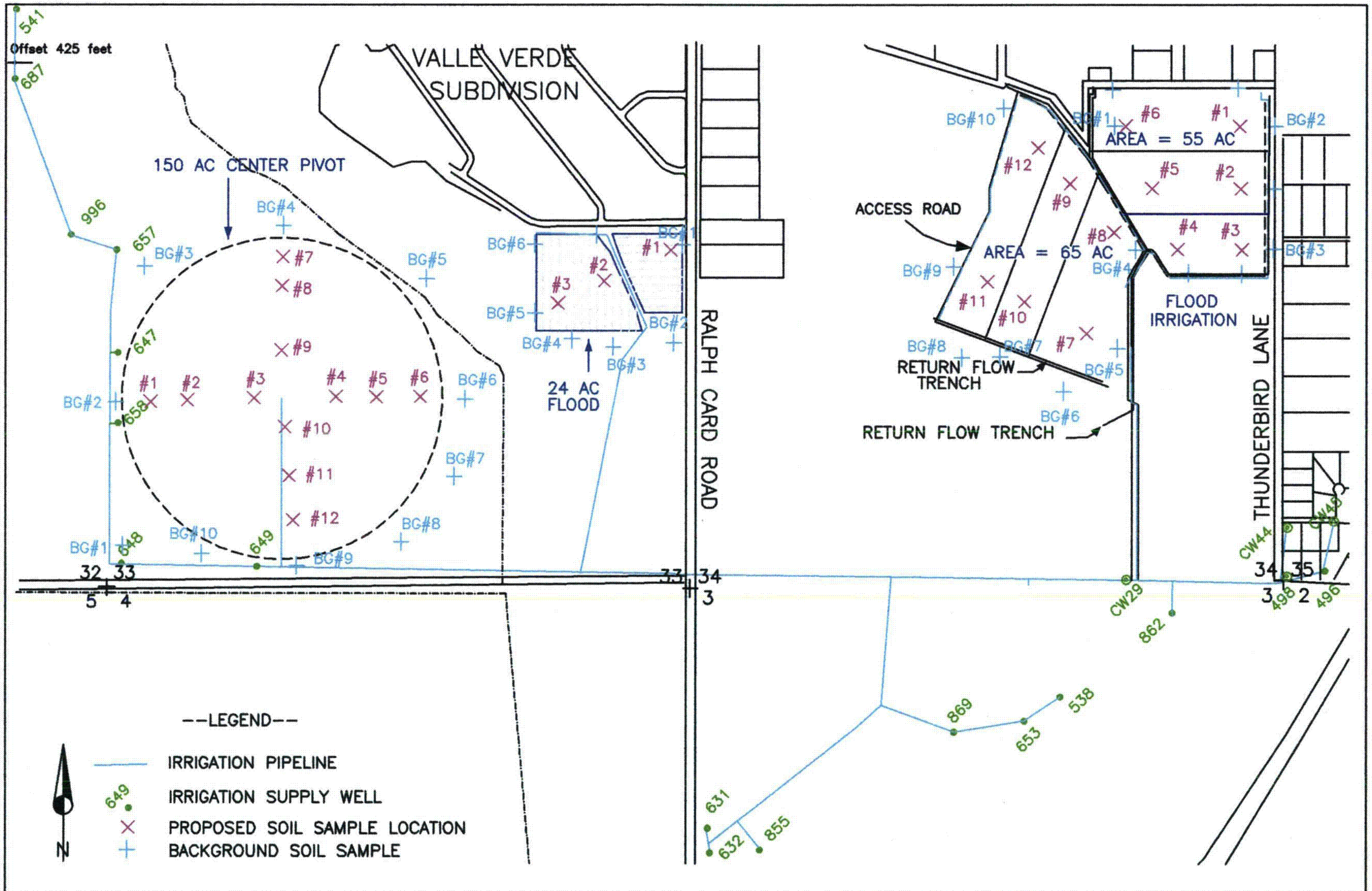

FIGURE 2-5. 2004 SECTIONS 33 AND 34 IRRIGATION AREAS WITH IRRIGATION WELLS AND SOIL SAMPLE LOCATIONS

SCALE: 1" = 1200'

DATE: 03/12/14

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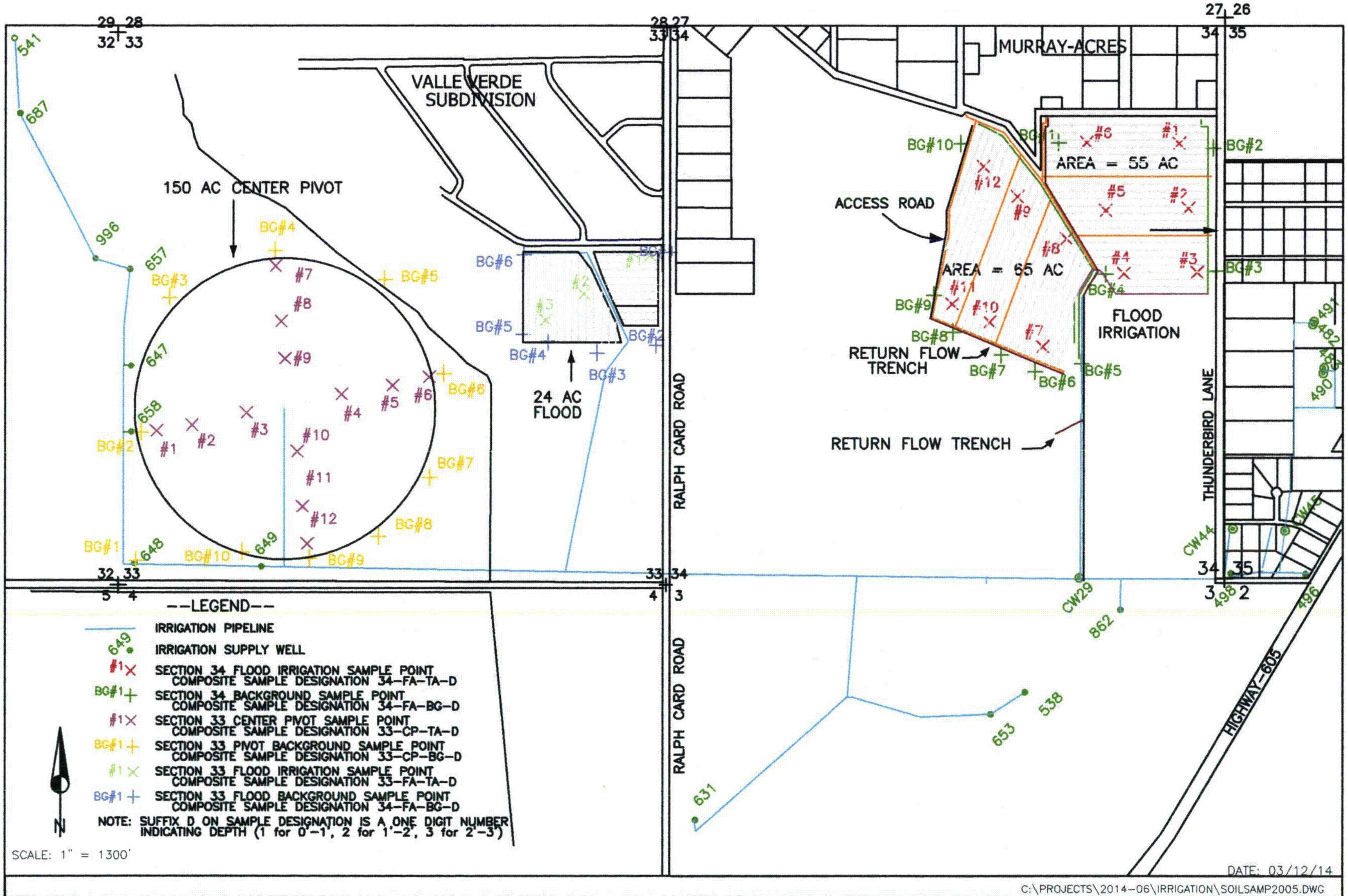

FIGURE 2–6. 2005 SECTIONS 33 AND 34 IRRIGATION AREAS WITH IRRIGATION WELLS AND SOIL SAMPLE LOCATIONS

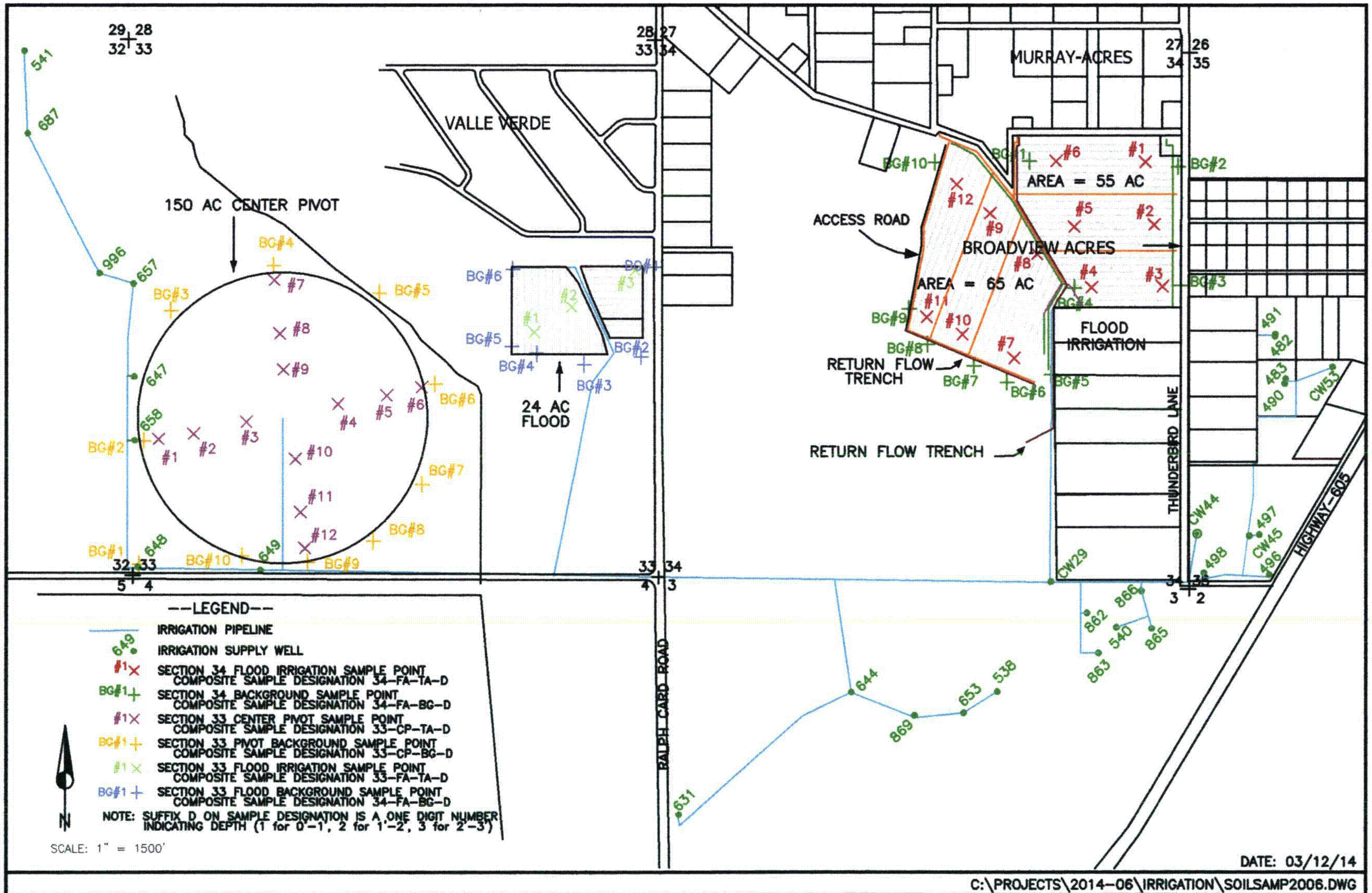

FIGURE 2-7. 2006 SECTION 33 AND 34 IRRIGATION AREAS WITH IRRIGATION WELLS AND SOIL SAMPLE LOCATIONS

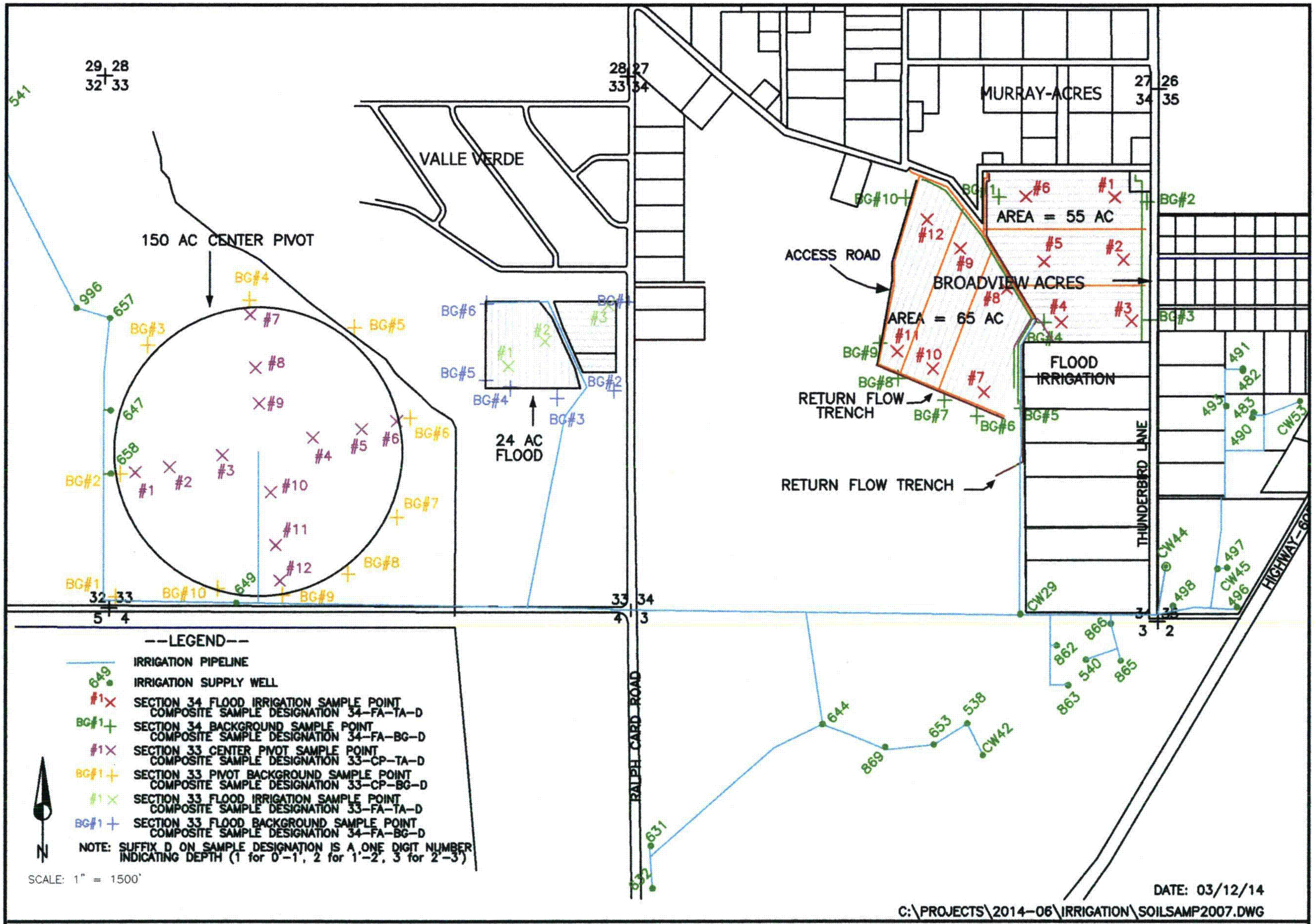

FIGURE 2-8. 2007 SECTION 33 AND 34 IRRIGATION AREAS WITH IRRIGATION WELLS AND SOIL SAMPLE LOCATIONS

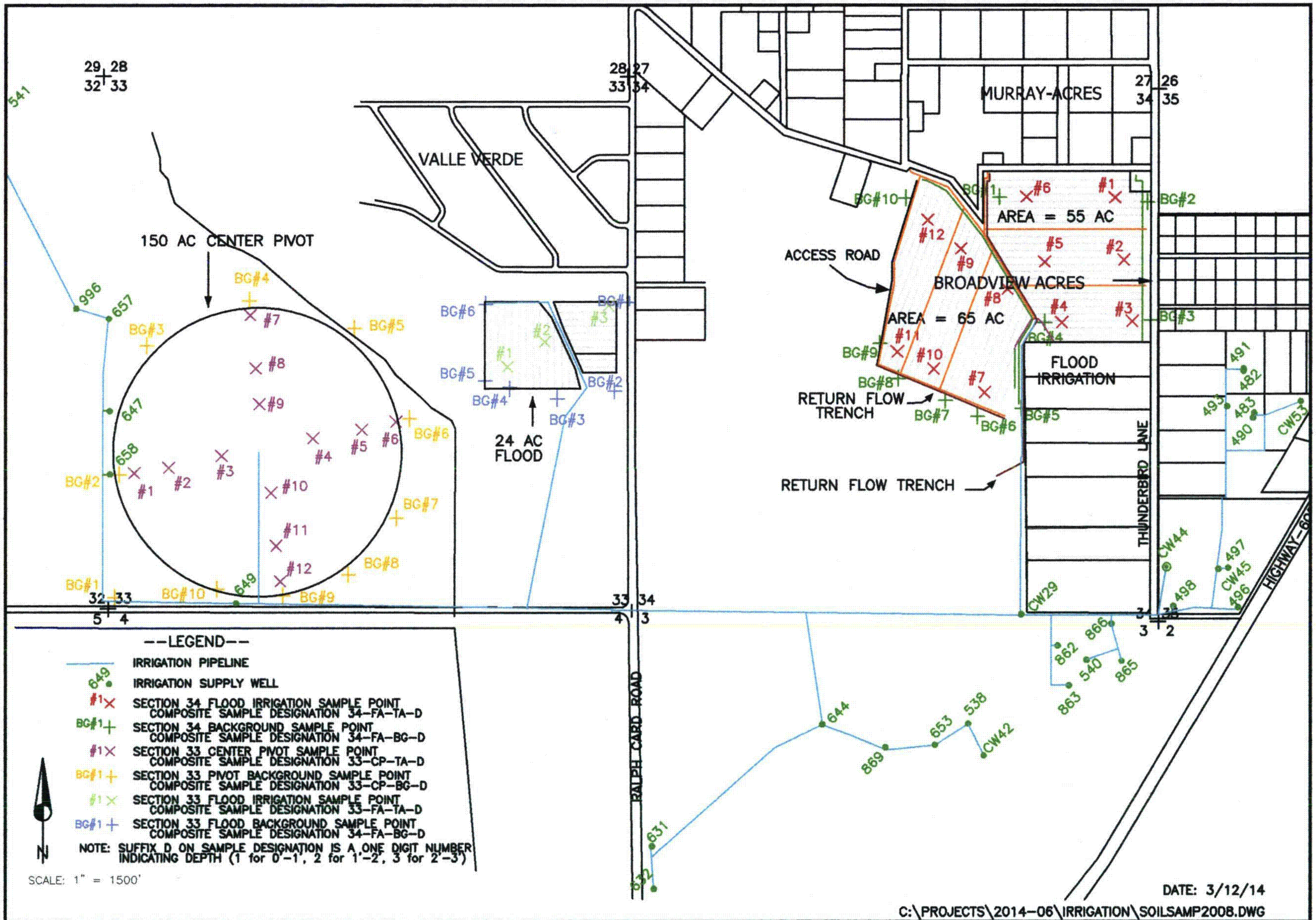

FIGURE 2-9. 2008 SECTION 33 AND 34 IRRIGATION AREAS WITH IRRIGATION WELLS AND SOIL SAMPLE LOCATIONS

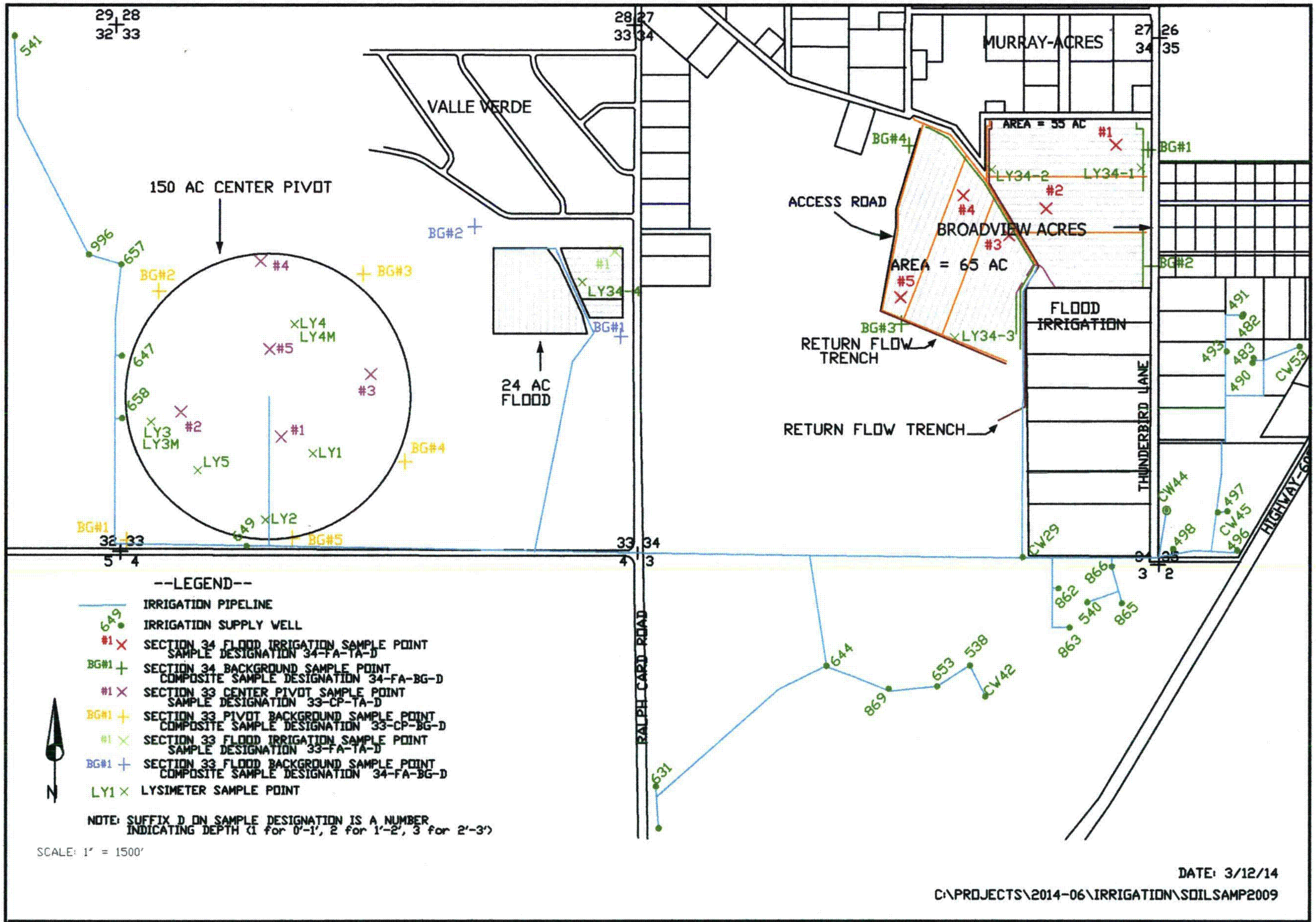

FIGURE 2-10. 2009 SECTION 33 AND 34 IRRIGATION AREAS WITH IRRIGATION WELLS AND SOIL SAMPLE LOCATIONS

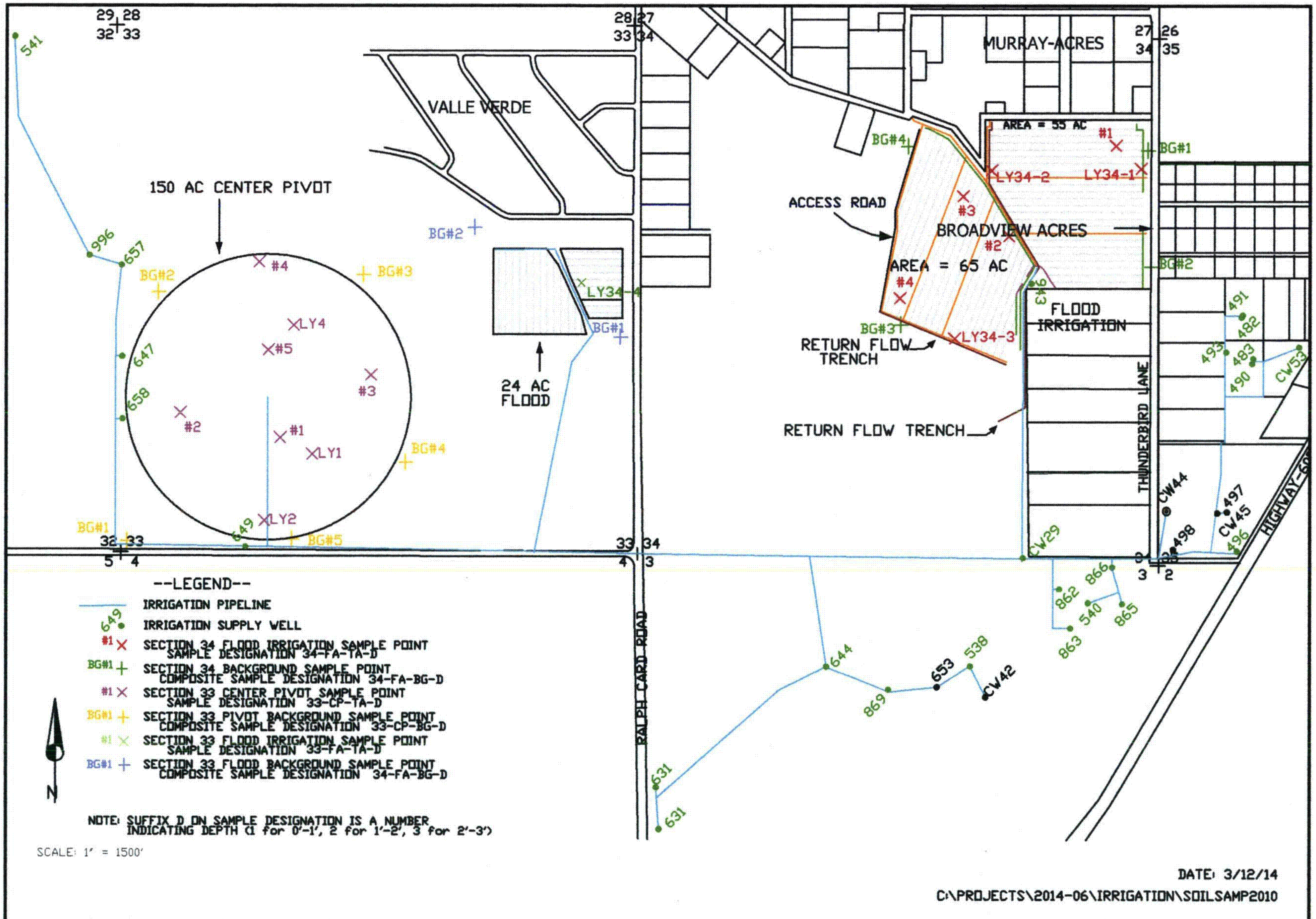

FIGURE 2-11. 2010 SECTION 33 AND 34 IRRIGATION AREAS WITH IRRIGATION WELLS AND SOIL SAMPLE LOCATIONS

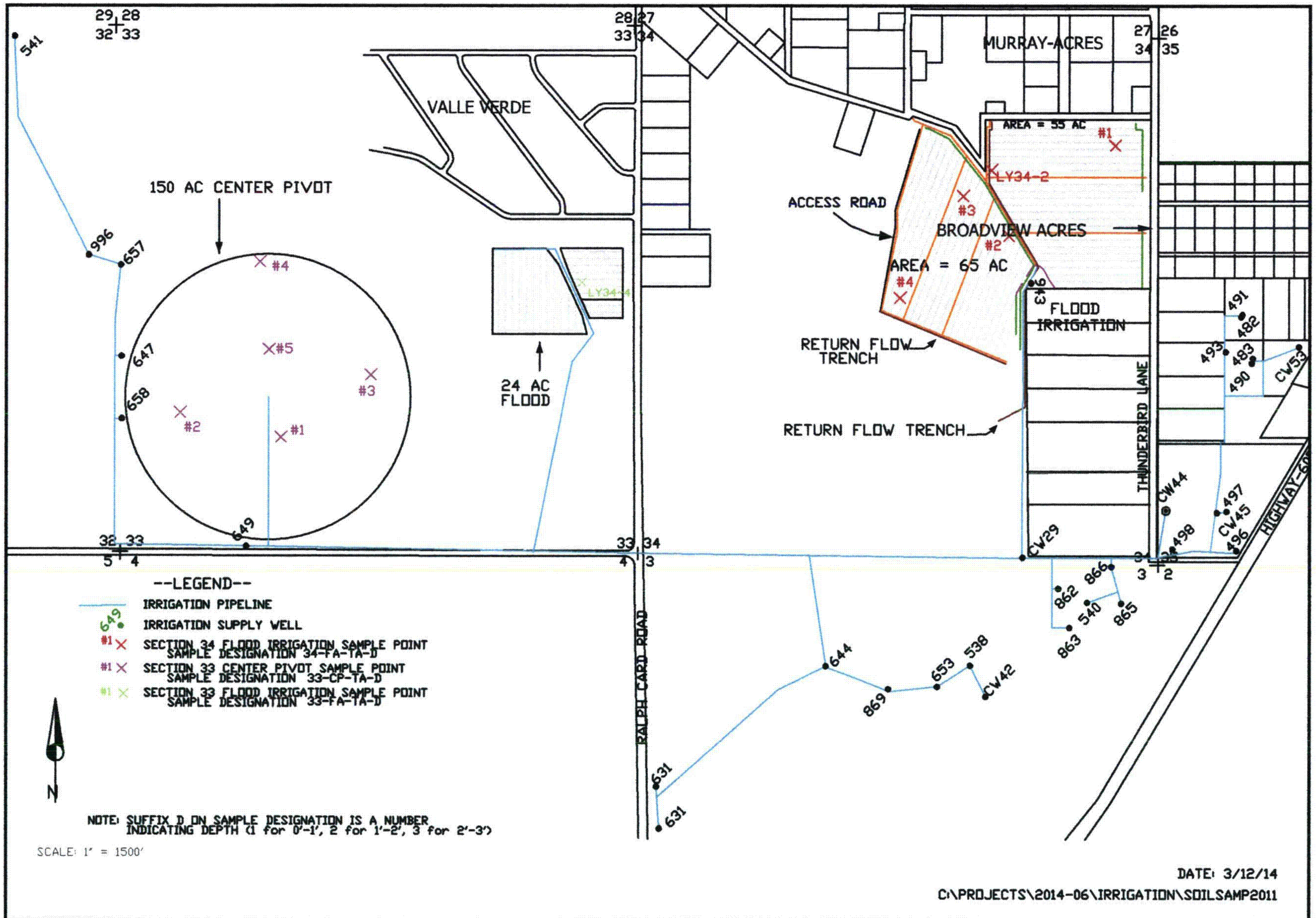

FIGURE 2-12. 2011 SECTION 33 AND 34 IRRIGATION AREAS WITH IRRIGATION WELLS AND SOIL SAMPLE LOCATIONS

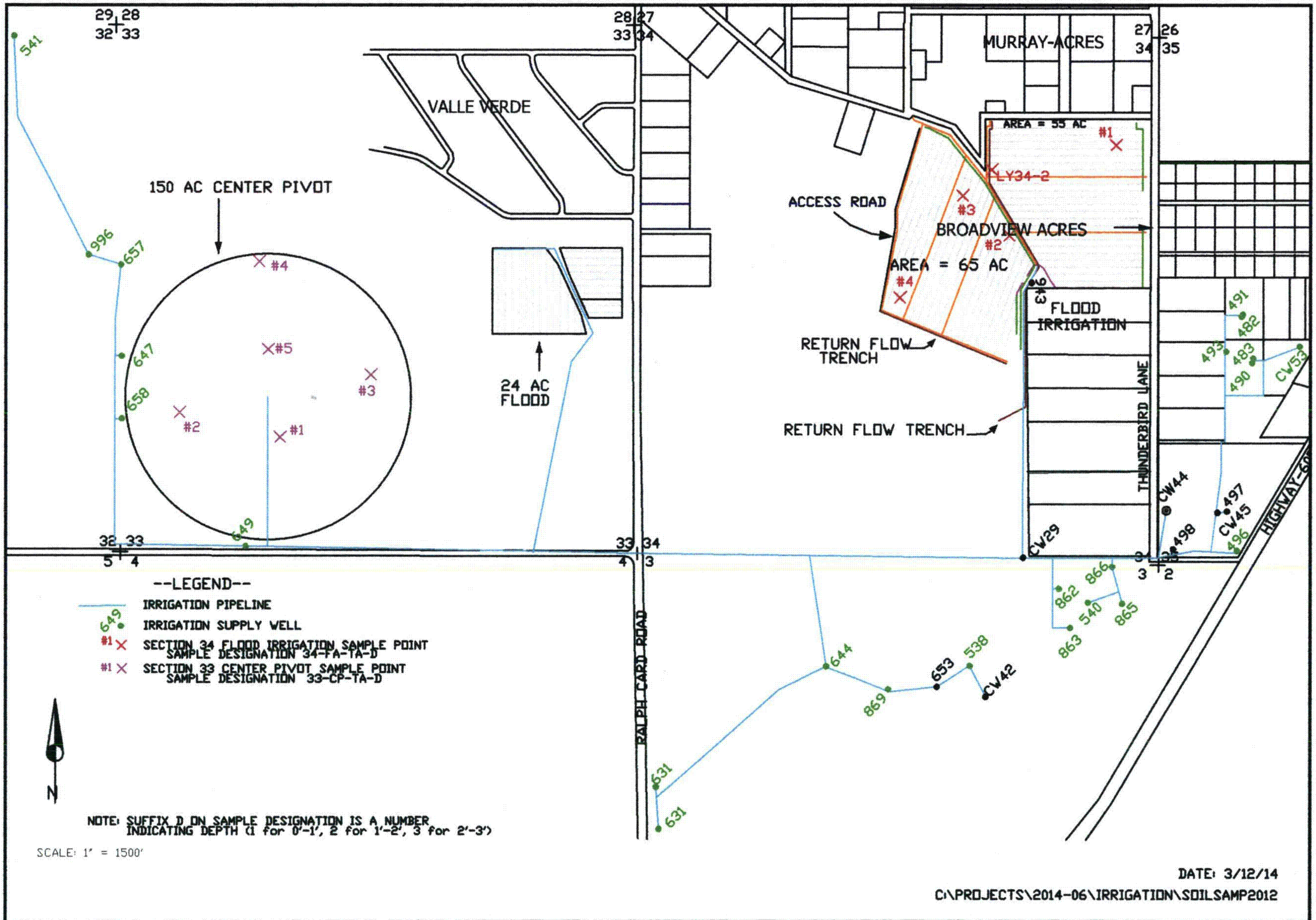

FIGURE 2-13. 2012 SECTION 33 AND 34 IRRIGATION AREAS WITH IRRIGATION WELLS AND SOIL SAMPLE LOCATIONS

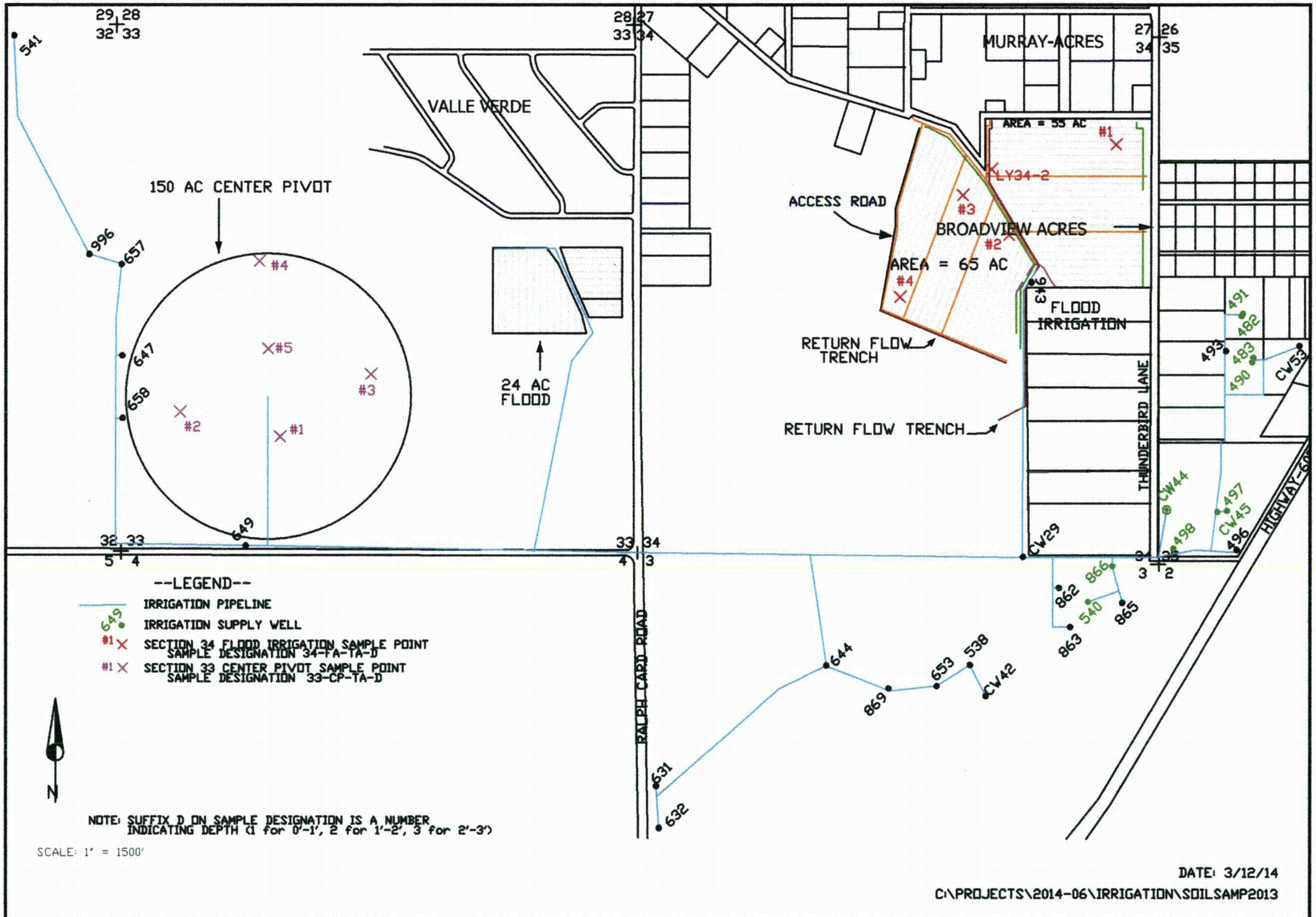

FIGURE 2-14. 2013 SECTION 33 AND 34 IRRIGATION AREAS WITH IRRIGATION WELLS AND SOIL SAMPLE LOCATIONS

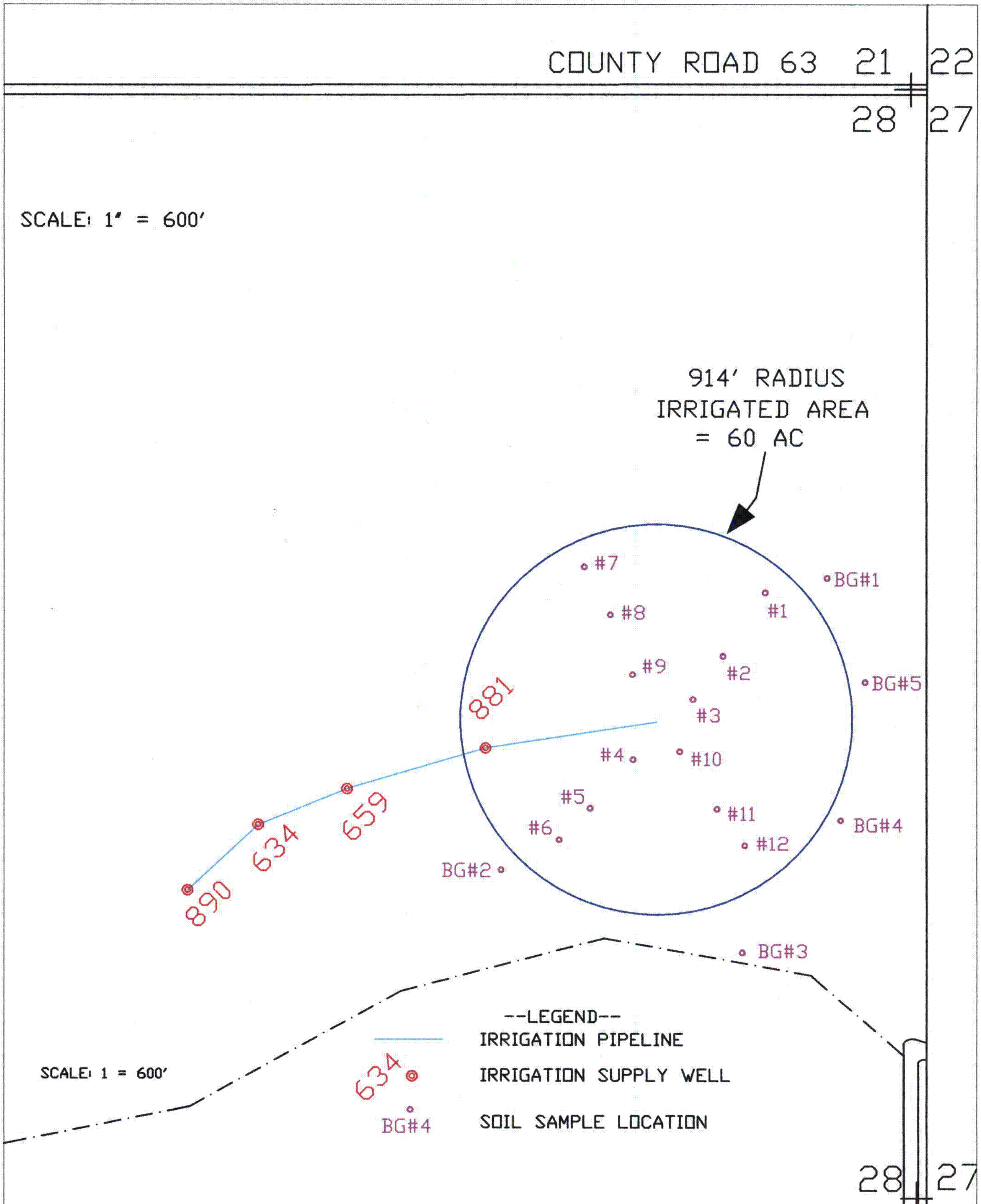

FIGURE 2-15. 2002 SECTION 28 IRRIGATION AREA WITH IRRIGATION WELLS AND SOIL SAMPLE LOCATIONS

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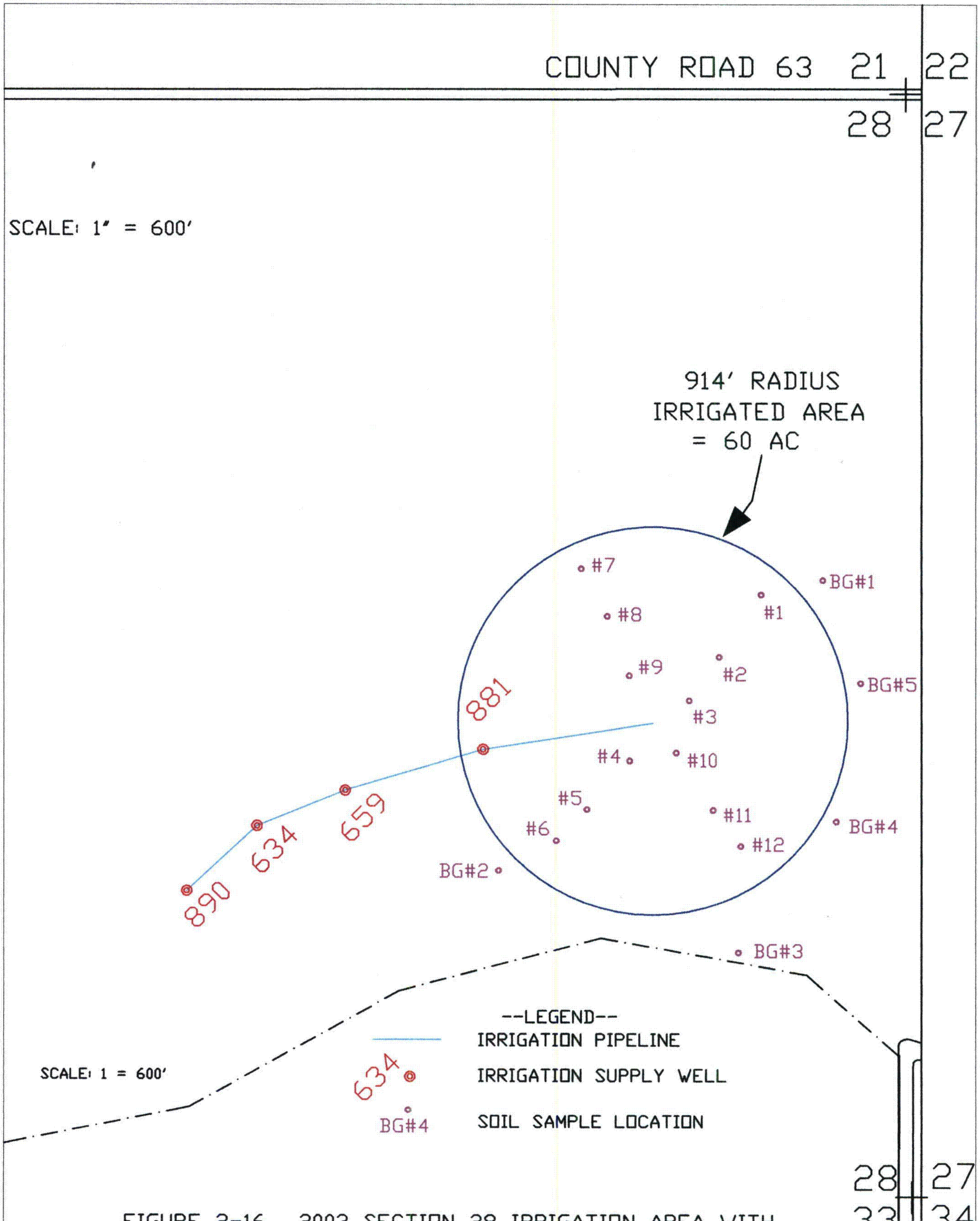

FIGURE 2-16. 2003 SECTION 28 IRRIGATION AREA WITH IRRIGATION WELLS AND SOIL SAMPLE LOCATIONS

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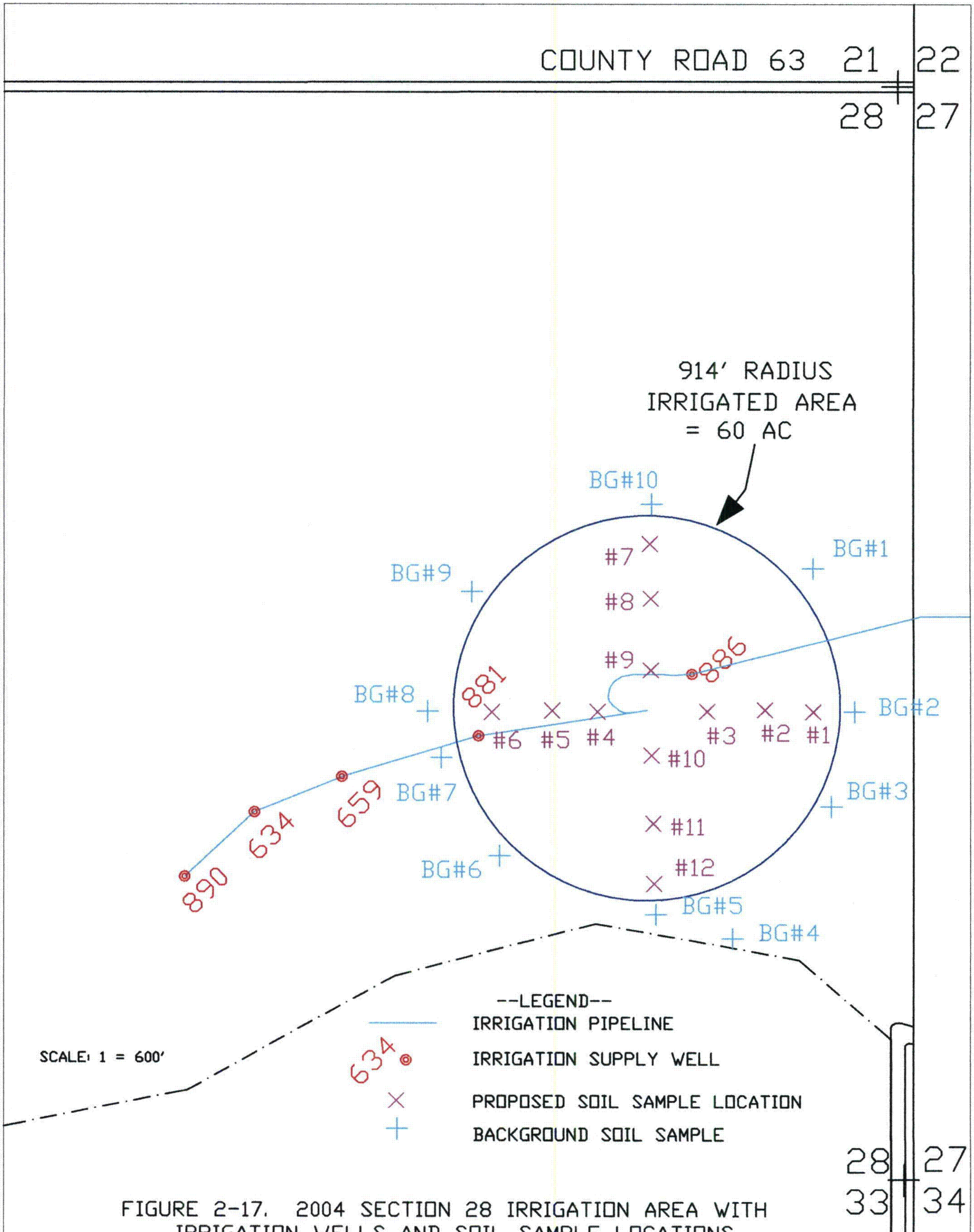

FIGURE 2-17. 2004 SECTION 28 IRRIGATION AREA WITH IRRIGATION WELLS AND SOIL SAMPLE LOCATIONS

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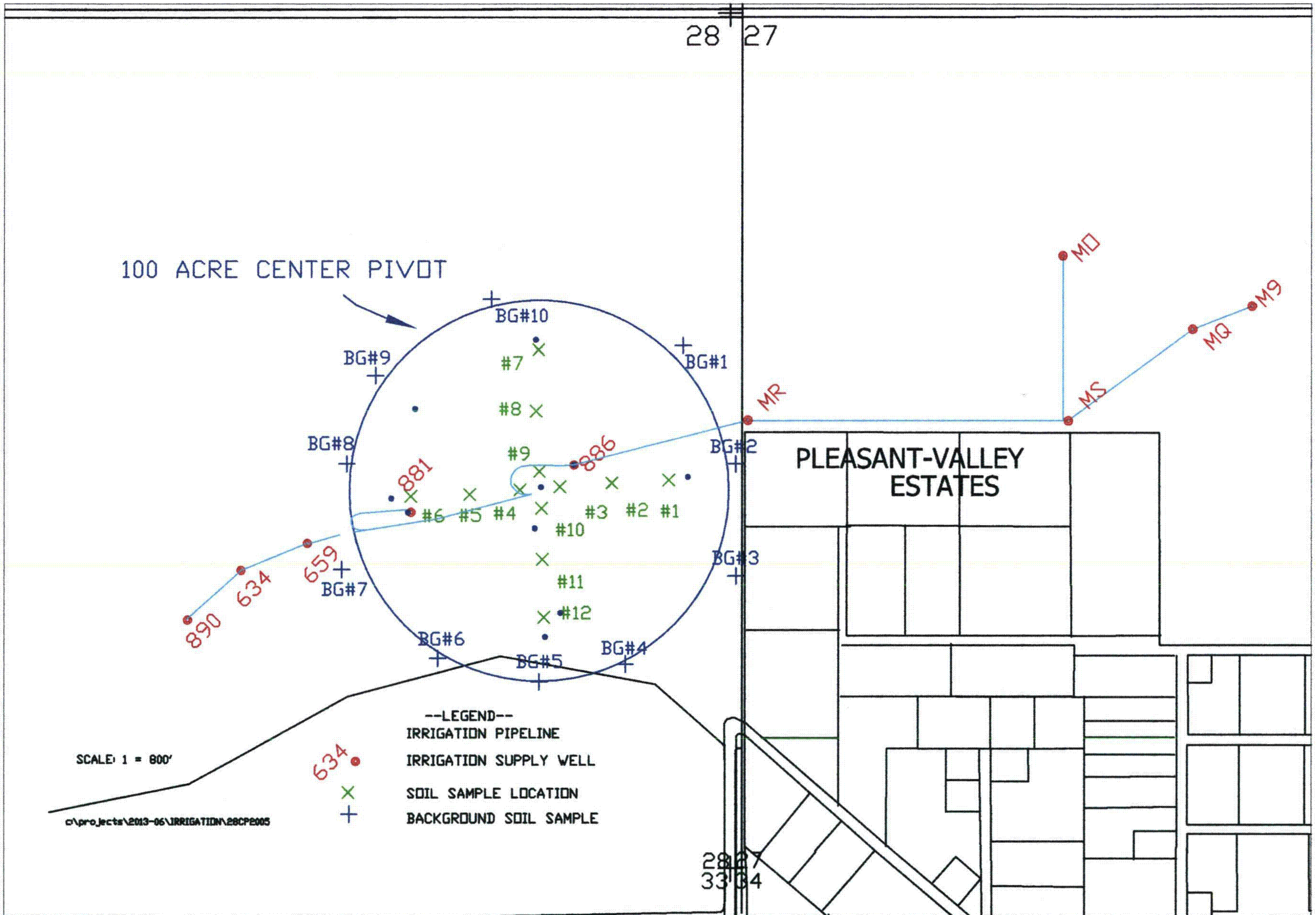


FIGURE 2-18. 2005 SECTION 28 IRRIGATION AREA WITH IRRIGATION WELLS AND SOIL SAMPLE LOCATIONS

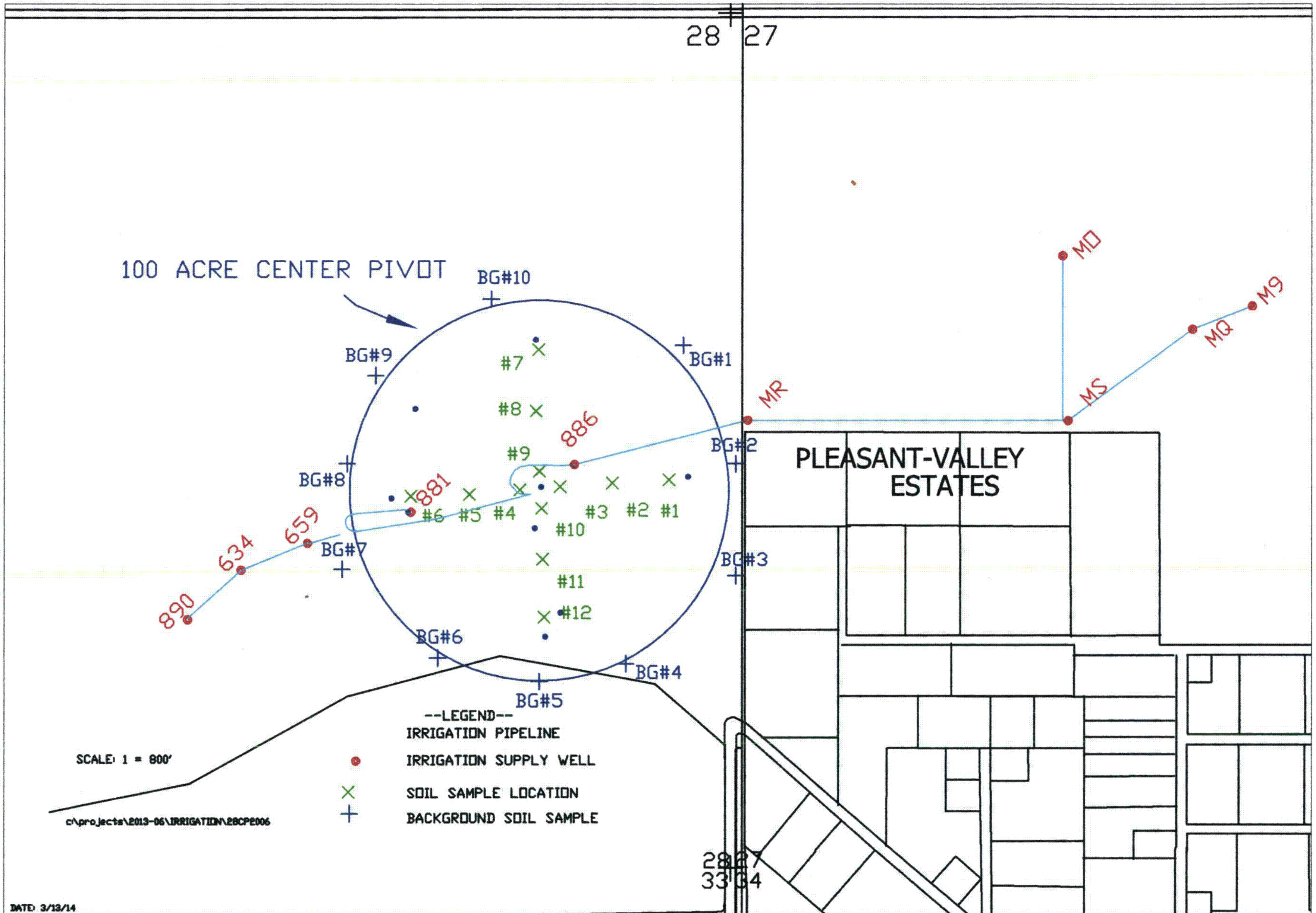


FIGURE 2-19. 2006 SECTION 28 IRRIGATION AREA WITH IRRIGATION WELLS AND SOIL SAMPLE LOCATIONS

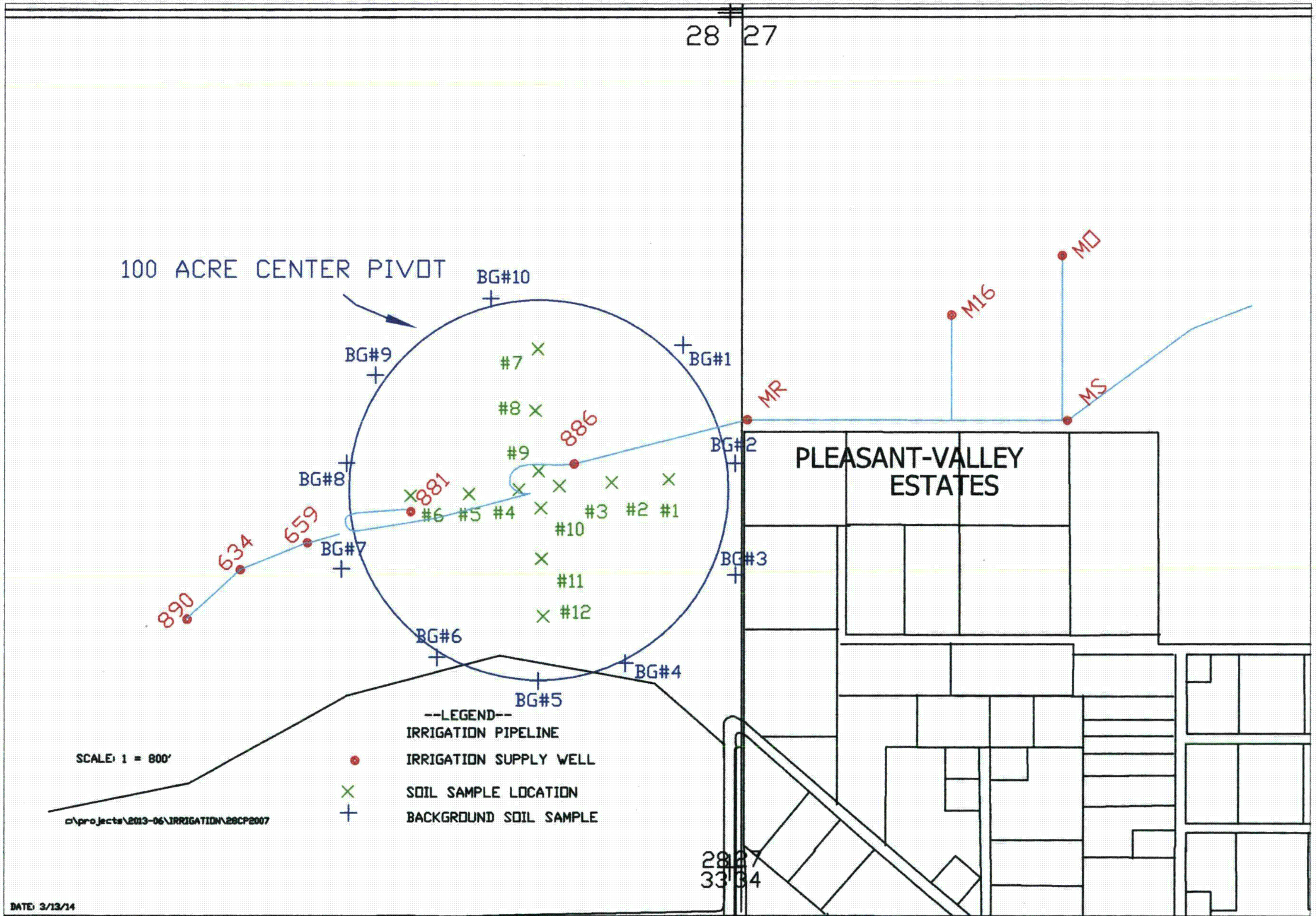


FIGURE 2-20. 2007 SECTION 28 IRRIGATION AREA WITH IRRIGATION WELLS AND SOIL SAMPLE LOCATIONS

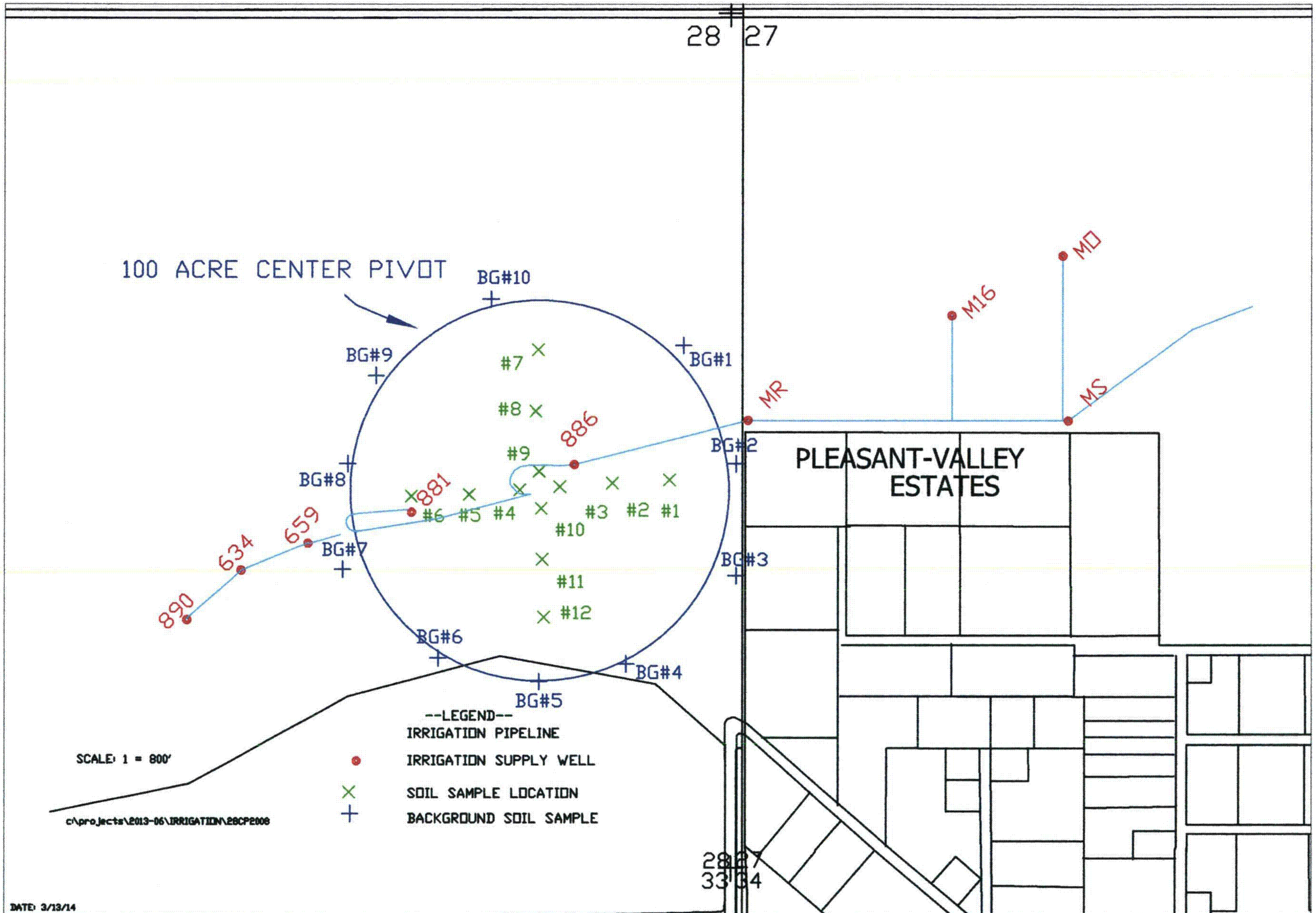


FIGURE 2-21. 2008 SECTION 28 IRRIGATION AREA WITH IRRIGATION WELLS AND SOIL SAMPLE LOCATIONS

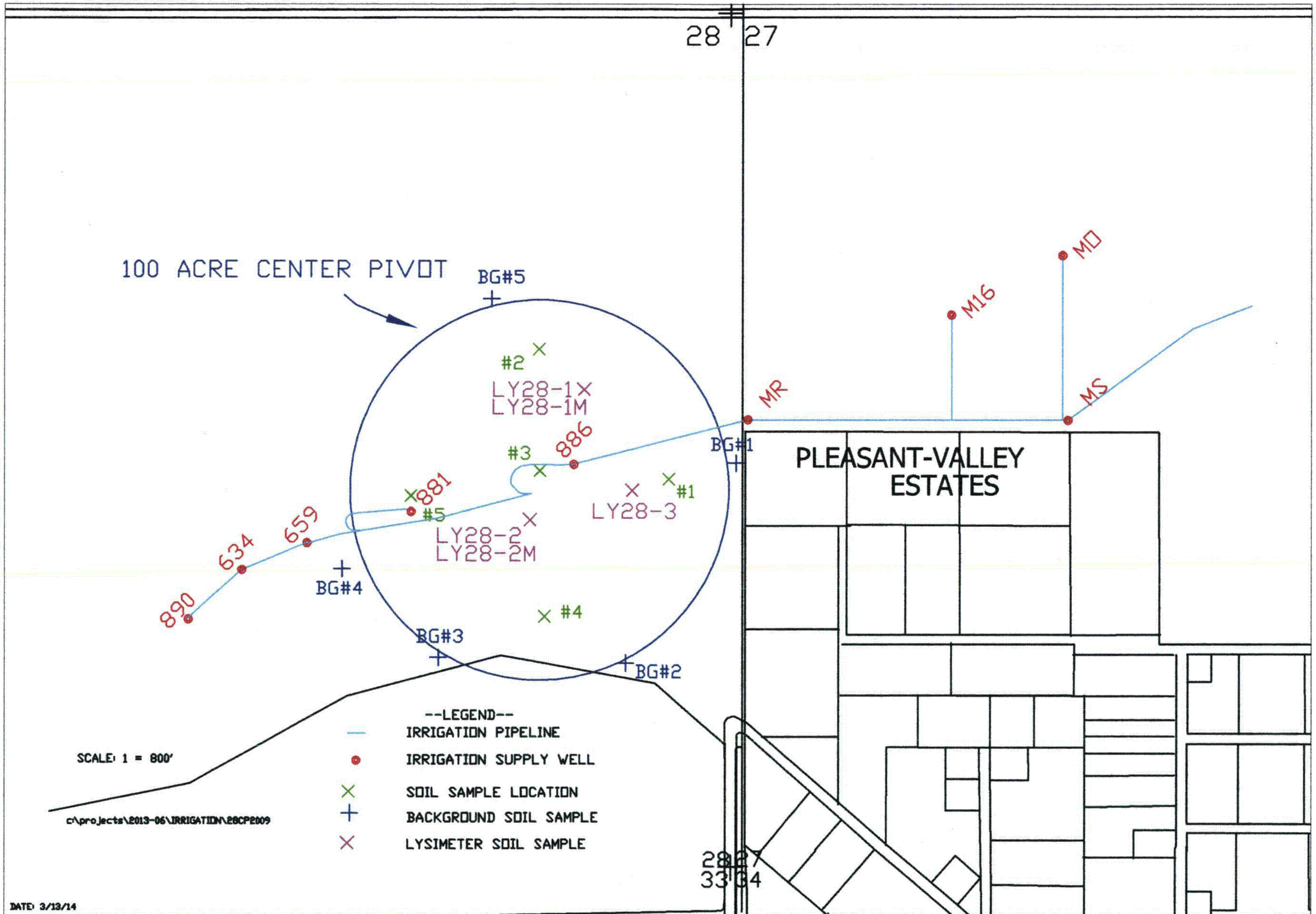


FIGURE 2-22. 2009 SECTION 28 IRRIGATION AREA WITH IRRIGATION WELLS AND SOIL SAMPLE LOCATIONS

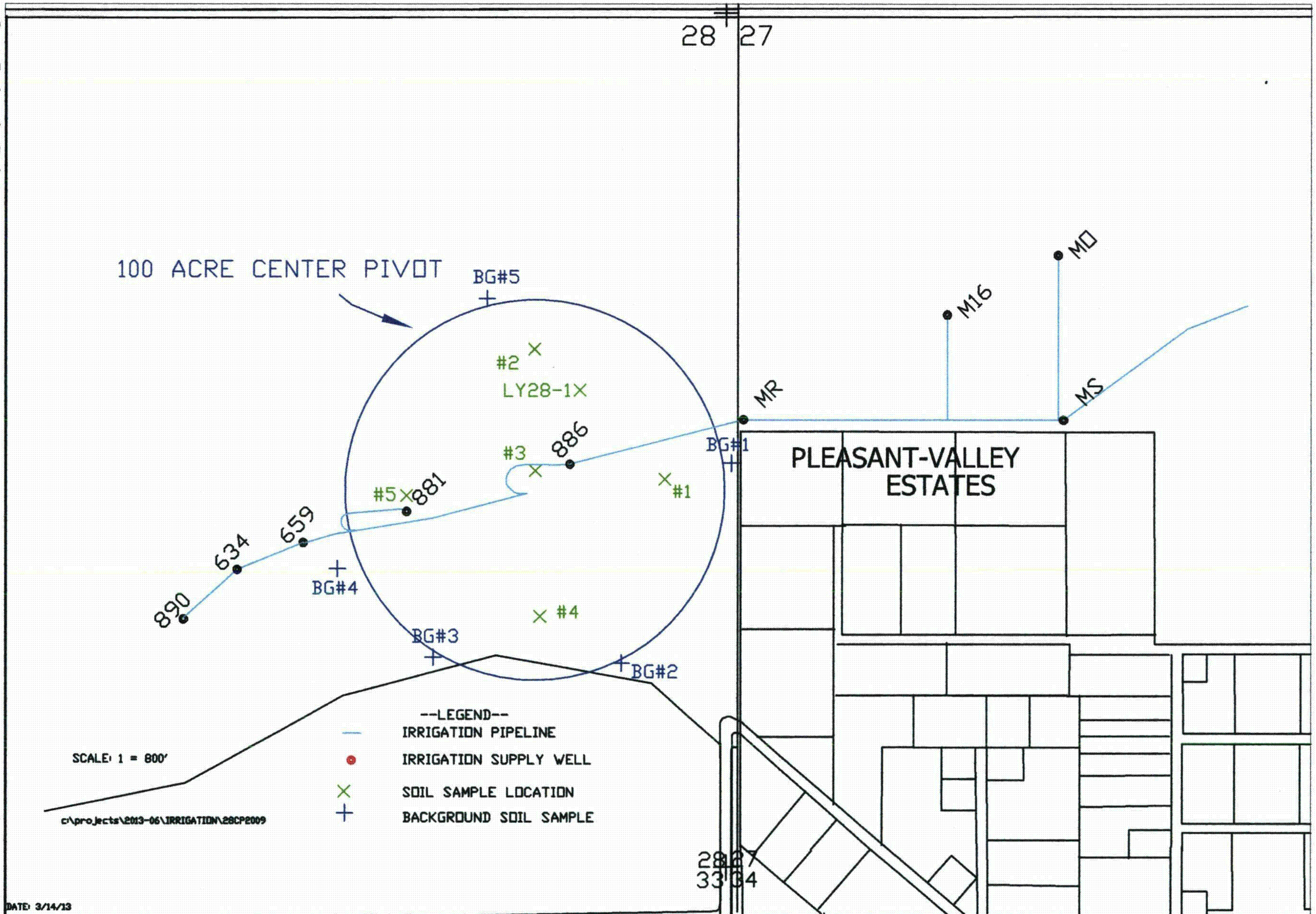


FIGURE 2-23. 2010 SECTION 28 IRRIGATION AREA WITH IRRIGATION WELLS AND SOIL SAMPLE LOCATIONS

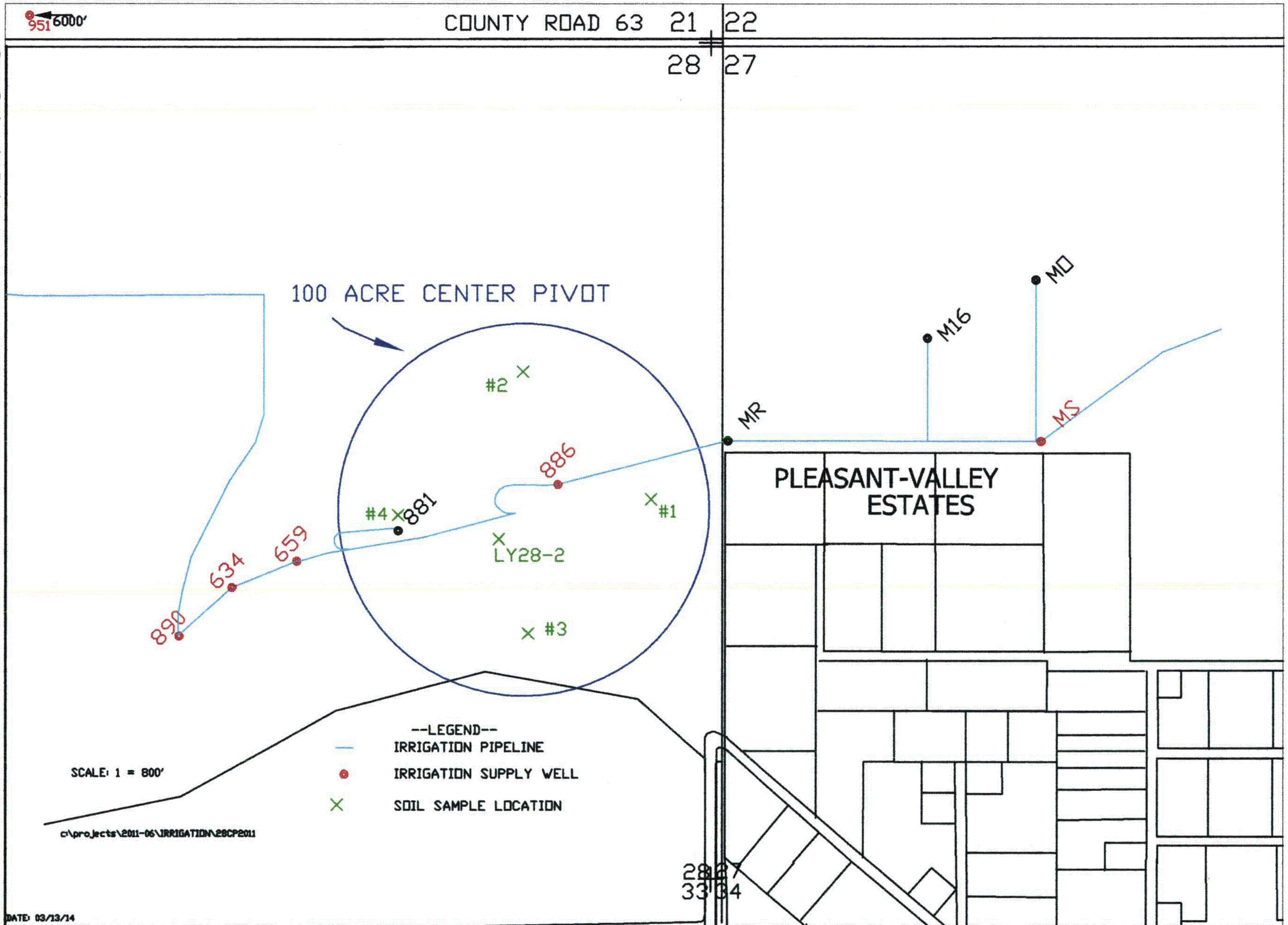


FIGURE 2-24. 2011 SECTION 28 IRRIGATION AREA WITH IRRIGATION WELLS AND SOIL SAMPLE LOCATIONS

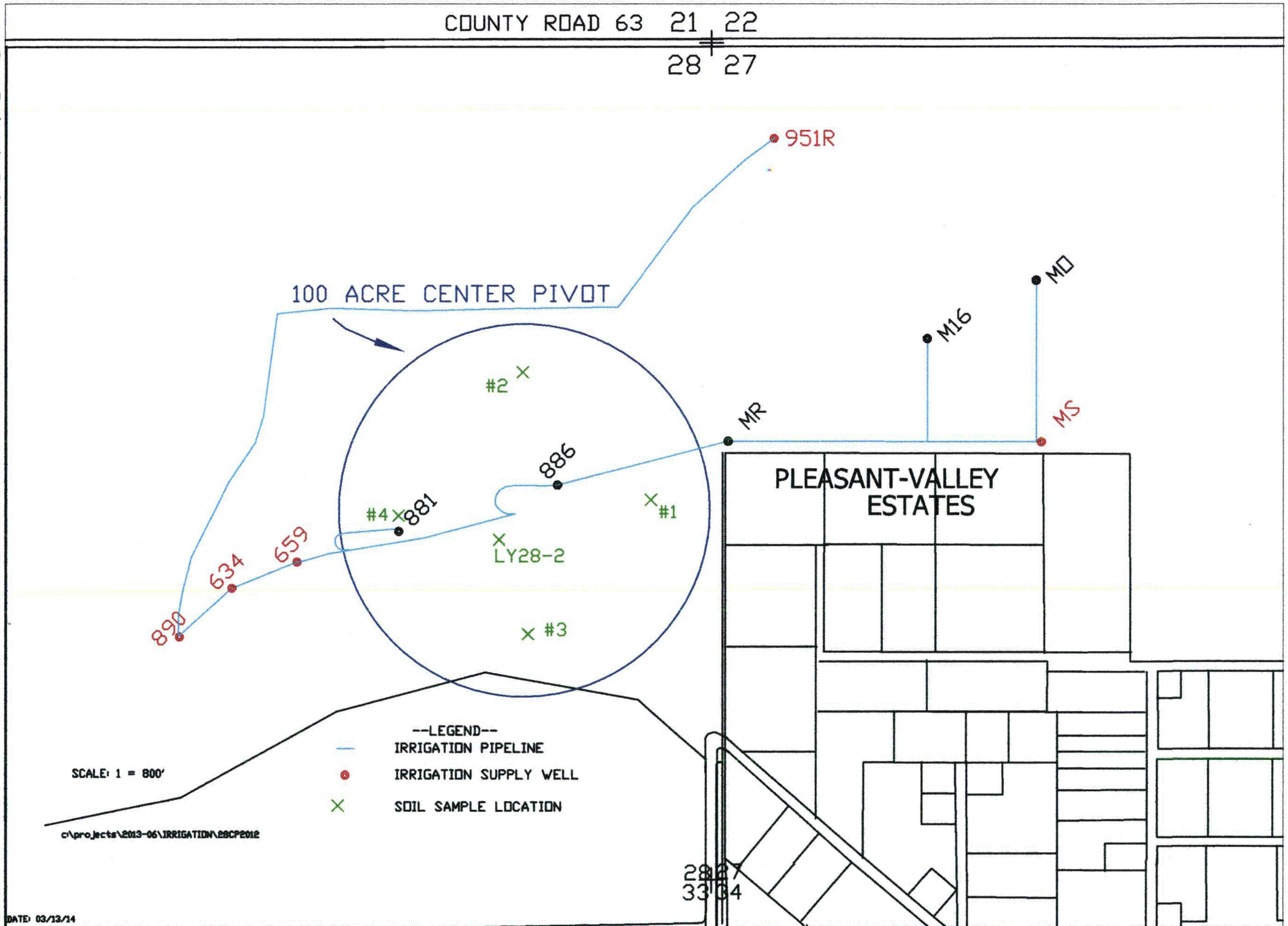


FIGURE 2-25. 2012 SECTION 28 IRRIGATION AREA WITH IRRIGATION WELLS AND SOIL SAMPLE LOCATIONS

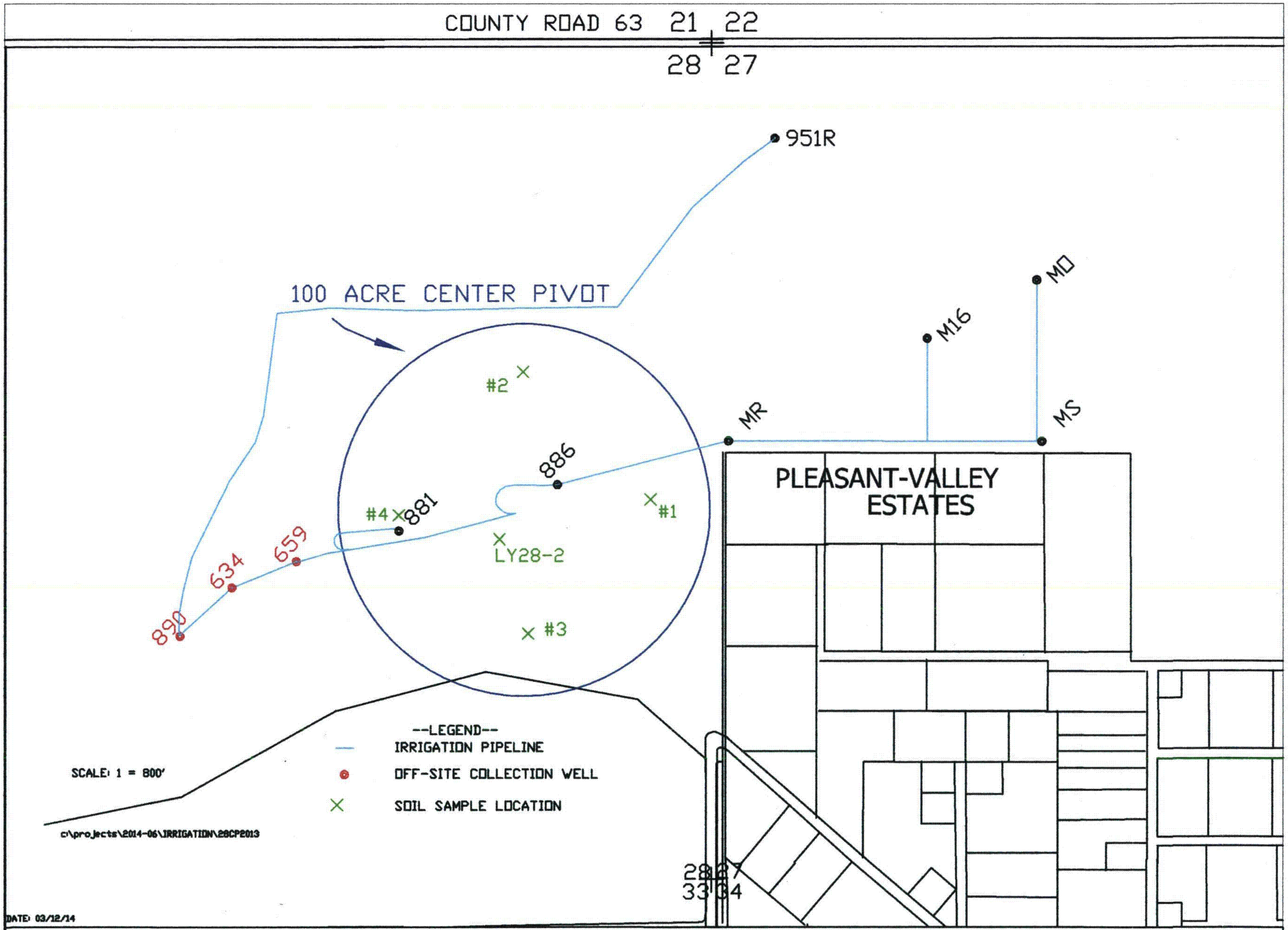


FIGURE 2-26. 2013 SECTION 28 IRRIGATION AREA WITH IRRIGATION WELLS AND SOIL SAMPLE LOCATIONS

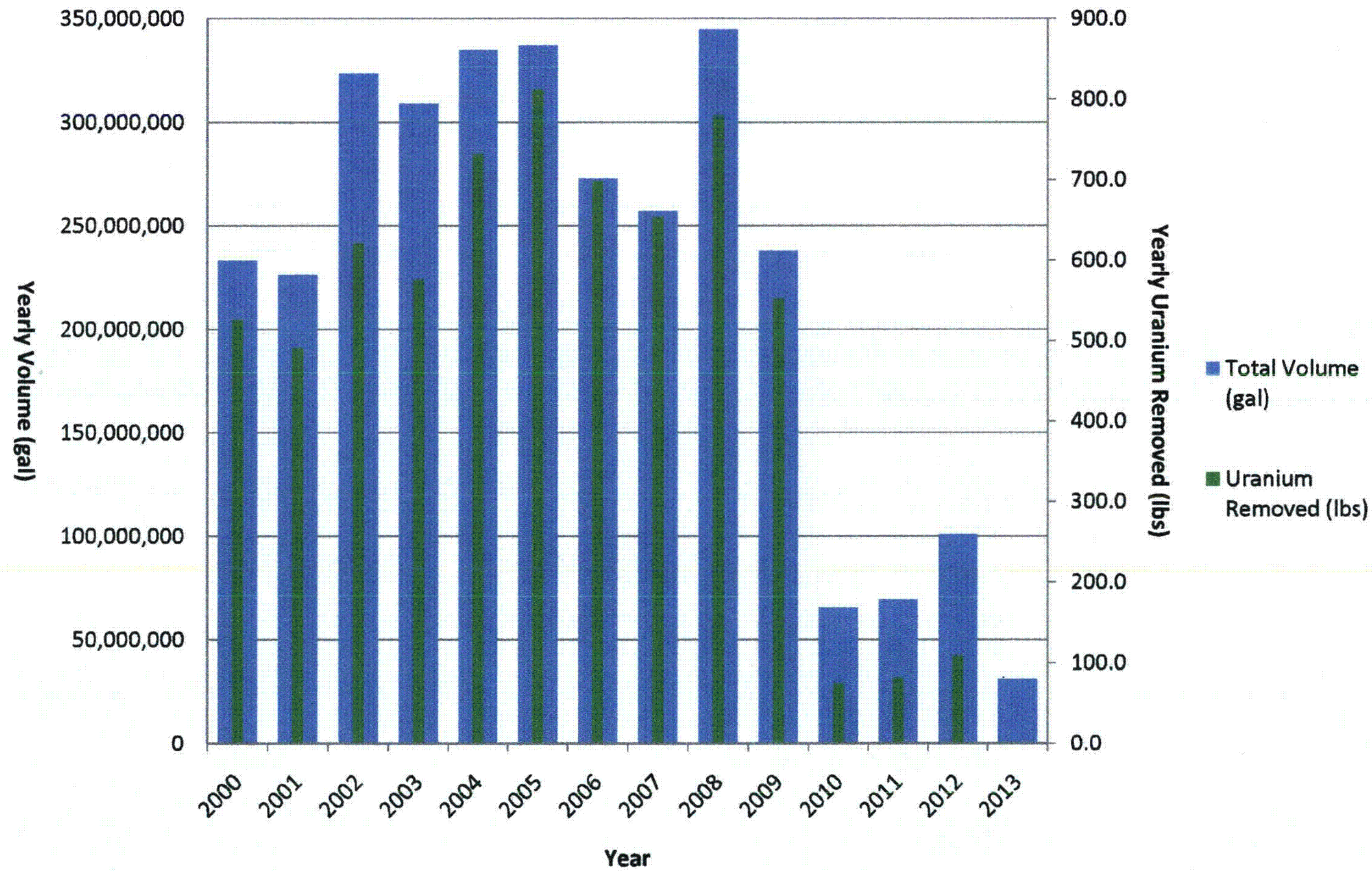


Figure 2-27. Yearly Quantity of Water and Uranium Removed

3.0 Soil and Soil Moisture Concentrations

Samples have been collected from irrigated and non-irrigated soils and analyzed for uranium, selenium, and chloride concentration to quantify the retention/adsorption of these constituents in the soil profile over time. The incremental quantity of uranium and selenium retained in soil was then used to calculate transfer coefficients from soil to hay. Chloride was tracked as a conservative constituent and used to verify observations of selenium retention in soil.

Investigators labeled the first samples collected from irrigated areas as pre-operations samples. Samples collected from adjacent, fallow areas were labeled as background samples. Areas slated for irrigation that were sampled prior to irrigation (pre-operations) were essentially background areas until they were irrigated with impacted ground water. Thus, to assist the reader, sampling areas are hereafter referred to as treated (irrigated areas) and untreated (non-irrigated areas) areas.

ACZ Laboratories, Inc. performed the analyses on the soil samples each year through 2012 and Energy Laboratories measured the soil concentrations in 2013. When testing for chloride and sulfate, ACZ consistently returned qualifiers for those two constituents stating "analysis exceeded method hold time."

Soil moisture concentrations were initially measured in the irrigated fields in 2009. Lysimeters were installed in selected locations to collect the soil moisture water samples. Three lysimeters that were not functional were replaced in 2011. Soil moisture content instruments were added in the upper soil profile in the Section 28 and 34 areas in 2012 to measure the soil moisture content variations.

3.1 Subsurface Conditions

The subsurface conditions are defined in this section. The depth to the top of the basalt is presented in this section to show the thickness of alluvial material above the basalt. Cross-sections are used to illustrate the subsurface conditions down to the base of the alluvial aquifer.

3.1.1 Section 34

The Section 34 flood area is shown on the eastern portion of Figure 3-1. This 120 acre flood area is just south of Murray Acres and the basalt is not present under any of the Section 34 flood area. Figure 3-1 shows the location of a cross-section which runs from well CW43 in the Section 33 flood area through the southern portion of the Section 34 Flood area and into the western edge of Section 35. This cross-section shows the depth to the alluvial aquifer and the base of the alluvial aquifer (see Figure 3-2). On the western side of the cross-section shown in Figure 3-2, the basalt is present and the elevation of the base of the alluvium is higher than the surrounding water-level elevation in the alluvium. The cross-section shows the location of the west fault east of well CW37, and also shows that the Upper Chinle aquifer subcrops against the alluvial aquifer in the eastern edge of this cross-section. Three lysimeters are shown on the cross section figure. The soil moisture content instruments in Section 34 are adjacent to lysimeter LY34-3 and are also shown on the cross section in Figure 3-2.

3.1.2 Section 28

Figure 3-3 shows the depth to basalt in the Section 28 center pivot area. The depth to basalt in this area generally increases from the southwest side of the center pivot where the depth to the top of the basalt is approximately 10 feet to greater than 20 feet on the northeast side of the center pivot. The cross-hatch pattern shows where the basalt does not exist in the alluvial material in the far southeast corner of Section 28. Figure 3-4 presents the cross-section from irrigation well 659 through well CW32 (see Figure 3-3 for location of this cross-section). This cross-section shows that the basalt extends down below the alluvial water level in the majority of the Section 28 center pivot area. Three irrigation supply wells are shown on this alluvial cross-section. The cross-section also shows the completion of two lysimeters and the soil moisture content instruments located adjacent to LY28-2 and LY28-2M.

3.1.3 Section 33

The depth of the alluvial material to the top of the basalt is presented in Figure 3-5 for the Section 33 area. This figure shows that the depth of the basalt below the land surface varies from less than 5 feet in the southwestern portion of Section 33 center pivot to greater than 20 feet in the southeastern portion of the pivot. The limits of the basalt are shown in the area of the eastern portion of Section 33 where the basalt is absent. It is shown by a cross-hatch pattern. Figure 3-5 shows the location of a cross-section that goes from irrigation well 657 to San Andres well 907 in Section 4. Figure 3-6 shows the cross-section indicating thickness of the alluvial material above the basalt and the thickness of the basalt. The base of the alluvial material is also shown on this cross-section and the alluvial water-level elevation is also presented to show how much of the alluvial material is saturated. The cross-section also shows the alluvial wells with their completion interval and also the depth of installation of lysimeters along this cross-section. The lysimeters results are presented later in Section 3.4.

3.2 Background Soil Concentrations

Naturally-occurring uranium and selenium concentrations in untreated soils were determined in two studies. In 1998, HMC characterized uranium and selenium concentrations in soils, prior to selecting fields for the irrigation study. In 1999, HMC investigated chloride concentrations in Sections 33 and 34 prior to the start of irrigation. HMC has also collected and analyzed soil background samples immediately prior to and during the irrigation program through 2010. The mean background soil concentration is considered to be well defined and no additional soil samples outside of the irrigation areas were collected in 2011 through 2013.

3.2.1 1998 Investigation

The first investigation (RIMCON and Hydro-Engineering, 1998) was completed prior to the selection of treatment areas. Surface and near-surface soil samples were collected inside and outside the fields slated for irrigation. The samples were analyzed for uranium and selenium concentrations and parameters to define soil types.

At the time of sampling, surface soils in Sections 28, 33, and 34 were placed in three general categories: loamy sand, sandy loam, and sandy clay loam, respectively. The percentage of clay in these soils appeared to increase from Section 28 to 33 to 34 (RIMCON and Hydro-Engineering, 1998).

The 1998 results are listed in Tables 3-1, 3-2 and 3-3 for Section 34, 28, and 33, respectively, along with recent "untreated area" background analyses. A "1998" in the comment column in the tables indicate the sample was taken during the 1998 background investigation. Figure 3-7 shows the location of the soil samples collected in Sections 33, 34, and Section 28. Seven soil samples collected from Section 33 were analyzed for uranium and selenium. The two eastern Section 33 soil results are included with the Section 34 results in Table 3-1 because the soil in eastern Section 33 is similar to the clay soils in Section 34. This figure also shows nine samples in Section 34 and one in the northern portion of Section 3 that are considered to be representative of the area for Section 34. Figure 3-7 also shows the location of seven samples in Section 28 and one along the western edge of Section 27 that were used to define the background concentrations in Section 28 in the 1998 investigation.

3.2.2 Background Determinations during Ongoing Investigation

Additional background samples were collected in treated (pre-operational) and untreated areas, starting in 1999. HMC continued to collect samples from the treated (post-treatment) and untreated areas in subsequent years with collection from the untreated areas ceasing after the 2010 samples.

The background soil samples were analyzed by ACZ Laboratories, Inc. Uranium concentrations were determined using U.S. Environmental Protection Agency (EPA) Method 6020 ICP-MS, with an MDL of 0.03 mg/kg for all samples collected in 2000, 2002, 2003 and 2004; 0.01 mg/kg in 2001; 0.06 mg/kg in 2005; and 0.05 mg/kg in 1999 and 2006 through 2010.

Selenium concentrations in samples collected from 1999-2001 were determined using EPA Method 7742 Modified AA-Hydride, with an MDL of 0.1 mg/kg. The 2002 selenium analyses were determined using three methods. The samples were first analyzed using EPA Method 6020 ICP-MS, with an MDL of 0.8 mg/kg. The samples were then re-analyzed twice: first by way of EPA Method 7742 modified AA-Hydride, followed by EPA Method 6020 ICP-MS. The latter analysis was performed because selenium concentrations reported by way of EPA Method 7742 were below the relatively high MDL of 0.6 mg/kg. A lower MDL (0.05 mg/kg) was then obtained in subsequent years, using EPA Method 6020. The EPA M6020 ICP-MS method was used for 2003 through 2010 samples. All selenium concentrations reported in 2002 were below the MDL of 0.60 mg/kg, limiting the usefulness of the data. The 2002 results were not considered in evaluating trends in selenium concentrations, because selenium concentrations prior to and after 2002 were lower than the lowest MDL observed in 2002 by a factor of two.

3.2.3 Mean Background Soil Concentrations

Mean background is defined as the average of the untreated, pre-irrigation-treated and background concentrations of constituents in all such samples collected to date (see Tables 3-1 through 3-3 for updated mean background values). This value is designated by section and layer(s) and is updated with new data as they are obtained through 2010. The 2013 mean background concentrations are the same as the 2010 values because no additional background soil samples were collected. These mean background values are used to calculate uptake of a constituent in the treated areas. Figures 3-8, 3-12 and 3-16 show the data used to calculate the mean uranium background concentrations for the upper three foot intervals for Section 34, 28 and 33 respectively. Figures 3-10, 3-14 and 3-18 depict the mean background plots for selenium.

In Section 34, the 2010 and 2013 mean background uranium concentrations were 2.00 (0-1 ft), 1.54 (1-2 ft), and 1.12 (2-3 ft) mg/kg. Table 3-1 presents the constituents in Section 34 background soils. The Section 34 soils generally show a decrease in mean uranium concentrations with increasing depth, but the difference between concentrations for each depth interval is greater in Section 34. A few results appeared to be outliers and were not used to calculate concentrations. Note that the six eastern samples from Section 33 are included in the Section 34 table because the soils from these two samples are primarily clays. The Sections 33 and 34 clay soils are combined in Table 3-1 to define the background concentrations for the two flood irrigated areas.

The background values for the deeper Section 34 soils from 3-4 to 11-13 feet varied from 0.55 to 1.12 mg/kg. The corresponding mean background concentrations for the upper three feet for selenium and chloride are 0.35, 0.29, and 0.26 mg/kg; and 70, 100, and 92 mg/kg, respectively. Table 3-1 lists uranium, selenium, and chloride concentrations in the 1998 and 1999 background samples and those collected near the Section 34 irrigation area from 2000 through 2010. This table is broken into eleven depth intervals: 0-1 through 15-17 ft. Results from a sample are listed in the depth interval if at least 6 inches (in) of the sample is from the interval.

In Section 28, the mean background uranium concentrations were 0.60 (0-1 ft), 0.52 (1-2 ft), and 0.51 (2-3 ft) mg/kg. Table 3-2 presents the results for Section 28. Mean background uranium concentrations for the first three Section 33 intervals are 0.80 (0-1 ft), 0.69 (1-2 ft), and 0.73 mg/kg (2-3 ft).

The mean background concentrations of selenium are similar in Sections 28 and 33. Selenium concentrations in Section 34 are generally higher, presumably because of their association with clay soils. Measurements for uranium, selenium, and chloride showed a high degree of variability between and within fields, with coefficients of variation (100 x standard deviation/mean) ranging between 0 and 89 percent.

Table 3-1. Pre-Operations and Background Soil Sample Results for Section 34

Interval (ft)	Location ID	Area	Depth (in)	Natural Uranium (pCi/g)	Natural Uranium mg/kg	Selenium (mg/kg)	Chloride (mg/kg)	Comment
0-1	S33-1	Untreated	0-6	0.96	1.42	0.13	----	1998
	S33-1	Untreated	6-24	1.23	1.82	0.19	----	1998
	S33-2	Untreated	0-6	1.12	1.65	0.18	----	1998
	S33-2	Untreated	6-24	1.02	1.51	0.19	----	1998
	S3-1	Untreated	0-14	0.70	1.03	0.11	----	1998
	S34-1	Untreated	3-24	@5.85	@8.77	0.10	----	1998
	S34-3	Treated	4-26	1.03	1.52	0.11	----	1998
	S34-5	Untreated	3-40	0.84	1.24	0.14	----	1998
	S34-7	Untreated	3-28	0.78	1.15	0.06	----	1998
	S34-8	Untreated	2-30	1.26	1.86	0.31	----	1998
	S34-10	Untreated	3-28	1.01	1.49	0.13	----	1998
	S34-11	Untreated	3-15	1.36	2.01	0.03	----	*1998
	S34-13	Untreated	4-18	@3.93	@5.81	0.11	----	1998
	S34-14	Treated	4-24	0.79	1.17	0.19	----	1998
	34A	Treated	0-6	1.84	2.72	0.40	36	1999
	34B	Treated	0-6	1.60	2.36	0.40	54	1999
	34C	Treated	0-6	1.18	1.75	0.30	79	1999
	34D	Treated	0-6	2.44	3.60	0.60	36	1999
	34E	Treated	0-6	1.56	2.31	0.40	25	1999
	34F	Treated	0-6	2.05	3.03	0.80	68	1999
	34G	Treated	0-6	1.25	1.85	0.30	13	1999
	34H	Treated	0-6	2.29	3.38	0.70	43	1999
	34I	Treated	0-6	0.67	0.99	0.10	42	1999
	BG-1-34	Untreated	0-12	1.67	2.47	0.30	100	2001
	BG-1-34	Untreated	0-12	0.30	0.45		7	#2002
	BG-1-34	Untreated	0-12	1.58	2.33	0.42	83	2003
	BG-1-34	Untreated	0-12	1.89	2.79	0.75	151	2004
	BG-1-34	Untreated	0-12	1.63	2.41	0.53	@400	2005
	BG-1-33F	Untreated	0-12	1.06	1.56	0.47	30	2004
	BG-1-33F	Untreated	0-12	0.76	1.12	0.25	76	2005
	BG-1-33F	Untreated	0-12	1.05	1.55	0.56	24	2006
	BG-1-34	Untreated	0-12	2.07	3.06	0.69	@253	2006
	BG-1-33F	Untreated	0-12	1.21	1.79	0.38	64	2007
	BG-1-34	Untreated	0-12	2.23	3.30	0.74	@267	2007
	BG-1-33F	Untreated	0-12	0.97	1.44	0.32	@220	2008
	BG-1-34	Untreated	0-12	1.71	2.52	0.57	@289	2008
	BG-1-33F	Untreated	0-12	0.83	1.22	0.23	50	2009
	BG-1-34	Untreated	0-12	2.27	3.35	0.59	135	2009
	BF-1-33F	Untreated	0-12	0.96	1.42	0.27	150	2010
	BF-1-34	Untreated	0-12	2.21	3.27	0.58	199	2010
			Mean	1.35	2.00	0.35	69.76	
			SDV	0.55	0.81	0.22	51.23	
			CV	40.34	40.37	63.10	73	

Table 3-1. Pre-Operations and Background Soil Sample Results for Section 34 (continued)

Interval (ft)	Location ID	Area	Depth (in)	Natural Uranium (pCi/g)	Natural Uranium mg/kg	Selenium (mg/kg)	Chloride (mg/kg)	Comment
1-2	S33-1	Untreated	6-24	1.23	1.82	0.19	----	1998
	S33-2	Untreated	6-24	1.02	1.51	0.19	----	1998
	S3-1	Untreated	14-38	0.71	1.05	0.09	----	1998
	S34-1	Untreated	3-24	@5.85	@8.77	0.10	----	1998
	S34-3	Treated	4-26	1.03	1.52	0.11	----	1998
	S34-5	Untreated	3-40	0.84	1.24	0.14	----	1998
	S34-7	Untreated	3-28	0.78	1.15	0.06	----	1998
	S34-8	Untreated	2-30	1.26	1.86	0.31	----	1998
	S34-10	Untreated	3-28	1.01	1.49	0.13	----	1998
	S34-11	Untreated	15-60	0.58	0.86	0.03	----	*1998
	S34-13	Untreated	4-18	@3.93	@5.81	0.11	----	1998
	S34-13	Untreated	18-30	0.68	1.00	0.14	----	1998
	S34-14	Treated	4-24	0.79	1.17	0.19	----	1998
	BG-2	Untreated	12-24	1.30	1.92	0.20	120	2001
	BG-2	Untreated	12-24	0.36	0.53		4	#2002
	BG-2	Untreated	12-24	0.99	1.46	0.35	131	2003
	BG-2-34	Untreated	12-24	1.38	2.04	0.68	----	2004
	BG-2-34	Untreated	12-24	1.65	2.44	0.69	----	2005
	BG-2-33F	Untreated	12-24	0.88	1.30	0.39	35	2004
	BG-2-33F	Untreated	12-24	0.62	0.92	0.20	103	2005
	BG-2-33F	Untreated	12-24	0.78	1.15	0.35	20	2006
	BG-2-34	Untreated	12-24	@2.66	@3.93	@0.87	@219	2006
	BG-2-33F	Untreated	12-24	0.87	1.29	0.31	57	2007
	BG-2-34	Untreated	12-24	1.87	2.67	0.78	@271	2007
	BG-2-33F	Untreated	12-24	0.80	1.18	0.31	90	2008
	BG-2-34	Untreated	12-24	1.48	2.19	0.48	@257	2008
	BG-2-33F	Untreated	12-24	1.08	1.60	0.29	70	2009
	BG-2-34	Untreated	12-24	1.46	2.15	0.39	168	2009
	BG-2-33F	Untreated	12-24	0.99	1.46	0.27	120	2010
	BG2-34	Untreated	12-24	1.77	2.61	0.56	284	2010
			Mean	1.04	1.54	0.29	100.17	
			SDV	0.38	0.55	0.20	75.64	
			CV	35.99	35.57	69.20	76	

Table 3-1. Pre-Operations and Background Soil Sample Results for Section 34 (continued)

Interval (ft)	Location ID	Area	Depth (in)	Natural Uranium (pCi/g)	Natural Uranium mg/kg	Selenium (mg/kg)	Chloride (mg/kg)	Comment
	S33-1	Untreated	24-48	1.32	1.95	0.23	----	1998
	S3-1	Untreated	14-38	0.71	1.05	0.09	----	1998
	S34-1	Untreated	24-36	0.43	0.64	0.13	----	1998
	S34-5	Untreated	3-40	0.84	1.24	0.14	----	1998
	S34-7	Untreated	28-40	0.43	0.64	0.41	----	1998
	S34-8	Untreated	30-60	0.69	1.02	0.34	----	1998
	S34-13	Untreated	18-30	0.68	1.00	0.14	----	1998
	S33-2	Untreated	24-48	0.40	0.59	0.09	----	1998
	S34-11	Untreated	15-60	0.58	0.86	0.03	----	*1998
	S34-14	Treated	30-90	0.20	0.30	0.03	----	*1998
	BG-3	Untreated	24-36	0.53	0.79	0.20	120	2001
	BG-3	Untreated	24-36	0.27	0.40		4	#2002
	BG-3	Untreated	24-36	1.12	1.66	0.36	141	2003
2-3	BG-3-34	Untreated	24-36	0.93	1.38	0.40	@169	2004
	BG-3-33F	Untreated	24-36	0.90	1.33	0.42	30	2004
	BG-3-34	Untreated	24-36	1.44	2.13	0.51	@354	2005
	BG-3-33F	Untreated	24-36	0.61	0.90	0.19	81	2005
	BG-3-33F	Untreated	24-36	0.71	1.05	0.34	14	2006
	BG-3-34	Untreated	24-36	1.55	2.29	0.54	@259	2006
	BG-3-33F	Untreated	24-36	0.84	1.24	0.35	43	2007
	BG-3-34	Untreated	24-36	1.11	1.64	0.53	@246	2007
	BG-3-33F	Untreated	24-36	0.66	0.97	0.25	@170	2008
	BG-3-34	Untreated	24-36	0.85	1.26	0.27	@210	2008
	BG-3-33F	Untreated	24-36	0.41	0.61	0.10	40	2009
	BG-3-34	Untreated	24-36	0.43	0.63	0.17	159	2009
	BG-3-33F	Untreated	24-36	0.58	0.86	0.17	110	2010
	BG-3-34	Untreated	24-36	1.14	1.69	0.42	265	2010
			Mean	0.75	1.12	0.26	91.55	
			SDV	0.35	0.52	0.16	77.99	
			CV	46.26	46.20	58.99	85	

Interval (ft)	Location ID	Area	Depth (in)	Natural Uranium (pCi/g)	Natural Uranium mg/kg	Selenium (mg/kg)	Chloride (mg/kg)	Comment
	S34-11	Untreated	15-60	0.58	0.86	<0.05	----	1998
	S34-1	Untreated	36-60	0.39	0.58	0.068	----	1998
	S34-8	Untreated	30-60	0.69	1.02	0.34	----	1998
	S33-1	Untreated	24-48	1.32	1.95	0.23	----	1998
	S33-8	Untreated	20-48	0.35	0.52	<0.05	----	1998
	S33-9	Untreated	24-48	0.70	1.03	0.10	----	1998
	S33-10	Untreated	30-60	0.40	0.59	<0.05	----	1998
3-4	S34-14	Treated	30-90	0.2	0.3	<0.05	----	1998
	S34-5	Untreated	40-53	0.3	0.44	0.08	----	1998
	S33-2	Untreated	24-48	0.40	0.59	0.09	----	1998
	S32-2	Treated	24-48	0.39	0.58	<0.05	----	1998
	BG-43-33F	Untreated	24-36	0.59	0.87	0.12	12	2009
	BG-4-34	Untreated	24-36	0.37	0.55	0.10	135	2009
	BG-4-33F	Untreated	36-48	0.64	0.94	0.16	40	2010
	BG-4-34	Untreated	36-48	0.38	0.56	0.17	105.00	2010
			Mean	0.51	0.76	0.15	73.00	
			SDV	0.27	0.40	0.08	56.80	
			CV	52.25	52.12	57.54	77.81	

Table 3-1. Pre-Operations and Background Soil Sample Results for Section 34 (continued)

Interval (ft)	Location ID	Area	Depth (in)	Natural Uranium (pCi/g)	Natural Uranium mg/kg	Selenium (mg/kg)	Chloride (mg/kg)	Comment
4-5	S34-11	Untreated	15-60	0.58	0.86	<0.05	----	1998
	S34-1	Untreated	36-60	0.39	0.58	0.068	----	1998
	S34-8	Untreated	30-60	0.69	1.02	0.34	----	1998
	S33-10	Untreated	30-60	0.40	0.59	<0.05	----	1998
	S34-3	Treated	50-90	0.2	0.3	<0.05	----	1998
	S34-14	Treated	30-90	0.2	0.3	<0.05	----	1998
	S34-5	Treated	40-53	0.76	1.12	0.07	----	1998
	BG-5-33F	Untreated	24-36	0.59	0.87	0.12	30	2009
	BG-5-34	Untreated	24-36	0.22	0.33	0.04	55	2009
	BG-5-33F	Untreated	48-60	0.39	0.58	<0.05	30	2010
	BG-5-34	Untreated	48-60	0.35	0.52	0.11	156.00	2010
			Mean	0.43	0.64	0.12	67.75	
			SDV	0.20	0.29	0.11	60.00	
			CV	45.04	44.75	87.85	88.56	

Interval (ft)	Location ID	Area	Depth (in)	Natural Uranium (pCi/g)	Natural Uranium mg/kg	Selenium (mg/kg)	Chloride (mg/kg)	Comment
5-7	S34-5	Untreated	53-73	0.76	1.12	0.07	----	1998
	S34-11	Untreated	60-90	0.26	0.38	<0.05	----	1998
	BG 5-7-33F	Untreated	60-72	0.28	0.42	0.05	60	2009
	BG 5-7-34	Untreated	60-72	0.21	0.31	0.04	33	2009
	BG 5-7-33F	Untreated	60-72	0.35	0.52	<0.05	50	2010
	BG 5-7-34	Untreated	60-72	0.35	0.52	0.09	79.00	2010
			Mean	0.37	0.55	0.06	55.50	
			SDV	0.20	0.29	0.02	19.23	
			CV	53.80	53.81	35.43	34.64	

Interval (ft)	Location ID	Area	Depth (in)	Natural Uranium (pCi/g)	Natural Uranium mg/kg	Selenium (mg/kg)	Chloride (mg/kg)	Comment
7-9	S34-11	Untreated	60-90	0.26	0.38	<0.05	----	1998
	BG 7-9-33F	Untreated	72-96	0.24	0.35	<0.05	70	2009
	BG 7-9-34	Untreated	72-96	0.63	0.93	0.09	84	2009
	BG 7-9-33F	Untreated	72-96	0.22	0.33	<0.05	40	2010
	BG 7-9-34	Untreated	72-96	0.55	0.81	0.12	51.00	2010
			Mean	0.38	0.56	0.11	61.25	
			SDV	0.19	0.29	0.02	19.59	
			CV	51.01	51.20	20.20	31.98	

Interval (ft)	Location ID	Area	Depth (in)	Natural Uranium (pCi/g)	Natural Uranium mg/kg	Selenium (mg/kg)	Chloride (mg/kg)	Comment
9-11	BG 9-11-33F	Untreated	96-120	0.30	0.44	0.07	40	2009
	BG 9-11-34	Untreated	96-120	0.75	1.11	0.17	139	2009
	BG 9-11-33F	Untreated	96-120	0.18	0.27	<0.05	40	2010
	BG 9-11-34	Untreated	96-120	0.62	0.91	0.11	100	2010
			Mean	0.46	0.68	0.12	79.75	
			SDV	0.27	0.39	0.05	48.58	
			CV	57.59	57.59	43.14	60.92	

Table 3-1. Pre-Operations and Background Soil Sample Results for Section 34 (continued)

Interval (ft)	Location ID	Area	Depth (in)	Natural Uranium (pCi/g)	Natural Uranium mg/kg	Selenium (mg/kg)	Chloride (mg/kg)	Comment
11-13	BG 11-13-33F	Untreated	120-144	0.90	1.33	0.14	60	2009
	BG 11-13-34	Untreated	120-144	0.85	1.26	1.31	150	2009
	BG 11-13-33F	Untreated	120-144	0.44	0.65	0.07	<30	2010
	BG 11-13-34	Untreated	120-144	0.83	1.23	0.14	63	2010
			Mean	0.76	1.12	0.42	91.00	
			SDV	0.21	0.31	0.60	51.12	
			CV	28.14	28.14	143.99	56.17	

Interval (ft)	Location ID	Area	Depth (in)	Natural Uranium (pCi/g)	Natural Uranium mg/kg	Selenium (mg/kg)	Chloride (mg/kg)	Comment
13-15	BG 13-15-34	Untreated	144-168	0.65	0.96	0.53	57	2009
15-17	BG 15-17-34	Untreated	168-192	0.66	0.97	0.27	62	2009

@ = considered an outlier, did not use
* = 1998 Se Reported as less than LLD of 0.05 mg/kg, used 0.025
# = 2002 Se MDL= 0.8 All data reported as < MDL, did not use
CV = coefficient of variation
SDV = standard deviation

Table 3-2. Pre-Operations and Background Soil Sample Results for Section 28

Interval (ft)	Location ID	Area	Depth (in)	Natural Uranium (pCi/g)	Natural Uranium mg/kg	Selenium mg/kg	Chloride (mg/kg)	Comment
0-1	S28-2	Untreated	0-40	@1.06	@1.57	0.14	----	1998
	S28-3	Untreated	4-22	0.23	0.34	0.18	----	1998
	S28-9	Treated	0-40	0.33	0.49	0.06	----	1998
	NE27-1	Untreated	0-6	0.34	0.50	0.03	----	*1998
	NE28-2	Untreated	0-6	0.24	0.35	0.03	----	*1998
	NE28-4	Untreated	0-8	0.13	0.19	0.16	----	1998
	NE28-5	Untreated	0-12	0.50	0.74	0.10	----	1998
	NE28-7	Untreated	0-8	0.51	0.75	0.12	----	1998
	BG-1	Untreated	0-12	2.02	@2.99		14	#2002
	BG-1	Untreated	0-12	0.35	0.51	0.15	6	2003
	BG-1	Untreated	0-12	0.60	0.88	0.22	12	2004
	BG-1	Untreated	0-12	0.32	0.47	0.12	@283	2005
	BG-1	Untreated	0-12	0.42	0.62	0.10	19	2006
	BG-1	Untreated	0-12	0.53	0.78	0.23	32	2007
	BG-1	Untreated	0-12	0.40	0.59	0.15	@220	2008
	BG-1	Untreated	0-12	0.75	1.11	0.16	60	2009
	BG-1	Untreated	0-12	0.44	0.65	0.16	30	2010
			Mean	0.41	0.60	0.13	24.71	
			SDV	0.16	0.23	0.06	18.19	
			CV	38.87	38.90	45.51	74	

Interval (ft)	Location ID	Area	Depth (in)	Natural Uranium (pCi/g)	Natural Uranium mg/kg	Selenium mg/kg	Chloride (mg/kg)	Comment
1-2	S28-2	Untreated	0-40	@1.06	@1.57	0.14	----	1998
	S28-3	Untreated	4-22	0.23	0.34	0.18	----	1998
	S28-9	Treated	0-40	0.33	0.49	0.06	----	1998
	NE28-4	Untreated	8-28	0.23	0.34	0.03	----	*1998
	NE28-7	Untreated	8-24	0.23	0.34	0.05	----	1998
	BG-2	Untreated	12-24	@1.10	@1.62		13	#2002
	BG-2	Untreated	12-24	0.41	0.61	0.10	6	2003
	BG-2	Untreated	12-24	0.52	0.77	0.22	14	2004
	BG-2	Untreated	12-24	0.32	0.47	0.07	----	2005
	BG-2	Untreated	12-24	0.35	0.51	0.03	14	2006
	BG-2	Untreated	12-24	0.62	0.91	0.24	26	2007
	BG-2	Untreated	12-24	0.31	0.46	0.15	@240	2008
	BG-2	Untreated	12-24	0.39	0.57	0.10	50	2009
	BG-2	Untreated	12-24	0.27	0.40	0.13	40	2010
			Mean	0.35	0.52	0.11	23.29	
			SDV	0.12	0.18	0.07	16.21	
			CV	34.20	34.19	60.66	70	

Table 3-2. Pre-Operations and Background Soil Sample Results for Section 28 (continued)

Interval (ft)	Location ID	Area	Depth (in)	Natural Uranium (pCi/g)	Natural Uranium mg/kg	Selenium mg/kg	Chloride (mg/kg)	Comment
2-3	S28-2	Untreated	0-40	@1.06	@1.57	0.14	----	1998
	S28-9	Treated	0-40	0.33	0.49	0.06	----	1998
	NE27-1	Untreated	24-80	0.14	0.21	0.03	----	*1998
	NE28-4	Untreated	28-84	0.22	0.32	0.03	----	*1998
	NE28-5	Untreated	25-84	0.44	0.65	0.03	----	*1998
	NE28-7	Untreated	24-48	0.14	0.21	0.03	----	*1998
	BG-3	Untreated	24-36	@0.98	@1.45		13	#2002
	BG-3	Untreated	24-36	0.36	0.53	0.12	11	2003
	BG-3	Untreated	24-36	0.55	0.81	0.19	10	2004
	BG-3	Untreated	24-36	0.37	0.55	0.07	@290	2005
	BG-3	Untreated	24-36	0.39	0.58	0.06	16	2006
	BG-3	Untreated	24-36	0.54	0.80	0.25	30	2007
	BG-3	Untreated	24-36	0.36	0.53	0.15	@270	2008
	BG-3	Untreated	24-36	0.38	0.56	0.11	70	2009
	BG-3	Untreated	24-36	0.30	0.45	0.13	60	2010
			Mean	0.35	0.51	0.10	30.00	
			SDV	0.13	0.19	0.07	24.99	
			CV	36.61	36.52	70.55	83	

Interval (ft)	Location ID	Area	Depth (in)	Natural Uranium (pCi/g)	Natural Uranium mg/kg	Selenium mg/kg	Chloride (mg/kg)	Comment
3-4	BG-4	Untreated	36-48	0.35	0.52	0.07	60	2009
	BG-4	Untreated	36-48	0.26	0.39	0.09	70	2010
			Mean	0.31	0.46	0.08	65.00	
			SDV	0.06	0.09	0.01	7.07	
			CV	20.20	20.20	17.68	11	

Interval (ft)	Location ID	Area	Depth (in)	Natural Uranium (pCi/g)	Natural Uranium mg/kg	Selenium mg/kg	Chloride (mg/kg)	Comment
4-5	BG-5	Untreated	48-60	0.30	0.45	0.06	90	2009
	BG-5	Untreated	48-60	0.24	0.36	0.07	80	2010
			Mean	0.27	0.41	0.06	85.00	
			SDV	0.04	0.06	0.01	7.07	
			CV	15.71	15.71	12.06	8	

Interval (ft)	Location ID	Area	Depth (in)	Natural Uranium (pCi/g)	Natural Uranium mg/kg	Selenium mg/kg	Chloride (mg/kg)	Comment
5-7	BG-5-7	Untreated	60-72	0.42	0.62	0.08	100	2009
	BG-5-7	Untreated	60-72	0.29	0.43	0.08	90	2010
			Mean	0.36	0.53	0.08	95.00	
			SDV	0.09	0.13	0.00	7.07	
			CV	25.59	25.59	0.00	7	

Interval (ft)	Location ID	Area	Depth (in)	Natural Uranium (pCi/g)	Natural Uranium mg/kg	Selenium mg/kg	Chloride (mg/kg)	Comment
7-9	BG-7-9	Untreated	72-96	0.53	0.79	0.08	61	2009
	BG-7-9	Untreated	72-96	0.30	0.44	0.09	140	2010
			Mean	0.42	0.62	0.09	100.50	
			SDV	0.17	0.25	0.01	55.86	
			CV	40.24	40.24	8.32	56	

Table 3-2. Pre-Operations and Background Soil Sample Results for Section 28 (continued)

Interval (ft)	Location ID	Area	Depth (in)	Natural Uranium (pCi/g)	Natural Uranium mg/kg	Selenium mg/kg	Chloride (mg/kg)	Comment
9-11	BG-9-11	Untreated	96-120	0.35	0.52	0.09	60	2009
	BG-9-11	Untreated	96-120	0.32	0.48	0.09	40	2010
			Mean	0.34	0.50	0.09	50.00	
			SDV	0.02	0.03	0.00	14.14	
			CV	5.66	5.66	0.00	28	

Interval (ft)	Location ID	Area	Depth (in)	Natural Uranium (pCi/g)	Natural Uranium mg/kg	Selenium mg/kg	Chloride (mg/kg)	Comment
11-13	BG-11-13	Untreated	120-144	0.66	0.97	0.12	15	2009
	BG-11-13	Untreated	120-144	0.44	0.65	0.12	30	2010
			Mean	0.55	0.81	0.12	22.50	
			SDV	0.15	0.23	0.00	10.61	
			CV	27.94	27.94	0.00	47	

Interval (ft)	Location ID	Area	Depth (in)	Natural Uranium (pCi/g)	Natural Uranium mg/kg	Selenium mg/kg	Chloride (mg/kg)	Comment
13-15	BG-13-15	Untreated	144-168	0.41	0.60	0.08	70	2009
	BG-13-15	Untreated	144-168	0.46	0.68	0.13	50	2010
			Mean	0.43	0.64	0.11	60.00	
			SDV	0.04	0.06	0.04	14.14	
			CV	8.84	8.84	33.67	24	

Interval (ft)	Location ID	Area	Depth (in)	Natural Uranium (pCi/g)	Natural Uranium mg/kg	Selenium mg/kg	Chloride (mg/kg)	Comment
15-17	BG-15-17	Untreated	168-192	0.57	0.84	0.10	70	2009
	BG-15-17	Untreated	168-192	0.37	0.54	0.09	40	2010
			Mean	0.47	0.69	0.10	55.00	
			SDV	0.14	0.21	0.01	21.21	
			CV	30.74	30.74	7.44	39	

@ = considered an outlier, did not use

* = 1998 Se Reported as less than LLD of 0.05 mg/kg, used 0.025

= 2002 Se MDL= 0.8 All data reported as < MDL, did not use

CV = coefficient of variation

SDV = standard deviation

Table 3-3. Pre-Operations and Background Soil Sample Results for Section 33

Interval (ft)	Location ID	Area	Depth (in)	Natural Uranium (pCi/g)	Natural Uranium mg/kg	Selenium mg/kg	Chloride (mg/kg)	Comment
0-1	S33-4	Treated	0-6	0.37	0.55	0.03	----	*1998
	S33-4	Treated	6-48	0.36	0.53	0.03	----	*1998
	S33-7	Treated	0-24	0.30	0.44	0.03	----	*1998
	S33-8	Treated	0-20	0.58	0.86	0.07	----	1998
	S33-9	Untreated	0-24	0.56	0.83	0.15	----	1998
	S33-10	Untreated	0-12	0.70	1.03	0.05	----	1998
	33A	Treated	0-6	0.24	0.36	0.10	13	1999
	33B	Treated	0-6	0.56	0.82	0.20	7	1999
	33C	Treated	0-6	0.44	0.65	0.05	35	**1999
	33D	Untreated	0-6	0.49	0.73	0.20	22	1999
	33D1	Untreated	0-6	0.77	1.14	0.20	18	2000
	BG-1	Untreated	0-12	0.66	0.98	0.10	32	2001
	BG-1	Untreated	0-12	0.58	0.85	----	2	&#2002
	BG-1	Untreated	0-12	0.53	0.78	0.12	21	2003
	BG-1	Untreated	0-12	0.60	0.88	0.27	28	2004
	BG-1	Untreated	0-12	0.53	0.78	0.18	27	2005
	BG-1	Untreated	0-12	0.60	0.88	0.18	18	2006
	BG-1	Untreated	0-12	0.60	0.89	0.39	68	2007
	BG-1	Untreated	0-12	0.49	0.72	0.21	@170	2008
	BG-1	Untreated	0-12	0.69	1.02	0.19	33	2009
	BG-1	Untreated	0-12	0.68	1.00	0.17	60	2010
			Mean	0.54	0.80	0.15	27.43	
			SDV	0.14	0.20	0.09	18.27	
			CV	25.28	25.28	64.28	67	

Interval (ft)	Location ID	Area	Depth (in)	Natural Uranium (pCi/g)	Natural Uranium mg/kg	Selenium mg/kg	Chloride (mg/kg)	Comment
1-2	S33-4	Treated	6-48	0.36	0.53	0.03	----	*1998
	S33-7	Treated	0-24	0.30	0.44	0.03	----	*1998
	S33-8	Treated	0-20	0.58	0.86	0.07	----	1998
	S33-9	Untreated	0-24	0.56	0.83	0.15	----	1998
	S33-10	Untreated	12-30	0.38	0.56	0.03	----	*1998
	BG-2	Untreated	12-24	0.51	0.76	0.20	29	2001
	BG-2	Untreated	12-24	0.40	0.59	----	8	#2002
	BG-2	Untreated	12-24	0.35	0.52	0.12	25	2003
	BG-2	Untreated	12-24	0.53	0.79	0.24	32	2004
	BG-2	Untreated	12-24	0.47	0.69	0.15	71	2005
	BG-2	Untreated	12-24	0.60	0.88	0.16	21	2006
	BG-2	Untreated	12-24	0.60	0.89	0.44	73	2007
	BG-2	Untreated	12-24	0.41	0.61	0.23	@160	2008
	BG-2	Untreated	12-24	0.49	0.73	0.15	25	2009
	BG-2	Untreated	12-24	0.50	0.74	0.14	80	2010
			Mean	0.47	0.69	0.15	40.44	
			SDV	0.10	0.14	0.11	26.62	
			CV	20.71	20.71	72.04	66	

Table 3-3. Pre-Operations and Background Soil Sample Results for Section 33 (continued)

Interval (ft)	Location ID	Area	Depth (in)	Natural Uranium (pCi/g)	Natural Uranium mg/kg	Selenium mg/kg	Chloride (mg/kg)	Comment
2-3	S33-4	Treated	6-48	0.36	0.53	0.03	----	*1998
	S33-7	Treated	24-48	0.24	0.35	0.03	----	*1998
	S33-8	Treated	20-48	0.35	0.52	0.03	----	*1998
	S33-9	Untreated	24-48	0.70	1.03	0.10	----	1998
	S33-10	Untreated	12-30	0.38	0.56	0.03	----	*1998
	S33-10	Untreated	30-60	0.40	0.59	0.03	----	*1998
	BG-3	Untreated	24-36	0.56	0.83	0.30	41	2001
	BG-3	Untreated	24-36	0.45	0.66		8	#2002
	BG-3	Untreated	24-36	0.45	0.67	0.12	22	2003
	BG-3	Untreated	24-36	0.55	0.81	0.26	31	2004
	BG-3	Untreated	24-36	0.53	0.79	0.15	@222	2005
	BG-3	Untreated	24-36	0.74	1.09	0.15	16	2006
	BG-3	Untreated	24-36	0.58	0.86	0.27	63	2007
	BG-3	Untreated	24-36	0.49	0.72	0.20	@180	2008
	BG-3	Untreated	24-36	0.56	0.82	0.13	70	2009
	BG-3	Untreated	24-36	0.58	0.86	0.19	40	2010
			Mean	0.49	0.73	0.13	36.38	
			SDV	0.13	0.19	0.10	21.81	
			CV	26.64	26.61	72.64	60	

Interval (ft)	Location ID	Area	Depth (in)	Natural Uranium (pCi/g)	Natural Uranium mg/kg	Selenium mg/kg	Chloride (mg/kg)	Comment
3-4	S32-2	Untreated	24-48	0.26	0.39	<0.05	----	*1998
	S33-2	Untreated	24-48	0.27	0.4	0.09	----	*1998
	S33-4	Treated	6-48	0.36	0.53	0.03	----	*1998
	S33-7	Treated	24-48	0.24	0.35	0.03	----	*1998
	S33-8	Treated	20-48	0.35	0.52	0.03	----	*1998
	S33-9	Untreated	24-48	0.70	1.03	0.10	----	1998
	S33-10	Untreated	30-60	0.40	0.59	0.03	----	*1998
	BG-4	Untreated	36-48	0.68	1.01	0.15	60	2009
	BG-4	Untreated	36-48	0.70	1.03	0.18	50	2010
			Mean	0.44	0.65	0.08	55.00	
			SDV	0.20	0.29	0.06	7.07	
			CV	44.64	44.64	80.80	12.86	

Interval (ft)	Location ID	Area	Depth (in)	Natural Uranium (pCi/g)	Natural Uranium mg/kg	Selenium mg/kg	Chloride (mg/kg)	Comment
4-5	S33-10	Untreated	30-60	0.40	0.59	0.03	----	*1998
	BG-5	Untreated	48-60	0.61	0.90	0.12	60	2009
	BG-5	Untreated	48-60	0.64	0.94	0.17	60	2010
			Mean	0.55	0.81	0.11	60.00	
			SDV	0.13	0.19	0.07	0.00	
			CV	23.58	23.65	70.15	0.00	

Table 3-3. Pre-Operations and Background Soil Sample Results for Section 33 (continued)

Interval (ft)	Location ID	Area	Depth (in)	Natural Uranium (pCi/g)	Natural Uranium mg/kg	Selenium mg/kg	Chloride (mg/kg)	Comment
5-7	BG-5-7	Untreated	60-72	0.35	0.52	0.08	70	2009
	BG-5-7	Untreated	60-72	0.46	0.68	0.11	50	2010
			Mean	0.41	0.60	0.10	60.00	
			SDV	0.08	0.11	0.02	14.14	
			CV	18.86	18.86	22.33	23.57	

Interval (ft)	Location ID	Area	Depth (in)	Natural Uranium (pCi/g)	Natural Uranium mg/kg	Selenium mg/kg	Chloride (mg/kg)	Comment
7-9	BG-7-9	Untreated	72-96	0.54	0.80	0.09	30	2009
	BG-7-9	Untreated	72-96	0.67	0.99	0.14	40	2010
			Mean	0.61	0.90	0.12	35.00	
			SDV	0.09	0.13	0.04	7.07	
			CV	15.01	15.01	30.74	20.20	

Interval (ft)	Location ID	Area	Depth (in)	Natural Uranium (pCi/g)	Natural Uranium mg/kg	Selenium mg/kg	Chloride (mg/kg)	Comment
9-11	BG-9-11	Untreated	96-120	0.49	0.72	0.05	32	2009
	BG-9-11	Untreated	96-120	0.67	0.99	0.11	<30	2010
			Mean	0.58	0.86	0.08	31.00	
			SDV	0.13	0.19	0.04	1.41	
			CV	22.33	22.33	53.03	4.56	

Interval (ft)	Location ID	Area	Depth (in)	Natural Uranium (pCi/g)	Natural Uranium mg/kg	Selenium mg/kg	Chloride (mg/kg)	Comment
11-13	BG-11-13	Untreated	120-144	0.51	0.76	<0.05	40	2009
	BG-11-13	Untreated	120-144	0.38	0.56	0.06	<30	2010
			Mean	0.45	0.66	0.05	35.00	
			SDV	0.10	0.14	0.01	7.07	
			CV	21.43	21.43	14.14	20.20	

Interval (ft)	Location ID	Area	Depth (in)	Natural Uranium (pCi/g)	Natural Uranium mg/kg	Selenium mg/kg	Chloride (mg/kg)	Comment
13-15	BG-13-15	Untreated	144-168	0.46	0.68	0.10	70	2009
	BG-13-15	Untreated	144-168	0.28	0.42	0.06	<30	2010
			Mean	0.37	0.55	0.08	50.00	
			SDV	0.12	0.18	0.03	28.28	
			CV	33.43	33.43	35.36	56.57	

Table 3-3. Pre-Operations and Background Soil Sample Results for Section 33 (continued)

Interval (ft)	Location ID	Area	Depth (in)	Natural Uranium (pCi/g)	Natural Uranium mg/kg	Selenium mg/kg	Chloride (mg/kg)	Comment
15-17	BG-15-17	Untreated	168-192	0.67	0.99	0.14	70	2009
	BG-15-17	Untreated	168-192	0.30	0.45	0.09	<30	2010
			Mean	0.49	0.72	0.12	50.00	
			SDV	0.26	0.38	0.04	28.28	
			CV	53.03	53.03	30.74	56.57	

@ = considered an outlier, did not use
* = 1998 Se Reported as less than LLD of 0.05 mg/kg, used 0.025
** = 1999 Se MDL= 0.1 Reported as less than MDL, used 0.05 mg/kg
# = 2002 Se MDL= 0.8 All data reported as < MDL, did not use
CV = coefficient of variation
SDV = standard deviation

3.3 Constituents in Treated Soil

Uranium, selenium, molybdenum, calcium, magnesium, sodium, chloride, and sulfate levels were measured in soil samples from Sections 33 and 34 in 1999 (prior to irrigation) and after each of the 2000 through 2013 irrigation seasons. The pH, conductivity and sodium absorption ratio (SAR) were also measured or calculated for the samples.

Changes in soil chemistry between pre-irrigation samples and those collected after the first irrigation season in 2000 are described in ERG and HYDRO, 2001, 2004, 2005, 2006, 2007, 2008, 2009, 2010, 2011, 2012, 2013 and in this report.

Figures 2-1 through 2-14 show the sampling locations in Sections 33 and 34 for 2000 through 2013. Figures 2-15 through 2-26 present the soil sampling locations in Section 28 for 2002 through 2013. Figures 3-8 through 3-19 present uranium and selenium soil concentrations for each of the irrigation areas.

Composite samples were prepared from locations indicated within each irrigation area and associated background locations. In 2000, the suffixes -1, -2, or -3 on sample labels indicate samples collected from 0-6 (-1), 6-18 (-2), or 18-36 in (-3) depth intervals. The ranges of sampling depths were changed in 2001, to better assess the impacts of irrigation. In 2001 through 2012, suffixes -1, -2, and -3 indicate composites from 0-1 ft, 1-2 ft and 2-3 ft, respectively. Comparisons between data acquired in 2000 and data from subsequent years must be qualified by the change in sampling depths.

An example of compositing conducted in 2001 at Section 33 is as follows: the grab samples collected from 0-1 ft at soil sample locations EW2, EW4, EW6, WW2, WW4, WW6, NW2, NW4, NW6, SW2, SW4 and SW6 (see Figure 2-2 for sample locations) were composited into one sample labeled P-1. Grab samples from 1-2 ft at these locations were composited into one sample labeled P-2.

Table 3-4 presents the results for composite samples collected at each of the areas in 2000 through 2013. Appendix A gives the 1999, 2000 and 2009 individual sample results that were used to calculate the 2000 average values presented in Table 3-4. Individual sample analyses were measured in the treated area in 2009 to make use of the lysimeter soil results. No samples were collected from Section 28 in 2001, and irrigation in this area began in 2002. Composite samples collected at treated areas are labeled P (Section 33), F (Section 34) or N (Section 28). They are further subdivided by P-, F-, or N-1 (0-1 ft), P-, F-, or N-2, (1-2 ft) and P-, F-, or N-3 (2-3 ft). Thus, constituents in the composite samples represent an average condition in layers across the center pivot area, at 0-1 ft, 1-2 ft and 2-3 ft depth intervals.

Table 3-4. Irrigation Soil Analyses, 2000-2013

Sample Site	Date	U (mg/kg)	Se (mg/kg)	Mo (mg/kg)	pH (units)	Cond. (mmhos/cm)	Ca (meq/l)	Mg (meq/l)	Na (meq/l)	SAR (ratio)	Cl (mg/kg)	SO4 (mg/kg)
						SECTION 34 FLOOD						
F-1	12/7/2000	3.35	0.68	<1	7.7	2.594	11.95	4.66	14.58	5.03	56	767
	8/8/2001	2.72	0.50	2	7.8	5.090	10.90	3.17	13.50	5.09	182	900
	11/22/2002	0.69	<0.6	<1	7.9	1.050	4.73	1.47	5.26	2.99	18	800
	11/26/2003	3.72	0.82	1	7.8	4.570	22.50	9.62	31.60	7.89	284	2620
	11/4/2004	4.43	1.15	2	7.7	5.220	20.50	8.98	40.40	10.52	398	680
	11/19/2005	3.94	1.10	2	8.0	5.420	20.80	8.64	37.60	9.80	416	5190
	10/28/2006	4.88	0.95	<1	7.9	3.500	12.20	5.72	22.90	7.65	445	5210
	11/10/2007	5.02	1.32	2	7.8	4.910	17.50	8.05	35.00	9.79	429	4400
	12/3/2008	4.38	1.14	1	7.7	4.430	19.40	9.10	33.40	8.85	392	7700
	10/8/2009	4.06	0.97	4	7.8	4.64	19.34	8.50	30.29	8.03	279	4002
	11/5/2010	4.64	1.05	5	7.8	4.11	18.90	8.52	24.30	6.56	219	7000
	10/19/2011	5.15	1.03	2	7.9	3.13	12.40	5.74	19.00	6.31	254	7700
	11/13/2012	4.67	0.88	1	7.9	3.96	14.80	6.75	27.30	8.32	317	7900
	12/18/2013	4.70	1.20	<1	7.8	6.56	25.80	10.80	49.50	11.60	276	4450
F-2	12/7/2000	2.22	0.37	<1	7.6	3.237	14.42	6.01	18.58	5.85	78	1497
	8/8/2001	1.88	0.40	2	7.6	4.970	8.20	2.25	8.57	3.75	139	1400
	11/22/2002	0.46	<0.6	<1	8.0	1.030	3.85	1.12	6.06	3.84	10	200
	11/26/2003	1.90	0.40	<1	7.8	5.020	25.20	8.01	33.60	8.25	396	2480
	11/4/2004	2.27	0.63	<1	7.6	5.370	23.80	7.90	40.50	10.17	390	370
	11/19/2005	1.41	0.38	1	7.9	4.890	20.50	5.55	32.60	9.03	352	3980
	10/28/2006	2.25	0.45	<1	7.6	3.610	12.90	4.34	23.30	7.94	478	4230
	11/10/2007	3.05	0.94	<1	7.7	5.770	21.20	8.24	40.60	10.60	560	4000
	12/3/2008	2.70	0.68	1	7.8	4.240	21.60	8.16	30.00	7.78	406	4900
	10/8/2009	2.59	0.63	3	7.8	4.62	20.06	7.64	29.49	7.85	388	4082
	11/5/2010	2.83	0.57	3	7.7	4.56	22.10	6.32	26.60	7.06	236	3600
	10/19/2011	2.90	0.57	<1	7.7	4.14	16.00	6.23	26.30	7.89	456	8200
	11/13/2012	2.78	0.52	<1	7.8	2.64	9.99	3.74	15.50	5.92	373	6300
	12/18/2013	3.10	<1	<1	7.6	6.83	28.30	9.30	50.10	11.50	465	3840
F-3	12/7/2000	1.62	0.03	<1	7.6	3.397	13.63	5.02	22.21	6.75	56	980
	8/8/2001	1.15	0.30	<1	7.6	5.960	10.10	3.25	9.83	3.80	170	1800
	11/22/2002	0.42	<0.6	<1	8.0	0.930	3.63	1.53	4.90	3.05	3	<100
	11/26/2003	1.08	0.19	<1	7.8	4.420	23.90	6.53	25.80	6.61	302	1550
	11/4/2004	1.40	0.37	<1	7.6	4.800	25.30	7.39	34.90	8.63	166	210
	11/19/2005	2.62	0.68	2	8.0	4.550	17.40	5.78	32.90	9.66	560	5840
	10/28/2006	1.21	0.28	<1	7.5	3.860	18.50	5.18	23.20	6.74	302	2340
	11/10/2007	1.75	0.64	<1	7.6	5.280	24.20	6.25	32.70	8.38	337	1700
	12/3/2008	1.71	0.37	<1	7.8	4.410	23.00	8.99	32.50	8.13	227	1810
	10/8/2009	1.82	0.46	3	7.7	4.66	23.09	7.41	26.51	6.83	430	3362
	11/5/2010	1.96	0.39	2	7.7	4.09	24.40	5.54	20.10	5.19	256	1500
	10/19/2011	1.13	0.22	<1	7.4	4.90	21.60	7.64	30.30	7.92	301	3400
	11/13/2012	1.40	0.24	<1	7.8	3.46	13.30	4.05	22.60	7.67	459	3300
	12/18/2013	1.40	<1	<1	7.6	7.21	33.90	8.20	46.70	10.20	565	2210
F-4	10/8/2009	0.95	0.21	3	7.7	3.49	19.12	5.37	17.90	5.32	268	2151
	11/5/2010	0.87	0.13	2	7.6	3.33	20.00	6.07	15.50	4.29	125	780
	10/19/2011	0.81	0.07	1	7.4	4.96	23.50	7.93	27.50	6.94	309	1700
	11/13/2012	0.88	0.12	<1	7.7	4.29	21.40	6.41	25.40	6.81	287	2400
	12/18/2013	<1	<1	<1	7.5	5.49	28.30	7.70	31.70	7.50	209	1340
F-5	10/8/2009	0.56	0.08	2	7.8	3.11	15.88	4.81	15.79	4.91	138	861
	11/5/2010	0.59	0.09	2	7.6	3.66	26.00	7.46	15.80	3.86	67	1800
	10/19/2011	0.44	<0.05	<1	7.6	3.78	20.70	8.38	17.10	4.48	199	1500
	11/13/2012	0.50	0.07	<1	7.7	3.30	19.00	5.58	16.40	4.68	171	860
	12/18/2013	<1	<1	<1	7.6	4.58	26.10	8.50	22.80	5.50	154	660
F-5-7	10/8/2009	0.35	0.05	1	8.1	1.92	9.71	3.13	9.09	3.90	70	459
	11/5/2010	0.44	0.09	1	7.8	1.83	8.66	3.48	9.02	3.66	33	184
	10/19/2011	0.36	<0.05	2	7.8	7.79	16.30	7.93	11.20	3.22	87	730
	11/13/2012	0.37	<0.05	<1	7.9	1.19	4.91	1.78	5.82	3.18	111	420
	12/18/2013	<1	<1	<1	7.7	2.40	11.10	4.10	10.80	3.90	62	207
F-7-9	10/8/2009	0.36	0.05	2	8.1	1.27	4.42	1.77	6.69	4.06	76	568
	11/5/2010	0.47	0.07	2	7.8	1.46	6.01	2.40	7.70	3.75	50	260
	10/19/2011	0.38	<0.05	2	8.1	8.05	3.64	2.09	5.03	2.97	56	177
	11/13/2012	0.37	<0.05	<1	7.6	1.63	6.31	3.19	8.10	3.72	116	430
	12/18/2013	<1	<1	<1	7.7	1.78	6.03	2.90	9.91	4.70	30	187
F-9-11	10/8/2009	0.52	0.10	2	7.9	1.70	7.56	3.13	8.10	3.78	61	540
	11/5/2010	1.12	0.22	2	7.6	2.84	16.40	9.50	11.10	3.08	69	400
	10/19/2011	0.73	0.12	<1	7.7	7.73	11.70	6.27	9.67	3.23	45	430
	11/13/2012	0.96	0.10	<1	7.8	2.18	12.20	6.90	8.31	2.69	97	1560
	12/18/2013	3.40	<1	4	7.6	3.94	24.90	12.80	15.00	3.50	48	1390

Table 3-4. Irrigation Soil Analyses, 2000-2013 (continued)

Sample Site	Date	U (mg/kg)	Se (mg/kg)	Mo (mg/kg)	pH (units)	Cond. (mmhos/cm)	Ca (meq/l)	Mg (meq/l)	Na (meq/l)	SAR (ratio)	Cl (mg/kg)	SO4 (mg/kg)
						SECTION 34 FLOOD						
F-11-13	10/8/2009	1.06	0.11	2	7.9	2.32	12.66	7.85	8.29	2.85	76	1506
	11/5/2010	0.72	0.13	2	7.7	1.93	8.38	5.34	8.31	3.17	47	260
	10/19/2011	0.68	0.06	2	7.6	7.64	13.60	7.47	8.55	2.63	31	460
	11/13/2012	1.24	0.11	<1	7.8	3.21	19.70	12.50	11.10	2.77	69	2800
	12/18/2013	<1	<1	<1	7.5	4.08	25.50	11.80	17.10	3.90	48	1940
F-13-15	10/8/2009	0.61	0.10	2	7.9	1.51	8.60	2.41	5.93	2.53	50	490
BG-1	8/8/2001	2.47	0.30	2	7.6	4.160	5.86	1.75	2.87	1.47	100	800
	11/22/2002	0.45	<0.6	<1	7.8	0.460	3.52	0.79	0.37	0.25	7	<100
	11/26/2003	2.33	0.42	<1	7.8	1.680	5.70	2.22	9.60	4.82	83	850
	11/3/2004	2.79	0.75	<1	7.8	2.320	8.67	2.05	13.30	5.74	151	490
	11/19/2005	2.41	0.53	2	7.7	3.230	12.80	3.50	15.40	5.39	400	1360
	10/28/2006	3.06	0.69	<1	7.8	2.200	9.53	2.22	10.60	4.37	253	810
	11/10/2007	3.30	0.74	2	7.7	3.650	19.10	4.81	19.60	5.67	267	800
	12/3/2008	2.52	0.57	1	7.8	2.740	13.70	3.37	15.00	5.13	289	810
	10/30/2009	3.35	0.59	<1	7.8	1.77	7.75	1.77	8.97	4.11	135	570
	11/4/2010	3.27	0.58	3	7.5	2.48	14.00	3.57	9.68	3.27	199	680
BG-2	8/8/2001	1.92	0.20	2	7.5	4.730	7.94	2.60	4.53	1.97	120	300
	12/4/2002	0.53	<0.6	<1	7.8	0.410	3.03	1.06	0.32	0.22	4	<100
	11/26/2003	1.46	0.35	1	7.8	3.290	18.70	8.07	16.90	4.62	131	670
	11/3/2004	2.04	0.68	<1	7.7	4.040	19.70	4.51	26.10	7.50	220	280
	11/19/2005	2.44	0.39	2	7.9	4.460	20.80	4.99	23.90	6.66	349	1040
	10/28/2006	3.93	0.87	<1	7.7	2.400	12.30	2.59	10.90	3.99	219	810
	11/10/2007	2.67	0.78	2	7.7	4.280	21.00	5.02	25.80	7.15	271	1240
	12/3/2008	2.19	0.48	2	7.8	3.260	17.90	4.59	18.50	5.52	257	1040
	10/30/2009	2.15	0.39	1	7.7	2.98	18.50	3.41	14.00	4.23	168	830
	11/4/2010	2.61	0.56	4	7.6	2.34	12.20	2.37	10.60	3.93	284	800
BG-3	8/8/2001	0.79	0.20	<1	7.6	8.200	6.35	2.12	2.77	1.35	120	100
	11/22/2002	0.40	<0.6	<1	7.9	0.360	2.51	1.14	0.35	0.25	4	<100
	11/26/2003	1.66	0.36	<1	7.7	2.460	12.80	5.95	10.70	3.49	141	370
	11/3/2004	2.04	0.40	<1	7.5	4.200	25.90	5.95	24.50	6.14	169	230
	11/19/2005	2.13	0.51	2	7.9	4.160	20.50	5.74	19.00	5.25	354	1280
	10/28/2006	2.29	0.54	<1	7.8	3.000	15.00	3.17	15.40	5.11	259	1040
	11/10/2007	1.64	0.53	<1	7.6	4.420	19.80	5.26	27.60	7.80	246	950
	12/3/2008	1.26	0.27	<1	7.7	3.990	22.30	6.24	24.60	6.51	210	1480
	10/30/2009	0.63	0.17	1	7.3	3.33	20.90	4.32	13.40	3.77	159	410
	11/4/2010	1.69	0.42	3	7.5	2.28	11.60	2.66	9.78	3.66	265	560
BG-4	10/30/2009	0.55	0.10	<1	7.4	3.73	27.50	5.50	12.90	3.18	135	1720
	11/4/2010	0.56	0.17	1	7.5	2.06	8.65	2.55	10.10	4.27	105	200
BG-5	10/30/2009	0.33	0.04	<1	7.8	1.65	9.96	2.54	5.51	2.20	55	189
	11/4/2010	0.52	0.11	1	7.5	4.12	30.00	9.14	14.10	3.19	156	810
BG-5-7	10/30/2009	0.31	0.04	<1	7.9	1.04	4.76	1.53	4.18	2.36	33	190
	11/4/2010	0.52	0.09	2	7.6	3.04	16.80	9.48	11.00	3.03	79	330
BG-7-9	10/30/2009	0.93	0.09	<1	7.8	2	7.60	5.49	8.97	3.51	84	360
	11/4/2010	0.81	0.12	1	7.7	1.83	7.24	5.11	7.77	3.13	51	230
BG-9-11	10/30/2009	1.11	0.17	<1	7.7	3.95	18.90	12.40	17.60	4.45	139	520
	11/4/2010	0.91	0.11	2	7.8	2.48	7.39	4.99	14.00	5.63	100	360
BG-11-13	10/30/2009	1.26	1.31	<1	7.8	5.2	22.10	15.90	28.90	6.63	150	1610
	11/4/2010	1.23	0.14	3	7.7	4.12	19.70	10.60	23.40	6.01	63	790
BG-13-15	10/30/2009	0.96	0.53	<1	7.8	3.33	12.60	9.96	18.80	5.60	57	400
BG-15-17	10/30/2009	0.97	0.27	<1	7.9	4.38	21.30	14.70	23.70	5.59	62	950

Table 3-4. Irrigation Soil Analyses, 2000-2013 (continued)

Sample Site	Date	U (mg/kg)	Se (mg/kg)	Mo (mg/kg)	pH (units)	Cond. (mmhos/cm)	Ca (meq/l)	Mg (meq/l)	Na (meq/l)	SAR (ratio)	Cl (mg/kg)	SO4 (mg/kg)
						SECTION 33 FLOOD						
F-1	11/5/2004	1.78	0.56	<1	7.6	2.810	19.10	7.21	11.30	3.11	114	190
	11/8/2005	1.35	0.31	1	7.8	2.690	16.80	6.23	10.20	3.01	66	1210
	10/28/2006	1.76	0.41	<1	7.8	1.480	8.25	2.91	4.79	2.03	72	1070
	11/10/2007	1.69	0.45	<1	7.8	2.000	9.35	3.60	8.85	3.48	98	450
	12/3/2008	1.70	0.43	2	8.0	1.780	7.42	2.68	11.20	4.98	89	910
	10/5/2009	1.17	0.10	<1	8.1	0.493	1.37	0.48	3.03	3.15	120	<50
	11/30/2010	1.84	0.36	1	8.0	1.61	6.69	2.73	7.75	3.57	150	840
	10/18/2011	1.63	0.33	2	7.7	1.71	7.98	3.23	7.35	3.10	201	820
F-2	11/5/2004	1.67	0.47	1	7.7	2.360	13.70	5.09	10.40	3.39	115	150
	11/8/2005	1.14	0.24	<1	7.8	2.260	13.30	4.68	9.22	3.08	57	620
	10/28/2006	1.24	0.26	<1	7.7	2.320	16.00	5.15	8.33	2.56	46	970
	11/10/2007	1.55	0.40	<1	7.8	3.070	16.90	6.58	13.00	3.79	63	390
	12/3/2008	1.53	0.39	<1	7.7	2.650	21.70	7.48	13.70	3.59	46	1670
	10/5/2009	1.17	0.09	<1	8.1	0.727	1.98	0.85	4.15	3.49	80	<50
	11/30/2010	1.96	0.41	<1	7.9	1.17	4.63	1.76	5.61	3.14	150	890
	10/18/2011	1.53	0.33	3	7.6	1.64	10.50	3.62	5.50	2.07	163	850
F-3	11/5/2004	1.68	0.49	<1	7.7	2.400	18.40	6.52	11.60	3.28	115	150
	11/8/2005	1.00	0.20	<1	7.8	2.670	17.80	5.91	10.70	3.11	41	350
	10/28/2006	1.62	0.21	<1	7.7	1.840	10.90	3.38	5.93	2.22	52	970
	11/10/2007	1.51	0.40	<1	7.7	2.010	11.50	4.06	7.97	2.86	52	470
	12/3/2008	0.96	0.23	<1	7.7	2.890	19.90	6.91	12.00	3.28	50	860
	10/5/2009	0.67	0.08	3	8.2	0.705	2.13	0.98	4.10	3.29	80	500
	11/30/2010	1.76	0.41	3	7.6	2.53	15.10	5.18	9.79	3.07	184	1070
	10/18/2011	1.62	0.30	2	7.6	1.89	10.90	4.22	6.74	2.45	106	920
F-4	10/5/2009	0.38	<0.05	<1	8.5	0.528	1.23	0.86	2.87	2.81	70	680
	11/30/2010	0.32	<0.05	1	7.5	2.28	15.60	3.81	7.78	2.50	40	430
	10/18/2011	0.41	0.06	1	7.6	2.04	13.10	3.42	7.94	2.76	61	400
F-5	10/5/2009	0.33	<0.05	<1	8.4	0.538	1.22	1.02	2.81	2.66	50	500
	11/30/2010	0.40	<0.05	<1	7.5	2.65	20.40	4.68	8.77	2.48	21	750
	10/18/2011	0.26	<0.05	2	7.6	1.35	6.76	1.71	6.66	3.24	28	290
F-5-7	10/5/2009	0.35	<0.05	<1	8.4	0.71	1.57	1.57	3.65	2.91	60	500
	11/30/2010	0.20	<0.05	<1	7.7	1.91	13.20	3.07	7.10	2.49	21	350
	10/18/2011	0.13	<0.05	<1	8.1	0.502	2.41	0.53	2.43	2.00	18	158
F-7-9	10/5/2009	0.27	<0.05	<1	8.6	0.44	1.01	0.86	2.19	2.26	20	170
	11/30/2010	0.19	<0.05	<1	7.9	0.837	3.22	0.78	4.54	3.21	30	220
	10/18/2011	0.19	<0.05	1	8.0	0.717	3.41	0.81	3.25	2.24	20	174
F-9-11	10/5/2009	0.52	0.06	<1	8.5	0.534	1.13	1.00	2.78	2.69	40	230
	11/30/2010	0.23	<0.05	<1	8.0	0.733	3.02	0.80	3.71	2.68	38	240
	10/18/2011	0.21	<0.05	<1	8.1	0.628	2.70	0.69	2.86	2.20	37	200
F-11-13	11/30/2010	0.27	<0.05	<1	8.1	0.569	2.35	0.65	2.79	2.28	40	250
	10/18/2011	0.21	<0.05	2	8.2	0.43	1.91	0.48	1.88	1.72	19	120

Table 3-4. Irrigation Soil Analyses, 2000-2013 (continued)

Sample Site	Date	U (mg/kg)	Se (mg/kg)	Mo (mg/kg)	pH (units)	Cond. (mmhos/cm)	Ca (meq/l)	Mg (meq/l)	Na (meq/l)	SAR (ratio)	Cl (mg/kg)	SO4 (mg/kg)
SECTION 33 FLOOD												
BG-1	11/5/2004	1.56	0.47	1	7.8	0.770	3.49	1.40	2.51	1.60	30	110
	11/8/2005	1.12	0.25	<1	7.8	0.962	5.16	1.84	2.29	1.22	76	2720
	10/28/2006	1.55	0.56	<1	7.9	0.702	2.93	1.04	1.98	1.41	24	100
	11/10/2007	1.79	0.38	<1	7.8	0.800	4.30	1.55	1.96	1.15	64	140
	12/3/2008	1.44	0.32	<1	7.9	1.150	6.04	2.29	4.20	2.06	220	1200
	10/27/2009	1.22	0.23	<1	8.0	0.464	2.66	0.96	0.97	0.72	50	250
	11/30/2010	1.42	0.27	<1	7.7	0.728	3.25	1.18	3.17	2.13	150	730
BG-2	11/5/2004	1.30	0.39	<1	7.8	0.820	4.42	1.70	2.28	1.30	35	120
	11/8/2005	0.92	0.20	<1	7.8	0.829	4.13	1.52	2.41	1.43	103	1960
	10/28/2006	1.15	0.35	<1	7.8	0.470	1.94	0.71	1.37	1.19	20	210
	11/10/2007	1.29	0.31	<1	7.8	0.810	4.24	1.65	1.79	1.04	57	160
	12/3/2008	1.18	0.32	<1	7.8	0.840	4.92	1.90	2.58	1.40	90	660
	10/27/2009	1.60	0.29	<1	8.0	0.651	2.53	1.06	2.86	2.13	70	390
	11/30/2010	1.46	0.27	1	7.7	0.755	3.17	1.19	3.54	2.40	120	780
BG-3	11/5/2004	1.33	0.42	<1	7.8	0.940	5.13	2.06	2.79	1.47	30	160
	11/8/2005	0.90	0.19	<1	7.8	1.110	5.74	2.20	3.55	1.78	81	3200
	10/28/2006	1.05	0.34	<1	7.9	0.677	2.88	1.05	1.84	1.31	14	190
	11/10/2007	1.24	0.35	<1	7.8	0.710	3.80	1.41	1.96	1.21	43	260
	12/3/2008	0.97	0.25	<1	7.8	0.840	4.66	1.85	3.09	1.71	170	900
	10/27/2009	0.61	0.10	1	7.9	0.93	3.66	1.94	3.68	2.20	40	400
	11/30/2010	0.86	0.17	1	7.8	0.987	3.29	1.43	5.31	3.46	110	680
BG-4	10/27/2009	0.87	0.12	<1	8.0	1.11	4.99	2.62	3.65	1.87	12	240
	11/30/2010	0.94	0.16	2	7.7	0.635	2.98	1.28	2.57	1.76	40	210
BG-5	10/27/2009	0.46	0.06	<1	7.9	0.739	3.15	1.65	2.25	1.45	30	320
	11/30/2010	0.58	<0.05	1	7.8	0.702	2.66	0.99	3.65	2.70	30	160
BG-5-7	10/27/2009	0.42	0.05	<1	8.1	0.603	2.42	1.13	1.81	1.36	60	470
	11/30/2010	0.52	<0.05	<1	7.9	0.471	1.75	0.60	2.48	2.29	50	340
BG-7-9	10/27/2009	0.35	<0.05	<1	8.1	0.667	2.89	1.24	2.00	1.39	70	480
	11/30/2010	0.33	<0.05	<1	8.1	0.453	1.43	0.56	2.59	2.60	40	230
BG-9-11	10/27/2009	0.44	0.07	<1	8.2	0.617	2.85	1.24	1.68	1.17	40	280
	11/30/2010	0.27	<0.05	<1	8.2	0.435	1.28	0.51	2.63	2.78	40	230
BG-11-13	10/27/2009	1.33	0.14	2	8.1	0.623	2.68	1.54	1.50	1.03	60	450
	11/30/2010	0.65	0.07	1	8.0	0.475	1.82	0.79	2.15	1.88	<30	140

Table 3-4. Irrigation Soil Analyses, 2000-2013 (continued)

Sample Site	Date	U (mg/kg)	Se (mg/kg)	Mo (mg/kg)	pH (units)	Cond. (mmhos/cm)	Ca (meq/l)	Mg (meq/l)	Na (meq/l)	SAR (ratio)	Cl (mg/kg)	SO4 (mg/kg)
SECTION 28 CENTER PIVOT												
N-1	11/19/2002	2.99	<0.6	2	7.7	4.27	20.80	9.40	26.90	6.92	48	3700
	11/24/2003	0.81	0.18	<1	7.8	1.95	8.47	3.94	10.00	4.01	24	400
	11/11/2004	0.89	0.37	<1	7.6	2.67	14.60	6.38	14.00	4.32	28	70
	11/15/2005	0.68	0.17	<1	7.9	2.65	13.90	6.55	11.40	3.57	42	430
	10/21/2006	1.11	0.16	2	7.6	2.37	12.70	6.20	9.35	3.04	57	280
	11/10/2007	1.14	0.47	<1	7.7	2.50	14.00	6.18	10.90	3.43	34	490
	11/22/2008	1.17	0.39	1	7.9	2.90	16.90	8.44	13.40	3.73	48	760
	10/9/2009	1.62	0.41	2	7.8	3.69	18.18	8.96	18.14	4.87	117	895
	11/3/2010	1.37	0.27	2	7.8	4.29	23.00	11.50	24.00	5.78	24	230
	10/20/2011	0.73	0.22	<1	7.3	2.45	21.00	6.58	5.32	1.43	17	500
	11/12/2012	1.15	0.39	1	7.7	1.33	5.90	2.56	5.23	2.54	90	680
	12/17/2013	<1	<1	<1	7.6	4.10	29.20	10.20	13.30	3.00	54	1020
N-2	11/19/2002	1.47	<0.6	<1	7.7	4.51	20.60	7.60	29.00	7.72	68	3400
	11/24/2003	0.70	0.16	<1	7.9	2.42	9.47	3.73	15.70	6.11	49	450
	11/11/2004	0.80	0.23	<1	7.7	2.63	11.50	4.60	16.20	5.71	61	70
	11/15/2005	0.74	0.15	<1	7.9	4.09	15.70	7.75	26.60	7.77	87	330
	10/21/2006	1.14	0.09	2	7.7	2.56	12.50	6.43	12.90	4.16	18	610
	11/10/2007	1.01	0.34	<1	7.6	3.11	17.60	8.91	15.00	4.12	37	500
	11/22/2008	1.01	0.24	1	7.8	3.27	18.40	9.17	16.40	4.42	35	870
	10/9/2009	1.12	0.19	1	7.8	3.57	20.66	10.80	15.65	3.97	65	1011
	11/3/2010	1.24	0.20	2	7.5	4.13	22.00	11.00	20.60	5.07	121	890
	10/20/2011	0.78	0.13	<1	7.6	2.18	18.50	7.14	3.73	1.04	11	770
	11/12/2012	0.77	0.13	<1	7.7	1.88	11.70	4.71	5.59	1.95	29	580
	12/17/2013	<1	<1	<1	7.8	3.58	27.10	13.60	8.91	2.00	15	890
N-3	11/19/2002	0.74	<0.6	<1	7.6	4.51	22.90	7.57	26.40	6.76	39	1300
	11/24/2003	0.57	0.13	<1	7.8	2.55	13.20	5.28	13.40	4.41	74	380
	11/11/2004	0.70	0.23	<1	7.6	3.30	17.00	7.29	17.40	4.99	134	70
	11/15/2005	0.58	0.12	<1	7.9	4.29	14.90	7.44	6.00	1.80	118	420
	10/21/2006	1.06	0.08	2	7.8	3.58	15.20	8.21	26.00	7.60	37	670
	11/10/2007	0.92	0.25	<1	7.8	3.46	16.30	8.70	20.60	5.83	37	540
	11/22/2008	1.01	0.25	1	8.0	3.11	15.20	8.55	17.50	5.08	60	910
	10/9/2009	1.24	0.20	1	8.0	4.13	18.94	12.63	23.56	5.72	65	1054
	11/3/2010	1.34	0.23	1	7.7	4.16	18.90	13.80	23.60	5.84	60	720
	10/20/2011	0.75	0.08	1	7.7	2.50	18.90	10.60	5.45	1.42	13	690
	11/12/2012	1.07	0.15	<1	7.6	2.53	16.80	5.89	9.16	2.72	38	930
	12/17/2013	1.30	<1	<1	7.9	4.92	25.20	17.00	26.40	5.70	21	1570
N-4	10/9/2009	0.78	0.10	1	8.1	3.47	12.67	9.14	22.18	6.39	50	683
	11/3/2010	1.03	0.15	1	7.9	2.98	11.70	6.84	17.50	5.75	44	560
	10/20/2011	0.76	0.15	<1	7.8	2.75	15.00	10.70	10.70	2.98	19	620
	11/12/2012	0.72	0.10	<1	7.8	1.88	9.28	3.97	7.50	2.91	35	460
	12/17/2013	<1	<1	<1	7.9	4.10	21.20	13.10	20.10	4.90	23	778
N-5	10/10/2009	0.83	0.12	3	8.2	3.77	11.46	8.43	27.17	9.22	100	783
	11/3/2010	0.84	0.14	1	7.9	3.26	10.10	5.11	22.80	8.27	60	710
	10/20/2011	0.62	<0.05	<1	8.0	2.49	8.29	6.90	14.50	5.26	40	560
	11/12/2012	0.63	0.06	<1	8.0	1.33	4.37	2.64	6.65	3.55	90	610
	12/17/2013	<1	<1	<1	8.2	1.52	3.28	2.60	9.69	5.60	10	188
N-5-7	10/11/2009	0.71	0.08	2	8.2	3.41	9.95	6.13	22.89	9.69	159	604
	11/3/2010	0.71	0.13	1	7.9	3.27	10.30	5.73	21.00	7.42	180	750
	10/20/2011	0.48	<0.05	1	8.0	2.69	7.56	5.29	17.60	6.94	67	690
	11/12/2012	0.71	0.06	<1	8.0	1.83	5.81	3.99	9.22	4.17	70	570
	12/17/2013	1.30	<1	<1	8.0	5.83	20.00	14.70	43.00	10.30	30	1090
N-7-9	10/12/2009	0.76	0.10	2	8.0	3.90	14.73	10.58	23.32	6.54	140	871
	11/3/2010	0.61	0.09	2	7.9	2.52	6.57	4.19	16.90	7.29	130	1000
	10/20/2011	0.38	<0.05	<1	8.0	2.66	10.70	7.25	14.40	4.81	58	680
	11/12/2012	0.97	0.09	<1	7.8	3.23	14.20	7.90	17.20	5.17	70	980
	12/17/2013	<1	<1	<1	7.9	4.42	13.50	9.00	31.00	9.20	54	550
N-9-11	10/13/2009	0.47	0.08	2	8.0	3.46	14.26	7.59	18.29	6.13	166	602
	11/3/2010	0.67	0.16	1	7.8	3.26	14.50	9.27	17.00	4.93	69	520
	10/20/2011	0.39	<0.05	<1	7.9	2.58	12.10	9.12	10.80	3.32	71	580
	11/12/2012	0.52	0.07	<1	7.7	2.75	11.50	6.24	13.90	4.67	49	640
	12/17/2013	<1	<1	<1	7.8	6.11	23.70	16.60	41.40	9.20	64	1550
N-11-13	10/14/2009	0.53	0.12	1	7.9	2.68	10.01	4.34	15.14	5.88	145	747
	11/3/2010	0.64	0.15	2	7.7	3.35	16.60	7.81	15.00	4.29	151	370
	10/20/2011	0.35	<0.05	<1	7.9	1.86	7.72	3.80	9.00	3.75	83	630
	11/12/2012	0.57	<0.05	<1	7.5	2.48	12.40	5.94	10.40	3.43	28	2700
	12/17/2013	<1	<1	<1	7.7	5.60	26.20	9.10	35.60	8.50	95	777

Table 3-4. Irrigation Soil Analyses, 2000-2013 (continued)

Sample Site	Date	U (mg/kg)	Se (mg/kg)	Mo (mg/kg)	pH (units)	Cond. (mmhos/cm)	Ca (meq/l)	Mg (meq/l)	Na (meq/l)	SAR (ratio)	Cl (mg/kg)	SO4 (mg/kg)
					SECTION 28 CENTER PIVOT							
N-13-15	10/15/2009	1.02	0.28	2	7.8	3.40	14.01	6.45	19.97	6.17	136	948
	11/3/2010	0.80	0.24	2	7.7	2.74	13.20	4.90	13.60	4.52	90	440
	10/20/2011	0.40	0.08	<1	7.7	2.29	11.50	4.65	10.30	3.62	84	520
	11/12/2012	0.51	0.07	<1	7.5	2.72	13.20	5.21	13.00	4.28	93	680
	12/17/2013	<1	<1	<1	7.5	4.99	25.10	7.90	31.70	7.80	62	847
N-15-17	10/16/2009	0.41	0.20	2	7.8	3.04	14.16	6.43	16.08	4.75	92	620
	11/3/2010	0.53	0.12	1	7.8	2.08	9.00	3.35	4.51	4.51	70	500
	12/17/2013	<1	<1	<1	7.8	2.41	8.96	2.90	16.00	6.60	54	311
BG-1	11/19/2002	2.99	<0.6	2	8.0	0.82	3.33	0.91	4.20	2.88	14	700
	11/24/2003	0.51	0.15	<1	7.9	0.33	1.94	0.61	0.30	0.26	6	60
	11/11/2004	0.88	0.22	<1	7.4	1.16	6.93	1.99	3.91	1.85	12	20
	11/15/2005	0.47	0.12	<1	7.8	1.01	6.37	2.00	2.32	1.13	283	4380
	10/21/2006	0.62	0.10	2	7.7	0.46	2.41	0.71	0.57	0.45	19	80
	11/10/2007	0.78	0.23	<1	7.7	0.71	4.19	1.35	0.95	0.57	32	118
	11/22/2008	0.59	0.15	1	7.8	0.44	2.56	0.77	0.88	0.68	220	1390
	10/15/2009	1.11	0.16	2	7.9	0.507	2.83	0.96	1.10	0.79	60	320
	11/2/2010	0.65	0.16	<1	7.6	1.1	6.39	2.17	2.68	1.30	30	90
BG-2	11/19/2002	1.62	<0.6	<1	7.7	2.00	14.90	3.27	6.88	2.28	13	500
	11/24/2003	0.61	0.10	<1	8.0	0.35	1.69	0.81	0.60	0.53	6	120
	11/11/2004	0.77	0.22	<1	7.4	0.66	4.22	1.42	1.01	0.60	14	<10
	11/15/2005	0.47	0.07	<1	8.0	0.73	3.71	1.58	1.50	0.92	405	5350
	10/21/2006	0.51	<.05	1	7.8	0.53	2.22	0.95	0.89	0.70	14	<50
	11/10/2007	0.91	0.24	<1	7.6	0.95	5.95	2.18	1.45	0.71	26	99
	11/22/2008	0.46	0.15	1	8.0	0.40	2.11	0.89	0.88	0.71	240	1300
	10/15/2009	0.57	0.10	<1	8.0	0.658	3.20	1.31	1.82	1.21	50	300
	11/2/2010	0.40	0.13	<1	7.8	0.53	3.41	1.41	0.71	0.45	40	110
BG-3	11/19/2002	1.45	<0.6	<1	7.8	1.51	9.24	1.95	6.29	2.66	13	500
	11/24/2003	0.53	0.12	<1	8.0	0.53	2.10	1.26	1.80	1.39	11	120
	11/11/2004	0.81	0.19	<1	7.5	0.80	4.74	2.03	1.60	0.86	10	10
	11/15/2005	0.55	0.07	<1	7.9	1.05	5.09	2.43	3.03	1.56	290	4340
	10/21/2006	0.58	0.06	1	7.9	0.44	1.33	0.68	1.25	1.25	16	70
	11/10/2007	0.80	0.25	<1	7.7	0.88	4.99	1.84	1.76	1.95	30	120
	11/22/2008	0.53	0.15	<1	8.1	0.493	1.96	0.95	1.95	1.62	270	1500
	10/15/2009	0.56	0.11	1	8.1	0.708	2.71	1.50	2.33	1.61	70	370
	11/2/2010	0.45	0.13	<1	7.9	0.509	2.72	1.45	0.99	0.68	60	340
BG-4	10/15/2009	0.52	0.07	<1	8.3	0.603	2.22	1.55	1.56	1.14	60	360
	11/2/2010	0.39	0.09	<1	8.0	0.53	2.28	1.44	1.72	1.26	70	440
BG-5	10/15/2009	0.45	0.06	<1	8.4	0.563	1.67	1.27	2.28	1.88	90	620
	11/2/2010	0.36	0.07	<1	8.1	0.34	1.43	0.92	1.09	1.01	80	520
BG-5-7	10/15/2009	0.62	0.08	1	8.3	0.867	2.25	1.74	4.22	2.99	100	600
	11/2/2010	0.43	0.08	<1	8.1	0.542	1.95	1.34	2.19	1.71	90	700
BG-7-9	10/15/2009	0.79	0.08	<1	8.1	1.51	3.73	3.01	7.83	4.27	61	370
	11/2/2010	0.44	0.09	<1	8.1	0.953	2.39	1.72	5.53	3.86	140	1180
BG-9-11	10/15/2009	0.52	0.09	<1	7.9	3.02	12.90	8.38	14.80	4.54	60	420
	11/2/2010	0.48	0.09	<1	7.9	1.51	5.89	3.71	7.19	3.28	40	400
BG-11-13	10/15/2009	0.97	0.12	1	7.8	2.82	19.70	10.40	6.74	1.74	15	540
	11/2/2010	0.65	0.12	<1	8.0	0.827	2.84	1.62	4.06	2.72	30	230
BG-13-15	10/15/2009	0.60	0.08	<1	7.9	0.636	2.77	1.15	1.93	1.38	70	480
	11/2/2010	0.68	0.13	<1	8.0	0.578	2.17	1.10	2.57	2.01	50	320
BG-15-17	10/15/2009	0.84	0.10	<1	7.9	1.27	4.48	1.79	6.25	3.53	70	560
	11/2/2010	0.54	0.09	<1	7.9	0.793	2.63	1.18	4.01	2.91	40	400

Table 3-4. Irrigation Soil Analyses, 2000-2013 (continued)

Sample Site	Date	U (mg/kg)	Se (mg/kg)	Mo (mg/kg)	pH (units)	Cond. (mmhos/cm)	Ca (meq/l)	Mg (meq/l)	Na (meq/l)	SAR (ratio)	Cl (mg/kg)	SO4 (mg/kg)
						SECTION 33 CENTER PIVOT						
P-1	12/7/2000	0.93	0.37	<1	7.9	0.987	4.00	1.27	5.67	3.40	26	98
	6/15/2001	0.94	0.30	<1	8.0	1.230	3.77	1.48	7.48	4.84	123	500
	11/20/2002	0.98	<0.6	<1	7.8	1.610	7.71	2.80	8.10	3.53	13	300
	11/18/2003	1.36	0.28	<1	7.8	2.200	7.99	3.25	13.50	5.69	55	590
	11/9/2004	1.78	0.45	<1	7.6	3.780	19.70	8.73	21.40	5.67	101	190
	11/5/2005	1.45	0.31	<1	8.1	2.060	9.35	4.02	11.20	4.33	51	460
	10/21/2006	1.87	0.36	<1	7.8	3.560	15.80	6.36	20.40	6.13	109	1020
	11/10/2007	1.67	0.44	<1	7.7	3.280	12.40	5.91	19.10	6.31	85	600
	11/22/2008	1.41	0.41	1	8.0	2.630	10.70	5.07	17.10	6.09	80	500
	10/6/2009	2.03	0.41	2	7.8	3.472	14.63	6.95	22.75	6.71	147	1059
	12/2/2010	1.87	0.35	<1	8.0	3.900	18.00	7.96	23.70	6.58	101	910
	10/17/2011	1.56	0.42	2	7.7	5.240	17.30	10.10	37.40	10.10	202	940
	11/14/2012	2.22	0.40	<1	8.3	4.230	21.70	10.70	22.90	5.69	69	2100
	12/16/2013	2.20	<1	<1	7.6	4.450	24.40	12.10	21.40	5.00	51	1310
P-2	12/7/2000	0.81	0.45	<1	7.8	1.480	6.30	1.88	7.77	3.84	46	290
	6/15/2001	0.60	0.30	<1	7.9	1.120	4.32	1.45	6.11	3.60	109	500
	11/20/2002	0.89	<0.6	<1	7.8	2.190	10.10	3.78	13.10	4.97	14	600
	11/18/2003	1.14	0.19	<1	7.9	2.690	10.30	3.86	16.10	6.05	82	710
	11/9/2004	1.52	0.39	<1	7.6	4.300	19.40	10.80	27.50	7.07	155	200
	11/5/2005	1.15	0.21	2	8.1	3.940	15.10	7.68	27.30	8.09	94	420
	10/21/2006	1.62	0.15	<1	7.7	3.320	14.20	5.93	17.90	5.64	142	900
	11/10/2007	1.34	0.30	<1	7.7	5.300	19.60	11.00	37.00	9.46	187	900
	11/22/2008	1.37	0.35	1	8.0	3.600	13.40	6.30	25.80	8.22	114	1130
	10/6/2009	1.84	0.29	2	7.9	3.906	14.45	7.40	30.01	8.53	243	1405
	12/2/2010	2.16	0.25	<1	8.0	4.000	17.40	7.66	25.60	7.23	102	850
	10/17/2011	1.19	0.19	2	7.8	3.900	13.80	7.36	24.80	7.62	177	950
	11/14/2012	2.51	0.34	<1	8.1	4.490	13.00	8.02	32.70	10.10	195	3700
	12/16/2013	1.60	<1	<1	7.8	5.610	21.80	14.20	36.00	8.50	133	1530
P-3	12/7/2000	1.03	0.25	<1	7.6	1.720	8.35	2.29	8.33	3.71	36	210
	6/15/2001	0.54	0.10	<1	7.8	1.020	4.74	2.18	4.27	2.30	67	400
	11/20/2002	0.68	<0.6	<1	7.7	2.400	11.70	5.34	11.60	3.97	34	1000
	11/18/2003	1.00	0.18	<1	7.8	2.970	15.50	5.67	17.30	5.32	106	570
	11/9/2004	1.15	0.38	<1	7.6	3.440	15.90	9.31	19.30	5.43	137	220
	11/5/2005	1.00	0.30	1	8.0	4.500	18.70	10.50	147.00	38.50	197	580
	10/21/2006	1.05	0.14	<1	7.8	3.500	13.90	6.17	19.70	6.22	126	780
	11/10/2007	1.30	0.39	<1	7.6	4.670	20.30	10.60	26.40	6.72	174	670
	11/22/2008	1.27	0.33	3	7.9	3.600	14.80	7.10	23.10	6.98	184	1220
	10/6/2009	1.52	0.28	2	7.8	4.271	16.22	7.79	28.20	7.85	279	972
	12/2/2010	1.95	0.24	<1	8.0	3.910	17.00	8.06	24.40	6.89	154	1360
	10/17/2011	0.86	0.18	2	7.8	4.660	14.20	7.77	33.30	10.00	179	570
	11/14/2012	1.58	0.24	<1	7.9	3.950	14.40	7.64	25.00	7.53	302	1600
	12/16/2013	1.20	<1	<1	7.8	5.870	22.70	16.40	38.90	8.80	139	2590
P-4	10/6/2009	1.32	0.27	2	7.8	4.113	17.19	7.87	24.92	7.17	258	911
	12/2/2010	1.52	0.26	<1	8.0	3.750	18.90	7.76	20.80	5.70	170	870
	10/17/2011	0.66	0.18	2	7.8	3.150	13.90	6.25	17.40	5.48	93	670
	11/14/2012	1.55	0.37	<1	7.9	3.650	17.20	7.90	19.20	5.42	550	2300
	12/16/2013	1.40	<1	<1	7.6	4.580	25.40	11.20	16.70	3.90	531	982
P-5	10/6/2009	1.20	0.27	2	7.9	3.426	14.81	7.20	19.76	6.10	163	884
	12/2/2010	1.79	0.33	<1	8.0	3.720	17.10	7.85	21.00	5.95	167	1640
	10/17/2011	0.79	0.17	2	77.0	3.030	15.10	7.89	14.20	4.19	89	300
	11/14/2012	1.20	0.24	<1	7.8	2.660	17.10	7.14	7.64	2.19	299	860
	12/16/2013	1.50	<1	<1	7.5	5.030	35.30	12.40	11.70	2.40	612	1210
P-5-7	10/6/2009	0.95	0.20	2	7.9	2.799	11.03	5.33	17.07	5.78	145	696
	12/2/2010	0.89	0.16	<1	8.0	2.640	12.50	5.72	13.00	4.31	91	670
	10/17/2011	0.51	0.10	2	7.9	1.040	4.16	1.88	4.11	2.37	133	600
	11/14/2012	1.02	0.18	<1	7.9	2.040	12.70	4.97	6.13	2.06	212	870
	12/16/2013	<1	<1	<1	7.6	2.630	15.60	5.40	7.30	2.30	227	407
P-7-9	10/6/2009	0.85	0.22	2	7.8	2.198	11.01	5.23	10.78	3.71	85	557
	12/2/2010	0.67	0.10	<1	8.1	1.850	8.26	3.23	8.05	3.36	72	400
	10/17/2011	0.48	0.07	2	8.1	1.42	3.76	2.77	7.36	4.07	126	350
	11/14/2012	0.49	<0.05	<1	8.1	0.649	2.96	0.97	2.08	1.48	90	620
	12/16/2013	<1	<1	<1	7.7	1.49	7.59	2.50	5.62	2.50	29	204
P-9-11	10/6/2009	0.93	0.19	2	7.9	2.086	13.89	6.24	6.12	1.97	86	619
	12/2/2010	0.67	0.10	1	7.9	2.680	13.10	4.05	4.63	1.58	59	370
	10/17/2011	0.58	0.11	2	7.9	2.800	9.66	7.28	14.10	4.84	87	420
	11/14/2012	0.62	0.06	<1	8.0	0.632	2.78	0.97	2.36	1.74	110	700
	12/16/2013	<1	<1	<1	7.6	1.670	9.24	3.00	5.63	2.30	35	251

Table 3-4. Irrigation Soil Analyses, 2000-2013 (continued)

Sample Site	Date	U (mg/kg)	Se (mg/kg)	Mo (mg/kg)	pH (units)	Cond. (mmhos/cm)	Ca (meq/l)	Mg (meq/l)	Na (meq/l)	SAR (ratio)	Cl (mg/kg)	SO4 (mg/kg)
SECTION 33 CENTER PIVOT												
P-11-13	10/6/2009	0.96	0.12	1	8.0	1.449	9.25	4.13	2.86	1.20	83	393
	12/2/2010	0.56	0.10	<1	8.0	1.140	6.69	1.86	2.70	1.31	51	270
	10/17/2011	0.52	0.10	2	7.9	1.15	4.36	2.27	4.68	2.57	122	670
	11/14/2012	0.54	0.08	<1	8.0	1.59	8.60	3.32	6.01	2.46	47	340
	12/16/2013	<1	<1	<1	7.6	1.82	9.67	3.20	6.22	2.50	60	251
P-13-15	10/6/2009	0.80	0.14	1	8.0	1.435	9.42	4.24	2.72	1.11	90	329
	12/2/2010	0.61	0.10	<1	8.0	1.440	9.12	2.58	3.47	1.43	36	180
	10/17/2011	0.43	0.12	3	7.5	1.420	6.54	3.23	5.67	2.57	52	420
	11/14/2012	0.59	0.13	<1	7.8	1.250	7.73	3.26	2.64	1.13	120	360
	12/16/2013	<1	<1	<1	7.7	1.310	6.05	2.60	4.85	2.30	42	208
P-15-17	10/6/2009	0.83	0.19	1	8.0	1.847	14.18	5.62	3.13	1.01	70	345
	12/2/2010	0.84	0.12	<1	8.0	1.380	9.83	2.73	3.17	1.26	30	160
	10/17/2011	0.50	0.10	2	7.7	1.710	8.29	3.88	6.75	2.74	44	360
	11/14/2012	0.52	0.11	<1	7.9	0.749	3.58	1.62	1.89	1.17	161	250
	12/16/2013	<1	<1	<1	7.8	2.160	9.65	4.90	8.04	3.00	118	305
BG-1	12/7/2000	1.14	0.20	<1	7.6	1.240	9.07	2.64	0.64	0.26	18	<50
	6/20/2001	0.98	0.10	1	7.9	0.231	1.51	0.48	0.43	0.43	32	<300
	11/20/2002	0.85	<0.6	<1	7.8	0.450	3.51	0.98	0.69	0.46	<4	<100
	11/18/2003	0.78	0.12	<1	7.8	0.700	4.13	1.15	0.60	0.36	21	160
	11/8/2004	0.88	0.27	<1	7.7	0.980	6.22	1.94	1.83	0.91	28	60
	11/5/2005	0.78	0.18	<1	8.1	0.835	5.20	1.54	1.60	0.87	27	570
	10/21/2006	0.88	0.18	<1	7.9	1.060	6.04	1.69	1.87	0.95	18	160
	11/10/2007	0.89	0.39	<1	7.7	1.510	7.57	2.80	2.03	0.89	68	280
	11/22/2008	0.72	0.21	1	8.0	0.883	6.13	2.12	1.81	0.89	170	820
	10/22/2009	1.02	0.19	<1	7.5	1.08	7.32	2.21	1.78	0.81	33	230
	12/1/2010	1.00	0.17	2	7.8	0.98	6.35	2.22	2.25	1.09	60	440
BG-2	6/20/2001	0.76	0.20	<1	7.9	0.321	1.83	0.92	0.57	0.48	29	<300
	11/20/2002	0.59	<0.6	<1	7.7	1.250	7.58	3.04	3.56	1.54	8	<100
	11/18/2003	0.52	0.12	<1	7.7	0.670	4.27	1.28	0.70	0.42	25	90
	11/8/2004	0.79	0.24	<1	7.8	0.690	4.05	1.45	1.22	0.74	32	70
	11/5/2005	0.69	0.15	<1	8.1	0.745	4.24	1.45	1.41	0.83	71	2140
	10/21/2006	0.88	0.16	<1	8.0	0.757	3.63	1.60	1.47	0.90	21	120
	11/10/2007	0.89	0.44	<1	7.7	1.550	9.46	3.44	2.42	0.95	73	350
	11/22/2008	0.61	0.23	2	8.0	0.809	5.05	2.21	1.73	0.90	160	680
	10/22/2009	0.73	0.15	<1	7.6	1.07	7.78	2.81	1.01	0.43	25	220
	12/1/2010	0.74	0.14	<1	7.9	0.63	3.62	1.65	0.87	0.53	80	320
BG-3	6/20/2001	0.83	0.30	<1	7.9	0.385	2.41	1.12	0.48	0.36	41	300
	11/20/2002	0.66	<0.6	<1	7.9	0.580	3.39	1.32	1.79	1.17	8	300
	11/18/2003	0.67	0.12	<1	7.7	0.620	3.77	1.39	0.70	0.43	22	70
	11/8/2004	0.81	0.26	<1	7.8	0.720	4.13	1.54	1.50	0.89	31	80
	11/5/2005	0.79	0.15	2	8.3	0.607	3.39	1.26	1.23	0.80	222	6770
	10/21/2006	1.09	0.15	<1	8.0	1.080	5.54	2.55	2.20	1.09	16	200
	11/10/2007	0.86	0.27	<1	7.7	1.740	10.60	3.73	2.81	1.05	63	300
	11/22/2008	0.72	0.20	3	8.0	0.877	5.06	2.27	2.37	1.24	180	870
	10/22/2009	0.82	0.13	1	7.7	0.600	3.48	1.36	0.87	0.55	70	370
	12/1/2010	0.86	0.19	1	8.0	0.529	2.55	1.36	1.14	0.81	40	200
BG-4	10/22/2009	1.01	0.15	<1	7.7	0.578	3.33	1.40	0.95	0.61	60	370
	12/1/2010	1.03	0.18	2	8.0	0.656	3.32	1.59	1.58	1.01	50	340
BG-5	10/22/2009	0.90	0.12	<1	7.7	0.692	4.09	1.66	1.15	0.67	60	390
	12/1/2010	0.94	0.17	2	8.0	0.920	4.71	2.31	2.47	1.32	60	330
BG-5-7	10/22/2009	0.52	0.08	<1	7.9	0.508	2.86	1.09	0.80	0.56	70	350
	12/1/2010	0.68	0.11	<1	7.9	0.635	3.53	1.48	1.34	0.84	50	360
BG-7-9	10/22/2009	0.80	0.09	<1	7.6	0.442	2.57	0.87	0.65	0.49	30	240
	12/1/2010	0.99	0.14	1	8.0	0.730	3.96	1.56	2.02	1.22	40	320
BG-9-11	10/22/2009	0.76	0.05	<1	7.6	0.426	2.47	0.81	0.63	0.49	32	230
	12/1/2010	0.99	0.11	2	7.7	1.260	8.78	3.15	2.91	1.19	<30	380
BG-11-13	10/22/2009	0.56	<0.05	<1	7.7	0.335	1.96	0.59	0.55	0.48	40	300
	12/1/2010	0.56	0.06	1	7.7	0.953	5.48	2.08	3.09	1.59	<30	380
BG-13-15	10/22/2009	0.68	0.10	<1	7.6	0.318	1.69	0.50	0.57	0.54	70	540
	12/1/2010	0.42	0.06	1	7.9	0.593	3.13	1.24	1.89	1.28	<30	290
BG-15-17	10/22/2009	0.99	0.14	1	7.7	0.387	2.06	0.68	0.87	0.74	70	530
	12/1/2010	0.45	0.09	1	7.9	0.501	2.74	1.00	1.48	1.08	<30	290

NOTE: 2000 Sample: 1 = 0 - 6 inches, 2 = 6 - 18 inches and 3 = 18 - 36 inches
2001 through 2008 Sample: 1 = 0 - 1 ft, 2 = 1 - 2 ft and 3 = 2 - 3 ft; BG samples are background.

Composite samples collected from untreated (background) areas are labeled BG-1, BG-2, or BG-3, representing the same three layers.

Table 3-5 lists concentrations of uranium and selenium in 1999 (background surface samples only), 2000 at 0-6, 6-18, and 18-36 in; and 2001 to 2011 at 0-1, 1-2 and 2-3 ft. Depths greater than three feet were first sampled in 2009.

3.3.1 Sections 33 and 34 Flood Areas

Composite soil samples were collected from three soil layers in the Section 34 flood irrigation area after the 2000 (15 samples from 3 depths at up to 9 locations), 2001 (30 samples from 3 depths at 10 locations), 2002 (36 samples from 3 depths at 12 locations), 2003 (33 samples from 3 depths at 11 locations); 2004, 2005, 2006, 2007 and 2008 (each with 36 samples from 3 depths at 12 locations) irrigation seasons. Samples were collected from three lysimeter locations and an additional five soil locations in 2009. Eight and six soil sample locations were composited in 2010 and 2011 (see Figures 2-1 through 2-12 for sample locations). Five samples from the Section 34 flood area were collected in 2012 and 2013 (see Figure 2-13 and 2-14 for locations). No samples from the Section 33 flood area were collected in 2012 or 2013. Uranium and selenium concentrations observed in the Sections 33 and 34 flood irrigation areas are presented in Figures 3-8 and 3-10, respectively. A comparison with background was not made for Section 33 flood, because there is insufficient data to analyze.

Figure 3-8 presents a plot of the background and treated uranium concentrations with time for the Section 33 and 34 flood areas. The mean background concentrations were presented in Section 3.2. Uranium concentrations have very gradually increased in the upper level for the previous eight years and were steady in 2013.The concentrations have had fairly steady levels in the second foot interval for the last six years. This indicates that no additional increases in these two layers are likely in the future. From 2001 to 2011, uranium concentrations in Section 34 flood increased in the 0-1 ft layer from 2.72 to 5.15 mg/kg but were fairly steady at 4.67 mg/kg and 4.70 in 2012 and 2013. The average uranium concentration in the first 3 feet of soil increased from 1.91 to 3.07 mg/kg, or by a factor of 1.61. Average uranium concentrations in deeper layers of treated soils were generally lower than those in the surface samples.

Figure 3-9 presents the uranium concentrations with depth for the treated and mean background concentrations. The distance between these two lines is the gain in uranium concentration. The green shaded area shows where uranium has been added in the Section 34 soils to a depth of 4 feet. The 2013 detection limit for uranium in the four to thirteen foot samples was too large to define the gain in these intervals. This figure shows that the uranium is accumulating in the treated areas of Section 34 primarily in the two upper feet with only a small amount in the two to four foot interval. A small 2012 gain in the 9 to 13 foot interval is shown on this figure with a black pattern. This indicated gain is small and could easily be variation in the laboratory analysis.

The 2013 selenium level in the upper interval was similar to the 2012 concentration, but slightly larger (see Figures 3-10 and 3-11). The 2013 detection limit was too large to estimate selenium gains from 2 to 13 feet.

A comparison of the results obtained from 2001 through 2013 indicates that selenium has accumulated in the treated areas of Section 34. Figure 3-11 shows that the selenium accumulation has mainly been in the upper foot interval of the soil.

Table 3-6 presents the treated area uranium and selenium concentrations for each year along with the mean background concentration, which was determined from all background data through that year. Table 3-6 presents the gain (difference between treated area and mean background) for 2013. The cumulative gain for 2013 is given and used in the cumulative buildup tables in the next subsection.

3.3.2 Section 28 Center Pivot

Twelve locations were sampled in the treated area of Section 28 in 2002, 2003, 2004, 2005, 2006, 2007 and 2008 at the three, 1-ft depth intervals described above. Eight (3 lysimeter locations plus 5 general sample locations) and five locations were sampled in 2009 through 2010 to the depth of the top of the basalt. Five samples were taken in 2011 through 2013 (1 lysimeter location plus 4 general sample locations). Graphical presentations of uranium and selenium concentrations are included in Figures 3-12 through 3-15 for the Section 28 area.

Uranium concentrations in composite samples collected from the treated and background areas in 2002 were, with one exception, at levels significantly above pre-operational and 2003 through 2012 treated levels. The 2002 data are likely elevated because of laboratory error and do not represent uranium concentrations in Section 28 soils. This data is not considered further.

Uranium concentrations in the treated area in the 2-3 ft interval increased in 2012 and 2013 from the low levels observed in 2011 (see Figure 3-12). The uranium concentrations in the 0-1 and 1-2 ft intervals were less than the detection limit in 2013. The most recent (2013) concentrations of uranium observed in the treated area produced uranium gains of <0.40 (0-1 ft), <0.48 (1-2 ft) and 0.79 (2-3 ft). These uranium gains in the upper soil profile in Section 28 indicate that the levels in the upper two feet may be moving downward.

In 2013, selenium concentrations observed in the treated area were all less than the detection limit. Figure 3-15 presents the selenium profile for the Section 28 area which shows gain in the upper four feet of the profile for 2012. The 2013 selenium detection limit was too large to define the small gains that have been observed in the Section 28 soils.

3.3.3 Section 33 Center Pivot

Twelve locations were sampled in the treated area of Section 33 in each of the eight latter years (2001 to 2008) and at the three depths described above. Samples were collected to the top of the basalt in 2009 through 2012. Samples were collected from the five lysimeter locations and were combined with five additional soil sample locations to develop the composite value for each depth interval in 2009. Appendix A presents the separate soil analysis. Five soil samples were composited together for the Section 33 soils in 2011 through 2013 (see Figure 2-12 through 2-14).

As stated in Section 3.1.3, the term "mean background" is defined as the average of all of the untreated, composite concentrations of a constituent determined from initial testing results to the most current. As defined, the mean background uranium concentration for Section 33 for the upper layer is 0.80 mg/kg.

Uranium concentrations in the treated area started to exceed those in background samples in 2002. The most recent (2013) concentrations observed in the treated area were 2.20 (0-1 ft), 1.60 (1-2 ft) and 1.20 (2-3 ft). This compares to the corresponding mean background values of 0.80 (0-1 ft), 0.69 (1-2 ft) and 0.73 mg/kg (2-3 ft). Uranium accumulated in the upper two feet of soil at a relatively constant rate until 2004, when concentrations reached a fairly steady state until an increase in 2009 and 2010 and a decline in 2011 (see Figure 3-16). The 2012 and 2013 data returned to values similar to those found in 2009 and 2010. Figure 3-17 shows the 2012 and 2013 gain in uranium in Section 33. The gain in only the upper five feet in 2012 is supported by the 2013 data. These two gain profiles are fairly similar indicating very little movement of uranium that was added to the Section 33 soils.

Selenium concentrations in 2012 for the top three feet of treated soil exceeded the mean background by factors of 2.67 (0-1 ft), 2.27 (1-2 ft) and 1.85 (2-3 ft). The 2013 selenium detection limit was too large to define the gains the selenium in Section 33 (see Figure 3-18). The Section 33 selenium gain profile is presented in Figure 3-19 showing the 2012 gain in soil concentrations. The black pattern shows that the majority of the 2012 gain is above seven feet while a small amount of gain was observed in two of the four lower intervals. Some selenium has likely migrated through the upper seventeen feet of soil.

Table 3-5. Summary of Irrigation Soil Analyses, 2000-2013

		Uranium (mg/kg)		Selenium (mg/kg)	
Section	Yearly Data	Treated Area	Background	Treated Area	Background
34 Flood	1999 AVG:	----	2.44	----	0.44
	2000-1 AVG:	3.35	----	0.68	----
	2000-2 AVG:	2.22	----	0.37	----
	2000-3 AVG	1.62	----	0.30	----
	2001-1	2.72	2.47	0.50	0.30
	2001-2	1.88	1.92	0.40	0.20
	2001-3	1.15	0.79	0.30	0.20
	2002-1	0.69	0.45	<0.60	<0.60
	2002-2	0.46	0.53	<0.60	<0.60
	2002-3	0.42	0.40	<0.60	<0.60
	2003-1	3.72	2.33	0.82	0.42
	2003-2	1.90	1.46	0.40	0.35
	2003-3	1.08	1.66	0.19	0.36
	2004-1	4.43	2.79	1.15	0.75
	2004-2	2.27	2.04	0.63	0.68
	2004-3	1.40	1.38	0.37	0.40
	2005-1	3.94	2.41	1.10	0.53
	2005-2	1.41	2.44	0.38	0.69
	2005-3	2.62	2.13	0.68	0.51
	2006-1	4.88	3.06	0.95	0.69
	2006-2	2.25	3.93	0.45	0.87
	2006-3	1.21	2.29	0.28	0.54
	2007-1	5.02	3.30	1.32	0.74
	2007-2	3.05	2.67	0.44	0.78
	2007-3	1.75	1.64	0.64	0.53
	2008-1	4.38	2.52	1.14	0.57
	2008-2	2.70	2.19	0.68	0.48
	2008-3	1.71	1.26	0.37	0.27
	2009-1	4.06	3.35	0.97	0.59
	2009-2	2.59	2.15	0.63	0.39
	2009-3	1.82	0.63	0.46	0.17
	2009-4	0.95	0.55	0.21	0.1
	2009-5	0.56	0.33	0.08	0.04
	2009-5-7	0.35	0.31	0.05	0.04
	2009-7-9	0.36	0.93	0.05	0.09
	2009-9-11	0.52	1.11	0.10	0.17
	2009-11-13	1.06	1.26	0.11	1.31
	2009-13-15	0.61	0.96	0.10	0.53

Table 3-5. Summary of Irrigation Soil Analyses, 2000-2013 (continued)

		Uranium (mg/kg)		Selenium (mg/kg)	
Section	Yearly Data	Treated Area	Background	Treated Area	Background
34 Flood	2010-1	4.64	3.27	1.05	0.58
	2010-2	2.83	2.61	0.57	0.56
	2010-3	1.96	1.69	0.39	0.42
	2010-4	0.87	0.56	0.13	0.17
	2010-5	0.59	0.52	0.09	0.11
	2010-5-7	0.44	0.52	0.09	0.09
	2010-7-9	0.47	0.81	0.07	0.12
	2010-9-11	1.12	0.91	0.22	0.11
	2010-11-13	0.72	1.23	0.13	0.14
	2011-1	5.15	----	1.03	----
	2011-2	2.90	----	0.57	----
	2011-3	1.13	----	0.22	----
	2011-4	0.81	----	0.07	----
	2011-5	0.44	----	<0.05	----
	2011-5-7	0.36	----	<0.05	----
	2011-7-9	0.38	----	<0.05	----
	2011-9-11	0.73	----	0.12	----
	2011-11-13	0.68	----	0.06	----
	2012-1	4.67	----	0.88	----
	2012-2	2.78	----	0.52	----
	2012-3	1.40	----	0.24	----
	2012-4	0.88	----	0.12	----
	2012-5	0.50	----	0.07	----
	2012-5-7	0.37	----	<0.05	----
	2012-7-9	0.37	----	<0.05	----
	2012-9-11	0.96	----	0.10	----
	2012-11-13	1.24	----	0.11	----
	2013-1	4.70	----	1.20	----
	2013-2	3.10	----	<1	----
	2013-3	1.40	----	<1	----
	2013-4	<1	----	<1	----
	2013-5	<1	----	<1	----
	2013-5-7	<1	----	<1	----
	2013-7-9	<1	----	<1	----
	2013-9-11	<1	----	<1	----
	2013-11-13	<1	----	<1	----

Table 3-5. Summary of Irrigation Soil Analyses, 2000-2013 (continued)

		Uranium (mg/kg)		Selenium (mg/kg)	
Section	Yearly Data	Treated Area	Background	Treated Area	Background
33 Flood	2004-1	1.78	1.56	0.56	0.47
	2004-2	1.67	1.30	0.47	0.39
	2004-3	1.68	1.33	0.49	0.42
	2005-1	1.35	1.12	0.31	0.25
	2005-2	1.14	0.92	0.24	0.20
	2005-3	1.00	0.90	0.20	0.19
	2006-1	1.76	1.62	0.41	0.21
	2006-2	1.24	1.55	0.26	0.56
	2006-3	1.62	1.05	0.21	0.35
	2007-1	1.69	1.79	0.45	0.38
	2007-2	1.55	1.29	0.40	0.31
	2007-3	1.51	1.24	0.40	0.35
	2008-1	1.70	1.44	0.43	0.32
	2008-2	1.53	1.18	0.39	0.32
	2008-3	0.96	0.97	0.23	0.25
	2009-1	1.17	1.22	0.1	0.23
	2009-2	1.17	1.6	0.09	0.29
	2009-3	0.67	0.61	0.08	0.1
	2009-4	0.38	0.87	<0.05	0.12
	2009-5	0.33	0.46	<0.05	0.06
	2009-5-7	0.35	0.42	<0.05	0.05
	2009-7-9	0.27	0.35	<0.05	<0.05
	2009-9-11	0.52	0.44	0.06	0.07
	2010-1	1.84	1.42	0.36	0.27
	2010-2	1.96	1.46	0.41	0.27
	2010-3	1.76	0.86	0.41	0.17
	2010-4	0.32	0.94	<0.05	0.16
	2010-5	0.40	0.58	<0.05	<0.05
	2010-5-7	0.20	0.52	<0.05	<0.05
	2010-7-9	0.19	0.33	<0.05	<0.05
	2010-9-11	0.23	0.27	<0.05	<0.05
	2010-11-13	0.27	0.65	<0.05	0.07
	2011-1	1.63	----	0.33	----
	2011-2	1.53	----	0.33	----
	2011-3	1.62	----	0.3	----
	2011-4	0.41	----	0.06	----
	2011-5	0.26	----	<0.05	----
	2011-5-7	0.13	----	<0.05	----
	2011-7-9	0.19	----	<0.05	----
	2011-9-11	0.21	----	<0.05	----
	2011-11-13	0.21	----	<0.05	----

Table 3-5. Summary of Irrigation Soil Analyses, 2000-2013 (continued)

		Uranium (mg/kg)		Selenium (mg/kg)	
Section	Yearly Data	Treated Area	Background	Treated Area	Background
28 Center Pivot	2002-1	2.99	2.99	<0.60	<0.60
	2002-2	1.47	1.62	<0.60	<0.60
	2002-3	0.74	1.45	<0.60	<0.60
	2003-1	0.81	0.51	0.18	0.15
	2003-2	0.70	0.61	0.16	0.10
	2003-3	0.57	0.53	0.13	0.15
	2004-1	0.89	0.88	0.37	0.22
	2004-2	0.80	0.77	0.23	0.22
	2004-3	0.70	0.81	0.23	0.19
	2005-1	0.68	0.47	0.17	0.12
	2005-2	0.74	0.47	0.15	0.07
	2005-3	0.58	0.55	0.12	0.07
	2006-1	1.11	0.62	0.16	0.10
	2006-2	1.14	0.51	0.09	<0.05
	2006-3	1.06	0.58	0.08	0.06
	2007-1	1.14	0.78	0.47	0.23
	2007-2	1.01	0.91	0.34	0.24
	2007-3	0.92	0.80	0.25	0.25
	2008-1	1.17	0.59	0.39	0.15
	2008-2	1.01	0.46	0.24	0.15
	2008-3	1.01	0.52	0.25	0.15
	2009-1	1.62	1.11	0.41	0.16
	2009-2	1.12	0.57	0.19	0.1
	2009-3	1.24	0.56	0.20	0.11
	2009-4	0.78	0.52	0.10	0.07
	2009-5	0.83	0.45	0.12	0.06
	2009-5-7	0.71	0.62	0.08	0.08
	2009-7-9	0.76	0.79	0.10	0.08
	2009-9-11	0.47	0.52	0.08	0.09
	2009-11-13	0.53	0.97	0.12	0.12
	2009-13-15	1.02	0.6	0.28	0.08
	2009-15-17	0.41	0.84	0.20	0.1
	2010-1	1.37	0.65	0.27	0.16
	2010-2	1.24	0.40	0.2	0.13
	2010-3	1.34	0.45	0.23	0.13
	2010-4	1.03	0.39	0.15	0.09
	2010-5	0.84	0.36	0.14	0.07

Table 3-5. Summary of Irrigation Soil Analyses, 2000-2013 (continued)

		Uranium (mg/kg)		Selenium (mg/kg)	
Section	Yearly Data	Treated Area	Background	Treated Area	Background
28 Center Pivot	2010-5-7	0.71	0.43	0.13	0.08
	2010-7-9	0.61	0.44	0.09	0.09
	2010-9-11	0.67	0.52	0.16	0.09
	2010-11-13	0.64	0.65	0.15	0.12
	2010-13-15	0.80	0.68	0.24	0.13
	2010-15-17	0.53	0.54	0.12	0.09
	2011-1	0.73	----	0.22	----
	2011-2	0.78	----	0.13	----
	2011-3	0.75	----	0.08	----
	2011-4	0.76	----	0.15	----
	2011-5	0.62	----	<0.05	----
	2011-5-7	0.48	----	<0.05	----
	2011-7-9	0.38	----	<0.05	----
	2011-9-11	0.39	----	<0.05	----
	2011-11-13	0.35	----	<0.05	----
	2011-13-15	0.40	----	0.08	----
	2012-1	1.15	----	0.39	----
	2012-2	0.77	----	0.13	----
	2012-3	1.07	----	0.15	----
	2012-4	0.72	----	0.10	----
	2012-5	0.63	----	0.06	----
	2012-5-7	0.71	----	0.06	----
	2012-7-9	0.97	----	0.09	----
	2012-9-11	0.52	----	0.07	----
	2012-11-13	0.57	----	<0.05	----
	2012-13-15	0.51	----	0.07	----
	2013-1	<1	----	<1	----
	2013-2	<1	----	<1	----
	2013-3	1.30	----	<1	----
	2013-4	<1	----	<1	----
	2013-5	<1	----	<1	----
	2013-5-7	1.30	----	<1	----
	2013-7-9	<1	----	<1	----
	2013-9-11	<1	----	<1	----
	2013-11-13	<1	----	<1	----
	2013-13-15	<1	----	<1	----
	2013-15-17	<1	----	<1	----

Table 3-5. Summary of Irrigation Soil Analyses, 2000-2013 (continued)

		Uranium (mg/kg)		Selenium (mg/kg)	
Section	Yearly Data	Treated Area	Background	Treated Area	Background
33 Center Pivot	1999 AVG:	----	0.61	----	0.12
	2000-1 AVG:	0.93	1.14	0.37	0.20
	2000-2 AVG:	0.81	----	0.45	----
	2000-3 AVG	1.03	----	0.25	----
	2001-1	0.94	0.98	0.30	0.10
	2001-2	0.60	0.76	0.30	0.20
	2001-3	0.54	0.83	0.10	0.30
	2002-1	0.98	0.85	<0.60	<0.60
	2002-2	0.89	0.59	<0.60	<0.60
	2002-3	0.68	0.66	<0.60	<0.60
	2003-1	1.36	0.78	0.28	0.12
	2003-2	1.14	0.52	0.19	0.12
	2003-3	1.00	0.67	0.18	0.12
	2004-1	1.78	0.88	0.45	0.27
	2004-2	1.52	0.79	0.39	0.24
	2004-3	1.15	0.81	0.38	0.26
	2005-1	1.45	0.78	0.31	0.18
	2005-2	1.15	0.69	0.21	0.15
	2005-3	1.00	0.79	0.30	0.15
	2006-1	1.87	0.88	0.36	0.18
	2006-2	1.62	0.88	0.15	0.16
	2006-3	1.05	1.09	0.14	0.15
	2007-1	1.67	0.89	0.44	0.39
	2007-2	1.34	0.89	0.30	0.44
	2007-3	1.30	0.86	0.39	0.27
	2008-1	1.41	0.72	0.41	0.21
	2008-2	1.37	0.61	0.35	0.23
	2008-3	1.27	0.72	0.33	0.20
	2009-1	2.03	1.02	0.41	0.19
	2009-2	1.84	0.73	0.29	0.15
	2009-3	1.52	0.82	0.28	0.13
	2009-4	1.32	1.01	0.27	0.15
	2009-5	1.20	0.9	0.27	0.12
	2009-5-7	0.95	0.52	0.20	0.08
	2009-7-9	0.85	0.8	0.22	0.09
	2009-9-11	0.93	0.76	0.19	0.05
	2009-11-13	0.96	0.56	0.12	<0.05
	2009-13-15	0.80	0.68	0.14	0.10
	2009-15-17	0.83	0.99	0.19	0.14
	2010-1	1.87	1	0.35	0.17
	2010-2	2.16	0.74	0.25	0.14
	2010-3	1.95	0.86	0.24	0.19

Table 3-5. Summary of Irrigation Soil Analyses, 2000-2013 (continued)

		Uranium (mg/kg)		Selenium (mg/kg)	
Section	Yearly Data	Treated Area	Background	Treated Area	Background
33 Center Pivot	2010-4	1.52	1.03	0.26	0.18
	2010-5	1.79	0.94	0.33	0.17
	2010-5-7	0.89	0.68	0.16	0.11
	2010-7-9	0.67	0.99	0.10	0.14
	2010-9-11	0.67	0.99	0.10	0.11
	2010-11-13	0.56	0.56	0.10	0.06
	2010-13-15	0.61	0.42	0.10	0.06
	2010-15-17	0.84	0.45	0.12	0.09
	2011-1	1.56	----	0.42	----
	2011-2	1.19	----	0.19	----
	2011-3	0.86	----	0.18	----
	2011-4	0.66	----	0.18	----
	2011-5	0.79	----	0.17	----
	2011-5-7	0.51	----	0.10	----
	2011-7-9	0.48	----	0.07	----
	2011-9-11	0.58	----	0.11	----
	2011-11-13	0.52	----	0.10	----
	2011-13-15	0.43	----	0.12	----
	2011-15-17	0.50	----	0.10	----
	2012-1	2.22	----	0.40	----
	2012-2	2.51	----	0.34	----
	2012-3	1.58	----	0.24	----
	2012-4	1.55	----	0.37	----
	2012-5	1.20	----	0.24	----
	2012-5-7	1.02	----	0.18	----
	2012-7-9	0.49	----	<0.05	----
	2012-9-11	0.62	----	0.06	----
	2012-11-13	0.54	----	0.08	----
	2012-13-15	0.59	----	0.13	----
	2012-15-17	0.52	----	0.11	----
	2013-1	2.20	----	<1	----
	2013-2	1.60	----	<1	----
	2013-3	1.20	----	<1	----
	2013-4	1.40	----	<1	----
	2013-5	1.50	----	<1	----
	2013-5-7	<1	----	<1	----
	2013-7-9	<1	----	<1	----
	2013-9-11	<1	----	<1	----
	2013-11-13	<1	----	<1	----
	2013-13-15	<1	----	<1	----
	2013-15-17	<1	----	<1	----

Notes:
2000 Sample: 1 = 0 - 6 inches, 2 = 6 - 18 inches and 3 = 18 - 36 inches
2001 through 2008 Sample: 1 = 0 - 1 ft, 2 = 1 - 2 ft and 3 = 2 - 3 ft

Table 3-6. Treated, Background and Gain in Soil Concentrations

		Uranium (mg/kg)			Selenium (mg/kg)		
Section	Yearly Data	Treated Area	Background	Gain	Treated Area	Background	Gain
34 Flood	1999 AVG:	----	2.44		----	0.44	
	2000-1 AVG:	3.35	----		0.68	----	
	2000-2 AVG:	2.22	----		0.37	----	
	2000-3 AVG	1.62	----		0.30	----	
	2001-1	2.72	2.47		0.50	0.30	
	2001-2	1.88	1.92		0.40	0.20	
	2001-3	1.15	0.79		0.30	0.20	
	2002-1	0.69	0.45		<0.60	<0.60	
	2002-2	0.46	0.53		<0.60	<0.60	
	2002-3	0.42	0.40		<0.60	<0.60	
	2003-1	3.72	2.33		0.82	0.42	
	2003-2	1.90	1.46		0.40	0.35	
	2003-3	1.08	1.66		0.19	0.36	
	2004-1	4.43	2.79		1.15	0.75	
	2004-2	2.27	2.04		0.63	0.68	
	2004-3	1.40	1.38		0.37	0.40	
	2005-1	3.94	2.41		1.10	0.53	
	2005-2	1.41	2.44		0.38	0.69	
	2005-3	2.62	2.13		0.68	0.51	
	2006-1	4.88	3.06		0.95	0.69	
	2006-2	2.25	3.93		0.45	0.87	
	2006-3	1.21	2.29		0.28	0.54	
	2007-1	5.02	3.30		1.32	0.74	
	2007-2	3.05	2.67		0.44	0.78	
	2007-3	1.75	1.64		0.64	0.53	
	2008-1	4.38	2.52		1.14	0.57	
	2008-2	2.70	2.19		0.68	0.48	
	2008-3	1.71	1.26		0.37	0.27	
	2009-1	4.06	1.98		0.97	0.35	
	2009-2	2.59	1.5		0.63	0.28	
	2009-3	1.82	1.16		0.46	0.28	
	2009-4	0.95	0.55		0.21	0.1	
	2009-5	0.56	0.33		0.08	<0.05	
	2009-5-7	0.35	0.31		0.05	<0.05	
	2009-7-9	0.36	0.93		0.05	0.09	
	2009-9-11	0.52	1.11		0.10	0.17	
	2009-11-13	1.06	1.26		0.11	1.31	
	2009-13-15	0.61	0.96		0.10	0.53	

Table 3-6.Treated, Background and Gain in Soil Concentrations (continued)

		Uranium (mg/kg)			Selenium (mg/kg)		
Section	Yearly Data	Treated Area	Background	Gain	Treated Area	Background	Gain
34 Flood	2010-1	4.64	2.00		1.05	0.35	
	2010-2	2.83	1.54		0.57	0.29	
	2010-3	1.96	1.12		0.39	0.26	
	2010-4	0.87	0.76		0.13	0.15	
	2010-5	0.59	0.64		0.09	0.12	
	2010-5-7	0.44	0.55		0.09	0.06	
	2010-7-9	0.47	0.56		0.07	0.11	
	2010-9-11	1.12	0.68		0.22	0.12	
	2010-11-13	0.72	1.12		0.13	0.42	
	2011-1	5.15	2.00		1.03	0.35	
	2011-2	2.90	1.54		0.57	0.29	
	2011-3	1.13	1.12		0.22	0.26	
	2011-4	0.81	0.76		0.07	0.15	
	2011-5	0.44	0.64		<0.05	0.12	
	2011-5-7	0.36	0.55		<0.05	0.06	
	2011-7-9	0.38	0.56		<0.05	0.11	
	2011-9-11	0.73	0.68		0.12	0.12	
	2011-11-13	0.68	1.12		0.06	0.42	
	2012-1	4.67	2.00		0.88	0.35	
	2012-2	2.78	1.54		0.52	0.29	
	2012-3	1.40	1.12		0.24	0.26	
	2012-4	0.88	0.76		0.12	0.15	
	2012-5	0.50	0.64		0.07	0.12	
	2012-5-7	0.37	0.55		<0.05	0.06	
	2012-7-9	0.37	0.56		<0.05	0.11	
	2012-9-11	0.96	0.68		0.1	0.12	
	2012-11-13	1.24	1.12		0.11	0.42	
	2013-1	4.70	2.00	2.70	1.2	0.35	0.85
	2013-2	3.10	1.54	1.56	<1	0.29	*<0.71
	2013-3	1.40	1.12	0.28	<1	0.26	*<0.74
	2013-4	<1	0.76	*<0.24	<1	0.15	*<0.85
	2013-5	<1	0.64	*<0.36	<1	0.12	*<0.88
	2013-5-7	<1	0.55	*<0.45	<1	0.06	*<0.94
	2013-7-9	<1	0.56	*<0.44	<1	0.11	*<0.89
	2013-9-11	<1	0.68	*<0.32	<1	0.12	*<0.88
	2013-11-13	<1	1.12	*<-0.12	<1	0.42	<0.58
			SUM	4.54		SUM	0.85

NOTE: *ONLY POSITIVE GAINS IN UPPER 7 FEET WERE USED

Table 3-6.Treated, Background and Gain in Soil Concentrations (continued)

		Uranium (mg/kg)			Selenium (mg/kg)		
Section	Yearly Data	Treated Area	Background	Gain	Treated Area	Background	Gain
33 Flood	2004-1	1.78	1.56		0.56	0.47	
	2004-2	1.67	1.30		0.47	0.39	
	2004-3	1.68	1.33		0.49	0.42	
	2005-1	1.35	1.12		0.31	0.25	
	2005-2	1.14	0.92		0.24	0.20	
	2005-3	1.00	0.90		0.20	0.19	
	2006-1	1.76	1.62		0.41	0.21	
	2006-2	1.24	1.55		0.26	0.56	
	2006-3	1.62	1.05		0.21	0.35	
	2007-1	1.69	1.79		0.45	0.38	
	2007-2	1.55	1.29		0.40	0.31	
	2007-3	1.51	1.24		0.40	0.35	
	2008-1	1.70	1.44		0.43	0.32	
	2008-2	1.53	1.18		0.39	0.32	
	2008-3	0.96	0.97		0.23	0.25	
	2009-1	1.17	1.22		0.10	0.23	
	2009-2	1.17	1.60		0.09	0.29	
	2009-3	0.67	0.61		0.08	0.10	
	2009-4	0.38	0.87		<0.05	0.12	
	2009-5	0.33	0.46		<0.05	0.06	
	2009-5-7	0.35	0.42		<0.05	0.05	
	2009-7-9	0.27	0.35		<0.05	<0.05	
	2009-9-11	0.52	0.44		0.06	0.07	
	2010-1	1.84	1.35		0.36	0.35	
	2010-2	1.96	1.54		0.41	0.29	
	2010-3	1.76	1.12		0.41	0.26	
	2010-4	0.32	0.76		<0.05	0.15	
	2010-5	0.40	0.64		<0.05	0.12	
	2010-5-7	0.20	0.55		<0.05	0.06	
	2010-7-9	0.19	0.56		<0.05	0.11	
	2010-9-11	0.23	0.68		<0.05	0.12	
	2010-11-13	0.27	1.12		<0.05	0.42	
	2011-1	1.63	1.35	0.28	0.33	0.35	*-0.02
	2011-2	1.53	1.54	*-0.01	0.33	0.29	0.04
	2011-3	1.62	1.12	0.50	0.3	0.26	0.04
	2011-4	0.41	0.76	*-0.35	0.06	0.15	*-0.09
	2011-5	0.26	0.64	*-0.38	<0.05	0.12	*-0.07
	2011-5-7	0.13	0.55	*-0.42	<0.05	0.06	*-0.01
	2011-7-9	0.19	0.56	*-0.37	<0.05	0.11	*-0.06
	2011-9-11	0.21	0.68	*-0.47	<0.05	0.12	*-0.07
	2011-11-13	0.21	1.12	*-0.91	<0.05	0.42	*-0.37
			SUM	0.78		SUM	0.08

NOTE: * DID NOT USE IN SUM

Table 3-6.Treated, Background and Gain in Soil Concentrations (continued)

		Uranium (mg/kg)			Selenium (mg/kg)		
Section	Yearly Data	Treated Area	Background	Gain	Treated Area	Background	Gain
28 Center Pivot	2002-1	2.99	2.99		<0.60	<0.60	
	2002-2	1.47	1.62		<0.60	<0.60	
	2002-3	0.74	1.45		<0.60	<0.60	
	2003-1	0.81	0.51		0.18	0.15	
	2003-2	0.70	0.61		0.16	0.10	
	2003-3	0.57	0.53		0.13	0.15	
	2004-1	0.89	0.88		0.37	0.22	
	2004-2	0.80	0.77		0.23	0.22	
	2004-3	0.70	0.81		0.23	0.19	
	2005-1	0.68	0.47		0.17	0.12	
	2005-2	0.74	0.47		0.15	0.07	
	2005-3	0.58	0.55		0.12	0.07	
	2006-1	1.11	0.62		0.16	0.10	
	2006-2	1.14	0.51		0.09	<0.05	
	2006-3	1.06	0.58		0.08	0.06	
	2007-1	1.14	0.78		0.47	0.23	
	2007-2	1.01	0.91		0.34	0.24	
	2007-3	0.92	0.80		0.25	0.25	
	2008-1	1.17	0.59		0.39	0.15	
	2008-2	1.01	0.46		0.24	0.15	
	2008-3	1.01	0.52		0.25	0.15	
	2009-1	1.62	0.59		0.41	0.13	
	2009-2	1.12	0.53		0.19	0.11	
	2009-3	1.24	0.52		0.20	0.1	
	2009-4	0.78	0.81		0.10	0.1	
	2009-5	0.83	0.85		0.12	0.09	
	2009-5-7	0.71	0.58		0.08	0.07	
	2009-7-9	0.76	0.66		0.10	0.1	
	2009-9-11	0.47	0.41		0.08	0.07	
	2009-11-13	0.53	0.39		0.12	0.1	
	2009-13-15	1.02	0.12		0.28	0.57	
	2009-15-17	0.41	0.22		0.20	0.06	

Table 3-6.Treated, Background and Gain in Soil Concentrations (continued)

		Uranium (mg/kg)			Selenium (mg/kg)		
Section	Yearly Data	Treated Area	Background	Gain	Treated Area	Background	Gain
28 Center Pivot	2010-1	1.37	0.60		0.27	0.13	
	2010-2	1.24	0.52		0.2	0.11	
	2010-3	1.34	0.51		0.23	0.10	
	2010-4	1.03	0.46		0.15	0.08	
	2010-5	0.84	0.41		0.14	0.06	
	2010-5-7	0.71	0.53		0.13	0.08	
	2010-7-9	0.61	0.62		0.09	0.09	
	2010-9-11	0.67	0.50		0.16	0.09	
	2010-11-13	0.64	0.81		0.15	0.12	
	2010-13-15	0.80	0.64		0.24	0.11	
	2010-15-17	0.53	0.69		0.12	0.10	
	2011-1	0.73	0.60		0.22	0.13	
	2011-2	0.78	0.52		0.13	0.11	
	2011-3	0.75	0.51		0.08	0.10	
	2011-4	0.76	0.46		0.15	0.08	
	2011-5	0.62	0.41		<0.05	0.06	
	2011-5-7	0.48	0.53		<0.05	0.08	
	2011-7-9	0.38	0.62		<0.05	0.09	
	2011-9-11	0.39	0.50		<0.05	0.09	
	2011-11-13	0.35	0.81		<0.05	0.12	
	2011-13-15	0.40	0.64		0.08	0.11	
	2012-1	1.15	0.60		0.39	0.13	
	2012-2	0.77	0.52		0.13	0.11	
	2012-3	1.07	0.51		0.15	0.10	
	2012-4	0.72	0.46		0.1	0.08	
	2012-5	0.63	0.41		0.06	0.06	
	2012-5-7	0.71	0.53		0.06	0.08	
	2012-7-9	0.97	0.62		0.09	0.09	
	2012-9-11	0.52	0.50		0.07	0.09	
	2012-11-13	0.57	0.81		<0.05	0.12	
	2012-13-15	0.51	0.64		0.07	0.11	
	2013-1	<1	0.60	*<0.40	<1	0.13	*<0.87
	2013-2	<1	0.52	*<0.48	<1	0.11	*<0.89
	2013-3	1.30	0.51	0.79	<1	0.10	*<0.90
	2013-4	<1	0.46	*<0.54	<1	0.08	*<0.92
	2013-5	<1	0.41	*<0.59	<1	0.06	*<0.94
	2013-5-7	1.30	0.53	0.77	<1	0.08	*<0.92
	2013-7-9	<1	0.62	*<0.38	<1	0.09	*<0.91
	2013-9-11	<1	0.50	*<0.50	<1	0.09	*<0.91
	2013-11-13	<1	0.81	*<0.19	<1	0.12	*<0.88
	2013-13-15	<1	0.64	*<0.46	<1	0.11	<0.89
	2013-15-17	<1	0.69	*<0.31	<1	0.10	*<0.90
			SUM	1.56		SUM	#

NOTE: * DID NOT USE IN SUM, # NO SUM CALCUATED DUE TO DETECTION LIMIT

Table 3-6.Treated, Background and Gain in Soil Concentrations (continued)

		Uranium (mg/kg)			Selenium (mg/kg)		
Section	Yearly Data	Treated Area	Background	Gain	Treated Area	Background	Gain
	1999 AVG:	----	0.68		----	0.09	
	2000-1 AVG:	0.93	0.72		0.37	0.10	
	2000-2 AVG:	0.81	0.64		0.45	0.06	
	2000-3 AVG	1.03	0.60		0.25	0.04	
	2001-1	0.94	0.74		0.30	0.10	
	2001-2	0.60	0.66		0.30	0.08	
	2001-3	0.54	0.63		0.10	0.08	
	2002-1	0.98	0.75		<0.60	0.10	
	2002-2	0.89	0.65		<0.60	0.08	
	2002-3	0.68	0.63		<0.60	0.08	
	2003-1	1.36	0.75		0.28	0.10	
	2003-2	1.14	0.64		0.19	0.09	
	2003-3	1.00	0.64		0.18	0.08	
	2004-1	1.78	0.76		0.45	0.11	
	2004-2	1.52	0.65		0.39	0.11	
	2004-3	1.15	0.66		0.38	0.10	
	2005-1	1.45	0.76		0.31	0.12	
	2005-2	1.15	0.66		0.21	0.11	
	2005-3	1.00	0.67		0.30	0.11	
33 Center Pivot	2006-1	1.87	0.77		0.36	0.12	
	2006-2	1.62	0.68		0.15	0.12	
	2006-3	1.05	0.70		0.14	0.11	
	2007-1	1.67	0.78		0.44	0.14	
	2007-2	1.34	0.69		0.30	0.15	
	2007-3	1.30	0.71		0.39	0.12	
	2008-1	1.41	0.77		0.41	0.14	
	2008-2	1.37	0.69		0.35	0.15	
	2008-3	1.27	0.72		0.33	0.13	
	2009-1	2.03	0.79		0.41	0.14	
	2009-2	1.84	0.69		0.29	0.15	
	2009-3	1.52	0.72		0.28	0.13	
	2009-4	1.32	0.60		0.27	0.06	
	2009-5	1.20	0.75		0.27	0.07	
	2009-5-7	0.95	0.52		0.20	0.08	
	2009-7-9	0.85	0.80		0.22	0.09	
	2009-9-11	0.93	0.72		0.19	0.05	
	2009-11-13	0.96	0.76		0.12	<0.05	
	2009-13-15	0.80	0.68		0.14	0.10	
	2009-15-17	0.83	0.99		0.19	0.14	

Table 3-6. Treated, Background and Gain in Soil Concentrations (continued)

		Uranium (mg/kg)			Selenium (mg/kg)		
Section	Yearly Data	Treated Area	Background	Gain	Treated Area	Background	Gain
33 Center Pivot	2010-1	1.87	0.8		0.35	0.15	
	2010-2	2.16	0.69		0.25	0.15	
	2010-3	1.95	0.73		0.24	0.13	
	2010-4	1.52	0.65		0.26	0.08	
	2010-5	1.79	0.81		0.33	0.11	
	2010-5-7	0.89	0.60		0.16	0.10	
	2010-7-9	0.67	0.90		0.10	0.12	
	2010-9-11	0.67	0.86		0.10	0.08	
	2010-11-13	0.56	0.66		0.10	0.06	
	2010-13-15	0.61	0.55		0.10	0.08	
	2010-15-17	0.84	0.72		0.12	0.12	
	2011-1	1.56	0.8		0.42	0.15	
	2011-2	1.19	0.69		0.19	0.15	
	2011-3	0.86	0.73		0.18	0.13	
	2011-4	0.66	0.65		0.18	0.08	
	2011-5	0.79	0.81		0.17	0.11	
	2011-5-7	0.51	0.60		0.10	0.10	
	2011-7-9	0.48	0.90		0.07	0.12	
	2011-9-11	0.58	0.86		0.11	0.08	
	2011-11-13	0.52	0.66		0.10	0.06	
	2011-13-15	0.43	0.55		0.12	0.08	
	2011-15-17	0.50	0.72		0.10	0.12	
	2012-1	2.22	0.8		0.40	0.15	
	2012-2	2.51	0.69		0.34	0.15	
	2012-3	1.58	0.73		0.24	0.13	
	2012-4	1.55	0.65		0.37	0.08	
	2012-5	1.20	0.81		0.24	0.11	
	2012-5-7	1.02	0.60		0.18	0.10	
	2012-7-9	0.49	0.90		<0.05	0.12	
	2012-9-11	0.62	0.86		0.06	0.08	
	2012-11-13	0.54	0.66		0.08	0.06	
	2012-13-15	0.59	0.55		0.13	0.08	
	2012-15-17	0.52	0.72		0.11	0.12	
	2013-1	2.20	0.8	1.40	<1	0.15	*<0.85
	2013-2	1.60	0.69	0.91	<1	0.15	*<0.85
	2013-3	1.20	0.73	0.47	<1	0.13	*<0.87
	2013-4	1.40	0.65	0.75	<1	0.08	*<0.92
	2013-5	1.50	0.81	0.69	<1	0.11	*<0.89
	2013-5-7	<1	0.60	*<0.40	<1	0.10	*<0.90
	2013-7-9	<1	0.90	*<0.10	<1	0.12	*<0.88
	2013-9-11	<1	0.86	*<0.14	<1	0.08	*<0.92
	2013-11-13	<1	0.66	*<0.34	<1	0.06	*<0.94
	2013-13-15	<1	0.55	*<0.45	<1	0.08	*<0.92
	2013-15-17	<1	0.72	*<0.28	<1	0.12	*<0.88
			SUM	4.22		SUM	#

NOTE: * DID NOT USE IN SUM, # NO SUM CALCULATED DUE TO DETECTION LIMIT

3.3.4 Comparison of Applied and Measured Soil Concentrations

3.3.4.1 Uranium

It was assumed when planning the irrigation program that all the uranium would be deposited in the upper 1-ft of soil (ERG and HYDRO, 1999). It was estimated that water containing 0.44 mg/l of uranium applied at 3 ac-ft/year would conservatively increase the concentration of uranium in the upper 1-ft of soil by 0.92 mg/kg per year. The actual average uranium concentrations in the applied water have always been lower than 0.44 mg/l. Actual irrigation application rates have range from significantly below to slightly above 3 ac-ft/yr.

The predictions of uranium accumulation in the soil have been superseded by actual measurements of uranium concentration in the irrigated areas. The measurements indicate that the applied uranium occurs beyond the upper three feet of the soil profile.

It is reasonable to adopt a cumulative mass balance approach to track the fate of the applied uranium since the beginning of the irrigation program for each area. Actual applied uranium concentrations, application rates of irrigation water, and calculated increases in soil are presented in Tables 3-7 and 3-8. The sums of measured concentrations minus background concentrations (gain) are from Table 3-6. Only the upper 7 feet was summed for the Section 34 clay soils to obtain the gain while the entire 17 feet of the Section 28 and 33 center pivot soils were used.

The calculated data in Tables 3-7 and 3-8 are determined as follows:

a = cumulative masses of uranium applied per irrigation area, mg = $\Sigma_{2000\text{-}2011}$[(average concentration in water, mg/l) (volume of water in ac-ft) (28.3 l/ft^3) (43,560 ft^2/ac)]

b = mass of soil per irrigation area, kg = (footage of soil used)(no. of acres)(90 lbs/ft^3) (454 g/lb)(43,560 ft^2/ac)(10^{-3}kg/g)

c = gain in uranium concentration, mg/kg = (sum of measured concentrations of uranium minus mean background concentrations)

d = measured mass of uranium, mg = (b)(c)/footage of soil used

e = ratio of measured to applied masses of uranium, unitless = d/a

The assumptions are consistent with those reported previously (ERG and HYDRO, 1999). For example, typical soil density is assumed to be 90 pounds per cubic foot (lb/ft^3).

The above-background concentrations (gain) of uranium in each section, in mg/kg are tabulated in Table 3-6 and are: Section 33 Center Pivot (4.22); Section 34 (4.54); and Section 28 (1.56).

Based on this series of calculations, the ratios of measured to applied masses of uranium in the total footage of soil are: Sections 33 Pivot (0.96), 34 (0.91), and 28 (0.34).

In Section 33 pivot and Section 28, 96 and 34 percent of the applied uranium is accounted for in 2013, respectively. Gains in the upper 17 feet of soil were used in calculating these percentages. The 2013 percentages are similar to the 2012 percentages. The majority of the applied uranium appears to be within the top 7 feet in the Section 33 pivot. Most of the uranium applied to Section 34 has been retained in the upper three feet and this is attributed to the presence of clay soils. Only the results in the upper three feet are thought to indicate some gain in the treated soil in Section 34. The measured concentrations in Section 33 Flood are thought to not produce a reliable retention value.

Accumulating uranium concentrations for each of the upper three layers in each irrigation area are shown in Figures 3-8 (Sections 33 and 34 Flood), 3-12 (Section 28 Center Pivot) and 3-16 (Section 33 Center Pivot). Each figure is subdivided into upper, middle, and lower intervals. The horizontal line on each figure represents the mean background concentration.

Table 3-7. Uranium Applied in Irrigation Water

	Uranium Concentration (mg/l)a		Acreages				Volume of Irrigation Water Applied (ft)			
Year	Section 28	Sections 33/34	Section 28	Section 33 Flood	Section 33 Pivot	Section 34	Section 28 Pivot	Section 33 Flood	Section 33 Pivot	Section 34 Flood
2000	NA	0.27	NA	NA	150	120	NA	NA	2.29	3.1
2001	NA	0.26	NA	NA	150	120	NA	NA	2.23	3
2002	0.23	0.23	60	NA	150	120	2.2	NA	3.1	3.3
2003	0.24	0.22	60	NA	150	120	2.57	NA	2.62	3.34
2004	0.27	0.26	60	24	150	120	3.04	1.26	2.85	3.23
2005	0.35	0.27	100	24	150	120	2.38	0.84	2.67	3.13
2006	0.35	0.29	100	NA	150	120	2.33	NA	1.94	2.61
2007	0.36	0.28	100	NA	150	120	2.42	NA	2.86	0.98
2008	0.36	0.24	100	24	150	120	2.76	1.93	2.75	2.69
2009	0.39	0.24	100	24	150	120	1.85	6.13	1.43	1.53
2010	NA	0.136	NA	NA	NA	120	NA	NA	NA	1.67
2011	0.14	NA	100	NA	NA	NA	2.13	NA	NA	NA
2012	0.14	0.116	100	NA	NA	120	1.6	NA	NA	1.25
2013	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA

Notes:
NA = not irrigated

Table 3-8. Cumulative Buildup of Uranium in Soils

	Section			
2013	28 Pivot	33 Flood	33 Pivot	34 Flood
Applied Mass of Uranium (mg), a	730,176,364	73,633,517	1,167,905,455	1,066,857,595
Sum of Measured Concentrations Minus Background (mg/kg), c	1.56	–	4.22	4.54
Mass of Soil (kg), b	2,669,792,400	555,316,819	4,538,647,080	1,495,083,744
Measured Mass of Uranium (mg), d	244,992,714	33,319,009	1,126,652,393	969,668,600
Ratio of Measured to Applied Masses, e	0.34	–	0.96	0.91

3.3.4.2 Selenium

The applied and measured selenium concentrations in the soil were calculated in a manner similar to that for uranium, and are presented in Tables 3-9 and 3-10.

The above-background concentrations of selenium in Section 34 for the soil layers was measured at 0.85 mg/kg in 2013. No calculations were done for Section 33 or 28 due to the higher detection limit used in 2013. Based on the same series of calculations shown above in Section 3.3.4.1, the ratio of measured to applied mass of selenium in the soil for Section 34 was 0.53.

Actual selenium measurements are also shown in Figures 3-10 (Sections 33 and 34 Flood), 3-14 (Section 28 Center Pivot) and 3-18 (Section 33 Center Pivot). Each figure is subdivided into upper, middle, and lower intervals. The horizontal lines on each figure represent the mean background concentration of each layer.

There are indications that selenium, when retained, may partly be in a dissolved phase, rather than being completely absorbed in soils. A review of Figures 3-11 through 3-13 indicates that some retention of selenium appears to be occurring. Only 5, 67 and 46 percent of the chloride concentration applied was measured in the soil in 2013 for Sections 28, 33 and 34, respectively. These percentages are less than those observed for selenium, showing that a significant percentage of the chloride added to the Section 28, 33 and 34 irrigation areas was not retained in the soil interval. The higher percentage for selenium indicates some retention of this constituent in the soil profile.

Table 3-9. Selenium Applied in Irrigation Water

	Selenium Concentration (mg/l)a		Acreages				Volume of Irrigation Water Applied (ft)			
Year	Section 28	Sections 33/34	Section 28	Section 33 Flood	Section 33 Pivot	Section 34	Section 28 Pivot	Section 33 Flood	Section 33 Pivot	Section 34 Flood
2000	NA	0.12	NA	NA	150	120	NA	NA	2.29	3.1
2001	NA	0.1	NA	NA	150	120	NA	NA	2.23	3
2002	0.08	0.1	60	NA	150	120	2.2	NA	3.1	3.3
2003	0.08	0.08	60	NA	150	120	2.57	NA	2.62	3.34
2004	0.07	0.09	60	24	150	120	3.04	1.26	2.85	3.23
2005	0.08	0.06	100	24	150	120	2.38	0.84	2.67	3.13
2006	0.08	0.07	100	NA	150	120	2.33	NA	1.94	2.61
2007	0.08	0.06	100	NA	150	120	2.42	NA	2.86	0.98
2008	0.07	0.05	100	24	150	120	2.76	1.93	2.75	2.69
2009	0.07	0.05	100	24	150	120	1.85	6.13	1.43	1.53
2010	NA	0.045	NA	NA	NA	120	NA	NA	NA	1.67
2011	0.03	NA	100	NA	NA	NA	2.13	NA	NA	NA
2012	0.04	0.04	100	NA	NA	120	1.6	NA	NA	1.25
2013	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA

Notes: a. 2003 concentration of selenium is assumed. The value was reported as <0.005 mg/l, which is assumed to be a laboratory artifact.
NA = not irrigated

Table 3-10. Cumulative Buildup of Selenium in Soils

	Section			
2013	**28 Pivot**	**33 Flood**	**33 Pivot**	**34 Flood**
Applied Mass of Selenium (mg), a	169,828,295	16,769,318	360,671,246	343,988,467
Sum of Measured Concentrations Minus Background (mg/kg), c	#	--	#	0.85
Mass of Soil (kg), b	2,669,792,400	555,316,819	4,538,647,080	1,495,083,744
Measured Mass of Selenium (mg), d	136,630,552	3,417,334	453,864,708	181,545,883
Ratio of Measured to Applied Masses, e	--	--	--	0.53

NOTE: # NO SUM CALCULATED DUE TO DETECTION LIMIT

3.3.5 Summary of Soil Concentration Comparison

The data collected in 2013 indicate that soil attenuation of uranium is of the same order of magnitude as that predicted by the pre-operational model.

The soil properties and method of irrigation differed for the Section 33 and 28 sites and the Section 33 flood and Section 34 flood areas. The irrigation water for the Section 33 and 28 sites was applied using center pivot systems while Section 34 was flood irrigated. An additional 24 acres of flood irrigation area was added in eastern Section 33 at the beginning of the 2004 season. The small incremental changes in concentrations in uranium and selenium along with the natural variability in both the center pivot and flood irrigation areas make it difficult to accurately determine the amount of increase in concentrations in the soil from year to year. The 2001 and 2002 data indicate that the soil concentrations were not continuing to increase with time for either type of irrigation among the three irrigation sites. The 2003 and 2004 data show some increase in Sections 33 and 34 while concentrations slightly increased in 2004 in Section 28. A slight decrease was observed at all three sites in 2005. In 2006, an increase was observed in all sites except Section 28 and 33, where selenium decreased slightly in the two lower intervals. Concentrations generally increased or were fairly steady in 2007, followed by a general decrease in 2008. Uranium concentrations in 2009 increased in the Section 33 and 28 soils. The upper foot uranium concentration in the two center pivot soils decreased in 2010, possibly due to the lack of irrigation in 2010. The soil concentrations in the two pivot areas further declined in 2011 even with irrigation in Section 28. The soil concentrations in 2012 increased from the 2011 values to values similar to 2010. The 2013 soils uranium concentrations were similar to the 2012 values. Future sampling may further diminish the effects of analytical and natural variability and more clearly reveal trends in the accumulation of uranium and selenium.

The 2013 results indicate that uranium is being retained in upper five feet in Section 33 and over a larger interval in Section 28 with a small amount of retention in some intervals down to the top of the basalt. Uranium is only being retained in the upper four feet interval in the Section 34 flood area based on the 2010 through 2013 results. The 2013 results generally indicate less selenium is being retained but these results need to be confirmed with future measurements.

In 2013, the measured uranium soil concentrations in the irrigated areas ranged from less than 1 to 4.70 mg/kg. The selenium concentrations in the soil in the irrigated areas for 2013 ranged from less than 1 to 1.2 mg/kg.

The mass balance approach to tracking uranium and selenium in soil indicates that irrigation can continue without concern for excessive accumulation of these constituents.

3.4 Observed Soil Moisture Concentrations

Lysimeters have been installed in the irrigation field areas to collect soil moisture samples and enable the measurement of the soil moisture constituent concentrations. The lysimeters were installed in augured holes at the desired depths. The porous cups were sand packed with a very fine flour sand to enhance their ability to pull moisture into the cup. A vacuum is placed on the lysimeter, which causes the soil moisture water to enter the cup. The soil moisture samples are then collected by purging the lysimeter cup. Lysimeters have been placed in each of the irrigation areas. Table 3-11 presents the completion information for the eight lysimeters in Section 33. Table 3-12 presents the lithology of the alluvium at each lysimeter. The sand pack interval is given in the fourth column of Table 3-11 while the depth to the top of the basalt is noted in the third column. A bentonite seal was placed above the sand pack that exists around the lysimeter to prevent soil moisture from readily moving down the annulus. Lysimeters LY34-2, LY28-2 and LY28-3 were washed out and reinstalled in 2011 due to them not functioning. Tables 3-13 and 3-14 present the soil moisture concentration data collected from the lysimeters. Table 3-15 presents the yearly representative soil moisture concentrations from each of the lysimeters.

3.4.1 Section 34

Four lysimeters have been placed in the clay soils in Section 34 and 33 flood areas. Lysimeters LY34-1, LY34-2 and LY34-3 are in the Section 34 flood while LY34-4 is in the Section 33 flood area. Figure 3-1 shows the location of these lysimeters. Three lysimeters were installed in the Section 34 area and were completed at intervals 8-10 feet below the land surface. The completion interval for the 34-4 lysimeter was 10-11 feet (see Table 3-11 for completion details). The Section 34 lysimeters were installed in October 2009. LY-34-1 produced a sample in October and December of 2009 and then continually from February of 2010. Lysimeter LY34-2 had produced a sample each month until mid-2011 when a vacuum could not be applied. This lysimeter was reinstalled in October of 2011. LY34-3 produced samples for each month. LY34-4 produced a sample for each month until February of 2010 and then again in August and September of 2010.

The soil moisture concentration time plots for TDS, sulfate, chloride, uranium, selenium, and molybdenum for lysimeter LY34-1 are presented in Figures 3-20 and 3-21. These plots show that the TDS, sulfate, uranium and selenium have been typically 4800, 2400, 0.35 and 0.15 mg/l respectively in 2013. Figure 3-22 presents TDS, sulfate and chloride concentrations for lysimeter LY34-2. These concentrations generally show steady concentrations in 2013 and a TDS and a sulfate of 4200 and 2000 mg/l are thought to best represent the 2013 values. TDS, sulfate, and chloride appear to be stabilizing in the soil moisture at this location. The uranium, selenium and molybdenum concentrations for lysimeter LY34-2 are presented in Figure 3-23 which shows a very gradual increasing trend for uranium and stable selenium and molybdenum concentrations. This data indicates that a uranium concentration of 0.10 is representative of the 2013 values for LY34-2. The late 2011 results after reinstalling the lysimeter should be used with caution. The data in 2013 shows a lower value for LY34-2 with the uranium and selenium values staying around 0.10 and 0.05 mg/l. The results from lysimeters LY34-3 are presented in Figures 3-24 and 3-25. The TDS, sulfate, chloride, uranium and selenium concentrations of 4300, 1900, 0.39 and 0.14 mg/l are representative of the 2013 values for LY34-3. In 2013, TDS, sulfate, uranium, and selenium all showed a small decline in the early portion of the year and a very gradual increase in the second half of the year.

Table 3-11. Irrigation Field Lysimeter Completion Information

LYSIMETER NUMBER	LYSIMETER INTERVAL (FT-LSD)	DEPTH TO TOP OF BASALT (FT-LSD)	INTERVAL OF SAND PACK (FT-LSD)	INTERVAL OF BENTONITE SEAL (FT-LSD)
		SECTION 33		
LY1	16-17	17	15-17	0-15
LY2	15-16	16	14-16	0-14
LY3	6-7	7	5-7	0-5
LY3M	30-31	7	29-31	0-29
LY4	14-15	15	13-15	0-13
LY4MU	24-25	14	24-25	0-24
LY4ML	44-45	14	44-45	25-44
LY5	3-4	4	3-4	0-3
		SECTION 28		
LY28-1	15-16	16	14-16	0-14
LY28-1M	20-21	16	19-21	0-19
LY28-2	7-8	8	6-8	0-6
LY28-2M	20-21	14	19-21	0-19
LY28-3	9-10	10	8-10	0-8
		SECTION 34 AND 33 FLOOD		
LY34-1	8-9	DNE	7-9	0-7
LY34-2	10-11	DNE	9-11	0-9
LY34-3	10-11	DNE	9-11	0-9
LY34-4	10-11	26	8-10	0-8

NOTE: DNE= DOES NOT EXIST AT THIS LOCATION

Table 3-12. Lithology of the Alluvium at the Lysimeters

SECTION 33 SOUTH PIVOT

LY33-1

SAMPLE DEPTH	SOIL TYPE	MOISTURE CONT.	COLOR
0-1	SAND/SILT/CLAY	WET	BROWN
1-2.5	SAND/SILT	WET	BROWN
2.5-4	SAND/CLAY	VERY MOIST	RED
4-5	SAND/CLAY	VERY MOIST	RED
5-7	SAND/CLAY	VERY MOIST	RED
7-9	SAND/CLAY	VERY MOIST	RED
9-11	SAND/CLAY	VERY MOIST	RED
11-12	SAND/CLAY	VERY MOIST	RED
12-12.8	SAND/CLAY	VERY MOIST	RED
12.8-13.8	CLAY	VERY MOIST	BROWN
13.8	BASALT		

SECTION 33 SOUTH PIVOT

LY33-2

SAMPLE DEPTH	SOIL TYPE	MOISTURE CONT.	COLOR
0-2	VERY FINE SAND/SILT/CLAY	MOIST	RED
2-4	VERY FINE SAND/SILT/CLAY	MOIST	RED
4-5.5	VERY FINE SAND	MOIST	RED
5.5-6	VERY FINE SAND	MOIST	RED
6-8	VERY FINE SAND	MOIST	RED
8.10	VERY FINE SAND	MOIST	RED
10-12	VERY FINE SAND	MOIST	RED
12-14	CLAY	MOIST	RED
14-16	CLAY	MOIST	RED
16-16.5	CLAY	MOIST	RED
16.5	BASALT		

SECTION 33 SOUTH PIVOT

LY33-3/M

SAMPLE DEPTH	SOIL TYPE	MOISTURE CONT.	COLOR
0-1	SAND/SILT	DRY	RED
1-1.5	V.F. SAND	MOIST	RED
1.5-2	V.F. SAND	MOIST	RED
2-4	V.F. SAND	MOIST	RED
4-6	V.F. SAND	MOIST	RED
6-6.6	V.F. SAND	MOIST	RED
6.6-35	BASALT		

Table 3-12. Lithology of the Alluvium at the Lysimeters (continued)

SECTION 33 SOUTH PIVOT

LY33-4/M

SAMPLE DEPTH	SOIL TYPE	MOISTURE CONT.	COLOR
0-2	V.F. SAND	DRY	RED
2-4	V.F. SAND	DRY	RED
4-6	V.F. SAND	DRY	RED
6-8	V.F. SAND	DRY	RED
8-10	V.F. SAND	DRY	RED
10-12	V.F. SAND	DRY	RED
12-14	V.F. SAND	DRY	RED
14-25	BASALT	MOIST	
25-50	BASALT		

SECTION 33 SOUTH PIVOT

LY33-5

SAMPLE DEPTH	SOIL TYPE	MOISTURE CONT.	COLOR
0-1	CLAY	DRY	RED
1-2	CLAY	DAMP	RED
2-3	CLAY	DAMP	RED
3-3.5	CLAY	DAMP	RED
3.5	BASALT		

Table 3-12. Lithology of the Alluvium at the Lysimeters (continued)

SECTION 33/34 FLOOD

LY34-1

SAMPLE DEPTH	SOIL TYPE	MOISTURE CONT.	COLOR
0-1	CLAY/SAND	DAMP	BROWN
1-2	CLAY	DAMP	BROWN
2-3	CLAY/SAND	DAMP	BROWN
3-4	SAND	DAMP	BLACK
4-5	SAND/LITTLE CLAY	MOIST	GREY
5-6	SAND	MOIST	GREY
6-7	SAND/GRAVEL	MOIST	GREY
7-8	CLAY/SAND	MOIST	TAN/GREY
8-9	CLAY/SAND	MOIST	TAN/ORANGE
9-10	SAND	MOIST	TAN/ORANGE

SECTION 33/34 FLOOD

LY34-2

SAMPLE DEPTH	SOIL TYPE	MOISTURE CONT.	COLOR
0-1	CLAY	MOIST	BROWN
1-2	CLAY	MOIST	BROWN
2-3	CLAY/LITTLE SAND	SOME MOISTURE	BROWN
3-4	CLAY/SAND	DRY	LIGHT BROWN
4-5	SAND	DRY	GREY/TAN
5-6	SAND	DRY	GREY
6-7	F. SAND/LITTLE CLAY	SOME MOISTURE	GREY/ORANGE
7-8	F. SAND/LITTLE CLAY	SOME MOISTURE	GREY/ORANGE
8-9	F. SAND/LITTLE CLAY	MOIST	BROWN/ORANGE
9-10	CLAY/FINE SAND	MOIST	BROWN/ORANGE
10-11	CLAY/FINE SAND	MOIST	BROWN
11-12	SAND/LITTLE CLAY	MOIST	BROWN/TAN

SECTION 33/34 FLOOD

LY34-3

SAMPLE DEPTH	SOIL TYPE	MOISTURE CONT.	COLOR
0-1	CLAY	DAMP	BROWN
1-2	CLAY	DAMP	BROWN
2-3	CLAY/SAND	DAMP	DARK BROWN
3-4	FINE SAND	MOIST	BROWN/BLACK
4-5	SAND	DAMP	BROWN/TAN
5-6	SAND	DAMP	TAN
6-7	SAND/CLAY	MOIST	TAN/ORANGE
7-8	CLAY/SAND	MOIST	GREY/ORANGE
8-9	CLAY/SAND	MOIST	BROWN/ORANGE
9-10	CLAY/SAND	MOIST	BROWN/RED
10-11	SAND/GRAVEL	MOIST	TAN/ORANGE

Table 3-12. Lithology of the Alluvium at the Lysimeters (continued)

SECTION 33/34 FLOOD			
LY34-4			
SAMPLE DEPTH	SOIL TYPE	MOISTURE CONT.	COLOR
0-1	CLAY	DRY	BROWN
1-2	CLAY	DRY	BROWN
2-3	CLAY	DRY	BROWN
3-4	CLAY/SAND	DRY	BROWN/GREY
4-5	SAND/CLAY	DRY	LIGHT GREY
5-6	SAND/CLAY	DRY	LIGHT GREY
6-7	SAND	DRY	LIGHT GREY
7-8	SAND	DRY	LIGHT GREY
8-9	CLAY/SAND	SOME MOISTURE	BROWN/LIGHT GREY
9-10	CLAY/SAND	MOIST	BROWN/LIGHT GREY
10-11	CLAY/SAND	MOIST	BROWN/LIGHT GREY
11-12	SAND/CLAY/COARSE	SOME MOISTURE	BROWN/LIGHT GREY
12-13	SAND/CLAY/COARSE	SOME MOISTURE	BROWN

Table 3-12. Lithology of the Alluvium at the Lysimeters (continued)

SECTION 28 NORTH PIVOT

LY28-1

SAMPLE DEPTH	SOIL TYPE	MOISTURE CONT.	COLOR
0-1	SAND	MOIST	LIGHT BROWN
1-2	SAND	MOIST	LIGHT BROWN
2-3	SAND	MOIST	LIGHT BROWN
3-4	SAND	DAMP	LIGHT BROWN
4-5	SAND	DAMP	LIGHT BROWN
5-6	SAND/LITTLE CLAY	DAMP	LIGHT BROWN /ORANGE
6-7	SAND/LITTLE CLAY	MOIST	BROWN
7-8	SAND/LITTLE CLAY	MOIST	BROWN
8-9	SAND/CLAY	MOIST	BROWN
9-10	SAND/CLAY	MOIST	TAN
10-11	CLAY/SAND	MOIST	TAN
11-12	CLAY/LITTLE SAND	DAMP	BROWN/ORANGE
12-13	CLAY/LITTLE SAND	DAMP	BROWN/RED
13-14	CLAY/LITTLE SAND	DAMP	BROWN/TAN
14-15	CLAY	DAMP	TAN
15-15.6	CLAY	DAMP	TAN
15.6	BASALT		

SECTION 28 NORTH PIVOT

LY28-2

SAMPLE DEPTH	SOIL TYPE	MOISTURE CONT.	COLOR
0-1	SAND	MOIST	BROWN
1-2	SAND/CLAY	MOIST	BROWN
2-3	SAND/CLAY	DAMP	LIGHT BROWN
3-4	SAND/CLAY	DAMP	BROWN /ORANGE
4-5	SAND	DAMP	BROWN/RED
5-6	SAND/CLAY	DAMP	BROWN/GREY
6-7	CLAY	DAMP	BROWN /ORANGE
7-7.3	CLAY	DAMP	BROWN /ORANGE
7.3	BASALT		

SECTION 28 NORTH PIVOT

LY28-3

SAMPLE DEPTH	SOIL TYPE	MOISTURE CONT.	COLOR
0-1	F. SAND	MOIST	LIGHT BROWN
1-2	SAND	MOIST	BROWN
2-3	SAND/CLAY	MOIST	BROWN
3-4	SAND/CLAY	DAMP	BROWN
4-5	SAND/CLAY	DAMP	LIGHT BROWN
5-6	SAND/CLAY	DAMP	BROWN/RED
6-7	CLAY/SAND	DAMP	BROWN/TAN
7-8	CLAY	DAMP	BROWN/TAN
8-8.6	CLAY	DAMP	BROWN
8.6	BASALT		

Table 3-13 WATER QUALITY ANALYSIS FOR LYSIMETERS

Ca THROUGH ION_BAL

Sample Point Name	Date	Lab	Ca (mg/l)	Mg (mg/l)	K (mg/l)	Na (mg/l)	HCO3 (mg/l)	CO3 (mg/l)	Cl (mg/l)	SO4 (mg/l)	TDS (mg/l)	Cond(calc.) (micromhos/	Ion_B (ratio)
LY1	7/22/2009	ENER	---	---	---	---	---	---	121	337	1240	---	---
	8/13/2009	ENER	---	---	---	---	---	---	152	543	1530	---	---
	9/23/2009	ENER	201	118	2.90	61.3	529	< 1.000	168	489	1500	* 2010	0.951
	10/16/2009	ENER	---	---	---	---	---	---	179	508	1550	* 2082	---
	11/13/2009	ENER	189	154	2.80	61.5	488	< 5.00	218	590	1560	* 2270	0.934
	12/18/2009	ENER	230	141	2.60	60.1	467	< 5.00	235	647	1640	* 2338	0.922
	12/30/2009	ENER	286	127	2.40	61.2	430	< 5.00	248	719	1770	* 2075	0.940
	1/31/2010	ENER	---	---	---	---	---	---	266	770	1940	* 2490	---
	2/22/2010	ENER	---	---	---	---	---	---	275	814	1850	* 2560	---
	3/25/2010	ENER	---	---	---	---	---	---	289	840	2100	* 2650	---
	4/29/2010	ENER	---	---	---	---	---	---	313	927	2160	* 2750	---
	5/31/2010	ENER	---	---	---	---	---	---	321	1020	2360	* 2870	---
	6/30/2010	ENER	---	---	---	---	---	---	350	1200	2670	* 3136	---
	7/27/2010	ENER	---	---	---	---	---	---	372	1370	2870	* 3310	---
	12/16/2011	ENER	---	---	---	---	---	---	661	1940	4100	* 4640	---
	1/31/2012	ENER	---	---	---	---	---	---	678	1930	4290	* 5036	---
	2/29/2012	ENER	---	---	---	---	---	---	663	1900	4180	* 5012	---
	4/30/2012	ENER	---	---	---	---	---	---	690	1910	4460	* 5033	---
	5/31/2012	ENER	---	---	---	---	---	---	659	1890	4420	* 4993	---
	6/30/2012	ENER	---	---	---	---	---	---	641	1890	4340	* 4941	---
	7/27/2012	ENER	---	---	---	---	---	---	643	1900	4420	* 4910	---
	8/31/2012	ENER	---	---	---	---	---	---	648	1850	4240	* 4944	---
	9/28/2012	ENER	---	---	---	---	---	---	707	1860	4510	* 5017	---
	10/31/2012	ENER	---	---	---	---	---	---	776	1880	4250	* 5082	---
	11/28/2012	ENER	---	---	---	---	---	---	825	1930	4220	* 5174	---
	1/31/2013	ENER	---	---	---	---	---	---	855	1840	4170	* 5245	---
	2/22/2013	ENER	---	---	---	---	---	---	892	1840	4320	* 5239	---
	3/26/2013	HMC	---	---	---	---	---	---	882	1800	4320	5292	---
	4/30/2013	ENER	---	---	---	---	---	---	907	1810	4390	* 5297	---

* Signifies Specific Conductivity from HMC

Table 3-13 WATER QUALITY ANALYSIS FOR LYSIMETERS (cont.)

Ca THROUGH ION_BAL

Sample Point Name	Date	Lab	Ca (mg/l)	Mg (mg/l)	K (mg/l)	Na (mg/l)	HCO3 (mg/l)	CO3 (mg/l)	Cl (mg/l)	SO4 (mg/l)	TDS (mg/l)	Cond(calc.) (micromhos/	Ion_B (ratio)
LY1	12/12/2013	ENER	---	---	---	---	—	---	287	1730	3340	* 3810	---
LY2	6/24/2009	ENER	---	---	---	---	—	---	225	654	1720	* 2308	---
	12/16/2011	ENER	---	---	---	---	—	---	593	1980	4420	* 5068	---
	1/31/2012	ENER	---	---	---	---	—	---	460	2130	4430	* 5013	---
	3/31/2012	ENER	---	---	---	---	—	---	421	2140	4480	* 4920	---
	4/30/2012	ENER	---	---	---	---	—	---	399	2160	4500	* 4988	---
	5/31/2012	ENER	---	---	---	---	—	---	374	2240	4420	* 4871	---
	6/30/2012	ENER	---	---	---	---	—	---	340	2140	4540	* 4844	---
	7/27/2012	ENER	---	---	---	---	—	---	596	2000	4470	* 5090	---
	8/31/2012	ENER	---	---	---	---	—	---	803	1640	4380	* 5351	---
	9/28/2012	ENER	---	---	---	---	—	---	597	1820	4310	* 4984	---
	11/28/2012	ENER	---	---	---	---	—	---	482	2080	4310	* 4831	---
	12/30/2012	ENER	---	---	---	---	—	---	472	2000	4250	* 4892	---
	1/31/2013	ENER	---	---	---	---	—	---	471	1970	4120	* 4777	---
LY4	12/4/2008	ENER	---	---	---	---	—	---	269	1430	3180	---	---
	12/5/2008	ENER	---	---	---	---	—	---	310	1700	3730	---	---
	12/8/2008	ENER	---	---	---	---	—	---	317	1720	3700	---	---
	12/11/2008	ENER	---	---	---	---	—	---	336	1850	4100	---	---
	12/12/2008	ENER	---	---	---	---	—	---	337	1860	4070	---	---
	1/7/2009	ENER	---	---	---	---	—	---	330	1870	4120	---	---
	2/18/2009	ENER	702	138	5.20	412	783	< 1.000	353	2050	4150	---	0.984
	3/20/2009	ENER	---	---	---	---	—	---	326	1940	4220	---	---
	4/18/2009	ENER	---	---	---	---	—	---	336	1990	3970	* 4522	---
	5/15/2009	ENER	---	---	---	---	—	---	328	1950	3990	---	---
	6/10/2009	ENER	---	---	---	---	—	---	336	1880	3870	* 4370	---
	6/24/2009	ENER	---	---	---	---	—	---	324	1920	4180	* 4503	---
	7/22/2009	ENER	---	---	---	---	—	---	315	1990	4220	---	---
	8/13/2009	ENER	---	---	---	---	—	---	354	2170	4380	---	---
	9/23/2009	ENER	728	142	3.50	392	842	< 1.000	339	2250	4530	* 4870	0.928

* Signifies Specific Conductivity from HMC

Table 3-13 WATER QUALITY ANALYSIS FOR LYSIMETERS (cont.)

Ca THROUGH ION_BAL

Sample Point Name	Date	Lab	Ca (mg/l)	Mg (mg/l)	K (mg/l)	Na (mg/l)	HCO3 (mg/l)	CO3 (mg/l)	Cl (mg/l)	SO4 (mg/l)	TDS (mg/l)	Cond(calc.) (micromhos/	Ion_B (ratio)
LY4	10/16/2009	ENER	---	---	---	---	---	---	340	2270	4240	* 5040	---
	11/13/2009	ENER	652	147	3.80	430	634	< 5.00	338	2220	4170	* 5100	0.957
	12/18/2009	ENER	757	149	4.00	425	712	< 5.00	343	2260	4170	* 5096	1.00
	12/30/2009	ENER	699	153	4.00	468	837	< 5.00	342	2260	4250	* 3091	0.962
	1/31/2010	ENER	---	---	---	---	---	---	343	2210	4470	* 5030	---
	2/22/2010	ENER	---	---	---	---	---	---	331	2160	4140	* 5020	---
	3/25/2010	ENER	---	---	---	---	---	---	339	2170	4520	* 5020	---
	4/29/2010	ENER	---	---	---	---	---	---	357	2280	4400	* 5040	---
	5/31/2010	ENER	---	---	---	---	---	---	349	2300	4410	* 5100	---
	6/30/2010	ENER	---	---	---	---	---	---	357	2320	4570	* 5100	---
	7/27/2010	ENER	---	---	---	---	---	---	357	2270	4500	* 4900	---
	8/31/2010	ENER	---	---	---	---	---	---	363	2190	4160	* 4900	---
	9/30/2010	ENER	---	---	---	---	---	---	366	2170	3970	* 4850	---
	10/31/2010	ENER	---	---	---	---	---	---	381	2180	4110	* 4670	---
	11/30/2010	ENER	---	---	---	---	---	---	383	2100	4150	* 4660	---
	1/31/2011	ENER	---	---	---	---	---	---	411	1880	3220	* 4510	---
	2/25/2011	ENER	---	---	---	---	---	---	424	2000	3820	* 4490	---
	3/31/2011	ENER	---	---	---	---	---	---	464	2040	3350	---	---
	5/26/2011	HMC	---	---	---	---	---	---	---	---	---	4490	---
	8/31/2011	ENER	---	---	---	---	---	---	507	1890	3770	* 4515	---
	9/30/2011	ENER	---	---	---	---	---	---	508	1900	3740	---	---
	10/31/2011	ENER	---	---	---	---	---	---	508	1920	3640	---	---
	11/30/2011	ENER	---	---	---	---	---	---	499	1770	3800	---	---
	1/31/2012	ENER	---	---	---	---	---	---	515	1810	3730	---	---
	4/30/2012	ENER	---	---	---	---	---	---	540	1850	4090	---	---
	5/31/2012	ENER	---	---	---	---	---	---	509	1770	4060	---	---
	6/30/2012	ENER	---	---	---	---	---	---	517	1760	3260	---	---
	7/27/2012	ENER	---	---	---	---	---	---	566	1810	3830	---	---
	9/28/2012	ENER	---	---	---	---	---	---	541	1770	3790	---	---

* Signifies Specific Conductivity from HMC

Table 3-13 WATER QUALITY ANALYSIS FOR LYSIMETERS (cont.)

Ca THROUGH ION_BAL

Sample Point Name	Date	Lab	Ca (mg/l)	Mg (mg/l)	K (mg/l)	Na (mg/l)	HCO3 (mg/l)	CO3 (mg/l)	Cl (mg/l)	SO4 (mg/l)	TDS (mg/l)	Cond(calc.) (micromhos/	Ion_B (ratio)
LY4	11/28/2012	ENER	---	---	---	---	---	---	591	1950	3760	---	---
	12/30/2012	HMC	---	---	---	---	---	---	---	---	---	4513	---
	3/26/2013	HMC	---	---	---	---	---	---	579	1790	3480	---	---
LY4ML	4/18/2009	ENER	---	---	---	---	---	---	142	409	---	---	---
	6/24/2009	ENER	---	---	---	---	---	---	684	5510	12000	---	---
	7/22/2009	ENER	---	---	---	---	---	---	650	5460	11600	---	---
	8/13/2009	ENER	---	---	---	---	---	---	663	5050	10400	---	---
	9/23/2009	ENER	180	29.6	6.00	2180	1140	< 1.000	629	3460	7340	* 9310	0.981
	10/16/2009	ENER	---	---	---	---	---	---	568	2570	5840	* 7904	---
	11/13/2009	ENER	166	98.2	11.0	2820	1570	72.0	591	3930	7830	* 7250	1.10
	12/18/2009	ENER	113	25.5	5.00	1520	1190	< 5.00	562	1760	4520	* 6490	1.03
	4/29/2010	ENER	---	---	---	---	---	---	571	1070	3700	* 5330	---
	5/31/2010	ENER	---	---	---	---	---	---	567	917	3080	---	---
	6/30/2010	ENER	---	---	---	---	---	---	581	907	3130	---	---
	7/27/2010	ENER	---	---	---	---	---	---	574	866	3190	* 4860	---
	8/31/2010	ENER	---	---	---	---	---	---	588	851	3080	* 4820	---
	9/30/2010	ENER	---	---	---	---	---	---	580	805	2980	* 4760	---
	10/31/2010	ENER	---	---	---	---	---	---	575	777	2970	* 4660	---
	11/30/2010	ENER	---	---	---	---	---	---	566	751	3180	* 4670	---
	4/29/2011	ENER	---	---	---	---	---	---	597	763	2520	---	---
	10/31/2011	ENER	---	---	---	---	---	---	727	1150	4240	---	---
LY4MU	7/22/2009	ENER	---	---	---	---	---	---	660	3240	8210	---	---
	8/13/2009	ENER	---	---	---	---	---	---	903	6990	13900	---	---
	9/23/2009	ENER	263	90.0	14.0	3510	1580	< 1.000	712	6130	11700	* 13860	1.000
	10/16/2009	ENER	---	---	---	---	---	---	592	4850	9780	* 12060	---
	11/13/2009	ENER	100.0	31.7	5.00	1790	1030	< 5.00	584	2210	5160	* 10600	1.08
	1/31/2010	ENER	---	---	---	---	---	---	600	2010	5730	* 7950	---
	2/22/2010	ENER	---	---	---	---	---	---	631	1260	4630	* 6740	---
	3/25/2010	ENER	---	---	---	---	---	---	634	920	4500	* 6390	---

* Signifies Specific Conductivity from HMC

Table 3-13 WATER QUALITY ANALYSIS FOR LYSIMETERS (cont.)

Ca THROUGH ION_BAL

Sample Point Name	Date	Lab	Ca (mg/l)	Mg (mg/l)	K (mg/l)	Na (mg/l)	HCO3 (mg/l)	CO3 (mg/l)	Cl (mg/l)	SO4 (mg/l)	TDS (mg/l)	Cond(calc.) (micromhos/	Ion_B (ratio)
LY4MU	4/29/2010	ENER	---	---	---	---	---	---	674	742	4210	* 6200	---
	5/31/2010	ENER	---	---	---	---	---	---	697	694	4090	* 6160	---
	6/30/2010	ENER	---	---	---	---	---	---	711	675	4220	* 6150	---
	7/27/2010	ENER	---	---	---	---	---	---	717	657	4190	* 6050	---
	8/31/2010	ENER	---	---	---	---	---	---	722	662	4140	* 6140	---
	9/30/2010	ENER	---	---	---	---	---	---	717	679	4210	* 6190	---
	10/31/2010	ENER	---	---	---	---	---	---	724	718	4080	* 6170	---
	11/30/2010	ENER	---	---	---	---	---	---	724	760	4350	* 6280	---
	1/31/2011	ENER	---	---	---	---	---	---	730	885	4160	* 6300	---
	2/25/2011	ENER	---	---	---	---	---	---	721	898	4230	* 6340	---
	4/29/2011	ENER	---	---	---	---	---	---	735	955	4310	* 6400	---
	5/26/2011	ENER	---	---	---	---	---	---	740	976	4440	* 6410	---
	6/30/2011	ENER	---	---	---	---	---	---	740	1050	4240	* 6460	---
	7/15/2011	ENER	---	---	---	---	---	---	701	1030	4380	* 6460	---
	8/31/2011	ENER	---	---	---	---	---	---	754	1090	4410	* 6582	---
	9/30/2011	ENER	---	---	---	---	---	---	749	1140	4330	* 6500	---
	10/31/2011	ENER	---	---	---	---	---	---	727	1150	4240	* 6600	---
	11/30/2011	ENER	---	---	---	---	---	---	733	1130	4490	* 6596	---
	1/31/2012	ENER	---	---	---	---	---	---	723	1170	4480	* 6667	---
	2/29/2012	ENER	---	---	---	---	---	---	725	1180	4530	* 6600	---
	3/31/2012	ENER	---	---	---	---	---	---	724	1180	4580	* 6585	---
	4/30/2012	ENER	---	---	---	---	---	---	721	1190	4740	* 6600	---
	5/31/2012	ENER	---	---	---	---	---	---	723	1220	4640	* 6589	---
	6/30/2012	ENER	---	---	---	---	---	---	691	1160	4720	---	---
	7/27/2012	ENER	---	---	---	---	---	---	775	1260	4550	* 6568	---
	8/31/2012	ENER	---	---	---	---	---	---	759	1250	4820	* 6554	---
	9/28/2012	ENER	---	---	---	---	---	---	736	1190	4370	* 6519	---
	10/31/2012	ENER	---	---	---	---	---	---	757	1220	4340	* 6476	---
	11/28/2012	ENER	---	---	---	---	---	---	791	1300	4220	* 6513	---

* Signifies Specific Conductivity from HMC

Table 3-13 WATER QUALITY ANALYSIS FOR LYSIMETERS (cont.)

Ca THROUGH ION_BAL

Sample Point Name	Date	Lab	Ca (mg/l)	Mg (mg/l)	K (mg/l)	Na (mg/l)	HCO3 (mg/l)	CO3 (mg/l)	Cl (mg/l)	SO4 (mg/l)	TDS (mg/l)	Cond(calc.) (micromhos/	Ion_B (ratio)
LY4MU	1/31/2013	ENER	---	---	---	---	---	---	766	1240	4340	* 6540	---
	2/22/2013	ENER	---	---	---	---	---	---	777	1240	4270	* 6416	---
	3/26/2013	HMC	---	---	---	---	---	---	766	1230	4170	5467	---
	4/30/2013	ENER	---	---	---	---	---	---	789	1250	4240	* 5137	---
	12/12/2013	ENER	---	---	---	---	---	---	761	1250	4370	* 6454	---
LY28-1	10/16/2009	ENER	---	---	---	---	---	---	101	358	852	* 1286	---
	11/13/2009	ENER	187	74.2	3.80	331	232	< 5.00	174	1040	1850	* 2650	0.980
	12/18/2009	ENER	308	61.7	3.40	345	399	< 5.00	184	1240	2320	* 3130	0.942
	12/30/2009	ENER	298	61.4	3.20	354	378	< 5.00	180	1220	2460	* 3163	0.961
	1/31/2010	ENER	---	---	---	---	---	---	187	1350	2550	* 3250	---
	2/22/2010	ENER	---	---	---	---	---	---	186	1350	2450	* 3250	---
	3/25/2010	ENER	---	---	---	---	---	---	183	1300	2660	* 3240	---
	4/29/2010	ENER	---	---	---	---	---	---	190	1340	2580	* 3250	---
	5/31/2010	ENER	---	---	---	---	---	---	191	1350	2550	* 3270	---
	6/30/2010	ENER	---	---	---	---	---	---	197	1380	2650	* 3280	---
	7/27/2010	ENER	---	---	---	---	---	---	201	1410	2670	* 3250	---
	8/31/2010	ENER	---	---	---	---	---	---	200	1360	2610	* 3270	---
	9/30/2010	ENER	---	---	---	---	---	---	192	1350	2700	* 3310	---
	10/31/2010	ENER	---	---	---	---	---	---	190	1330	2600	* 3290	---
	11/30/2010	ENER	---	---	---	---	---	---	191	1310	2660	* 3300	---
	1/31/2011	ENER	---	---	---	---	---	---	198	1400	2530	* 3260	---
	2/25/2011	ENER	---	---	---	---	---	---	187	1290	2590	* 3240	---
	3/29/2011	HMC	---	---	---	---	---	---	---	---	---	3410	---
	4/29/2011	ENER	---	---	---	---	---	---	194	1340	2540	* 3220	---
	5/26/2011	ENER	---	---	---	---	---	---	---	1300	2520	* 3200	---
	6/30/2011	ENER	---	---	---	---	---	---	197	1350	2540	* 3220	---
	7/15/2011	ENER	---	---	---	---	---	---	193	1330	2510	* 3200	---
	8/31/2011	ENER	---	---	---	---	---	---	187	1350	2530	* 3200	---
	9/30/2011	ENER	---	---	---	---	---	---	176	1370	2660	* 3290	---

* Signifies Specific Conductivity from HMC

Table 3-13 WATER QUALITY ANALYSIS FOR LYSIMETERS (cont.)

Ca THROUGH ION_BAL

Sample Point Name	Date	Lab	Ca (mg/l)	Mg (mg/l)	K (mg/l)	Na (mg/l)	HCO3 (mg/l)	CO3 (mg/l)	Cl (mg/l)	SO4 (mg/l)	TDS (mg/l)	Cond(calc.) (micromhos/	Ion_B (ratio)
LY28-1	10/31/2011	ENER	---	---	---	---	---	---	192	1390	2670	* 3470	---
	11/30/2011	ENER	---	---	---	---	---	---	183	1380	2770	* 3529	---
	12/16/2011	ENER	---	---	---	---	---	---	181	1440	2830	* 3575	---
	1/31/2012	ENER	---	---	---	---	---	---	179	1400	2630	* 3568	---
	2/29/2012	ENER	---	---	---	---	---	---	176	1380	2870	* 3540	---
	4/30/2012	ENER	---	---	---	---	---	---	190	1360	3080	* 3658	---
	5/31/2012	ENER	---	---	---	---	---	---	193	1400	3040	* 3594	---
	6/30/2012	ENER	---	---	---	---	---	---	176	1310	3000	* 3547	---
	7/27/2012	ENER	---	---	---	---	---	---	192	1400	2920	* 3538	---
	8/31/2012	ENER	---	---	---	---	---	---	181	1360	3010	* 3542	---
	9/28/2012	ENER	---	---	---	---	---	---	187	1370	2860	* 3526	---
	10/31/2012	ENER	---	---	---	---	---	---	186	1380	2920	* 3558	---
	11/28/2012	ENER	---	---	---	---	---	---	248	1180	2570	* 3297	---
	12/30/2012	ENER	---	---	---	---	---	---	291	1280	2590	* 3524	---
	1/31/2013	ENER	---	---	---	---	---	---	229	1070	2280	* 3295	---
	2/22/2013	ENER	---	---	---	---	---	---	261	1190	2690	* 3349	---
	3/26/2013	HMC	---	---	---	---	---	---	266	1170	2680	3332	---
	4/30/2013	ENER	---	---	---	---	---	---	270	1210	2670	* 3382	---
	9/17/2013	ENER	---	---	---	---	---	---	261	1180	2660	* 3377	---
	12/12/2013	ENER	---	---	---	---	---	---	269	1240	2690	* 3380	---
LY28-1M	10/16/2009	ENER	---	---	---	---	---	---	114	84.0	440	* 698	---
LY28-2	10/16/2009	ENER	---	---	---	---	---	---	335	218	954	* 1580	---
	10/31/2011	ENER	---	---	---	---	---	---	178	3280	5170	* 6660	---
	11/30/2011	ENER	---	---	---	---	---	---	128	3560	6090	* 7221	---
	12/16/2011	ENER	---	---	---	---	---	---	139	3790	6100	* 7151	---
	1/31/2012	ENER	---	---	---	---	---	---	144	3680	6110	* 6988	---
	2/29/2012	ENER	---	---	---	---	---	---	149	3150	5350	* 6110	---
	4/30/2012	ENER	---	---	---	---	---	---	107	3130	5630	* 6062	---
	5/31/2012	ENER	---	---	---	---	---	---	90.0	3270	5500	* 6165	---

* Signifies Specific Conductivity from HMC

Table 3-13 WATER QUALITY ANALYSIS FOR LYSIMETERS (cont.)

Ca THROUGH ION_BAL

Sample Point Name	Date	Lab	Ca (mg/l)	Mg (mg/l)	K (mg/l)	Na (mg/l)	HCO3 (mg/l)	CO3 (mg/l)	Cl (mg/l)	SO4 (mg/l)	TDS (mg/l)	Cond(calc.) (micromhos/	Ion_B (ratio)
LY28-2	6/30/2012	ENER	---	---	---	---	---	---	102	3630	6310	* 6761	---
	7/27/2012	ENER	---	---	---	---	---	---	156	4050	6690	* 7611	---
	8/31/2012	ENER	---	---	---	---	---	---	195	2940	5130	* 5980	---
	9/28/2012	ENER	---	---	---	---	---	---	246	2580	4860	* 5437	---
	10/31/2012	ENER	---	---	---	---	---	---	217	2300	4170	* 4840	---
	11/28/2012	ENER	---	---	---	---	---	---	257	2270	3920	* 4641	---
	12/30/2012	ENER	---	---	---	---	---	---	262	2160	3820	* 4591	---
	1/31/2013	ENER	---	---	---	---	---	---	267	2160	3830	* 4594	---
	2/22/2013	ENER	---	---	---	---	---	---	271	2060	3590	* 4429	---
	3/26/2013	HMC	---	---	---	---	---	---	276	2070	3890	4470	---
	4/30/2013	ENER	---	---	---	---	---	---	279	2120	3840	* 4509	---
	9/17/2013	ENER	---	---	---	---	---	---	263	2280	4320	* 4894	---
	12/12/2013	ENER	---	---	---	---	---	---	266	2510	4410	* 4964	---
LY28-2M	10/16/2009	ENER	---	---	---	---	---	---	158	255	773	* 1176	---
	11/13/2009	ENER	147	60.5	7.80	106	414	6.00	128	304	937	* 1560	1.01
	12/18/2009	ENER	150	54.5	6.90	83.6	447	< 5.00	123	247	980	* 1482	0.980
	12/30/2009	ENER	143	51.5	7.30	80.2	438	< 5.00	120	202	939	* 1544	1.01
	1/31/2010	ENER	---	---	---	---	---	---	115	156	901	* 1320	---
	2/22/2010	ENER	---	---	---	---	---	---	113	132	756	* 1280	---
	3/25/2010	ENER	---	---	---	---	---	---	107	111	858	* 1260	---
	4/29/2010	ENER	---	---	---	---	---	---	120	106	778	* 1250	---
	5/31/2010	ENER	---	---	---	---	---	---	110	95.0	787	* 1300	---
	6/30/2010	ENER	---	---	---	---	---	---	112	93.0	847	* 1290	---
	7/27/2010	ENER	---	---	---	---	---	---	109	89.0	842	* 1230	---
	8/31/2010	ENER	---	---	---	---	---	---	112	88.0	841	* 1260	---
	9/30/2010	ENER	---	---	---	---	---	---	108	83.0	896	* 1230	---
	10/31/2010	ENER	---	---	---	---	---	---	110	84.0	891	* 1200	---
	11/30/2010	ENER	---	---	---	---	---	---	108	83.0	956	* 1220	---
	1/31/2011	ENER	---	---	---	---	---	---	108	99.0	763	* 1230	---

* Signifies Specific Conductivity from HMC

Table 3-13 WATER QUALITY ANALYSIS FOR LYSIMETERS (cont.)

Ca THROUGH ION_BAL

Sample Point Name	Date	Lab	Ca (mg/l)	Mg (mg/l)	K (mg/l)	Na (mg/l)	HCO3 (mg/l)	CO3 (mg/l)	Cl (mg/l)	SO4 (mg/l)	TDS (mg/l)	Cond(calc.) (micromhos/	Ion_B (ratio)
LY28-2M	2/25/2011	ENER	---	---	---	---	---	---	111	96.0	813	* 1210	---
	6/30/2011	ENER	---	---	---	---	---	---	109	99.0	760	* 1190	---
	7/15/2011	ENER	---	---	---	---	---	---	104	97.0	753	* 1160	---
	8/31/2011	ENER	---	---	---	---	---	---	902	3540	7150	* 8320	---
	9/30/2011	ENER	---	---	---	---	---	---	865	3490	6850	* 8060	---
	10/31/2011	ENER	---	---	---	---	---	---	801	3330	6450	* 7780	---
	11/30/2011	ENER	---	---	---	---	---	---	696	2820	5760	* 7006	---
	12/16/2011	ENER	---	---	---	---	---	---	651	2500	5000	* 5995	---
	1/31/2012	ENER	---	---	---	---	---	---	560	2110	4080	* 5476	---
	2/29/2012	ENER	---	---	---	---	---	---	491	1890	3750	* 4986	---
	4/30/2012	ENER	---	---	---	---	---	---	412	1570	3570	* 4284	---
	5/31/2012	ENER	---	---	---	---	---	---	320	1090	2580	* 3305	---
	6/30/2012	ENER	---	---	---	---	---	---	248	725	1900	* 2587	---
	7/27/2012	ENER	---	---	---	---	---	---	210	483	1470	* 2044	---
	8/31/2012	ENER	---	---	---	---	---	---	777	3340	6760	* 8112	---
	9/28/2012	ENER	---	---	---	---	---	---	774	2940	6240	* 7836	---
	10/31/2012	ENER	---	---	---	---	---	---	874	3120	6530	* 8181	---
	11/28/2012	ENER	---	---	---	---	---	---	953	2470	6770	* 8672	---
	12/30/2012	ENER	---	---	---	---	---	---	1030	3390	7140	* 1344	---
	1/31/2013	ENER	---	---	---	---	---	---	1050	3470	7280	* 9181	---
	2/22/2013	ENER	---	---	---	---	---	---	1020	3560	7340	* 9070	---
	3/26/2013	HMC	---	---	---	---	---	---	954	3540	7550	8840	---
	4/30/2013	ENER	---	---	---	---	---	---	919	3590	7010	* 7171	---
	9/17/2013	ENER	---	---	---	---	---	---	848	3050	6180	* 8350	---
	12/12/2013	ENER	---	---	---	---	---	---	834	3000	6170	* 7816	---
LY28-3	10/16/2009	ENER	---	---	---	---	---	---	190	781	1710	* 2476	---
	11/13/2009	ENER	306	96.9	10.00	983	421	< 5.00	290	2300	4110	* 5560	1.05
	12/18/2009	ENER	392	126	11.0	1200	399	< 5.00	318	3030	5220	* 6638	1.05
	12/30/2009	ENER	426	126	11.0	1260	394	< 5.00	339	3260	5720	* 6961	1.03

* Signifies Specific Conductivity from HMC

Table 3-13 WATER QUALITY ANALYSIS FOR LYSIMETERS (cont.)

Ca THROUGH ION_BAL

Sample Point Name	Date	Lab	Ca (mg/l)	Mg (mg/l)	K (mg/l)	Na (mg/l)	HCO3 (mg/l)	CO3 (mg/l)	Cl (mg/l)	SO4 (mg/l)	TDS (mg/l)	Cond(calc.) (micromhos/	Ion_B (ratio)
LY28-3	1/31/2010	ENER	---	---	---	---	---	---	339	3380	5770	* 7250	---
	2/22/2010	ENER	---	---	---	---	---	---	344	3520	5880	* 7360	---
	3/25/2010	ENER	---	---	---	---	---	---	347	3360	6360	* 7320	---
	4/29/2010	ENER	---	---	---	---	---	---	350	3590	6340	* 7470	---
	5/31/2010	ENER	---	---	---	---	---	---	410	3730	6600	* 7920	---
	6/30/2010	ENER	---	---	---	---	---	---	471	3850	7210	* 8340	---
	7/27/2010	ENER	---	---	---	---	---	---	597	3690	7160	* 8200	---
	8/31/2010	ENER	---	---	---	---	---	---	786	3420	6660	---	---
	10/31/2011	ENER	---	---	---	---	---	---	171	943	1950	* 2760	---
	11/30/2011	ENER	---	---	---	---	---	---	353	2610	4830	* 5994	---
	12/16/2011	ENER	---	---	---	---	---	---	444	2910	5570	* 6614	---
	1/31/2012	ENER	---	---	---	---	---	---	578	3420	6560	* 7946	---
	2/29/2012	ENER	---	---	---	---	---	---	560	3390	6810	* 7983	---
	4/30/2012	ENER	---	---	---	---	---	---	668	3590	8150	* 8922	---
	5/31/2012	ENER	---	---	---	---	---	---	767	3730	8090	* 9556	---
	6/30/2012	ENER	---	---	---	---	---	---	864	3640	8600	* 9967	---
	7/27/2012	ENER	---	---	---	---	---	---	1150	3830	9000	* 10950	---
	8/31/2012	ENER	---	---	---	---	---	---	1130	4310	9540	* 11460	---
	9/28/2012	ENER	---	---	---	---	---	---	1150	4350	9830	* 11790	---
	10/31/2012	ENER	---	---	---	---	---	---	1170	4260	8950	* 11370	---
	11/28/2012	ENER	---	---	---	---	---	---	610	4240	8050	* 10000	---
	12/30/2012	ENER	---	---	---	---	---	---	713	4210	8400	* 9920	---
	1/31/2013	ENER	---	---	---	---	---	---	755	4240	8310	* 10330	---
	2/22/2013	ENER	---	---	---	---	---	---	726	4110	8550	* 10250	---
	3/26/2013	HMC	---	---	---	---	---	---	781	4340	8380	10240	---
	4/30/2013	ENER	---	---	---	---	---	---	747	4300	9450	* 8585	---
	9/17/2013	ENER	---	---	---	---	---	---	740	4080	8330	* 10180	---
	12/12/2013	ENER	---	---	---	---	---	---	766	4190	8130	* 10090	---
LY34-1	10/16/2009	ENER	---	---	---	---	---	---	124	239	1060	* 1620	---

* Signifies Specific Conductivity from HMC

Table 3-13 WATER QUALITY ANALYSIS FOR LYSIMETERS (cont.)

Ca THROUGH ION_BAL

Sample Point Name	Date	Lab	Ca (mg/l)	Mg (mg/l)	K (mg/l)	Na (mg/l)	HCO3 (mg/l)	CO3 (mg/l)	Cl (mg/l)	SO4 (mg/l)	TDS (mg/l)	Cond(calc.) (micromhos/	Ion_B (ratio)
LY34-1	12/30/2009	ENER	292	77.1	2.50	543	667	< 5.00	310	1160	2630	* 3763	1.01
	2/22/2010	ENER	---	---	---	---	---	---	321	1230	2760	* 3940	---
	3/25/2010	ENER	---	---	---	---	---	---	326	1240	3120	* 4030	---
	4/29/2010	ENER	---	---	---	---	---	---	359	1350	3130	* 4090	---
	5/31/2010	ENER	---	---	---	---	---	---	353	1340	3050	* 4140	---
	6/30/2010	ENER	---	---	---	---	---	---	362	1370	3250	* 4190	---
	7/27/2010	ENER	---	---	---	---	---	---	362	1380	3220	* 3920	---
	8/31/2010	ENER	---	---	---	---	---	---	362	1410	3490	* 4190	---
	9/30/2010	ENER	---	---	---	---	---	---	375	1450	3530	* 4490	---
	10/31/2010	ENER	---	---	---	---	---	---	514	1910	5220	* 5390	---
	11/30/2010	ENER	---	---	---	---	---	---	501	1890	4230	* 5360	---
	1/31/2011	ENER	---	---	---	---	---	---	482	1910	4370	* 5310	---
	2/25/2011	ENER	---	---	---	---	---	---	498	1970	4170	* 5400	---
	3/31/2011	ENER	---	---	---	---	---	---	532	2080	4370	* 5400	---
	4/29/2011	ENER	---	---	---	---	---	---	506	1980	4240	* 5420	---
	6/30/2011	ENER	---	---	---	---	---	---	514	2040	4240	* 5430	---
	7/15/2011	ENER	---	---	---	---	---	---	489	1970	4180	* 5640	---
	8/31/2011	ENER	---	---	---	---	---	---	508	2030	4070	* 5760	---
	9/30/2011	ENER	---	---	---	---	---	---	498	2030	4140	* 5580	---
	10/31/2011	ENER	---	---	---	---	---	---	488	2040	4070	* 6620	---
	11/30/2011	ENER	---	---	---	---	---	---	494	1960	4080	* 5607	---
	12/16/2011	ENER	---	---	---	---	---	---	501	2060	4210	* 5590	---
	2/29/2012	ENER	---	---	---	---	---	---	476	1960	4000	* 5560	---
	4/30/2012	ENER	---	---	---	---	---	---	491	1980	4670	* 5623	---
	5/31/2012	ENER	---	---	---	---	---	---	465	1920	4330	---	---
	6/30/2012	ENER	---	---	---	---	---	---	468	1900	3920	* 5598	---
	7/27/2012	ENER	---	---	---	---	---	---	511	1970	4130	* 5254	---
	8/31/2012	ENER	---	---	---	---	---	---	663	2460	5060	* 6475	---
	9/28/2012	ENER	---	---	---	---	---	---	524	2560	5130	* 6571	---

* Signifies Specific Conductivity from HMC

Table 3-13 WATER QUALITY ANALYSIS FOR LYSIMETERS (cont.)

Ca THROUGH ION_BAL

Sample Point Name	Date	Lab	Ca (mg/l)	Mg (mg/l)	K (mg/l)	Na (mg/l)	HCO3 (mg/l)	CO3 (mg/l)	Cl (mg/l)	SO4 (mg/l)	TDS (mg/l)	Cond(calc.) (micromhos/	Ion_B (ratio)
LY34-1	10/31/2012	ENER	---	---	---	---	---	---	426	2380	4970	* 6012	---
	11/28/2012	ENER	---	---	---	---	---	---	436	2490	5090	* 6046	---
	12/30/2012	ENER	---	---	---	---	---	---	445	2510	4810	* 6102	---
	1/31/2013	ENER	---	---	---	---	---	---	451	2500	4810	* 6091	---
	2/22/2013	ENER	---	---	---	---	---	---	437	2410	4920	* 6017	---
	3/26/2013	HMC	---	---	---	---	---	---	464	2470	4990	4990	---
	4/30/2013	ENER	---	---	---	---	---	---	462	2460	4690	* 4814	---
	9/17/2013	ENER	---	---	---	---	---	---	471	2370	4600	* 6153	---
	12/12/2013	ENER	---	---	---	---	---	---	479	2390	4920	* 6044	---
LY34-2	10/16/2009	ENER	---	---	---	---	---	---	96.0	214	590	* 1000	---
	11/13/2009	ENER	175	69.4	12.3	354	457	< 5.00	315	676	1850	* 2950	0.985
	12/18/2009	ENER	231	84.8	10.8	387	372	< 5.00	397	868	1220	* 3413	1.00
	12/30/2009	ENER	192	85.6	11.8	436	567	< 5.00	377	799	2250	* 3339	0.977
	1/31/2010	ENER	---	---	---	---	---	---	467	1020	2500	* 3920	---
	2/22/2010	ENER	---	---	---	---	---	---	514	1190	2960	* 4160	---
	3/25/2010	ENER	---	---	---	---	---	---	515	1250	3460	* 4710	---
	4/29/2010	ENER	---	---	---	---	---	---	653	1600	3720	---	---
	5/31/2010	ENER	---	---	---	---	---	---	659	1710	3660	---	---
	6/30/2010	ENER	---	---	---	---	---	---	723	1950	4180	---	---
	7/27/2010	ENER	---	---	---	---	---	---	710	1910	4450	* 5660	---
	8/31/2010	ENER	---	---	---	---	---	---	686	1550	3470	---	---
	9/30/2010	ENER	---	---	---	---	---	---	651	1350	3640	* 4680	---
	10/31/2010	ENER	---	---	---	---	---	---	689	1880	3090	* 5650	---
	11/30/2010	ENER	---	---	---	---	---	---	632	2220	4930	* 6060	---
	1/31/2011	ENER	---	---	---	---	---	---	810	2770	5400	* 6970	---
	2/25/2011	ENER	---	---	---	---	---	---	856	2900	6220	* 7500	---
	3/31/2011	ENER	---	---	---	---	---	---	884	2940	6250	* 7620	---
	4/29/2011	ENER	---	---	---	---	---	---	911	2930	6130	* 7740	---
	5/26/2011	ENER	---	---	---	---	---	---	913	2830	6160	* 7860	---

* Signifies Specific Conductivity from HMC

Table 3-13 WATER QUALITY ANALYSIS FOR LYSIMETERS (cont.)

Ca THROUGH ION_BAL

Sample Point Name	Date	Lab	Ca (mg/l)	Mg (mg/l)	K (mg/l)	Na (mg/l)	HCO3 (mg/l)	CO3 (mg/l)	Cl (mg/l)	SO4 (mg/l)	TDS (mg/l)	Cond(calc.) (micromhos/	Ion_B (ratio)
LY34-2	6/30/2011	ENER	---	---	---	---	---	---	939	2950	5980	* 7880	---
	7/13/2011	HMC	---	---	---	---	---	---	---	---	---	5640	---
	10/31/2011	ENER	---	---	---	---	---	---	57.0	124	464	* 786	---
	11/30/2011	ENER	---	---	---	---	---	---	134	321	1130	* 7740	---
	12/16/2011	ENER	---	---	---	---	---	---	143	400	1360	* 1913	---
	1/31/2012	ENER	---	---	---	---	---	---	384	868	2440	---	---
	2/29/2012	ENER	---	---	---	---	---	---	219	537	1860	---	---
	8/31/2012	ENER	---	---	---	---	---	---	453	1910	3930	* 5085	---
	9/28/2012	ENER	---	---	---	---	---	---	501	2170	4610	* 5584	---
	10/31/2012	ENER	---	---	---	---	---	---	444	2320	4670	* 5557	---
	11/28/2012	ENER	---	---	---	---	---	---	417	2230	4360	* 5307	---
	12/30/2012	ENER	---	---	---	---	---	---	403	2110	4140	* 5077	---
	1/31/2013	ENER	---	---	---	---	---	---	413	2100	4080	* 5168	---
	2/22/2013	ENER	---	---	---	---	---	---	402	2010	4240	* 5080	---
	3/26/2013	HMC	---	---	---	---	---	---	424	2040	4190	5052	---
	4/30/2013	ENER	---	---	---	---	---	---	420	1990	4120	* 4023	---
	9/17/2013	ENER	---	---	---	---	---	---	442	1960	4190	* 5288	---
	12/12/2013	ENER	---	---	---	---	---	---	449	2000	4200	* 5246	---
LY34-3	10/16/2009	ENER	---	---	---	---	---	---	96.0	102	637	* 920	---
	11/13/2009	ENER	90.9	44.0	4.30	229	488	6.00	128	277	956	* 1660	1.04
	12/18/2009	ENER	178	78.0	3.90	338	648	< 5.00	184	766	1900	* 2760	0.943
	12/30/2009	ENER	234	105	4.70	456	680	< 5.00	211	904	2170	* 3030	1.12
	1/31/2010	ENER	---	---	---	---	---	---	231	983	2410	* 3246	---
	2/22/2010	ENER	---	---	---	---	---	---	244	1030	2370	* 3350	---
	3/25/2010	ENER	---	---	---	---	---	---	250	1020	2630	* 3460	---
	4/29/2010	ENER	---	---	---	---	---	---	279	1100	2580	* 3520	---
	5/31/2010	ENER	---	---	---	---	---	---	287	1120	2580	* 3610	---
	6/30/2010	ENER	---	---	---	---	---	---	293	1120	2790	* 3680	---
	7/27/2010	ENER	---	---	---	---	---	---	321	1220	2780	* 3700	---

* Signifies Specific Conductivity from HMC

Table 3-13 WATER QUALITY ANALYSIS FOR LYSIMETERS (cont.)

Ca THROUGH ION_BAL

Sample Point Name	Date	Lab	Ca (mg/l)	Mg (mg/l)	K (mg/l)	Na (mg/l)	HCO3 (mg/l)	CO3 (mg/l)	Cl (mg/l)	SO4 (mg/l)	TDS (mg/l)	Cond(calc.) (micromhos/	Ion_B (ratio)
LY34-3	8/31/2010	ENER	---	---	---	---	---	---	302	1130	2780	* 3780	---
	9/30/2010	ENER	---	---	---	---	---	---	322	1210	2990	* 3850	---
	10/31/2010	ENER	---	---	---	---	---	---	315	1150	2330	* 3850	---
	11/30/2010	ENER	---	---	---	---	---	---	323	1160	3030	* 3920	---
	1/31/2011	ENER	---	---	---	---	---	---	314	1170	2990	* 3960	---
	2/25/2011	ENER	---	---	---	---	---	---	329	1040	3530	* 3880	---
	3/31/2011	ENER	---	---	---	---	---	---	394	1050	2790	* 3860	---
	4/29/2011	ENER	---	---	---	---	---	---	428	996	2850	* 3950	---
	6/30/2011	ENER	---	---	---	---	---	---	541	1010	2980	* 4100	---
	7/15/2011	ENER	---	---	---	---	---	---	566	1020	3050	* 4380	---
	8/31/2011	ENER	---	---	---	---	---	---	631	1070	3200	* 4570	---
	9/30/2011	ENER	---	---	---	---	---	---	620	1090	3210	* 4540	---
	10/31/2011	ENER	---	---	---	---	---	---	580	1140	3080	* 4510	---
	11/30/2011	ENER	---	---	---	---	---	---	603	1170	3140	* 4617	---
	12/16/2011	ENER	---	---	---	---	---	---	606	1250	3340	* 4640	---
	1/31/2012	ENER	---	---	---	---	---	---	601	1290	3410	* 4748	---
	2/29/2012	ENER	---	---	---	---	---	---	577	1280	3380	* 4610	---
	4/30/2012	ENER	---	---	---	---	---	---	552	1290	3600	* 4591	---
	5/31/2012	ENER	---	---	---	---	---	---	645	1600	4100	* 5226	---
	6/30/2012	ENER	---	---	---	---	---	---	830	2150	5800	* 6719	---
	7/27/2012	ENER	---	---	---	---	---	---	826	2310	5230	* 6765	---
	8/31/2012	ENER	---	---	---	---	---	---	1100	3310	7090	* 8925	---
	9/28/2012	ENER	---	---	---	---	---	---	871	2850	5900	* 7942	---
	10/31/2012	ENER	---	---	---	---	---	---	742	2580	5450	* 6955	---
	11/28/2012	ENER	---	---	---	---	---	---	652	2510	4570	* 6417	---
	12/30/2012	ENER	---	---	---	---	---	---	550	2270	4580	* 6023	---
	1/31/2013	ENER	---	---	---	---	---	---	466	2010	4320	* 5469	---
	2/22/2013	ENER	---	---	---	---	---	---	386	1700	3890	* 4853	---
	3/26/2013	HMC	---	---	---	---	---	---	401	1700	3860	4830	---

* Signifies Specific Conductivity from HMC

Table 3-13 WATER QUALITY ANALYSIS FOR LYSIMETERS (cont.)

Ca THROUGH ION_BAL

Sample Point Name	Date	Lab	Ca (mg/l)	Mg (mg/l)	K (mg/l)	Na (mg/l)	HCO3 (mg/l)	CO3 (mg/l)	Cl (mg/l)	SO4 (mg/l)	TDS (mg/l)	Cond(calc.) (micromhos/	Ion_B (ratio)
LY34-3	4/30/2013	ENER	---	---	---	---	---	---	407	1720	3670	* 3763	---
	9/17/2013	ENER	---	---	---	---	---	---	537	2070	4480	* 5968	---
	12/12/2013	ENER	---	---	---	---	---	---	542	2080	4580	* 5830	---
LY34-4	10/16/2009	ENER	---	---	---	---	---	---	74.0	322	854	* 1245	---
	11/13/2009	ENER	58.4	18.3	4.20	289	335	6.00	106	384	977	* 1660	1.03
	12/18/2009	ENER	80.3	20.7	3.70	347	329	13.0	130	501	1260	* 1996	1.05
	12/30/2009	ENER	110	22.6	3.40	331	295	8.00	146	608	1470	* 2038	0.998
	1/31/2010	ENER	---	---	---	---	---	---	163	763	1630	* 2540	---
	7/27/2010	HMC	---	---	---	---	---	---	---	---	---	4850	---
	8/31/2010	ENER	---	---	---	---	---	---	259	1350	2960	* 3930	---
	9/30/2010	ENER	---	---	---	---	---	---	269	1480	3450	---	---

* Signifies Specific Conductivity from HMC

Table 3-14 WATER QUALITY ANALYSIS FOR LYSIMETERS

pH THROUGH Th-230

Sample Point Name	Date	Lab	pH (std. units)	Unat (mg/l)	Mo (mg/l)	Se (mg/l)	NO3 (mg/l)	Ra226 (pCi/l)	Ra228 (pCi/l)	V (mg/l)	Th230 (pCi/l)
LY1	7/22/2009	ENER	---	0.0420	0.0400	0.0300	1.14	---	---	---	---
	8/13/2009	ENER	---	0.0878	< 0.0300	0.0500	1.10	---	---	---	---
	9/23/2009	ENER	7.77	0.0519	0.0300	0.0350	1.90	---	---	---	---
	10/16/2009	ENER	---	0.0540	< 0.0300	0.0400	1.70	---	---	---	---
	11/13/2009	ENER	8.17	0.0487	< 0.0300	0.0390	2.80	---	---	---	---
	12/18/2009	ENER	7.81	0.0656	< 0.0300	0.0470	2.20	---	---	---	---
	12/30/2009	ENER	7.80	0.0585	< 0.0300	0.0790	1.80	---	---	---	---
	1/31/2010	ENER	---	0.0506	< 0.0300	0.0720	1.60	---	---	---	---
	2/22/2010	ENER	---	0.0506	< 0.0300	0.0820	1.50	---	---	---	---
	3/25/2010	ENER	---	0.0471	< 0.0300	0.105	1.40	---	---	---	---
	4/29/2010	ENER	---	0.0471	< 0.0300	0.0860	1.30	---	---	---	---
	5/31/2010	ENER	---	0.0527	0.0300	0.116	1.20	---	---	---	---
	6/30/2010	ENER	---	0.0574	< 0.0300	0.115	1.30	---	---	---	---
	7/27/2010	ENER	---	0.0532	< 0.0300	0.127	1.30	---	---	---	---
	12/16/2011	ENER	---	0.0496	< 0.0300	0.115	---	---	---	---	---
	1/31/2012	ENER	---	0.0493	< 0.0300	0.142	---	---	---	---	---
	2/29/2012	ENER	---	0.0447	< 0.0300	0.152	---	---	---	---	---
	4/30/2012	ENER	---	0.0481	< 0.0300	0.149	---	---	---	---	---
	5/31/2012	ENER	---	0.0445	< 0.0300	0.134	---	---	---	---	---
	6/30/2012	ENER	---	0.0460	< 0.0300	0.129	---	---	---	---	---
	7/27/2012	ENER	---	0.0442	< 0.0300	0.127	---	---	---	---	---
	8/31/2012	ENER	---	0.0471	< 0.0300	0.143	---	---	---	---	---
	9/28/2012	ENER	---	0.0443	< 0.0300	0.134	---	---	---	---	---
	10/31/2012	ENER	---	0.0470	< 0.0300	0.168	---	---	---	---	---
	11/28/2012	ENER	---	0.0488	< 0.0300	0.150	---	---	---	---	---
	1/31/2013	ENER	---	0.0467	< 0.0300	0.178	---	---	---	---	---
	2/22/2013	ENER	---	0.0504	< 0.0300	0.187	4.70	---	---	---	---
	3/26/2013	HMC	---	0.0475	< 0.0300	0.182	5.00	---	---	---	---
	4/30/2013	ENER	---	0.0487	< 0.0300	0.174	---	---	---	---	---

Table 3-14 WATER QUALITY ANALYSIS FOR LYSIMETERS (cont.)

pH THROUGH Th-230

Sample Point Name	Date	Lab	pH (std. units)	Unat (mg/l)	Mo (mg/l)	Se (mg/l)	NO3 (mg/l)	Ra226 (pCi/l)	Ra228 (pCi/l)	V (mg/l)	Th230 (pCi/l)
LY1	12/12/2013	ENER	---	0.0296	< 0.0300	0.0780	7.80	---	---	---	---
LY2	6/24/2009	ENER	---	0.0406	0.0400	0.0140	3.31	---	---	---	---
	12/16/2011	ENER	---	0.0630	< 0.0300	0.161	---	---	---	---	---
	1/31/2012	ENER	---	0.0652	< 0.0300	0.140	---	---	---	---	---
	3/31/2012	ENER	---	0.0636	< 0.0300	0.110	---	---	---	---	---
	4/30/2012	ENER	---	0.0544	< 0.0300	0.124	---	---	---	---	---
	5/31/2012	ENER	---	0.0475	< 0.0300	0.110	---	---	---	---	---
	6/30/2012	ENER	---	0.0470	< 0.0300	0.100	---	---	---	---	---
	7/27/2012	ENER	---	0.0538	< 0.0300	0.171	---	---	---	---	---
	8/31/2012	ENER	---	0.0758	< 0.0300	0.271	---	---	---	---	---
	9/28/2012	ENER	---	0.0640	< 0.0300	0.171	---	---	---	---	---
	11/28/2012	ENER	---	0.0635	< 0.0300	0.131	---	---	---	---	---
	12/30/2012	ENER	---	0.0563	< 0.0300	0.138	---	---	---	---	---
	1/31/2013	ENER	---	0.0606	< 0.0300	0.148	---	---	---	---	---
LY4	12/4/2008	ENER	---	0.0566	< 0.0300	0.0400	1.20	---	---	---	---
	12/5/2008	ENER	---	0.0624	< 0.0300	0.0600	0.900	---	---	---	---
	12/8/2008	ENER	---	0.0715	0.0400	0.0460	0.600	---	---	---	---
	12/11/2008	ENER	---	0.0644	< 0.0300	0.0450	0.660	---	---	---	---
	12/12/2008	ENER	---	0.0641	< 0.0300	0.0440	0.650	---	---	---	---
	1/7/2009	ENER	---	0.0813	< 0.0300	0.0410	0.870	---	---	---	---
	2/18/2009	ENER	7.44	0.0655	< 0.0300	0.0410	1.40	---	---	---	---
	3/20/2009	ENER	---	0.0732	< 0.0300	0.0430	1.72	---	---	---	---
	4/18/2009	ENER	---	0.0589	< 0.0300	0.0350	0.800	---	---	---	---
	5/15/2009	ENER	---	0.0611	< 0.0300	0.0380	1.46	---	---	---	---
	6/10/2009	ENER	---	0.0630	< 0.0300	0.0550	0.800	---	---	---	---
	6/24/2009	ENER	---	0.0621	< 0.0300	0.0500	0.560	---	---	---	---
	7/22/2009	ENER	---	0.0636	< 0.0300	0.0430	0.460	---	---	---	---
	8/13/2009	ENER	---	0.0718	< 0.0300	0.0400	0.600	---	---	---	---
	9/23/2009	ENER	7.29	0.0664	< 0.0300	0.0340	0.500	---	---	---	---

Table 3-14 WATER QUALITY ANALYSIS FOR LYSIMETERS (cont.)

pH THROUGH Th-230

Sample Point Name	Date	Lab	pH (std. units)	Unat (mg/l)	Mo (mg/l)	Se (mg/l)	NO3 (mg/l)	Ra226 (pCi/l)	Ra228 (pCi/l)	V (mg/l)	Th230 (pCi/l)
LY4	10/16/2009	ENER	---	0.0701	< 0.0300	0.0310	0.500	---	---	---	---
	11/13/2009	ENER	7.84	0.0652	< 0.0300	0.0330	0.600	---	---	---	---
	12/18/2009	ENER	7.58	0.0651	< 0.0300	0.0310	0.500	---	---	---	---
	12/30/2009	ENER	7.60	0.0643	< 0.0300	0.0340	0.600	---	---	---	---
	1/31/2010	ENER	---	0.0702	< 0.0300	0.0380	0.500	---	---	---	---
	2/22/2010	ENER	---	0.0732	< 0.0300	0.0350	0.500	---	---	---	---
	3/25/2010	ENER	---	0.0720	< 0.0300	0.0360	0.500	---	---	---	---
	4/29/2010	ENER	---	0.0699	< 0.0300	0.0380	0.600	---	---	---	---
	5/31/2010	ENER	---	0.0833	< 0.0300	0.0540	0.600	---	---	---	---
	6/30/2010	ENER	---	0.0766	< 0.0300	0.0420	0.600	---	---	---	---
	7/27/2010	ENER	---	0.0707	< 0.0300	0.0420	0.700	---	---	---	---
	8/31/2010	ENER	---	0.0708	< 0.0300	0.0420	0.800	---	---	---	---
	9/30/2010	ENER	---	0.0682	< 0.0300	0.0450	1.10	---	---	---	---
	10/31/2010	ENER	---	0.0672	< 0.0300	0.0440	---	---	---	---	---
	11/30/2010	ENER	---	0.0610	< 0.0300	0.0520	---	---	---	---	---
	1/31/2011	ENER	---	0.0514	< 0.0300	0.0590	---	---	---	---	---
	2/25/2011	ENER	---	0.0460	< 0.0300	0.0600	---	---	---	---	---
	3/31/2011	ENER	---	0.0421	< 0.0300	0.0570	---	---	---	---	---
	8/31/2011	ENER	---	0.0295	< 0.0300	0.0670	---	---	---	---	---
	9/30/2011	ENER	---	< 0.0003	< 0.0300	< 0.0050	---	---	---	---	---
	10/31/2011	ENER	---	0.0227	< 0.0300	0.0810	---	---	---	---	---
	11/30/2011	ENER	---	0.0287	< 0.0300	0.0770	---	---	---	---	---
	1/31/2012	ENER	---	0.0183	< 0.0300	0.0950	---	---	---	---	---
	4/30/2012	ENER	---	0.0226	< 0.0300	0.0980	---	---	---	---	---
	5/31/2012	ENER	---	0.0217	< 0.0300	0.0920	---	---	---	---	---
	6/30/2012	ENER	---	0.0232	< 0.0300	0.0880	---	---	---	---	---
	7/27/2012	ENER	---	0.0270	< 0.0300	0.0900	---	---	---	---	---
	8/31/2012	ENER	---	0.0288	< 0.0300	0.104	---	---	---	---	---
	9/28/2012	ENER	---	0.112	< 0.0300	< 0.0050	---	---	---	---	---

Table 3-14 WATER QUALITY ANALYSIS FOR LYSIMETERS (cont.)

pH THROUGH Th-230

Sample Point Name	Date	Lab	pH (std. units)	Unat (mg/l)	Mo (mg/l)	Se (mg/l)	NO3 (mg/l)	Ra226 (pCi/l)	Ra228 (pCi/l)	V (mg/l)	Th230 (pCi/l)
LY4	11/28/2012	ENER	---	0.0258	< 0.0300	0.108	---	---	---	---	---
	3/26/2013	HMC	---	0.0169	< 0.0300	0.114	1.10	---	---	---	---
LY4ML	4/18/2009	ENER	---	0.0188	0.120	0.0050	0.200	---	---	---	---
	6/24/2009	ENER	---	0.358	0.110	< 0.0050	10.00	---	---	---	---
	7/22/2009	ENER	---	0.552	0.0900	0.0100	0.0200	---	---	---	---
	8/13/2009	ENER	---	0.421	0.0600	< 0.0050	< 0.100	---	---	---	---
	9/23/2009	ENER	7.76	0.268	0.0400	0.0100	< 0.100	---	---	---	---
	10/16/2009	ENER	---	0.244	0.0400	0.0060	< 0.100	---	---	---	---
	11/13/2009	ENER	8.35	0.508	0.0900	0.0110	< 0.100	---	---	---	---
	12/18/2009	ENER	7.55	0.214	< 0.0300	0.0050	< 0.100	---	---	---	---
	4/29/2010	ENER	---	0.292	0.0500	0.0110	< 0.100	---	---	---	---
	5/31/2010	ENER	---	0.463	0.0900	0.0150	< 0.100	---	---	---	---
	6/30/2010	ENER	---	0.482	0.110	0.0120	< 0.100	---	---	---	---
	7/27/2010	ENER	---	0.375	0.0900	0.0170	< 0.100	---	---	---	---
	8/31/2010	ENER	---	0.366	0.0900	0.0150	< 0.100	---	---	---	---
	9/30/2010	ENER	---	0.394	0.100	0.0130	< 0.100	---	---	---	---
	10/31/2010	ENER	---	0.394	0.100	0.0140	---	---	---	---	---
	11/30/2010	ENER	---	0.453	0.140	0.0180	---	---	---	---	---
	4/29/2011	ENER	---	0.461	0.570	0.0430	---	---	---	---	---
	10/31/2011	ENER	---	0.660	0.0600	0.0260	---	---	---	---	---
LY4MU	7/22/2009	ENER	---	0.261	0.140	0.0100	0.0200	---	---	---	---
	8/13/2009	ENER	---	0.596	0.160	0.0060	< 0.100	---	---	---	---
	9/23/2009	ENER	7.68	0.563	0.120	0.0090	< 0.100	---	---	---	---
	10/16/2009	ENER	---	0.557	0.100	0.0090	< 0.100	---	---	---	---
	11/13/2009	ENER	8.04	0.212	0.0300	0.0090	< 0.100	---	---	---	---
	1/31/2010	ENER	---	0.504	0.0500	0.0100	< 0.100	---	---	---	---
	2/22/2010	ENER	---	0.516	0.0500	0.0100	0.800	---	---	---	---
	3/25/2010	ENER	---	0.574	0.0500	0.0100	1.80	---	---	---	---
	4/29/2010	ENER	---	0.546	0.0400	0.0120	2.30	---	---	---	---

Table 3-14 WATER QUALITY ANALYSIS FOR LYSIMETERS (cont.)

pH THROUGH Th-230

Sample Point Name	Date	Lab	pH (std. units)	Unat (mg/l)	Mo (mg/l)	Se (mg/l)	NO3 (mg/l)	Ra226 (pCi/l)	Ra228 (pCi/l)	V (mg/l)	Th230 (pCi/l)
LY4MU	5/31/2010	ENER	---	0.626	0.0400	0.0130	3.20	---	---	---	---
	6/30/2010	ENER	---	0.617	0.0400	0.0090	3.50	---	---	---	---
	7/27/2010	ENER	---	0.600	0.0400	0.0110	3.50	---	---	---	---
	8/31/2010	ENER	---	0.0395	0.350	0.0460	4.10	---	---	---	---
	9/30/2010	ENER	---	0.691	0.0500	0.0060	3.80	---	---	---	---
	10/31/2010	ENER	---	0.633	0.0400	0.0060	---	---	---	---	---
	11/30/2010	ENER	---	0.628	0.0400	0.0100	---	---	---	---	---
	1/31/2011	ENER	---	0.644	0.0400	0.0130	---	---	---	---	---
	2/25/2011	ENER	---	0.662	0.0400	0.0140	---	---	---	---	---
	4/29/2011	ENER	---	0.632	0.0500	0.0120	---	---	---	---	---
	5/26/2011	ENER	---	0.617	0.0500	0.0120	---	---	---	---	---
	6/30/2011	ENER	---	0.649	0.0500	0.0180	---	---	---	---	---
	7/15/2011	ENER	---	0.569	0.0600	0.0100	---	---	---	---	---
	8/31/2011	ENER	---	0.582	0.0600	0.0100	---	---	---	---	---
	9/30/2011	ENER	---	0.646	0.0600	0.0060	---	---	---	---	---
	10/31/2011	ENER	---	0.660	0.0600	0.0260	---	---	---	---	---
	11/30/2011	ENER	---	0.640	0.0600	0.0180	---	---	---	---	---
	1/31/2012	ENER	---	0.593	0.0600	0.0130	---	---	---	---	---
	2/29/2012	ENER	---	0.610	0.0900	0.0170	---	---	---	---	---
	3/31/2012	ENER	---	0.610	0.0600	0.0090	---	---	---	---	---
	4/30/2012	ENER	---	0.582	0.0600	0.0100	---	---	---	---	---
	5/31/2012	ENER	---	0.600	0.0600	0.0110	---	---	---	---	---
	6/30/2012	ENER	---	0.586	0.0600	0.0120	---	---	---	---	---
	7/27/2012	ENER	---	0.592	0.0600	0.0050	---	---	---	---	---
	8/31/2012	ENER	---	0.573	0.0600	< 0.0050	---	---	---	---	---
	9/28/2012	ENER	---	0.145	0.0400	0.518	---	---	---	---	---
	10/31/2012	ENER	---	0.554	0.0600	0.0060	---	---	---	---	---
	11/28/2012	ENER	---	0.550	0.0600	< 0.0050	---	---	---	---	---
	1/31/2013	ENER	---	0.544	0.0600	0.0060	---	---	---	---	---

Table 3-14 WATER QUALITY ANALYSIS FOR LYSIMETERS (cont.)

pH THROUGH Th-230

Sample Point Name	Date	Lab	pH (std. units)	Unat (mg/l)	Mo (mg/l)	Se (mg/l)	NO3 (mg/l)	Ra226 (pCi/l)	Ra228 (pCi/l)	V (mg/l)	Th230 (pCi/l)
LY4MU	2/22/2013	ENER	---	0.526	0.0700	0.0130	7.10	---	---	---	---
	3/26/2013	HMC	---	0.491	0.0600	0.0050	7.10	---	---	---	---
	4/30/2013	ENER	---	0.497	0.0600	0.0090	---	---	---	---	---
	12/12/2013	ENER	---	0.463	0.0700	0.0090	9.90	---	---	---	---
LY28-1	10/16/2009	ENER	---	0.0224	0.0500	0.0100	2.60	---	---	---	---
	11/13/2009	ENER	8.19	0.0489	< 0.0300	0.0250	4.40	---	---	---	---
	12/18/2009	ENER	7.77	0.131	< 0.0300	0.0310	0.900	---	---	---	---
	12/30/2009	ENER	7.83	0.161	< 0.0300	0.0420	6.60	---	---	---	---
	1/31/2010	ENER	---	0.149	< 0.0300	0.0370	6.70	---	---	---	---
	2/22/2010	ENER	---	0.161	< 0.0300	0.0380	6.10	---	---	---	---
	3/25/2010	ENER	---	0.161	< 0.0300	0.0400	7.90	---	---	---	---
	4/29/2010	ENER	---	0.150	< 0.0300	0.0390	7.50	---	---	---	---
	5/31/2010	ENER	---	0.194	0.0300	0.0490	7.60	---	---	---	---
	6/30/2010	ENER	---	0.183	< 0.0300	0.0410	7.20	---	---	---	---
	7/27/2010	ENER	---	0.171	< 0.0300	0.0440	8.00	---	---	---	---
	8/31/2010	ENER	---	0.187	< 0.0300	0.0470	7.50	---	---	---	---
	9/30/2010	ENER	---	0.194	< 0.0300	0.0450	7.30	---	---	---	---
	10/31/2010	ENER	---	0.191	0.0800	0.0610	---	---	---	---	---
	11/30/2010	ENER	---	0.168	< 0.0300	0.0470	---	---	---	---	---
	1/31/2011	ENER	---	0.149	< 0.0300	0.0550	---	---	---	---	---
	2/25/2011	ENER	---	0.135	0.0500	0.0590	---	---	---	---	---
	4/29/2011	ENER	---	0.132	0.0400	0.0630	---	---	---	---	---
	5/26/2011	ENER	---	0.121	< 0.0300	0.0620	---	---	---	---	---
	6/30/2011	ENER	---	0.111	< 0.0300	0.0670	---	---	---	---	---
	7/15/2011	ENER	---	0.112	< 0.0300	0.0570	---	---	---	---	---
	8/31/2011	ENER	---	0.114	< 0.0300	0.0510	---	---	---	---	---
	9/30/2011	ENER	---	0.137	< 0.0300	0.0500	---	---	---	---	---
	10/31/2011	ENER	---	0.128	< 0.0300	0.0780	---	---	---	---	---
	11/30/2011	ENER	---	0.194	< 0.0300	0.0700	---	---	---	---	---

Table 3-14 WATER QUALITY ANALYSIS FOR LYSIMETERS (cont.)

pH THROUGH Th-230

Sample Point Name	Date	Lab	pH (std. units)	Unat (mg/l)	Mo (mg/l)	Se (mg/l)	NO3 (mg/l)	Ra226 (pCi/l)	Ra228 (pCi/l)	V (mg/l)	Th230 (pCi/l)
LY28-1	12/16/2011	ENER	---	0.193	< 0.0300	0.0540	---	---	---	---	---
	1/31/2012	ENER	---	0.198	< 0.0300	0.0750	---	---	---	---	---
	2/29/2012	ENER	---	0.210	< 0.0300	0.0650	---	---	---	---	---
	4/30/2012	ENER	---	0.200	< 0.0300	0.0560	---	---	---	---	---
	5/31/2012	ENER	---	0.206	< 0.0300	0.0590	---	---	---	---	---
	6/30/2012	ENER	---	0.200	< 0.0300	0.0530	---	---	---	---	---
	7/27/2012	ENER	---	0.202	< 0.0300	0.0500	---	---	---	---	---
	8/31/2012	ENER	---	0.198	< 0.0300	0.0560	---	---	---	---	---
	9/28/2012	ENER	---	0.206	< 0.0300	0.0490	---	---	---	---	---
	10/31/2012	ENER	---	0.201	< 0.0300	0.0560	---	---	---	---	---
	11/28/2012	ENER	---	0.212	< 0.0300	0.0460	---	---	---	---	---
	12/30/2012	ENER	---	0.195	< 0.0300	0.0430	---	---	---	---	---
	1/31/2013	ENER	---	0.200	< 0.0300	0.0460	---	---	---	---	---
	2/22/2013	ENER	---	0.203	< 0.0300	0.0460	21.0	---	---	---	---
	3/26/2013	HMC	---	0.196	< 0.0300	0.0430	21.0	---	---	---	---
	4/30/2013	ENER	---	0.188	0.0600	0.0380	---	---	---	---	---
	9/17/2013	ENER	---	0.153	< 0.0300	0.0440	21.0	---	---	---	---
	12/12/2013	ENER	---	0.131	< 0.0300	0.0340	21.0	---	---	---	---
LY28-1M	10/16/2009	ENER	---	0.0009	0.160	0.0070	1.40	---	---	---	---
LY28-2	10/16/2009	ENER	---	0.0031	0.0500	0.0140	1.10	---	---	---	---
	10/31/2011	ENER	---	0.415	0.180	0.0760	---	---	---	---	---
	11/30/2011	ENER	---	0.770	0.0400	0.0430	---	---	---	---	---
	12/16/2011	ENER	---	0.932	0.0600	0.0190	---	---	---	---	---
	1/31/2012	ENER	---	0.884	0.0300	0.0310	---	---	---	---	---
	2/29/2012	ENER	---	0.762	< 0.0300	0.0470	---	---	---	---	---
	4/30/2012	ENER	---	0.641	< 0.0300	0.0470	---	---	---	---	---
	5/31/2012	ENER	---	0.572	< 0.0300	0.0480	---	---	---	---	---
	6/30/2012	ENER	---	0.533	< 0.0300	0.0480	---	---	---	---	---
	7/27/2012	ENER	---	0.432	< 0.0300	0.0510	---	---	---	---	---

Table 3-14 WATER QUALITY ANALYSIS FOR LYSIMETERS (cont.)

pH THROUGH Th-230

Sample Point Name	Date	Lab	pH (std. units)	Unat (mg/l)	Mo (mg/l)	Se (mg/l)	NO3 (mg/l)	Ra226 (pCi/l)	Ra228 (pCi/l)	V (mg/l)	Th230 (pCi/l)
LY28-2	8/31/2012	ENER	---	0.867	< 0.0300	0.0510	---	---	---	---	---
	9/28/2012	ENER	---	0.814	< 0.0300	0.0490	---	---	---	---	---
	10/31/2012	ENER	---	0.624	< 0.0300	0.0530	---	---	---	---	---
	11/28/2012	ENER	---	0.521	< 0.0300	0.0560	---	---	---	---	---
	12/30/2012	ENER	---	0.418	< 0.0300	0.0600	---	---	---	---	---
	1/31/2013	ENER	---	0.411	< 0.0300	0.0660	---	---	---	---	---
	2/22/2013	ENER	---	0.374	< 0.0300	0.0750	21.0	---	---	---	---
	3/26/2013	HMC	---	0.328	< 0.0300	0.0770	22.0	---	---	---	---
	4/30/2013	ENER	---	0.283	0.0600	0.0740	---	---	---	---	---
	9/17/2013	ENER	---	0.190	< 0.0300	0.0960	32.0	---	---	---	---
	12/12/2013	ENER	---	0.136	< 0.0300	0.0870	30.0	---	---	---	---
LY28-2M	10/16/2009	ENER	---	0.0044	0.160	0.0110	1.80	---	---	---	---
	11/13/2009	ENER	8.15	0.0327	0.120	< 0.0050	2.30	---	---	---	---
	12/18/2009	ENER	7.73	0.0567	0.100	< 0.0050	5.90	---	---	---	---
	12/30/2009	ENER	7.87	0.0641	0.0900	< 0.0050	6.30	---	---	---	---
	1/31/2010	ENER	---	0.0489	0.0900	< 0.0050	6.40	---	---	---	---
	2/22/2010	ENER	---	0.0558	0.0900	0.0060	7.10	---	---	---	---
	3/25/2010	ENER	---	0.0581	0.100	0.0070	7.40	---	---	---	---
	4/29/2010	ENER	---	0.0552	0.0800	0.0060	7.60	---	---	---	---
	5/31/2010	ENER	---	0.0619	0.110	0.0090	8.70	---	---	---	---
	6/30/2010	ENER	---	0.0117	< 0.0300	< 0.0050	9.00	---	---	---	---
	7/27/2010	ENER	---	0.0502	0.0900	0.0080	10.00	---	---	---	---
	8/31/2010	ENER	---	0.0504	0.0800	0.0080	9.70	---	---	---	---
	9/30/2010	ENER	---	0.0534	0.100	0.0060	9.70	---	---	---	---
	10/31/2010	ENER	---	0.0475	0.140	0.0090	---	---	---	---	---
	11/30/2010	ENER	---	0.0396	0.100	0.0090	---	---	---	---	---
	1/31/2011	ENER	---	0.0480	0.100	0.0110	---	---	---	---	---
	2/25/2011	ENER	---	0.0433	0.150	0.0130	---	---	---	---	---
	6/30/2011	ENER	---	0.0368	0.130	0.0130	---	---	---	---	---

Table 3-14 WATER QUALITY ANALYSIS FOR LYSIMETERS (cont.)

pH THROUGH Th-230

Sample Point Name	Date	Lab	pH (std. units)	Unat (mg/l)	Mo (mg/l)	Se (mg/l)	NO3 (mg/l)	Ra226 (pCi/l)	Ra228 (pCi/l)	V (mg/l)	Th230 (pCi/l)
LY28-2M	7/15/2011	ENER	---	0.0344	0.130	0.0080	---	---	---	---	---
	8/31/2011	ENER	---	0.340	0.0400	0.150	---	---	---	---	---
	9/30/2011	ENER	---	0.369	0.0500	0.133	---	---	---	---	---
	10/31/2011	ENER	---	0.367	0.0600	0.153	---	---	---	---	---
	11/30/2011	ENER	---	0.334	0.0800	0.157	---	---	---	---	---
	12/16/2011	ENER	---	0.263	0.0800	0.108	---	---	---	---	---
	1/31/2012	ENER	---	0.222	0.0900	0.103	---	---	---	---	---
	2/29/2012	ENER	---	0.199	0.0900	0.0840	---	---	---	---	---
	4/30/2012	ENER	---	0.153	0.0900	0.0720	---	---	---	---	---
	5/31/2012	ENER	---	0.100	0.0900	0.0550	---	---	---	---	---
	6/30/2012	ENER	---	0.0659	0.100	0.0370	---	---	---	---	---
	7/27/2012	ENER	---	0.0512	0.100	0.0220	---	---	---	---	---
	8/31/2012	ENER	---	0.444	0.260	0.109	---	---	---	---	---
	9/28/2012	ENER	---	0.313	0.280	0.122	---	---	---	---	---
	10/31/2012	ENER	---	0.346	0.230	0.150	---	---	---	---	---
	11/28/2012	ENER	---	0.368	0.160	0.148	---	---	---	---	---
	12/30/2012	ENER	---	0.334	0.180	0.155	---	---	---	---	---
	1/31/2013	ENER	---	0.389	0.160	0.161	---	---	---	---	---
	2/22/2013	ENER	---	0.382	0.150	0.158	54.0	---	---	---	---
	3/26/2013	HMC	---	0.418	0.120	0.132	45.0	---	---	---	---
	4/30/2013	ENER	---	0.401	0.110	0.124	---	---	---	---	---
	9/17/2013	ENER	---	0.341	0.110	0.134	45.0	---	---	---	---
	12/12/2013	ENER	---	0.338	0.110	0.0990	38.0	---	---	---	---
LY28-3	10/16/2009	ENER	---	0.0875	0.100	0.0230	21.0	---	---	---	---
	11/13/2009	ENER	8.11	0.487	0.100	0.0500	43.5	---	---	---	---
	12/18/2009	ENER	7.87	0.553	< 0.0300	0.0420	53.7	---	---	---	---
	12/30/2009	ENER	7.90	0.628	< 0.0300	0.0480	55.3	---	---	---	---
	1/31/2010	ENER	---	0.694	< 0.0300	0.0490	60.0	---	---	---	---
	2/22/2010	ENER	---	0.758	< 0.0300	0.0520	63.7	---	---	---	---

Table 3-14 WATER QUALITY ANALYSIS FOR LYSIMETERS (cont.)

pH THROUGH Th-230

Sample Point Name	Date	Lab	pH (std. units)	Unat (mg/l)	Mo (mg/l)	Se (mg/l)	NO3 (mg/l)	Ra226 (pCi/l)	Ra228 (pCi/l)	V (mg/l)	Th230 (pCi/l)
LY28-3	3/25/2010	ENER	---	0.707	< 0.0300	0.0450	58.9	---	---	---	---
	4/29/2010	ENER	---	0.710	0.0500	0.0580	52.0	---	---	---	---
	5/31/2010	ENER	---	0.971	0.110	0.0940	54.0	---	---	---	---
	6/30/2010	ENER	---	0.973	0.0400	0.0910	62.0	---	---	---	---
	7/27/2010	ENER	---	0.781	< 0.0300	0.105	72.0	---	---	---	---
	8/31/2010	ENER	---	0.809	< 0.0300	0.167	74.0	---	---	---	---
	10/31/2011	ENER	---	0.0790	0.0500	0.0150	---	---	---	---	---
	11/30/2011	ENER	---	0.587	0.0400	0.0430	---	---	---	---	---
	12/16/2011	ENER	---	0.677	0.0400	0.0440	---	---	---	---	---
	1/31/2012	ENER	---	0.796	0.0500	0.0880	---	---	---	---	---
	2/29/2012	ENER	---	0.870	0.0600	0.0730	---	---	---	---	---
	4/30/2012	ENER	---	0.864	0.0600	0.0840	---	---	---	---	---
	5/31/2012	ENER	---	0.929	0.0500	0.0920	---	---	---	---	---
	6/30/2012	ENER	---	1.03	0.0500	0.104	---	---	---	---	---
	7/27/2012	ENER	---	1.22	0.0400	0.117	---	---	---	---	---
	8/31/2012	ENER	---	1.50	< 0.0300	0.126	---	---	---	---	---
	9/28/2012	ENER	---	1.67	< 0.0300	0.144	---	---	---	---	---
	10/31/2012	ENER	---	1.55	< 0.0300	0.148	---	---	---	---	---
	11/28/2012	ENER	---	1.57	< 0.0300	0.0580	---	---	---	---	---
	12/30/2012	ENER	---	1.33	< 0.0300	0.0650	---	---	---	---	---
	1/31/2013	ENER	---	1.59	< 0.0300	0.0780	---	---	---	---	---
	2/22/2013	ENER	---	1.49	< 0.0300	0.0850	151	---	---	---	---
	3/26/2013	HMC	---	1.49	< 0.0300	0.0740	147	---	---	---	---
	4/30/2013	ENER	---	1.42	0.0400	0.0700	---	---	---	---	---
	9/17/2013	ENER	---	1.01	0.0400	0.0810	156	---	---	---	---
	12/12/2013	ENER	---	0.855	0.0500	0.0730	156	---	---	---	---
LY34-1	10/16/2009	ENER	---	0.0837	0.0800	0.0090	2.80	---	---	---	---
	12/30/2009	ENER	7.80	0.375	< 0.0300	0.0540	10.1	---	---	---	---
	2/22/2010	ENER	---	0.368	0.0400	0.0470	11.7	---	---	---	---

Table 3-14 WATER QUALITY ANALYSIS FOR LYSIMETERS (cont.)

pH THROUGH Th-230

Sample Point Name	Date	Lab	pH (std. units)	Unat (mg/l)	Mo (mg/l)	Se (mg/l)	NO3 (mg/l)	Ra226 (pCi/l)	Ra228 (pCi/l)	V (mg/l)	Th230 (pCi/l)
LY34-1	3/25/2010	ENER	---	0.312	< 0.0300	0.0450	13.7	---	---	---	---
	4/29/2010	ENER	---	0.279	< 0.0300	0.0460	14.5	---	---	---	---
	5/31/2010	ENER	---	0.324	0.0500	0.0610	15.2	---	---	---	---
	6/30/2010	ENER	---	0.332	0.0400	0.0470	14.8	---	---	---	---
	7/27/2010	ENER	---	0.272	0.0400	0.0450	15.0	---	---	---	---
	8/31/2010	ENER	---	0.231	< 0.0300	0.0490	15.9	---	---	---	---
	9/30/2010	ENER	---	0.317	< 0.0300	0.0610	30.0	---	---	---	---
	10/31/2010	ENER	---	0.310	< 0.0300	0.0680	---	---	---	---	---
	11/30/2010	ENER	---	0.339	< 0.0300	0.0720	---	---	---	---	---
	1/31/2011	ENER	---	0.340	< 0.0300	0.0610	---	---	---	---	---
	2/25/2011	ENER	---	0.362	< 0.0300	0.0780	---	---	---	---	---
	3/31/2011	ENER	---	0.367	< 0.0300	0.0670	---	---	---	---	---
	4/29/2011	ENER	---	0.401	0.0500	0.0940	---	---	---	---	---
	6/30/2011	ENER	---	0.328	< 0.0300	0.0960	---	---	---	---	---
	7/15/2011	ENER	---	0.345	0.0400	0.0880	---	---	---	---	---
	8/31/2011	ENER	---	0.328	0.0600	0.0720	---	---	---	---	---
	9/30/2011	ENER	---	0.292	0.0600	0.0680	---	---	---	---	---
	10/31/2011	ENER	---	0.284	0.0700	0.0720	---	---	---	---	---
	11/30/2011	ENER	---	0.279	0.0700	0.0800	---	---	---	---	---
	12/16/2011	ENER	---	0.267	0.0800	0.0620	---	---	---	---	---
	2/29/2012	ENER	---	0.285	0.0700	0.0760	---	---	---	---	---
	4/30/2012	ENER	---	0.265	0.0600	0.0780	---	---	---	---	---
	5/31/2012	ENER	---	0.279	0.0600	0.0730	---	---	---	---	---
	6/30/2012	ENER	---	0.271	0.0600	0.0660	---	---	---	---	---
	7/27/2012	ENER	---	0.178	< 0.0300	0.0560	---	---	---	---	---
	8/31/2012	ENER	---	0.309	< 0.0300	0.0870	---	---	---	---	---
	9/28/2012	ENER	---	0.377	< 0.0300	0.0570	---	---	---	---	---
	10/31/2012	ENER	---	0.432	< 0.0300	0.0540	---	---	---	---	---
	11/28/2012	ENER	---	0.432	< 0.0300	0.0490	---	---	---	---	---

Table 3-14 WATER QUALITY ANALYSIS FOR LYSIMETERS (cont.)

pH THROUGH Th-230

Sample Point Name	Date	Lab	pH (std. units)	Unat (mg/l)	Mo (mg/l)	Se (mg/l)	NO3 (mg/l)	Ra226 (pCi/l)	Ra228 (pCi/l)	V (mg/l)	Th230 (pCi/l)
LY34-1	12/30/2012	ENER	---	0.420	< 0.0300	0.0500	---	---	---	---	---
	1/31/2013	ENER	---	0.460	< 0.0300	0.0540	---	---	---	---	---
	2/22/2013	ENER	---	0.456	< 0.0300	0.0590	69.0	---	---	---	---
	3/26/2013	HMC	---	0.445	< 0.0300	0.0540	68.0	---	---	---	---
	4/30/2013	ENER	---	0.446	< 0.0300	0.0500	---	---	---	---	---
	9/17/2013	ENER	---	0.353	< 0.0300	0.0570	72.0	---	---	---	---
	12/12/2013	ENER	---	0.340	< 0.0300	0.0500	72.0	---	---	---	---
LY34-2	10/16/2009	ENER	---	0.0067	0.140	0.0060	< 0.100	---	---	---	---
	11/13/2009	ENER	8.34	0.0695	0.110	0.0150	2.40	---	---	---	---
	12/18/2009	ENER	7.94	0.0871	0.0800	0.0190	7.50	---	---	---	---
	12/30/2009	ENER	7.98	0.0876	0.100	0.0210	8.30	---	---	---	---
	1/31/2010	ENER	---	0.0962	0.0800	0.0300	12.5	---	---	---	---
	2/22/2010	ENER	---	0.118	0.0900	0.0330	9.40	---	---	---	---
	3/25/2010	ENER	---	0.126	0.0800	0.0350	14.0	---	---	---	---
	4/29/2010	ENER	---	0.142	0.0800	0.0440	12.0	---	---	---	---
	5/31/2010	ENER	---	0.192	0.110	0.0550	11.4	---	---	---	---
	6/30/2010	ENER	---	0.222	0.120	0.0600	12.8	---	---	---	---
	7/27/2010	ENER	---	0.202	0.100	0.0590	12.1	---	---	---	---
	8/31/2010	ENER	---	0.104	0.0500	0.0430	8.00	---	---	---	---
	9/30/2010	ENER	---	0.0932	0.0400	0.0370	6.20	---	---	---	---
	10/31/2010	ENER	---	0.195	0.0600	0.0600	---	---	---	---	---
	11/30/2010	ENER	---	0.406	0.0700	0.0690	---	---	---	---	---
	1/31/2011	ENER	---	0.379	0.0400	0.0700	---	---	---	---	---
	2/25/2011	ENER	---	0.388	0.0500	0.0850	---	---	---	---	---
	3/31/2011	ENER	---	0.389	0.0400	0.0830	---	---	---	---	---
	4/29/2011	ENER	---	0.394	0.0900	0.114	---	---	---	---	---
	5/26/2011	ENER	---	0.343	0.0400	0.0790	---	---	---	---	---
	6/30/2011	ENER	---	0.311	0.0400	0.113	---	---	---	---	---
	10/31/2011	ENER	---	0.0861	0.260	0.0130	---	---	---	---	---

Table 3-14 WATER QUALITY ANALYSIS FOR LYSIMETERS (cont.)

pH THROUGH Th-230

Sample Point Name	Date	Lab	pH (std. units)	Unat (mg/l)	Mo (mg/l)	Se (mg/l)	NO3 (mg/l)	Ra226 (pCi/l)	Ra228 (pCi/l)	V (mg/l)	Th230 (pCi/l)
LY34-2	11/30/2011	ENER	---	0.184	0.300	0.0140	---	---	---	---	---
	12/16/2011	ENER	---	0.169	0.210	0.0070	---	---	---	---	---
	1/31/2012	ENER	---	0.183	0.120	0.0640	---	---	---	---	---
	2/29/2012	ENER	---	0.0973	0.180	0.0100	---	---	---	---	---
	8/31/2012	ENER	---	0.0998	0.0400	0.0450	---	---	---	---	---
	9/28/2012	ENER	---	0.0642	< 0.0300	0.0580	---	---	---	---	---
	10/31/2012	ENER	---	0.0660	< 0.0300	0.0560	---	---	---	---	---
	11/28/2012	ENER	---	0.0706	< 0.0300	0.0510	---	---	---	---	---
	12/30/2012	ENER	---	0.0664	< 0.0300	0.0500	---	---	---	---	---
	1/31/2013	ENER	---	0.0722	< 0.0300	0.0490	---	---	---	---	---
	2/22/2013	ENER	---	0.0737	< 0.0300	0.0530	10.7	---	---	---	---
	3/26/2013	HMC	---	0.0737	< 0.0300	0.0500	10.00	---	---	---	---
	4/30/2013	ENER	---	0.0758	0.0400	0.0450	---	---	---	---	---
	9/17/2013	ENER	---	0.0913	< 0.0300	0.0520	12.0	---	---	---	---
	12/12/2013	ENER	---	0.0932	0.0300	0.0440	16.0	---	---	---	---
LY34-3	10/16/2009	ENER	---	0.0051	0.130	0.0070	1.50	---	---	---	---
	11/13/2009	ENER	8.24	0.0749	0.210	0.0250	3.60	---	---	---	---
	12/18/2009	ENER	7.91	0.239	0.0800	0.0420	7.10	---	---	---	---
	12/30/2009	ENER	7.92	0.349	0.0600	0.0740	7.60	---	---	---	---
	1/31/2010	ENER	---	0.269	0.0700	0.0600	9.20	---	---	---	---
	2/22/2010	ENER	---	0.292	0.0700	0.0630	0.500	---	---	---	---
	3/25/2010	ENER	---	0.282	0.0700	0.0640	10.5	---	---	---	---
	4/29/2010	ENER	---	0.243	0.0600	0.0620	9.60	---	---	---	---
	5/31/2010	ENER	---	0.291	0.0900	0.0880	9.60	---	---	---	---
	6/30/2010	ENER	---	0.266	0.0600	0.0700	8.80	---	---	---	---
	7/27/2010	ENER	---	0.254	0.0600	0.0710	8.20	---	---	---	---
	8/31/2010	ENER	---	0.250	0.0500	0.0800	6.70	---	---	---	---
	9/30/2010	ENER	---	0.287	0.0600	0.0730	5.00	---	---	---	---
	10/31/2010	ENER	---	0.275	0.120	0.103	---	---	---	---	---

Table 3-14 WATER QUALITY ANALYSIS FOR LYSIMETERS (cont.)

pH THROUGH Th-230

Sample Point Name	Date	Lab	pH (std. units)	Unat (mg/l)	Mo (mg/l)	Se (mg/l)	NO3 (mg/l)	Ra226 (pCi/l)	Ra228 (pCi/l)	V (mg/l)	Th230 (pCi/l)
LY34-3	11/30/2010	ENER	---	0.279	0.0500	0.0720	---	---	---	---	---
	1/31/2011	ENER	---	0.285	0.0500	0.0920	---	---	---	---	---
	2/25/2011	ENER	---	0.274	0.110	0.102	---	---	---	---	---
	3/31/2011	ENER	---	0.224	0.0300	0.0620	---	---	---	---	---
	4/29/2011	ENER	---	0.267	0.120	0.0940	---	---	---	---	---
	6/30/2011	ENER	---	0.223	< 0.0300	0.103	---	---	---	---	---
	7/15/2011	ENER	---	0.229	< 0.0300	0.0990	---	---	---	---	---
	8/31/2011	ENER	---	0.266	0.0300	0.0710	---	---	---	---	---
	9/30/2011	ENER	---	0.222	0.0300	0.0660	---	---	---	---	---
	10/31/2011	ENER	---	0.201	0.0400	0.122	---	---	---	---	---
	11/30/2011	ENER	---	0.274	0.0400	0.112	---	---	---	---	---
	12/16/2011	ENER	---	0.288	0.0300	0.0770	---	---	---	---	---
	1/31/2012	ENER	---	0.268	0.0400	0.0990	---	---	---	---	---
	2/29/2012	ENER	---	0.291	0.0400	0.0930	---	---	---	---	---
	4/30/2012	ENER	---	0.260	0.0400	0.0900	---	---	---	---	---
	5/31/2012	ENER	---	0.339	0.0400	0.121	---	---	---	---	---
	6/30/2012	ENER	---	0.458	0.0600	0.174	---	---	---	---	---
	7/27/2012	ENER	---	0.436	0.0600	0.177	---	---	---	---	---
	8/31/2012	ENER	---	0.544	0.0800	0.280	---	---	---	---	---
	9/28/2012	ENER	---	0.536	0.0700	0.248	---	---	---	---	---
	10/31/2012	ENER	---	0.509	0.0600	0.223	---	---	---	---	---
	11/28/2012	ENER	---	0.467	0.0300	0.172	---	---	---	---	---
	12/30/2012	ENER	---	0.427	0.0500	0.169	---	---	---	---	---
	1/31/2013	ENER	---	0.412	0.0500	0.142	---	---	---	---	---
	2/22/2013	ENER	---	0.384	0.0400	0.137	15.9	---	---	---	---
	3/26/2013	HMC	---	0.376	0.0400	0.133	16.0	---	---	---	---
	4/30/2013	ENER	---	0.368	< 0.0300	0.122	---	---	---	---	---
	9/17/2013	ENER	---	0.416	0.0600	0.173	15.0	---	---	---	---
	12/12/2013	ENER	---	0.396	0.0700	0.149	19.6	---	---	---	---

Table 3-14 WATER QUALITY ANALYSIS FOR LYSIMETERS (cont.)

pH THROUGH Th-230

Sample Point Name	Date	Lab	pH (std. units)	Unat (mg/l)	Mo (mg/l)	Se (mg/l)	NO3 (mg/l)	Ra226 (pCi/l)	Ra228 (pCi/l)	V (mg/l)	Th230 (pCi/l)
LY34-4	10/16/2009	ENER	---	0.0261	0.280	0.0050	1.40	---	---	---	---
	11/13/2009	ENER	8.38	0.0613	0.310	0.0110	4.20	---	---	---	---
	12/18/2009	ENER	8.34	0.0714	0.280	0.0130	12.4	---	---	---	---
	12/30/2009	ENER	8.36	0.0671	0.230	0.0180	15.8	---	---	---	---
	1/31/2010	ENER	---	0.0574	0.270	0.0220	22.9	---	---	---	---
	8/31/2010	ENER	---	0.0397	0.320	0.0480	49.0	---	---	---	---
	9/30/2010	ENER	---	0.0749	0.460	0.0510	53.0	---	---	---	---

Table 3-15. Land Treatment Field Lysimeter Key Concentrations, in mg/l

LYSIMETER NUMBER	YEAR	URANIUM	SELENIUM	TDS	SULFATE	CHLORIDE	NITRATE	MOLYBDENUM
				SECTION 34				
LY34-1	2010	0.33	0.06	3500	1500	400	15	0.03
	2011	0.35	0.08	4200	2000	500	--	0.05
	2012	0.35	0.06	4800	2400	470	--	0.04
	2013	0.35	0.05	4800	2400	470	70	0.02
LY34-2	2010	0.22	0.06	4400	1900	630	12	0.08
	2011	0.38	0.1	6100	2900	900	--	0.2
	2012	0.08	0.06	4400	2200	450	--	0.1
	2013	0.1	0.05	4200	2000	430	12	0.03
LY34-3	2010	0.3	0.08	2800	1200	310	8	0.06
	2011	0.27	0.1	3100	1100	600	--	0.03
	2012	0.4	0.18	5500	2600	700	--	0.05
	2013	0.39	0.14	4300	1900	500	16	0.05
				SECTION 28				
LY28-1	2010	0.2	0.05	2700	1300	190	7	0.02
	2011	0.16	0.07	2700	1400	190	--	0.02
	2012	0.2	0.06	2900	1300	200	--	0.02
	2013	0.18	0.04	2670	1200	265	21	0.02
LY28-2	2011	0.78	0.04	6100	3500	160	--	0.05
	2012	0.65	0.05	5500	3200	170	--	0.02
	2013	0.3	0.08	4100	2200	270	26	0.02
LY28-2M	2010	0.04	0.01	900	100	110	9	0.09
	2011	0.34	0.15	6000	3200	720	--	0.1
	2012	0.34	0.12	6000	3000	800	--	0.2
	2013	0.38	0.13	6700	3300	920	45	0.12
LY28-3	2010	0.8	0.14	7000	3500	700	70	0.04
	2011	0.6	0.04	5000	2400	350	--	0.04
	2012	1.2	0.1	8000	3600	800	--	0.04
	2013	1.2	0.08	8400	4200	750	152	0.04
				SECTION 33				
LY1	2009	0.05	0.04	1600	550	230	2	0.02
	2010	0.05	0.11	2600	1200	350	1.3	0.02
	2011	0.05	0.11	4100	1940	661	--	0.02
	2012	0.05	0.15	4200	1860	720	--	0.02
	2013	0.05	0.18	4200	1820	880	6	0.02
LY2	2011	0.063	0.16	4420	1980	493	--	0.03
	2012	0.05	0.15	4300	2000	500	--	0.02
	2013	0.06	0.15	4120	1970	471	--	0.02
LY4	2009	0.07	0.04	4200	2150	340	0.6	0.02
	2010	0.08	0.05	4200	2150	370	0.8	0.02
	2011	0.03	0.08	3700	1900	500	--	0.02
	2012	0.03	0.1	3800	1800	540	--	0.02
	2013	0.02	0.11	3480	1790	579	1.1	0.02
LY4MU	2009	0.55	0.02	10000	5000	700	0.1	0.1
	2010	0.64	0.02	4400	1000	740	3	0.04
	2011	0.65	0.02	4300	1100	740	--	0.05
	2012	0.59	0.02	4100	1200	750	--	0.06
	2013	0.52	0.01	4300	1240	770	8	0.06
LY4ML	2009	0.4	0.01	8000	3500	640	0.6	0.02
	2010	0.4	0.02	3200	800	570	0.6	0.1

3.4.2 Section 28

Lysimeters were installed at three locations in the Section 28 Center Pivot area. Table 3-11 shows that five lysimeters were installed at these three locations. In addition to the alluvial lysimeters at the LY28-1 and LY28-2 locations, there is also a basalt lysimeter. The completion details of these lysimeters are presented in Table 3-11. Lysimeter LY28-2 and LY28-3 were reinstalled in 2011 while lysimeter LY28-1M was not successfully washed out.

Tables 3-13 and 3-14 presents the water quality results obtained from the LY28 series of lysimeters. Only one sample was obtained from the basalt lysimeter LY28-1M. Samples have routinely been obtained from lysimeter LY28-1. Only an initial sample was collected from LY28-2 prior to being reinstalled. Consistent samples have been taken from LY28-2 since its reinstallation. Samples have been obtained from the basalt lysimeter at LY28-2M and routine samples were collected from lysimeter LY28-3 through August of 2010 prior to it becoming non-functional. LY28-3 has routinely given samples since its reinstallation.

The time concentration plots for lysimeter LY28-1 are presented in Figure 3-26 and 3-27. The TDS, sulfate and chloride concentrations each have been fairly steady in 2013 with values of 2670, 1200 and 265 mg/l, respectively, are typical for this lysimeter in 2013. The uranium and selenium concentrations show typical 2013 values of 0.18 and 0.04 mg/l. The uranium has shown a decreasing trend in 2013 while the selenium has shown a very slight overall decreasing trend. The molybdenum concentrations have been low in lysimeter LY28-1.

The results from LY28-2 for 2013 indicate values of 4100, 2200, 270, 0.30 and 0.08 mg/l for TDS, sulfate, chloride, uranium, and selenium, respectively (see Figures 3-28 and 3-29). Uranium has shown a significant declining trend in 2013 while molybdenum has remained consistently low. A very gradual increasing trend was observed in selenium in 2013.

The monitoring data for lysimeter LY28-2M is presented in Figures 3-30 and 3-31. TDS, chloride, sulfate, uranium and selenium concentrations in this lysimeter were fairly steady in 2013. A small declining trend in the last half of 2013 may have started. Molybdenum had shown a gradual increasing trend in late 2011 and 2012 until the sharp increase occurred. The low major constituent concentrations indicate that all of the concentrations occurring in LY28-2M may be natural prior to the increase in the last half of 2011.

The soil moisture sample concentrations for lysimeter LY28-3 show an increasing trend for the major constituents of TDS, sulfate and chloride (see Figure 3-32) in 2012. For 2012, an increasing trend is also observed for uranium in this soil moisture (see Figure 3-33) and followed by a declining trend in 2013. This data indicates variable soil moisture moving past this lysimeter in 2012 and 2013.

3.4.3 Section 33

A total of eight lysimeters have been installed in Section 33 Center Pivot irrigation area. These lysimeters have been installed at five different locations. Figure 3-5 shows the five lysimeter locations. Lysimeters were placed in the alluvial material above the basalt except at the locations LY-3 and LY-4. A hole was drilled to a depth of 31 feet at LY-3M and the lysimeter placed in the bottom of this hole with the top of the lysimeter being located 23 feet below the top of the basalt. Two lysimeters were installed in a drill hole at the LY-4M site. These lysimeters were installed ten and thirty feet below the top of the basalt at this location. Future sampling from the Section 33 lysimeters will become less likely due to less soil moisture without irrigation since 2009.

Vacuum was applied to each of the lysimeters during each sampling event. Some of the lysimeters have not produced soil moisture samples while some have produced a sample each time a vacuum has been applied. Tables 3-13 and 3-14 present the water quality analysis of the soil moisture for the lysimeters. Lysimeter LY-1 was installed in July, 2009 and monthly samples have been obtained for this lysimeter each time the vacuum has been applied through July 2010 and during all of 2012 and early 2013. Only the fourth quarter sample had sufficient water in the 2nd half of 2013. LY-2 was installed in June of 2009 and a sample shortly after installation was obtained from this lysimeter. Samples were obtained throughout 2012 and only January in 2013. Lysimeters LY-3 and LY-3M were installed in June 2009 and neither of these lysimeters have ever produced a soil moisture sample. LY-4 was installed in December of 2008 and samples from this lysimeter have been obtained each time the vacuum was applied to the lysimeter until April 2011. In 2012, this lysimeter produced samples for the majority of the times a vacuum was applied but only produced enough water only in March for 2013. Lysimeter LY-4ML was installed in June of 2009 and monthly samples were collected from this lysimeter through December 2009. LY-4ML did not produce a sample in January, February and March of 2010, only one in 2011, and none in 2012 or 2013. Lysimeter LY-4MU was installed in July of 2009 and samples from this lysimeter have been collected fairly consistently through April 2013. The fourth quarter sample was the only sample with enough water in the second half of 2013. .

Figure 3-34 shows the TDS, sulfate and chloride concentrations for samples from LY-1, which is installed 16 feet below the land surface. These concentrations gradually increased during the last half of 2009 and 2010 until samples were not able to be collected, possibly arising from a decrease in the rate of flow. The samples obtained in 2012 and early 2013 showed an increasing trend in chloride, and fairly steady values for TDS and sulfate. The fourth quarter sample of 2013 showed a decrease in concentrations. Figure 3-35 presents the uranium, selenium and molybdenum concentrations for LY-1, which show overall low concentrations in each of these constituents with an increase in selenium concentrations in 2010. Selenium showed an overall increasing trend through 2012 and early 2013, while uranium and molybdenum remained steady and low. Selenium and uranium also decreased in the fourth quarter sample.

Lysimter LY-2, which only produced an initial sample after installation in 2009 has consistently produced samples in 2012 through January 2013. Figures 3-36 and 3-37 show the concentration data for this lysimeter. Selenium and chloride have both shown a fair amount of variability in the concentrations while all of the other constituents have remained fairly steady. The uranium and molybdenum concentrations in the soil moisture from LY-2 are small.

Figure 3-38 presents the TDS, sulfate, chloride concentrations for lysimeter LY-4. The TDS and sulfate scales are shown on the left of the graph and the chloride scale is presented on the right. The chloride concentrations are presented with the green triangles. The first 2 to 3 samples from this lysimeter likely show some effect from the water that was used to install the fine flour sand pack around this lysimeter. Subsequent sample results indicate a very gradual increasing trend in concentrations of chloride but not sulfate or TDS. Figure 3-39 presents the uranium, selenium and molybdenum concentrations for LY-4 lysimeter. The uranium concentrations changes are similar to the TDS and sulfate changes while the selenium changes are similar to the chloride changes. A typical uranium concentration of 0.02 is significantly less than the concentration of 0.24 mg/l that was present in irrigation water applied in 2009. The 2013 selenium concentration of 0.11 mg/l in the lysimeter is twice the selenium concentration of the irrigation water. No measurable molybdenum concentrations above the detection limit of 0.03 mg/l is indicated at this lysimeter. This data indicates that a similar amount of soil moisture has been moving past this lysimeter in the previous three years, but the amount of soil moisture may be too small to get a sample after January of 2013.

The TDS, sulfate and chloride concentrations for the lysimeter that was placed ten feet below the top of the basalt (LY-4MU) is presented in Figure 3-40. The constituent concentrations in the soil moisture gradually declined in late 2009 to early 2010, when the TDS and sulfate concentrations became fairly steady and the chloride concentrations gradually increased. The first sample from this lysimeter may have been biased by water used in installation, and results should not be given any significance. This data shows a much higher TDS, sulfate and chloride concentrations existing in the soil moisture until the last part of 2009. The concentrations then declined to levels that are fairly similar to the levels in lysimeter LY-4 which is located at a shallower depth at the base of the alluvial material above the basalt. Figure 3-41 presents the uranium concentrations for LY-4MU. This data shows that a gradual increasing trend in uranium concentrations was observed in the soil moisture samples from LY-4MU during 2010 and fairly steady uranium in 2011. The uranium plot shows a slight decline in concentrations through 2012 and 2013. The November 2009 value from LY-4MU and LY-4ML should not be given much significance because it appears that these two samples may have been switched in November 2009. This plot indicates that the uranium concentrations are not decreasing at the same rate as the major constituents and its concentrations indicate that the soil moisture passing LY-4MU is getting some uranium that previously migrated to this interval of the basalt. The selenium concentration in Figure 3-41 has been steady while the molybdenum concentration decreased to a low value in late 2009 and has shown a very gradual increase in the last three years.

3.5 Observed Soil Moisture Content

In July of 2012, new soil moisture measurement devices were implemented in the Section 34 flood area and the Section 28 center pivot. Two different types of instruments were installed. The Campbell Scientific CS655 is a water content reflectometer. This device measures volumetric water content, electrical conductivity and temperature in porous materials such as soil. The volumetric water content is calculated using the relationship between the travel time of electromagnetic waves along the rods. The electrical conductivity is determined by the signal attenuation of a known non-polarizing waveform and the temperature is measured by a thermistor attached to one of the rods.

The Campbell Scientific CS229 is a heat dissipation matric water potential sensor. The sensor indirectly measures soil water matric potential using an empirical relationship between heat dissipation and the soil water matric potential. The device has a heating element and a thermocouple encased in a porous ceramic cylinder. To measure the heat dissipation, the heating element is turned on for 30 seconds while the thermocouple takes a measurement at the beginning and at the end of the heating cycle. A decrease in the delta temperature indicates an increase in soil moisture content.

3.5.1 Section 34

Instrumentation for the Section 34 flood area was installed next to lysimeter LY34-3 (see Figure 3-1). A CS655 and a CS229 were installed at depths of 5 feet, 10 feet, and 15 feet. Completion information and initial soil moisture content in the installation interval are shown in Table 3-16. The initial soil moisture contents for the three Section 34 flood intervals were very low. The instruments were attached to a data logger that collected the data every 15 minutes up to October 8 and every hour after that date.

Table 3-16. Irrigation Field Soil Moisture Instruments

INSTRUMENT DETPH	INTERVAL (FT-LSD)	DEPTH TO TOP OF BASALT (FT-LSD)	INTERVAL OF BENTONITE SEAL (FT-LSD)	SOIL MOISTURE CONTENT (% BY WEIGHT)
		SECTION 28		
4'	3-4	8	0.5-2.5	15.34
6'	5-6	8	2.5-4.5	4.87
8'	7-8	8	4.5-6.5	18.46
		SECTION 34 FLOOD		
5'	4-5	DNE	1.5-3.5	3.79
10'	9-10	DNE	7.5-9.5	5.31
15'	14-15	DNE	11.5-13.5	2.71

Figure 3-42 presents the volumetric water content values for the instruments in Section 34. The slight increases in water content in the 5 foot depth and the 15 foot depth are indicative of what would be expected from the irrigation in 2012. However the sharp increase in the 5 foot and the sharp decrease in the 10 foot instruments in October 2012 have no current explanation. The values are within the accepted range for the water content in these clay soils but the manner of change is questionable. As expected, a decline in moisture content in the 5 foot depth after irrigation was observed. The majority of the 10 and 15 foot data is out of the accuracy range and should be used with caution. The small increase and decrease in water content in 2013 may be the variation that will be observed without irrigation applications.

The electrical conductivity of the soil in Section 34 is presented in Figure 3-43. The initial increase in conductivity is likely due to the use of RO water during installation. The sharp increase shown in the 5 foot depth, like the increase in water content, is inexplicable. A steady increase starting in March 2013 and steady decline in October 2013 are observed for all three depths with the magnitude decreasing with depth.

Figure 3-44 presents the data collected from the CS229's in Section 34. The average daily delta temperature is the change in temperature from the start of the heating cycle to the end of it. The change in temperature is inversely proportional to the water content (higher delta temperature equals lower water content). Both the 10 foot and 15 foot depth show a slight but steady increase in delta T, indicating a decrease in water content. The 5 foot depth showed a significantly larger amount of change. The decrease in change in delta temperature in September 2012 matches up with the increase in volumetric water content. However the increase and sharp decrease in July and August of 2012 shows no connection to other parameters measured. The gradual increase of delta T in the 5 foot depth since October 2012 is an indication that the soil moisture is decreasing. This data supports the soil moisture model predictions for Section 34 of very slow movement of the soil moisture profile. The sensor for the 5 foot depth appears to have malfunctioned in October of 2013 and attempts to fix it were unsuccessful.

3.5.2 Section 28

The soil moisture measurement devices were installed next to lysimeters LY28-2 and LY28-2M (see Figure 3-3). One of each instrument was installed at 4, 6, and 8 feet below the ground surface (see Table 3-16 for completion information and initial soil moisture contents). Data was collected every fifteen minutes before October 8, 2012 and every hour after that date by a data logger.

The volumetric water content is presented in Figure 3-45. The sharp increase shown in all three depths early in the irrigation season is much larger than reasonable water content values. It is highly unlikely that the water content of the soil reached 78% at the 8 foot depth and is likely due to the imprecision of the equipment beyond a certain range of measurement. The inverse relationship between depth and water content is expected given the increase in clay content with depth. Data from the six foot interval was not recorded from the middle of November through the end of 2012 due to a wire to the data logger coming loose. The rate of decline for two to three weeks after irrigation is slightly steeper than the rate before and after this period, indicating some decrease in the moisture content shortly after irrigation ceased in each of the three depths. These measurements indicate movement of soil moisture through all three depths during the 2012 irrigation season. The rate of decline has been steady throughout 2013 in all three depths.

Figure 3-46 presents the electrical conductivity for Section 28. The trends shown follow a very similar pattern to the water content, however all three depths show a possible seasonal variation in conductivity that isn't correlated to water content. The larger rate of decline in the electrical conductivity for a few weeks after irrigation in 2012 was also observed.

The data collected from the CS229's in Section 28 is presented in Figure 3-47. All three intervals showed an increase initially until a sharp decrease that coincides with the spike in water content and electrical conductivity. After the initial changes, the four foot depth shows changes in moisture content after some of the pivot cycles. The center pivot rotation rate was set at 1.5 days per revolution. Both the six and eight foot depths show some variations during the irrigation with some overall decrease in the delta temperature in the last half of the irrigation season. The four foot depth showed more variation than the other depths with an increase in delta temperature after the irrigation ceased. A smaller increase in the six and eight foot depths in delta temperature after irrigation also indicates a decrease in moisture content in these two deeper depths after irrigation. The increase in delta temperature has continued through all of 2013 indicating that the soil is drying out. The changes were inversely related, as expected, to the water content measures made at the same depths by the CS655 instruments.

3.6 Predicted Soil Moisture Concentrations

This 2000-2013 irrigation monitoring report also presents information that indicates ground-water uranium concentrations are not increasing in the irrigation areas. The partially saturated numerical model LEACHP model was used to predict the movement of constituents in soil moisture below the irrigation areas with time. These predictions support the measured lysimeter constituent concentrations in the soil profile. The LEACHP model was also used to predict future soil moisture concentrations of constituents of concern for the Section 28 pivot and Section 34 flood irrigated areas. The results of the LEACHP modeling are presented in Appendix C. The LEACHP simulations are compared with lysimeter sample data for 2013, and the simulations extend through year 2100 to predict future irrigation impacts.

Until the alternative treatment processes are proven and permitted, irrigation is needed to maintain control of impacted areas and restore the ground-water quality for off-site areas. Homestake proposes to continue the irrigation program in the Section 28 pivot and Section 34 flood area with reduced irrigation water quality limits on constituents of concern in Sections 28 and 34 through 2016. Table 3-17 below shows the proposed schedule assuming that alternate treatment is approved in 2014 with reduced maximum concentrations for uranium, selenium, TDS and sulfate in irrigation water applied to these fields. The maximum uranium concentration in the irrigation water is proposed to be at 0.16 mg/L in 2015 and 2016. The selenium concentrations limit is proposed to be 0.1 mg/l for these years. A maximum TDS and sulfate concentration of 2000 and 900 mg/l, respectively, is proposed for the irrigation water.

Table 3-17. Proposed Irrigation Supply Upper Limits for Uranium, Selenium, TDS and Sulfate and Anticipated Irrigation Amount

	Maximum Concentration Applied, mg/l				Anticipated Irrigation (Ft of Water)		
Year	U	Se	TDS	SO4	Sec 34 Flood	Sec 28 Pivot	Sec 33 Pivot and Flood
2015	0.16	0.1	2000	900	2.5	2.5	0
2016	0.16	0.1	2000	900	2.5	2.5	0

In order to meet the proposed upper constituent concentration limits, San Andres water will have to be used until the ground-water restoration or alternate restoration reduces alluvial water constituent concentrations to a level which meets the irrigation concentration limits.

Table 3-17 also presents the anticipated feet of irrigation water applied each year. An irrigation application depth of 2.5 feet/year is planned for Section 34 and Section 28 irrigation areas for

2015 and 2016. Irrigation application depths may vary due to the combination of restoration programs used and operational constraints.

3.6.1 Section 34

The past and planned future flood irrigation in Section 34 through 2014 was simulated with LEACHP as described in Appendix C. The simulation results are compared with observed lysimeter soil moisture uranium, selenium, TDS, sulfate and chloride concentrations for lysimeters LY34-1, LY34-2 and LY34-3 for 2012 and 2013 (see Figures C-1 through C-5 in Appendix C). These comparisons illustrate that LEACHP predictions are consistent with lysimeter results, and that the virtually all of uranium and selenium applied in the irrigation water through 2012 is retained within the upper 10 feet of the soil profile. The TDS, sulfate and chloride applied in the irrigation water through 2012 is also largely retained within the upper 10 feet of the soil profile. The predicted soil moisture concentrations for years 2030, 2050 and 2100 indicate that constituents will continue to migrate through the soil profile after operation of the irrigation program through 2014. Figures C-1 through C-5 show that the pulse of elevated constituent concentrations in the soil profile is spread and attenuated as it slowly moves through the profile. After irrigation is discontinued, the expected annual recharge to the ground water in the flood irrigation area is very small and this results in a very slow rate of movement for the constituents in the soil moisture. A conservatively large estimate of the long-term recharge to the field which reports as drainage of soil moisture from the bottom of the soil profile is 9 mm/year or 2.2 gpm for the 120 acre flood area. Table C-1 in Appendix C presents the inputs and results from the LEACHP soil moisture model for the flood irrigation. The column labeled interval rain in Table C-1 includes both rainfall and irrigations depths.

3.6.2 Section 28

The past and planned future Section 28 Center Pivot irrigation through 2014 was simulated with LEACHP as described in Appendix C. The simulation results are compared with observed lysimeter soil moisture uranium, selenium, TDS, sulfate and chloride concentrations for lysimeters LY28-1, LY28-2, LY28-2M and LY28-3 for 2012 and 2013 (see Figures C-6 through C-10 in Appendix C). These comparisons illustrate that LEACHP predictions are consistent with lysimeter results, and that the virtually all of uranium and selenium applied in the irrigation water through 2012 is retained within the upper 30 feet of the soil profile. The TDS, sulfate and chloride applied in the irrigation water through 2012 has migrated to the ground water. The predicted soil moisture concentrations for years 2030, 2050 and 2100 indicate that constituents will continue to migrate through the soil profile after operation of the irrigation program through 2014. Figures C-9 through C-10 show that the pulse of elevated uranium and selenium concentrations in the soil profile is spread and attenuated as it slowly moves through the profile. After irrigation is discontinued, the expected annual recharge to the ground water in the flood irrigation area is very small and this results in a very slow rate of movement for the constituents in the soil moisture. A conservatively large estimate of the long-term recharge to the field which reports as drainage of soil moisture from the bottom of the soil profile is 9 mm/year or 1.8 gpm for the 100 acre pivot area. The soil moisture sample predictions for TDS, sulfate and chloride show the long-term concentrations of these constituents that reach the water table will be relative constant in the future (see Figures C-6, C-7 and C-8). Table C-2 in Appendix C presents the inputs and results from the LEACHP soil moisture model for the flood irrigation. The column labeled interval rain in Table C-2 includes both rainfall and irrigations depths.

3.6.3 Section 33

No soil moisture predictions were made for the Section 33 center pivot or the Section 33 flood area. There is no irrigation planned for either of these areas in the future.

3.7 Soil Health

Soil health as related to irrigated crop production is generally monitored as a function of the salt loading of the soils and potential adverse affects on soils due to excessive sodium in the irrigation water and in the soils. In order to understand the possible effects of these parameters on the irrigated soils, it is desirable to know other characteristics of the soil including soil particle size and texture, natural salt and sodium levels, bulk density, clay mineralogy, infiltration rates, hydraulic conductivity, and depth to bedrock. The following sections describe the soil conditions at the Grants irrigation sites and the affects of many years of irrigation on the soil health.

3.7.1 Irrigated Soil Physical Characteristics

Prior to establishment of the irrigated areas, a detailed assessment of the potential soils to be irrigated was conducted in 1998. Originally, SCS (now NRCS) soil mapping was used to establish baseline conditions at the site and then backhoe trenching was utilized to refine the characteristics of the irrigation areas. Following is a general description of those soils prior to irrigation.

For the Section 33 Center Pivot area, the majority of the area is comprised of the Mespun sandy loam to sandy soil series with minor acreages of Sparank sandy clay loam to clay loam and the Aparejo silty clay loam series. Following the backhoe examination, it was determined that the soils located under the pivot were comprised largely of the Mespun series and another sandy series referred to as the Glenberg, or Glenberg- variant soil series. Both soils have sandy loam to loam surface textures. The Mespun soil developed in wind blown sands and the surface sandy loam layer is shallow, generally 10 inches or less. Below 10 inches are high permeability stratified fine to medium sands. The Glenberg soils developed in fluvial deposits and the sandy loam to loam surface layer is up to 24 inches thick. Below 24 inches are highly permeable stratified fine to medium sands. The Glenberg soils generally have slopes of 1% or less and the Mespun soil slopes range from 1% to 6%.

Irrigation suitability of these soils was based on NRCS suitability ratings, field investigations including backhoe trench analyses and laboratory analyses, and double ring infiltrometer tests. These soils are generally unsuitable for flood irrigation due to their sandy nature, rolling topography, and extremely rapid infiltration rates. While these soils were considered by NRCS to be marginal for sprinkler irrigation due to their droughty nature and rapid infiltration rate, with proper irrigation application rates and pivot cycles, these soils were determined to be acceptable for the establishment of a center pivot irrigation system.

The Section 28 Center Pivot was initially established as a 60 acre system and later expanded to cover 100 acres. The NRCS mapped this area as the Glenberg soil series with San Mateo soils occurring in swale areas. The backhoe examination confirmed the NRCS mapping and the majority of the area under the Section 28 center pivot is comprised of Glenberg sandy loam soils. This soil generally has sandy loam surface and subsurface soils ranging up to 24 inches in depth. Below 24 inches are stratified medium and fine sands. Swales are dominated by the San Mateo sandy clay loam soils consisting of loam to sandy clay loam surface and subsurface textures up to 28 inches deep. Below 28 inches are fins to medium stratified sands.

The NRCS rated the sprinkler irrigation suitability of the Glenberg soil as somewhat limited due to droughty condition and relatively low water holding capacities. However, these soils were determined to be adequate to support sprinkler irrigation as long as proper irrigation application rates and cycles were maintained.

The Section 34 flood irrigated soils were mapped by the NRCS with the majority of these soils described as the Sparank clay loam soils. These soils are characterized as having clay loam surface horizons with clay loam to clay subsurface horizons ranging up to 24 to 36 inches deep. Generally, stratified clay loam, sandy clay loam, and silty clay loam soils are found below these depths. Field examinations, including backhoe trenches, indicate that the northern one third of these soils in the flood irrigation area are the San Mateo soils with sandy clay loam to clay loam surface textures and clay loam sub-surface textures to 24 inch depths. Below 24 inches in these soils are stratified fine and medium sands. The remaining soils were determined to be the Sparank series as described by the NRCS. However, these soils were found to have stratified fine and medium sands located at depths of about 36 inches.

The NRCS rated these soils as somewhat limited for flood irrigation due to very slow percolation or infiltration rates. However, these soils had been flood irrigated historically since the 1950's. The biggest factor in flood irrigation of these soils was excessive cracking if they were allowed to dry. Extensive laser leveling was conducted on the site prior to irrigation in 2000 and the site was seeded to alfalfa forage production. Irrigation was accomplished through gated irrigation piping.

The Section 33 flood irrigated soils were mapped by the NRCS as the Sparank soils. These soils are characterized as having clay loam surface horizons and clay loam to clay subsurface horizons to depths of 72 inches. Field investigations for these soils showed that the southwest portion of the Section 33 flood irrigated soils were comprised of the Aparejo clay loam soil series, sandy substratum phase. The remainder of the soil was the Sparank clay loam soils as mapped by NRCS. Like some of the Section 34 flood irrigated soils, these soils had fine to medium sands at depths of 24 to 36 inches. As with the Section 34 flood irrigated area, these soils were historically flood irrigated in the 1950's and 1960's. These soils were seeded to grasses and irrigated in 2004, 2005 and 2008. They were tilled and seeded to triticale in the fall of 2008.

3.7.2 Soil Salt and Sodium Relationships with Irrigation Water Quality

Measurement of soil chemistry, particularly sodium levels and salt (Electrical Conductivity - EC) levels provides an understanding of the amount of soil constituents that remain in the soil after an irrigation season. In the case of soil salinity, it is desirable to leach salts through the root zone to prevent crop toxicity from occurring. The concentration of sodium and salt in the site irrigation water has been examined to assess their affect on the irrigated soils.

Sodium affects soil physical properties by causing soil clays to expand and disperse. The expansion of clay results in a significant decrease in soil permeability making it difficult to push irrigation water through the soil profile. Because potential adverse affects of sodium on soils are related to the amount of exchangeable sodium that can adsorb on the soil cation exchange complex, measurement of the exchangeable sodium and cation exchange capacity provides a valuable tool for predicting and monitoring potential adverse affects on soil health due to sodium in the irrigation water.

Since soil clays are directly affected by sodium, it stands to reason that sandy center pivot soils are not generally affected by the presence of high sodium levels. Conversely, heavy clay irrigated soils have a higher risk for being adversely affected by higher sodium levels. In addition, the salinity concentrations in the soil and irrigation water will alter how significant the affect of sodium is on the soil clays. Salts tend to flocculate clays, reducing the amount of expansion. When salts are significant, soil permeability may not be affected by higher concentrations of the sodium.

Historically, since ESP and CEC are more difficult and expensive to analyze, scientists developed an empirical relationship comparing soluble sodium to exchangeable sodium (U.S.D.A. Handbook 60) and assumes the soils are in chemical equilibrium. The sodium adsorption ratio (SAR) compares soluble sodium concentrations to the concentration of soluble calcium and magnesium in the soil. In soils that were in chemical equilibrium, a SAR of 12 was comparable to an ESP of 15. For irrigated soils like those at the Grants irrigation sites, the soil may not be in chemical equilibrium and the historical comparison of SAR to ESP may not be as accurate. However, SAR is still a useful parameter to examine for potential sodium risks to soil health.

Irrigation wells have been analyzed for sodium and salinity concentrations. This data is useful in assessing the current and potential adverse risk to the soil associated with the irrigation water. The mean SAR of these wells was 5.2 and the SAR range was 4.2 to 6.1. The mean electrical conductivity (EC) of these wells was 2690 umhos and the range was 2205 to 3440 umhos.

As described previously, the concentration of salts in irrigation water can be useful to counteract the possible adverse effects of sodium on expanding soil clays. Table B-1 in Appendix B shows the level of exchangeable sodium, at varying clay contents, which would cause a 25% reduction in soil hydraulic conductivity at three concentrations of salt in the irrigation water. Without considering all other factors that ameliorate the effects of sodium on soils, an ESP of 15% (SAR 12) was historically considered risky for successful irrigation of all soils.

For the Section 33 and 28 center pivot soils, the average clay content would be approximately 15%. Referring to Table B-1, the estimated critical ESP of these soils would be 25%, 30%, and 40% for irrigation water with salt concentrations of 1000 umhos/cm, 2000 umhos/cm, and 4000 umhos/cm, respectively. Essentially, this data confirms that because of low clay content, little risk of sodium hazard exists for irrigation of these soils in relation to adverse affects due to sodium.

For the Section 33 and 34 flood irrigated areas, the average clay content will be 35 to 40%. Referring to Table B-1, the critical ESP for these soils would be 15%, 21%, and 28% for the 1000 umhos/cm, 2000 umhos/cm, and 4000 umhos/cm salt levels, respectively. In relation to the average site irrigation water electrical conductivity of 2690 umhos/cm, adverse soil problems associated with sodium would not likely occur as long as the ESP of the soils stayed below about 25% (SAR < 20).

Table B-2 in Appendix B shows the soil health risk when the sodium level (SAR) of the irrigation water is included with the salinity concentrations effects. The table summarizes the associated risk for all soil textural families ranging from sandy (center pivot irrigation) soils to fine loamy to fine clay (flood irrigation) soils. The average SAR of the irrigation water is 5.2 and, when coupled with the 2690 umhos/cm salinity levels, the resulting irrigation water quality class is a C4S1. For the sandy center pivot irrigated soils, the soil health risk associated with irrigation of the C4S1 water will be very low to low in relation to possible reductions in permeability and hydraulic conductivity. For the fine loamy to clayey flood irrigated soils, the soil health risk is low.

While sodium effects are primarily a physical problem in soils, high salinity levels could cause problems related to crop toxicity to salts. Without specific crop knowledge, a soil salinity level in excess of 2200 umhos/cm may be considered toxic to plants. However, individual crops respond differently to salinity levels. The primary crops grown at the site are alfalfa and grass. Both of these crops are adapted to the growing conditions for the Grants area and are moderately to strongly salt tolerant. Soil salt levels around 4500 umhos/cm may prevent some germination of these crops. However, once geminated they are strongly salt tolerant and can withstand salt concentrations in excess of 4500 umhos/cm. Regardless of the individual crop salt tolerance, it is important for all crops to overall soil health to leach a portion of the salts below the root zone to prevent the buildup of salts over time.

3.7.3 Effects of Current Irrigation Practices on Soil Health

ESP is not generally available in the HMC irrigated soil data base; therefore, any discussions in this report on possible sodium soil changes will focus on the use of SAR. Table 3-4 provides a summary of the soluble sodium, calcium, magnesium, SAR, and EC annual monitoring data for both background and irrigated soils for the life of the irrigation project. Note that the Section 33 center pivot and the Section 33 and 34 flood irrigated soils did not receive irrigation water in the 2011 irrigation season. The Section 33 center pivot and the Section 33 flood irrigated soils did not receive irrigation water in the 2009 through 2012 seasons.

For the Section 33 center pivot area, the SAR for background soil samples before irrigation was approximately 1.0. After the 2013 season, and without irrigation the past four years, the reported SAR under the center pivot for the 1 foot, 2 foot, and 3 foot sampling depths was 5.00, 8.50, and 8.80, respectively. The SAR value for the 0 to 2 foot depths decreased while the 3 foot zone increased slightly, likely reflecting seasonal leaching fluctuations following the monsoon season.

The SAR values from 3 to 17 feet have begun to increase slightly, most likely reflecting drain down following the previous irrigation seasons. Overall, the Section 33 sandy soils do not show adverse effects due to the resident sodium levels.

The background electrical conductivity levels for all depths for the Section 33 pivot ranged from 200 to 1740 umhos/cm. After the 2013 season, the average EC for the zero to three foot sampling depths under the pivot for all years was 4450, 5610, and 5870 umhos/cm, all increasing over the previous year. In addition, the salinity levels for the 3 foot to 17 foot depths have also increased slightly over the previous year. However, salt constituents are still lower than levels that will create concern over potential toxicity for the crops that have been grown.

For Section 28, the average background SAR in the soil for all depths is 1.21. After the 2013 irrigation season, the average SAR under the pivot in the 3 foot sampling depth was 3.56 and the SAR for the 1 foot depth, 2 foot depth, and 3 foot depth was 3.00, 2.00, and-5.70, respectively. While all three depths have increased, the 3 foot depth has increased significantly, however, all three depths SAR are much lower than concern levels. SAR values increased, some significantly, in the entire 3 foot to 15 foot zones. Again, the sodium has little effect on the permeability of sandy soils and these SAR values are not elevated to levels of concern.

The average EC of the 3 foot soil profile for Section 28 for all years is 773 umhos/cm and the individual 1 foot depth, 2 foot depth, and 3 foot depth averages for all years was 704, 802, and 814 umhos/cm, respectively. In 2013 the average EC was 4200 umhos/cm and the 1 foot, 2 foot, and 3 foot depths were 4100, 3580, and 4920 umhos/cm, respectively. In addition, the EC concentrations for the 3 to 15 foot zone also increased. However, all EC levels for all depths are lower than levels expected to cause salt toxicity problems in the site crops.

For the Section 34 flood area the average background SAR for the 3 foot root zone is 3.62 and the average for all years of the individual 1 foot, 2 foot, and 3 foot sampling depths was 4.01, 4.62, and 4.39, respectively. Following the 2013 season, the average SAR level under the irrigated areas for the 3 foot depth was 11.10 and the 1 foot, 2 foot, and 3 foot depths were 11.60, 11.50, and 10.20, respectively. The average SAR value is higher than the previous year.

The average background EC of the 3 foot sampling depth is 2367 umhos/cm and for the 1 foot, 2 foot, and 3 foot depths the EC was 2480, 2340, and 2340 umhos/cm, respectively, for the Section 34 flood area. After the 2013 irrigation season, the average EC for the flood irrigated areas for the 3 foot sampling depth was 6867 umhos/cm and for the 1 foot, 2 foot, and 3 foot depths, the EC were 6560, 6830 , and 7210 umhos/cm, respectively and are higher than the previous season. While these EC levels may be marginal for some crops, particularly some row crops, they are suitable for the hay and grass crops grown on the site.

For the Section 33 flood irrigated soils, the average background SAR was 1.43 and the average for all years of the individual 1 foot, 2 foot, and 3 foot sampling depths was 1.49, 1.27, and 1.52 , respectively. At the end of the 2010 irrigation season, the last where data is available, and which no irrigation water was applied , the average SAR for all depths was 2.54 and the 1 foot, 2 foot, and 3 foot SAR values were 3.10, 2.07, and 2.45, respectively with no significant change over the 2010 season. The SAR value after five years of irrigation is still well below levels of concern for reducing hydraulic conductivities and permeability.

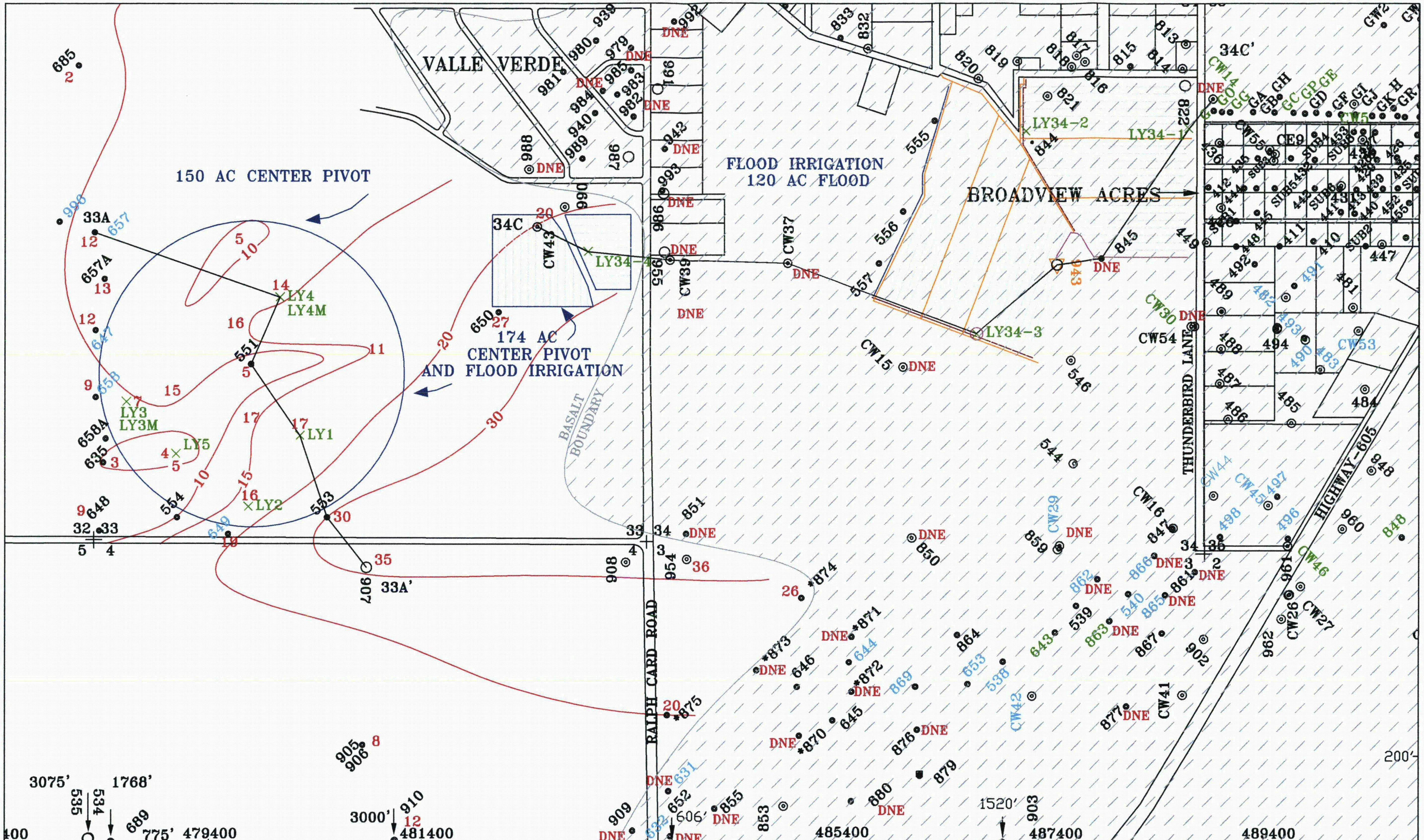
The average background EC for the Section 33 flood area for the 3 foot sample depth is 828 umhos/cm and the background EC for the 1 foot, 2 foot, and 3 foot individual sample depths is 876, 754, and 855 umhos/cm, respectively. At the end of the 2010irrigation season, the average 3 foot EC was 1746 umhos and the individual 1 foot, 2 foot, and 3 foot depth EC was 1710, 1640, and 1890 umhos/cm, respectively. These EC levels are well within the desired toxicity range for the crops grown at the site.

Irrigation of the Section 33 center pivot soils and the Section 33 flood irrigated soils did not occur in 2009 through 2013. While leaching of salts can be quantitatively explained by conducting a mass balance of chloride data for the season, it is apparent that sufficient leaching of salts, necessary to prevent plant toxicities, occurred in the Section 28 center pivot soils and Section 34 flood soils.

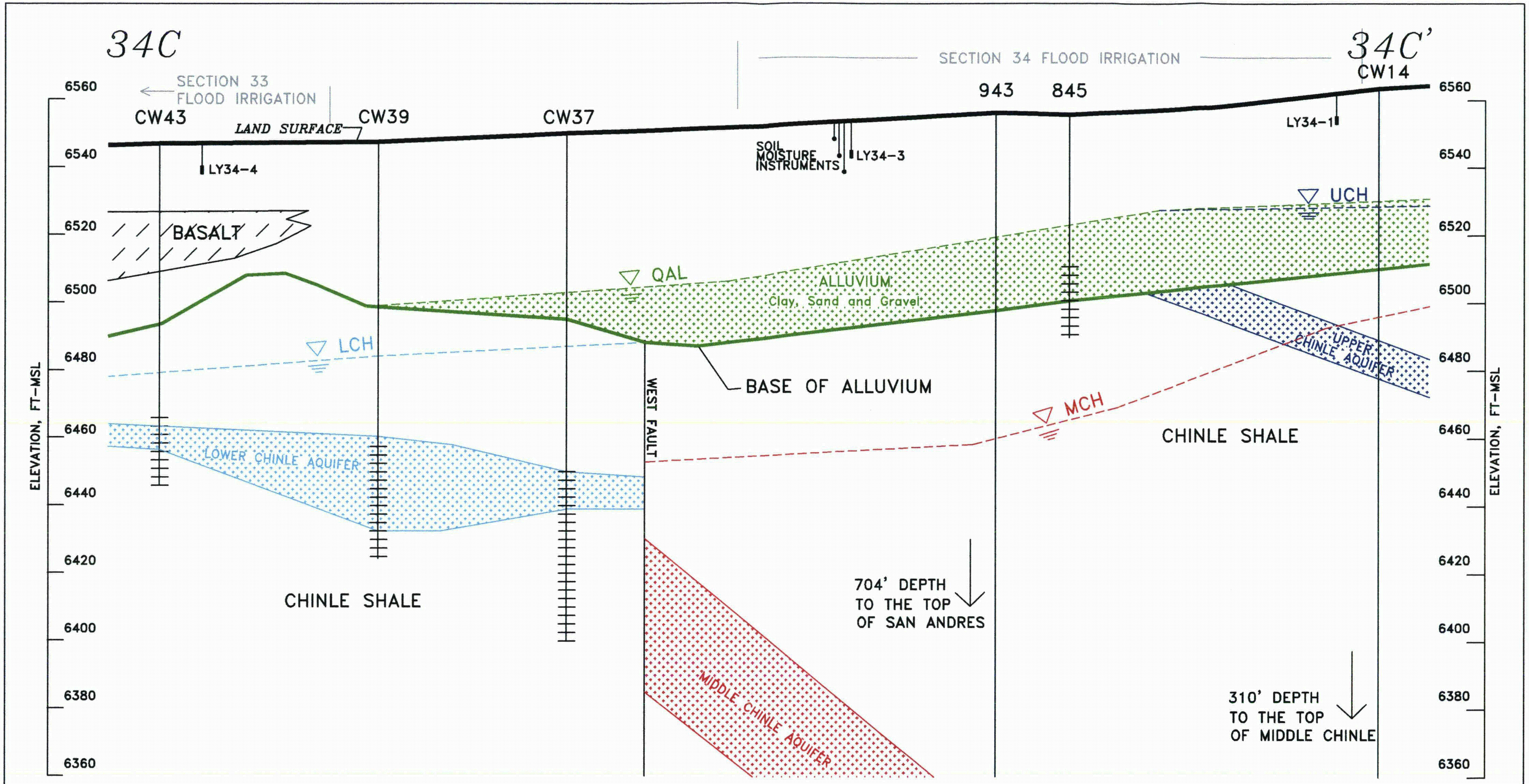
3.7.4 Conclusions

Soil Health associated with irrigation programs is generally centered around the affects of excess sodium on soil physical properties and on salt buildup to potentially toxic levels for vegetation or crops. The potential risk that these elements pose is much different for sandy soils than for heavier clay or clay loam soils. The low clay content of sandy soils allows for much higher sodium concentrations because sodium has no adverse affect on sand particles. The irrigation water quality for the site wells can be classified as C4S1 water with SAR levels less than 10 and EC levels greater than 2250 umhos/cm. The average SAR for the site water is 5.2 and the average EC is 2690 umhos/cm. This water quality is rated as very low to low sodium risk on sandy soils and low sodium risk on fine loamy soils, due to the flocculation effects that salts have on soil clays.

While salt concentrations are important to counteract the affect of higher sodium levels on soil clays, the salts may have a toxic affect on vegetation. For the alfalfa and grasses grown at the site, the soil salt toxicity level of concern is in excess of 4500 umhos/cm. Leaching of salts at all sprinkler and flood irrigated sites has prevented the buildup of salts to toxic levels. Review of the annual data indicates that the soil health, as related to salts and sodium, has not been adversely affected over the years.



SCALE: 1" = 800'	LEGEND		FIGURE 3-1. SECTION 34 DEPTH TO TOP OF BASALT, LOCATION OF LYSIMETERS, ADDITIONAL ALLUVIUM MONITORING WELLS AND CROSS SECTION	HOMESTAKE MINING COMPANY
C:\PROJECTS\2013-06\BASALT	LY34-1 LYSIMETER LOCATION	DNE BASALT DOES NOT EXIST AT THIS LOCATION		GRANTS, NEW MEXICO
DATE: 1/08/13	658 IRRIGATION SUPPLY WELL	-15 - DEPTH TO TOP OF BASALT, FT		PAGE: 3-99
	*657 ABANDONED WELL	9 OBSERVED DEPTH TO TOP OF BASALT, FT		
	SOIL MOISTURE INSTRUMENT LOCATION	34C- CROSS SECTION		
		BASALT DOES NOT EXIST IN THIS AREA		



SCALE: 1" = 550'

C:\PROJECTS\2011-06\Xsec

DATE: 1/24/12

LEGEND

ALLUVIAL
BASE
QAL WATER LEVEL ELEVATION (WLE)

MIDDLE CHINLE
LIMITS OF SANDSTONE
MCH WLE

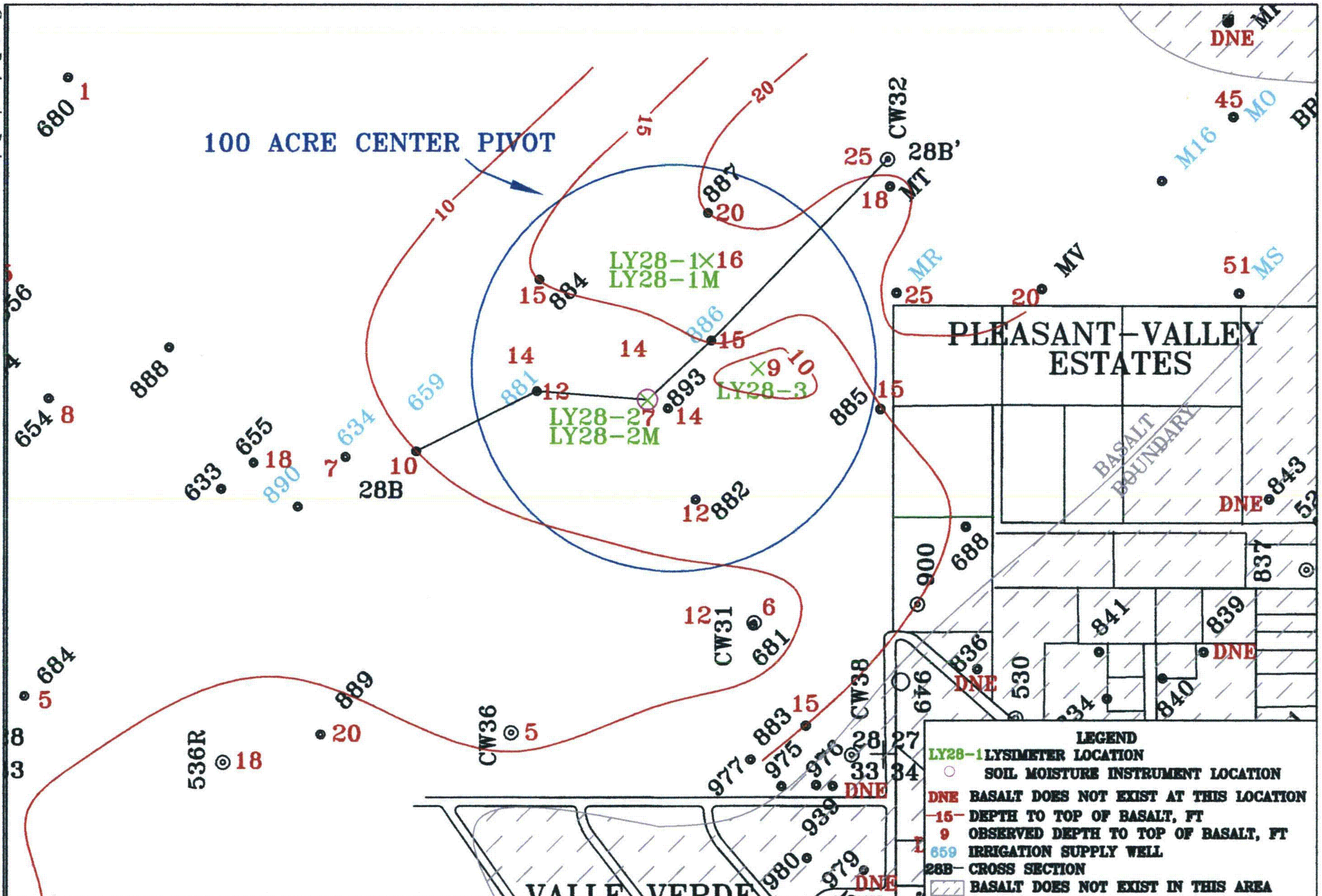
BASALT
LIMITS OF SANDSTONE

UPPLE CHINLE
LIMITS OF SANDSTONE
UCH WLE

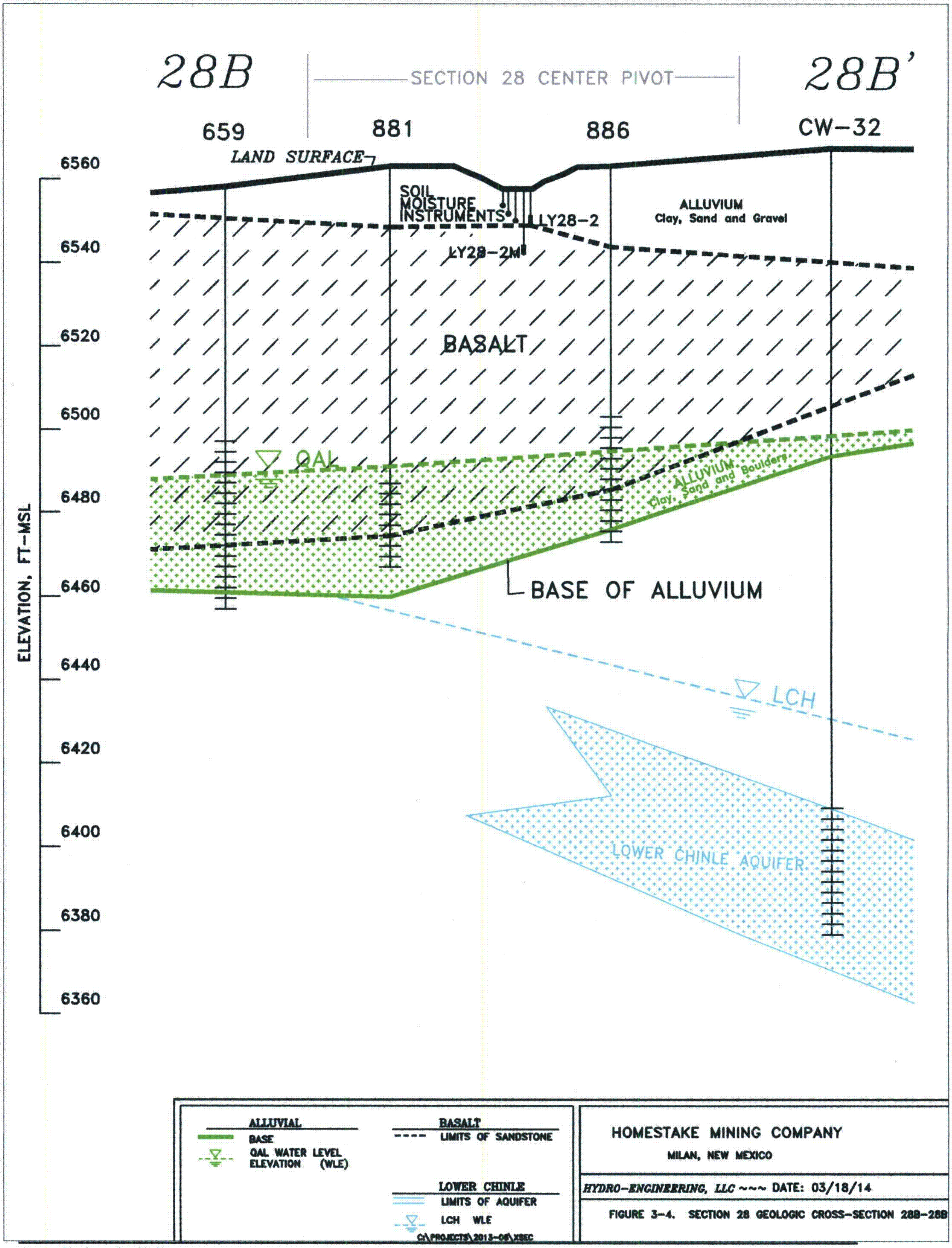
LOWER CHINLE
LIMITS OF AQUIFER
LCH WLE

FIGURE 3-2. SECTION 34 GEOLOGIC CROSS-SECTION 34C-34C'

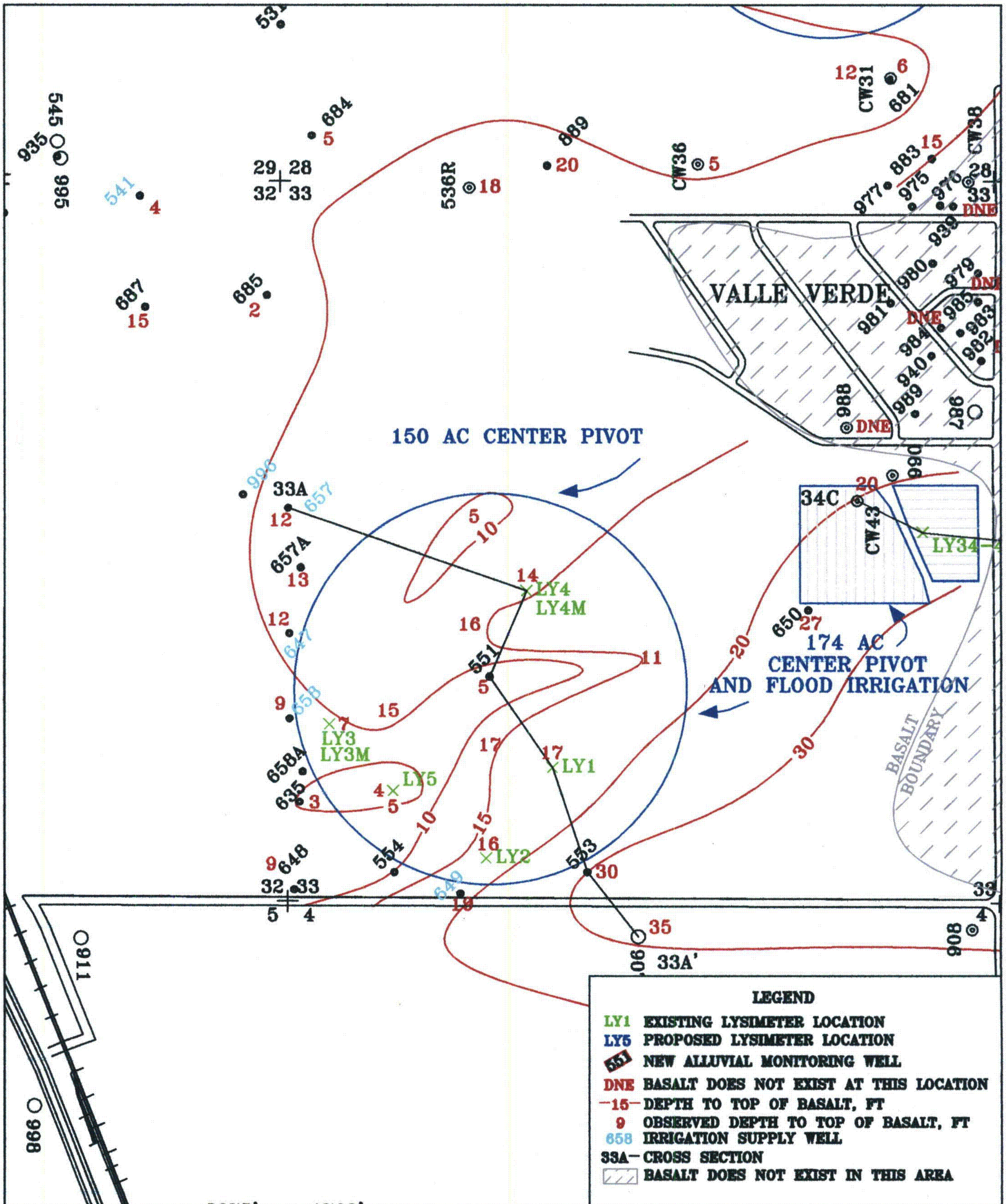
HOMESTAKE MINING COMPANY
GRANTS, NEW MEXICO



SCALE: 1" = 500'	FIGURE 3-3. SECTION 28 DEPTH TO TOP OF BASALT, LOCATION OF LYSIMITERS, ADDITIONAL ALLUVIUM MONITORING WELLS AND CROSS SECTION	HOMESTAKE MINING COMPANY GRANTS, NEW MEXICO
C:\PROJECTS\2013-06\BASALT		
DATE: 3/18/14		



28B
SECTION 28 CENTER PIVOT
28B'
659
881
886
CW-32
LAND SURFACE
SOIL MOISTURE INSTRUMENTS
LY28-2
LY28-2M
ALLUVIUM
Clay, Sand and Gravel
BASALT
QAL
ALLUVIUM
Clay, Sand and Boulders
BASE OF ALLUVIUM
LCH
LOWER CHINLE AQUIFER
ELEVATION, FT-MSL
6560
6540
6520
6500
6480
6460
6440
6420
6400
6380
6360
ALLUVIAL
BASE
QAL WATER LEVEL ELEVATION (WLE)
BASALT
LIMITS OF SANDSTONE
LOWER CHINLE
LIMITS OF AQUIFER
LCH WLE
C:\PROJECTS\2013-08\XSEC
HOMESTAKE MINING COMPANY
MILAN, NEW MEXICO
HYDRO-ENGINEERING, LLC ~~~ DATE: 03/18/14
FIGURE 3-4. SECTION 28 GEOLOGIC CROSS-SECTION 28B-28B



SCALE: 1" = 900'	FIGURE 3-5. SECTION 33 DEPTH TO TOP OF BASALT, LOCATION OF PROPOSED LYSIMETERS, ADDITIONAL ALLUVIAL MONITORING WELLS AND CROSS SECTION.	HOMESTAKE MINING COMPANY GRANTS, NEW MEXICO
C:\PROJECTS\2013-06\BASALT		
DATE: 3/18/14		

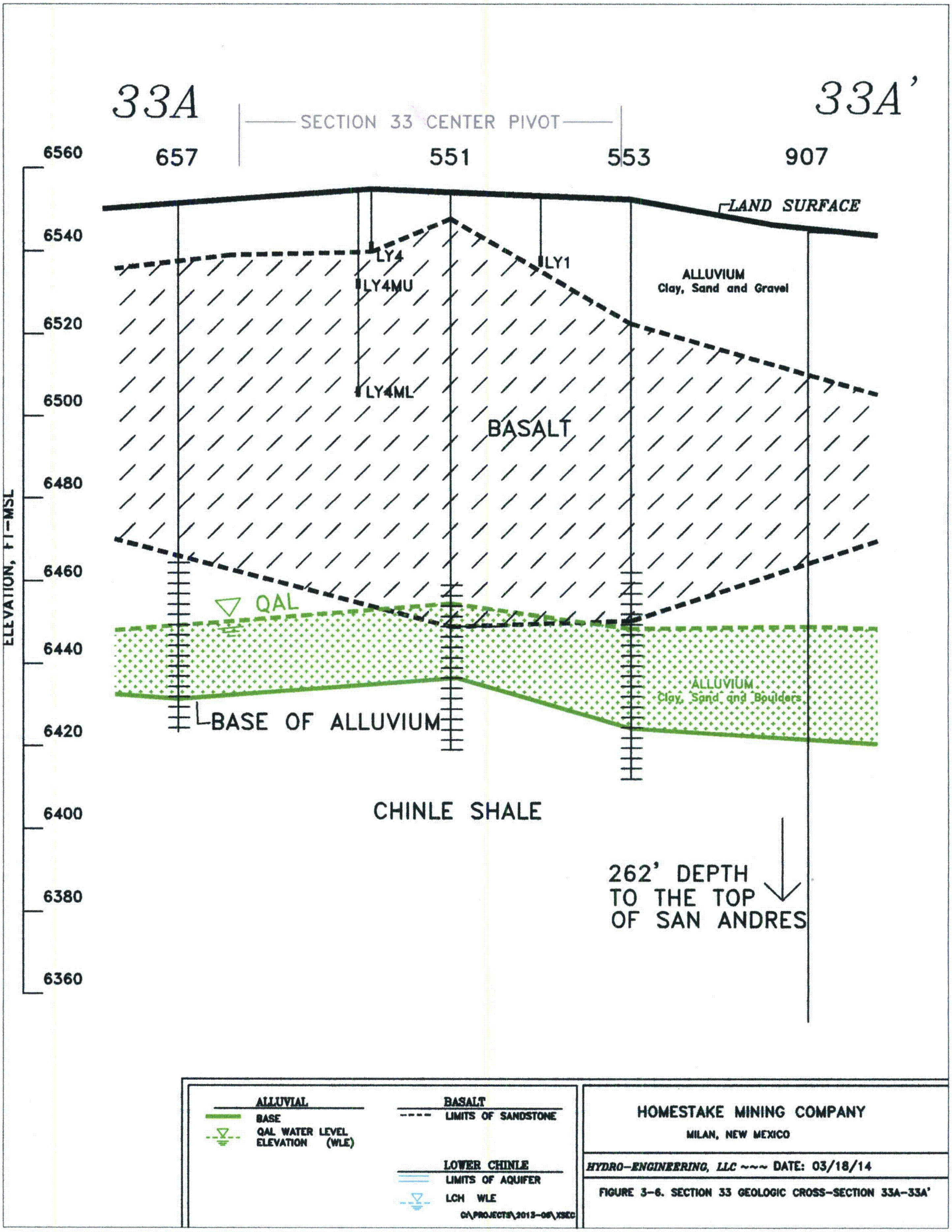


FIGURE 3-6. SECTION 33 GEOLOGIC CROSS-SECTION 33A-33A'

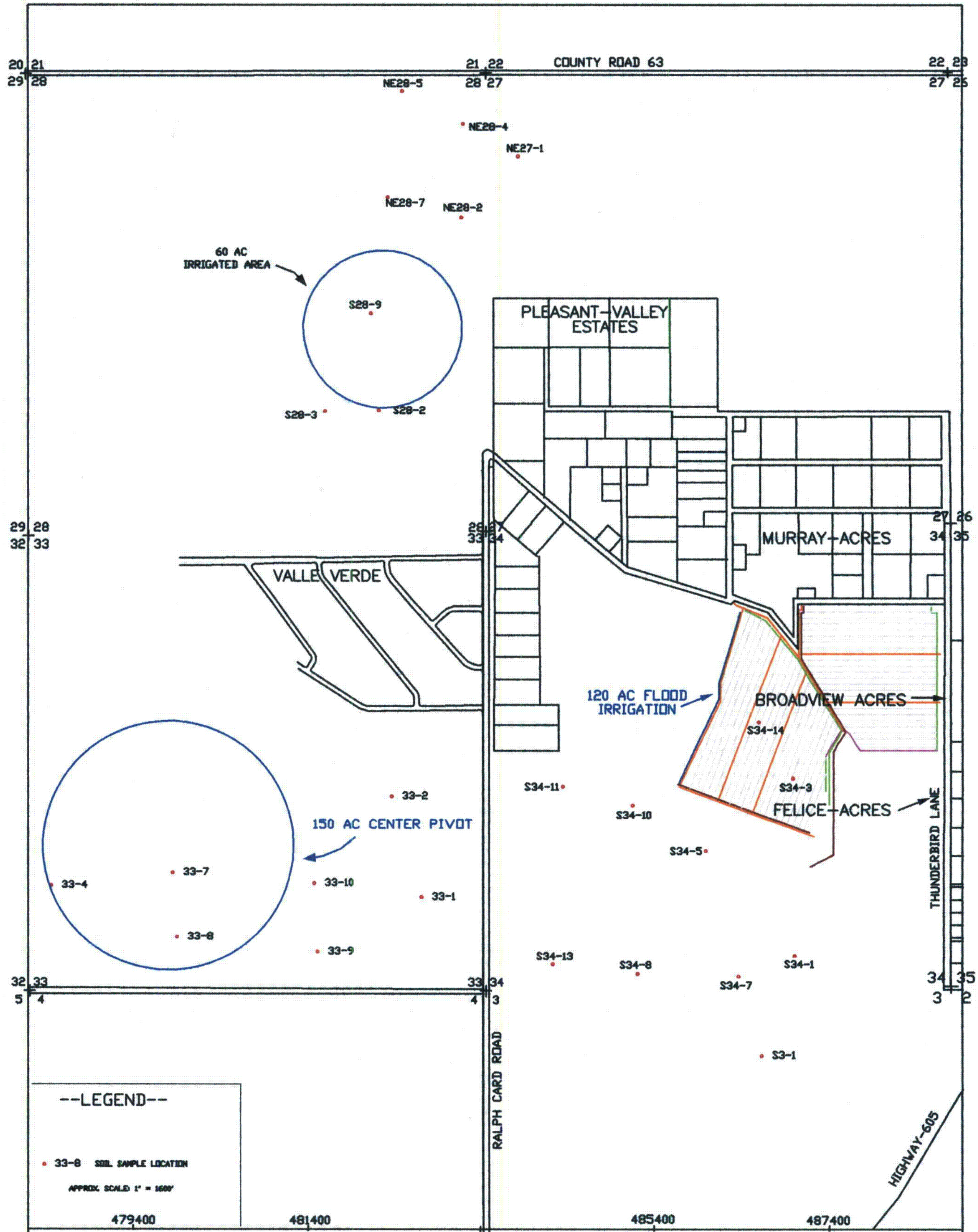


FIGURE 3-7. LOCATION OF IRRIGATION AREAS WITH SOIL SAMPLE LOCATIONS FROM THE 1998 INVESTIGATION

DATE: 03/18/14
C:\PROJECTS\2014-06\IRRIGATION\98IRRI

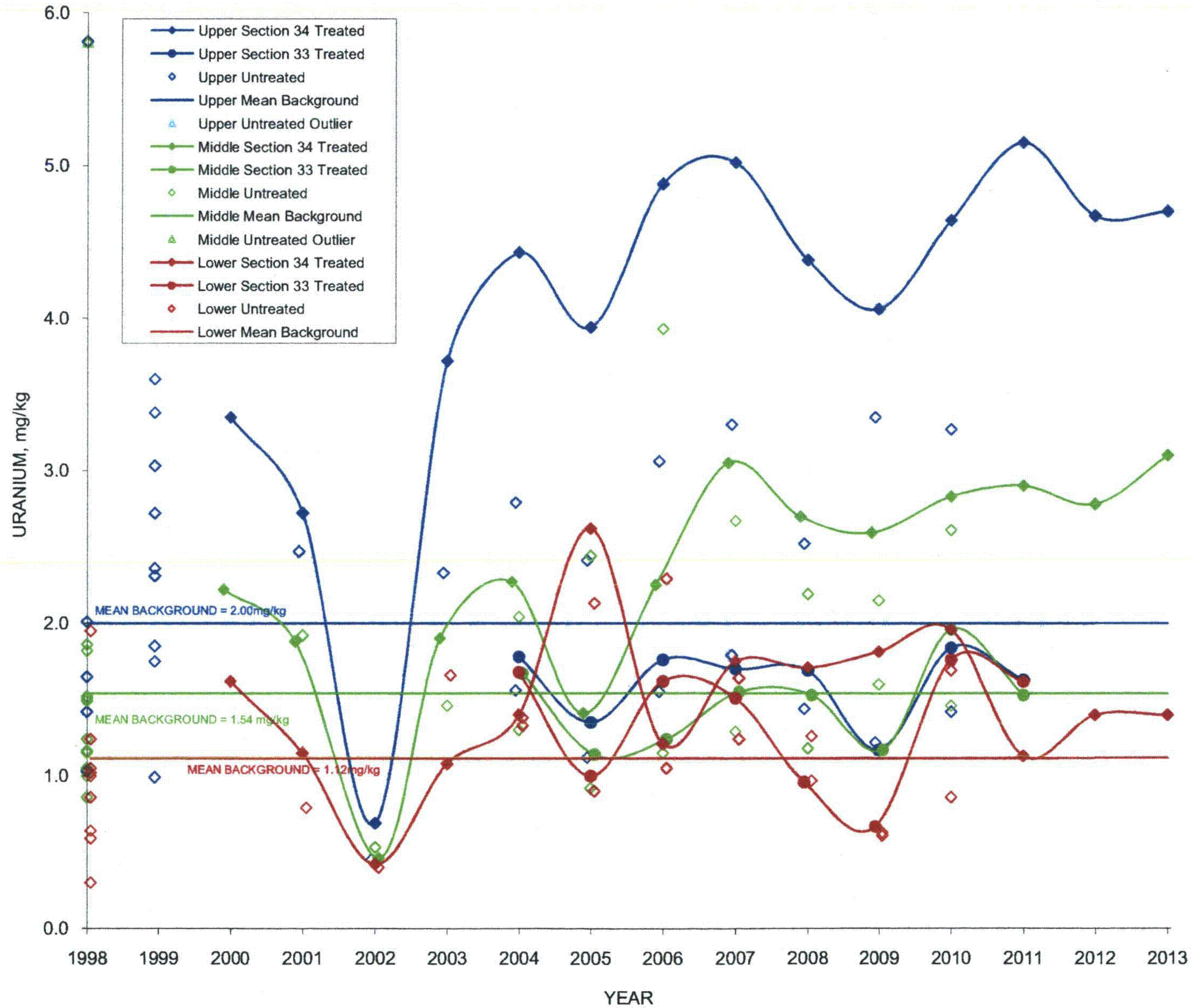


FIGURE 3-8. URANIUM CONCENTRATIONS VERSUS TIME FOR SECTIONS 33 AND 34 FLOOD SOIL SAMPLES

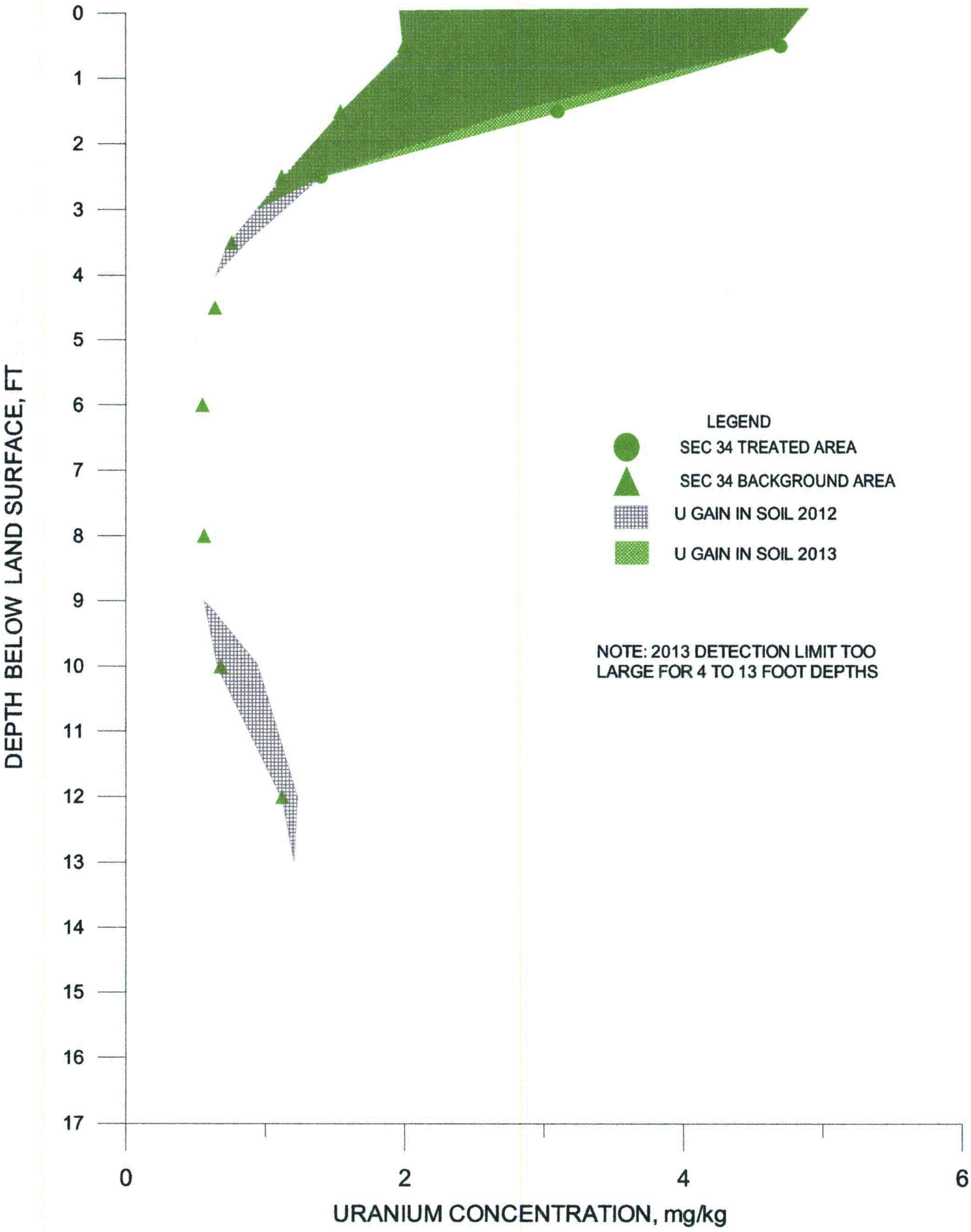


FIGURE 3-9. URANIUM CONCENTRATION IN THE SOILS WITH DEPTH IN SECTION 34 IRRIGATION AREA

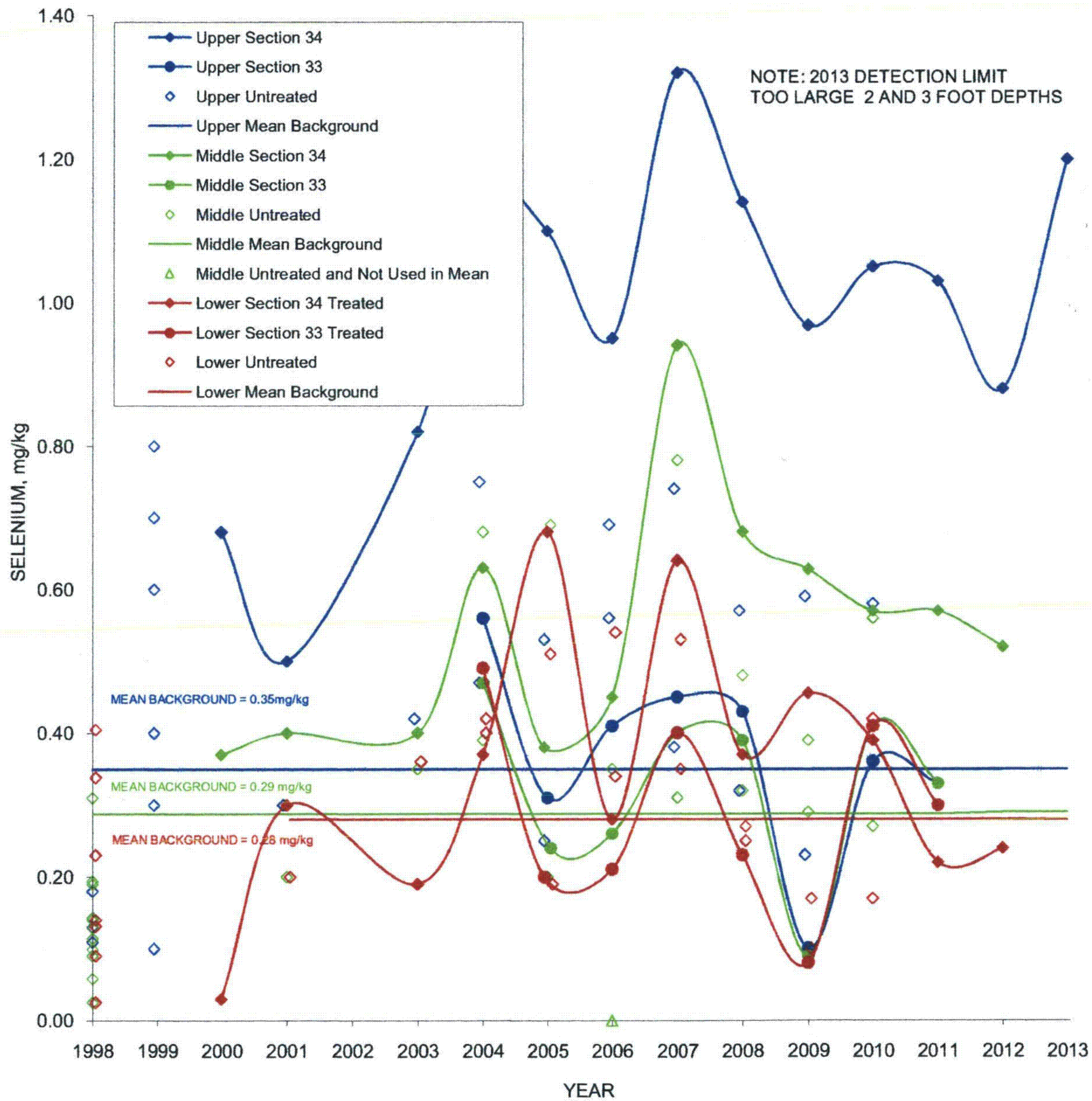


FIGURE 3-10. SELENIUM CONCENTRATIONS VERSUS TIME FOR SECTIONS 33 AND 34 FLOOD SOIL SAMPLES

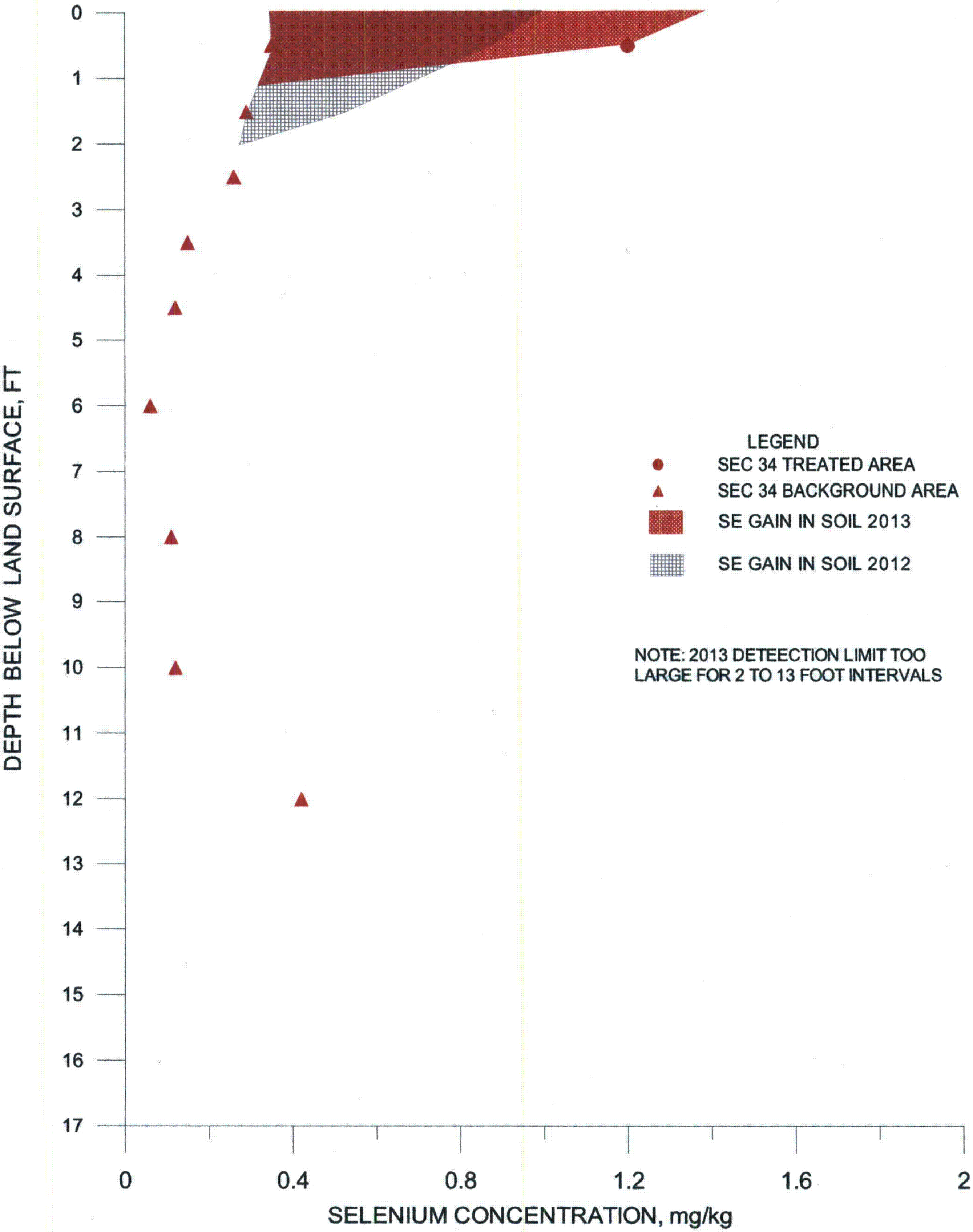


FIGURE 3-11. SELENIUM CONCENTRATION IN THE SOILS WITH DEPTH IN SECTION 34 IRRIGATION AREA

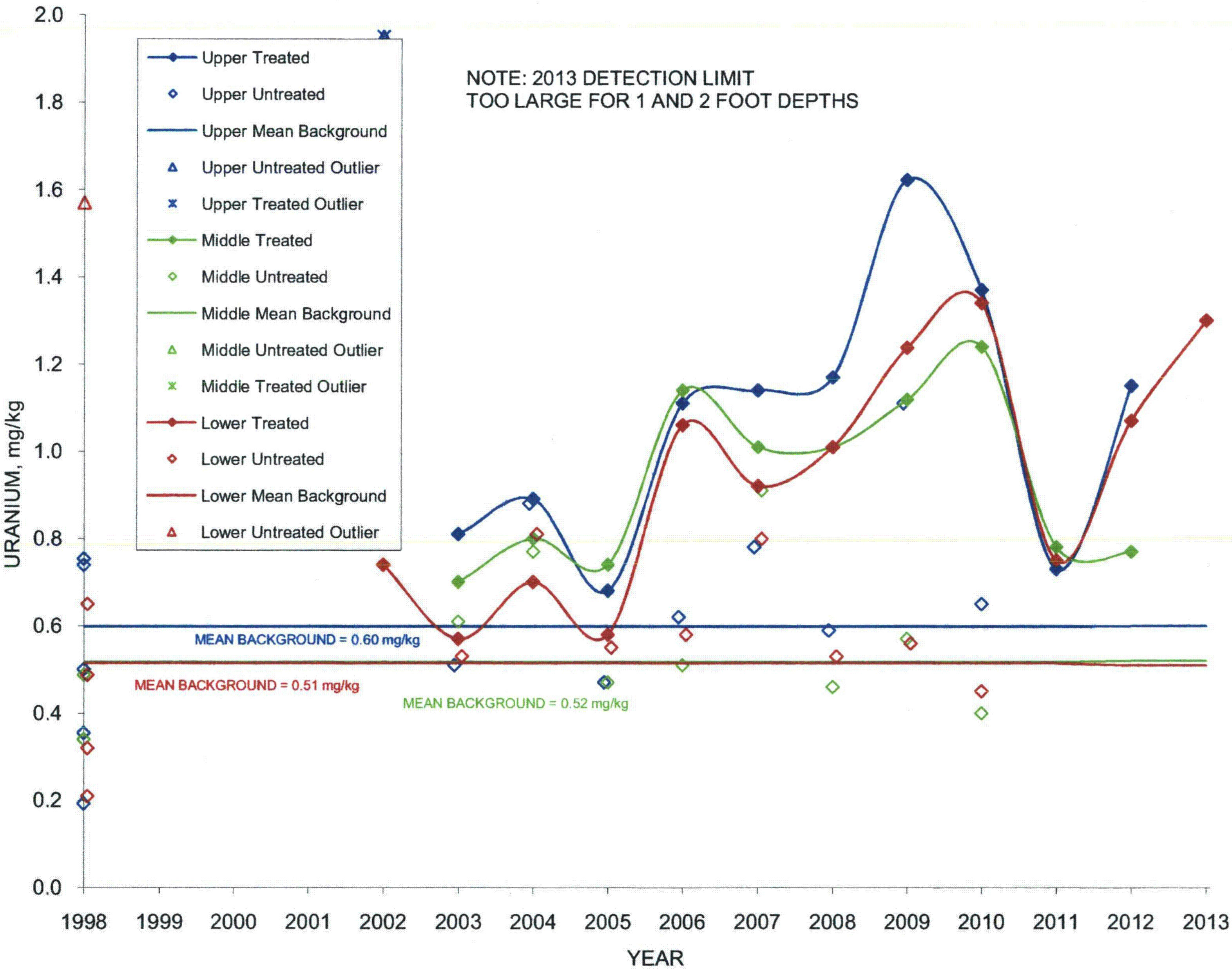


FIGURE 3-12. URANIUM CONCENTRATIONS VERSUS TIME FOR SECTION 28 CENTER PIVOT SOIL SAMPLES

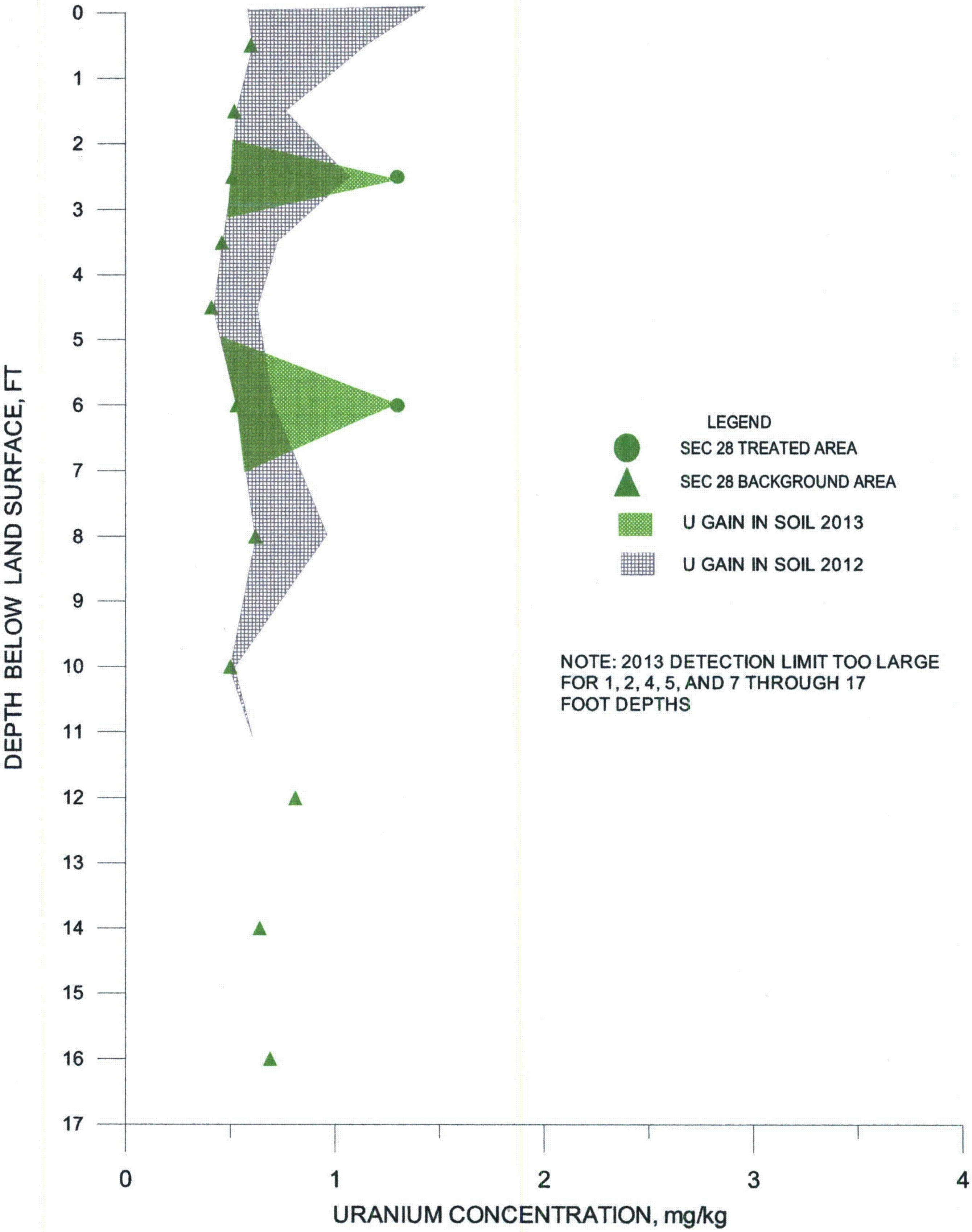


FIGURE 3-13. URANIUM CONCENTRATION IN THE SOILS WITH DEPTH IN SECTION 28 IRRIGATION AREA

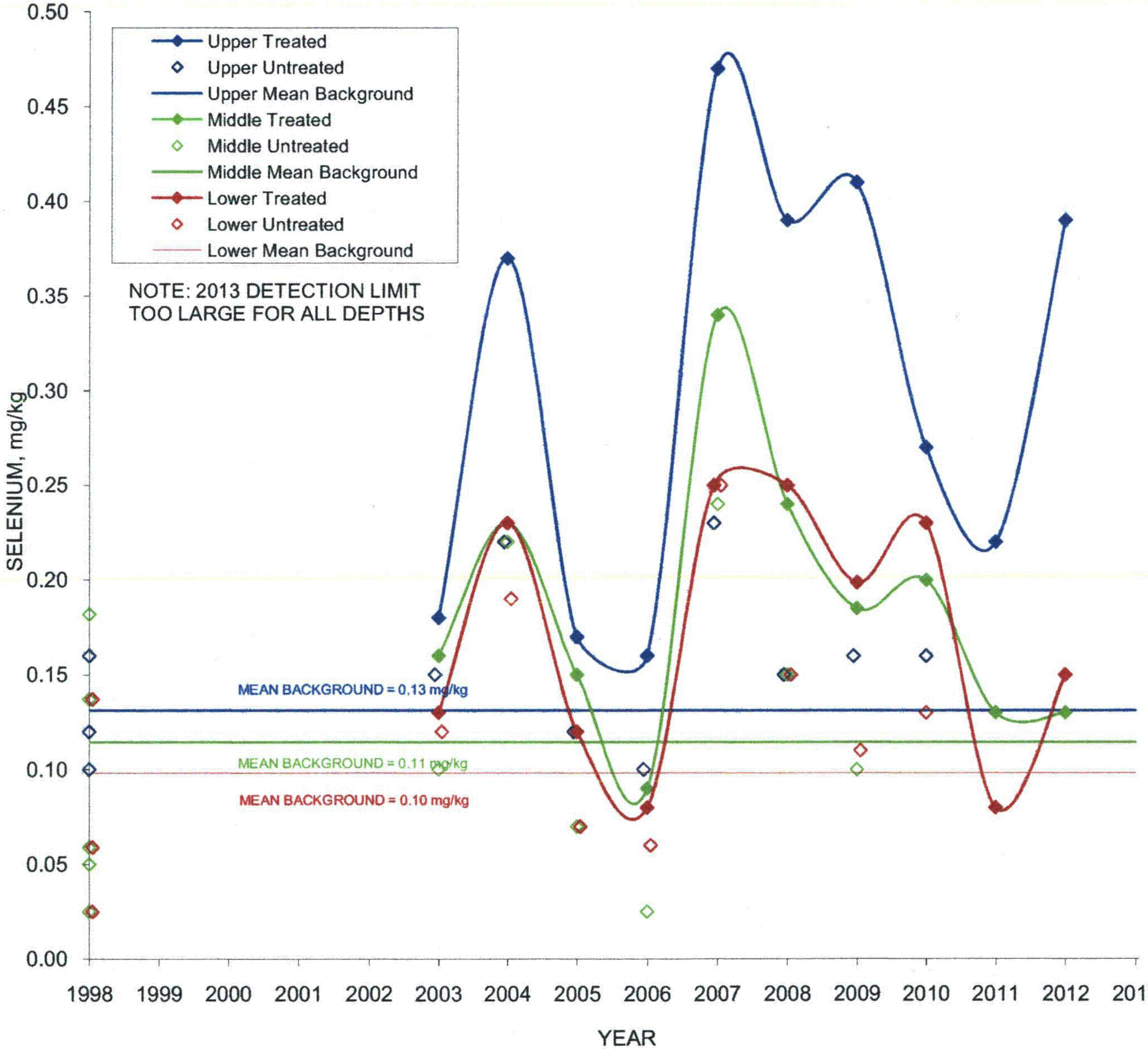


FIGURE 3-14. SELENIUM CONCENTRATIONS VERSUS TIME FOR SECTION 28 CENTER PIVOT SOIL SAMPLES

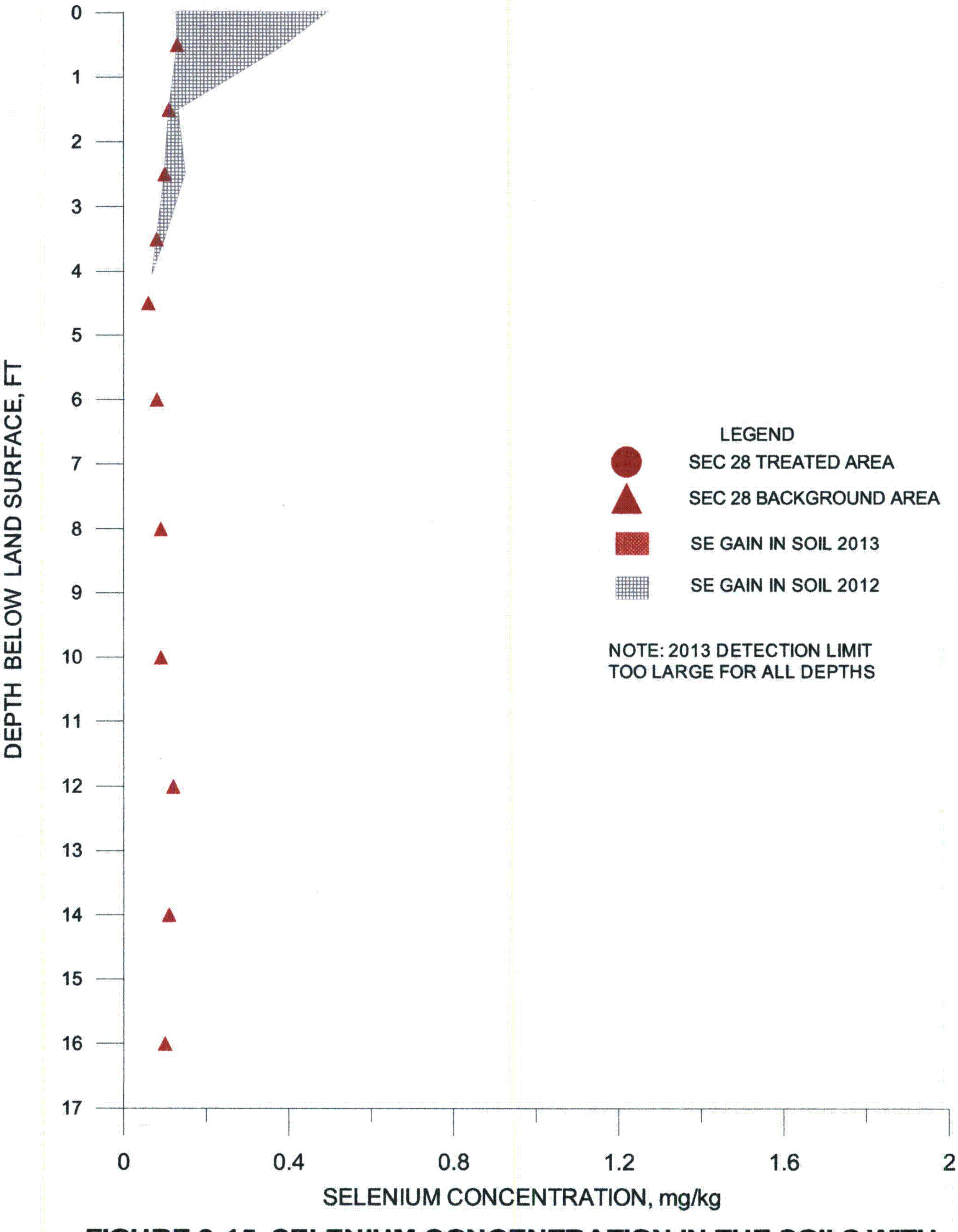


FIGURE 3-15. SELENIUM CONCENTRATION IN THE SOILS WITH DEPTH IN SECTION 28 IRRIGATION AREA

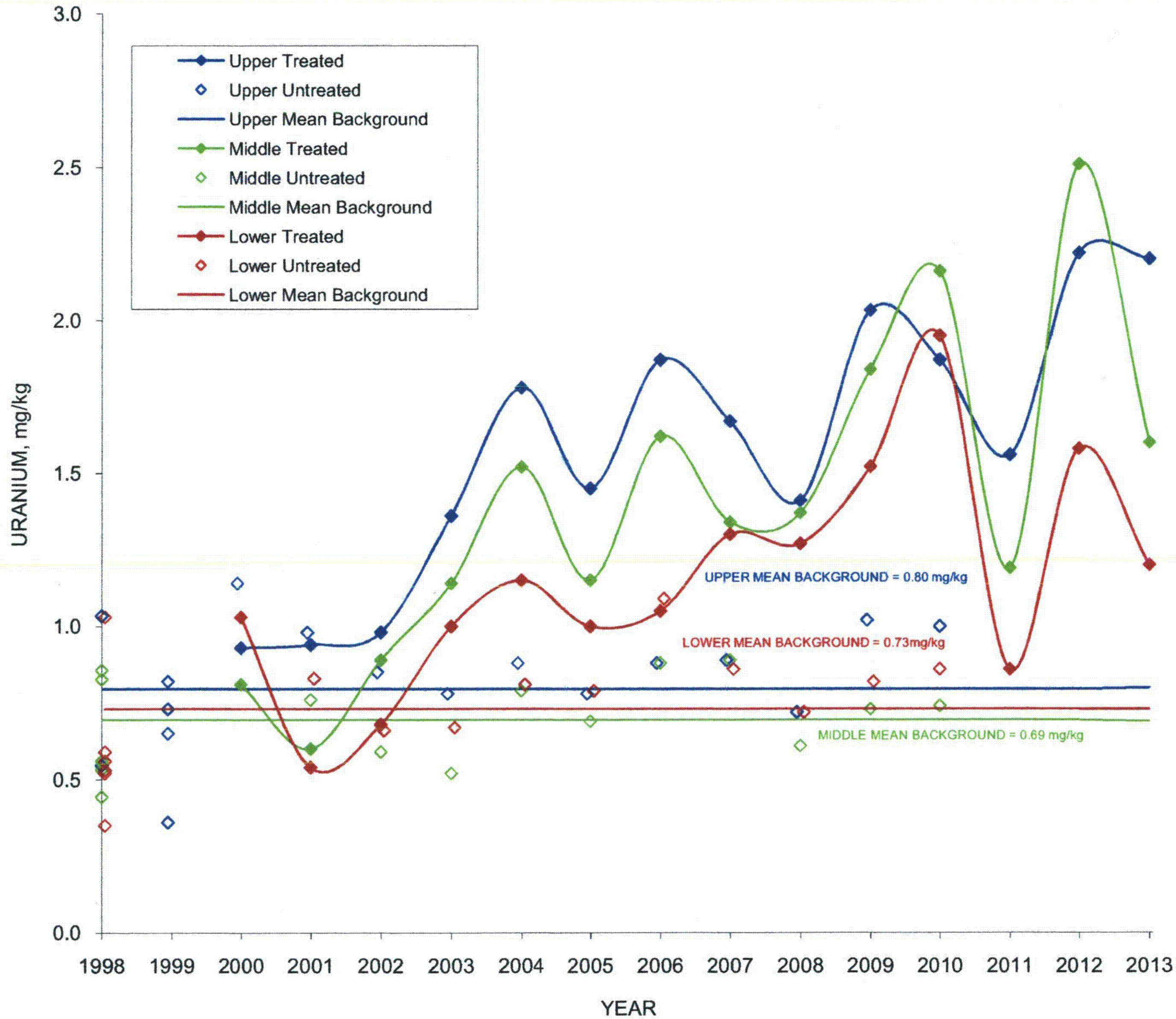


FIGURE 3-16. URANIUM CONCENTRATIONS VERSUS TIME FOR SECTION 33 CENTER PIVOT SOIL SAMPLES

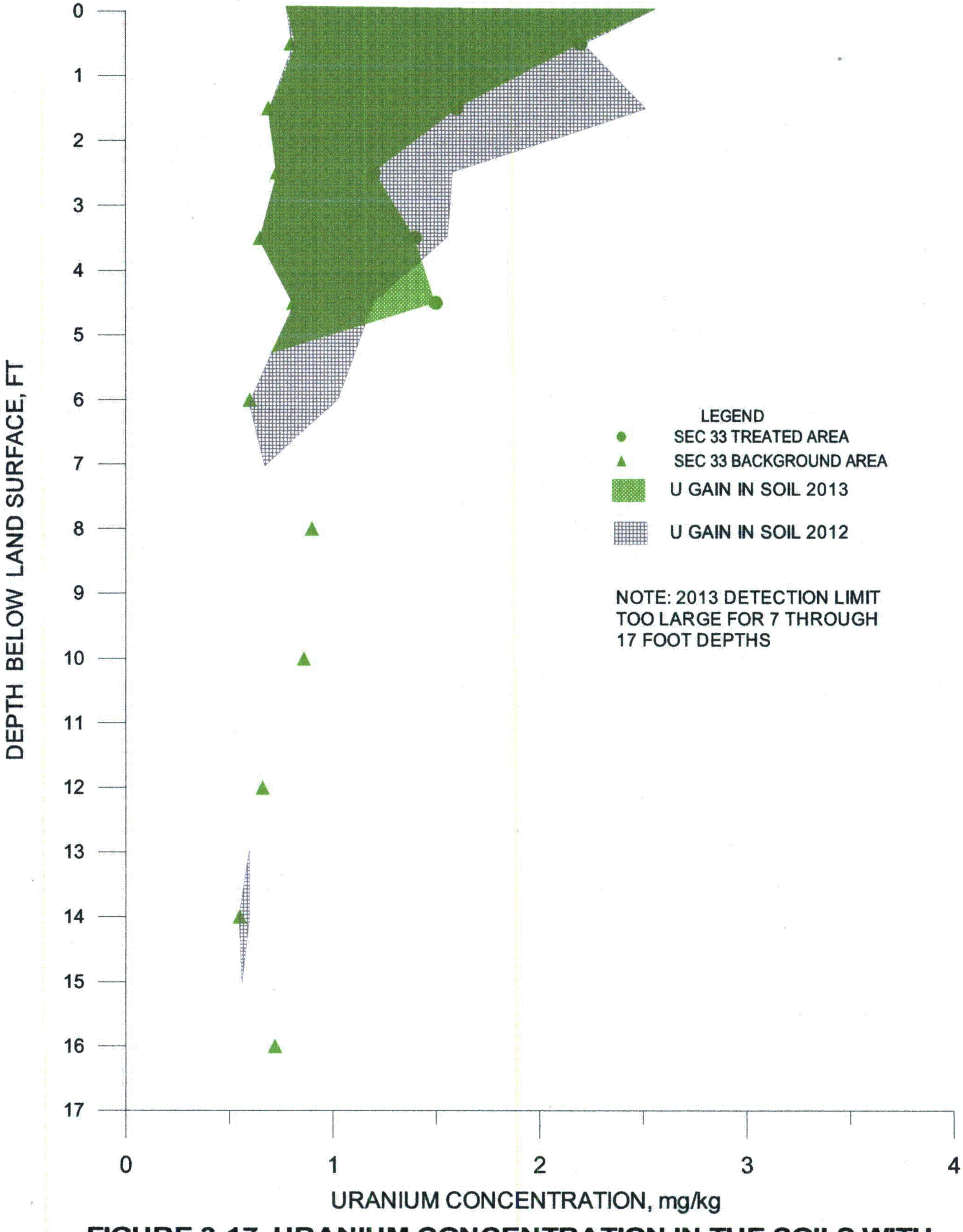


FIGURE 3-17. URANIUM CONCENTRATION IN THE SOILS WITH DEPTH IN SECTION 33 IRRIGATION AREAS

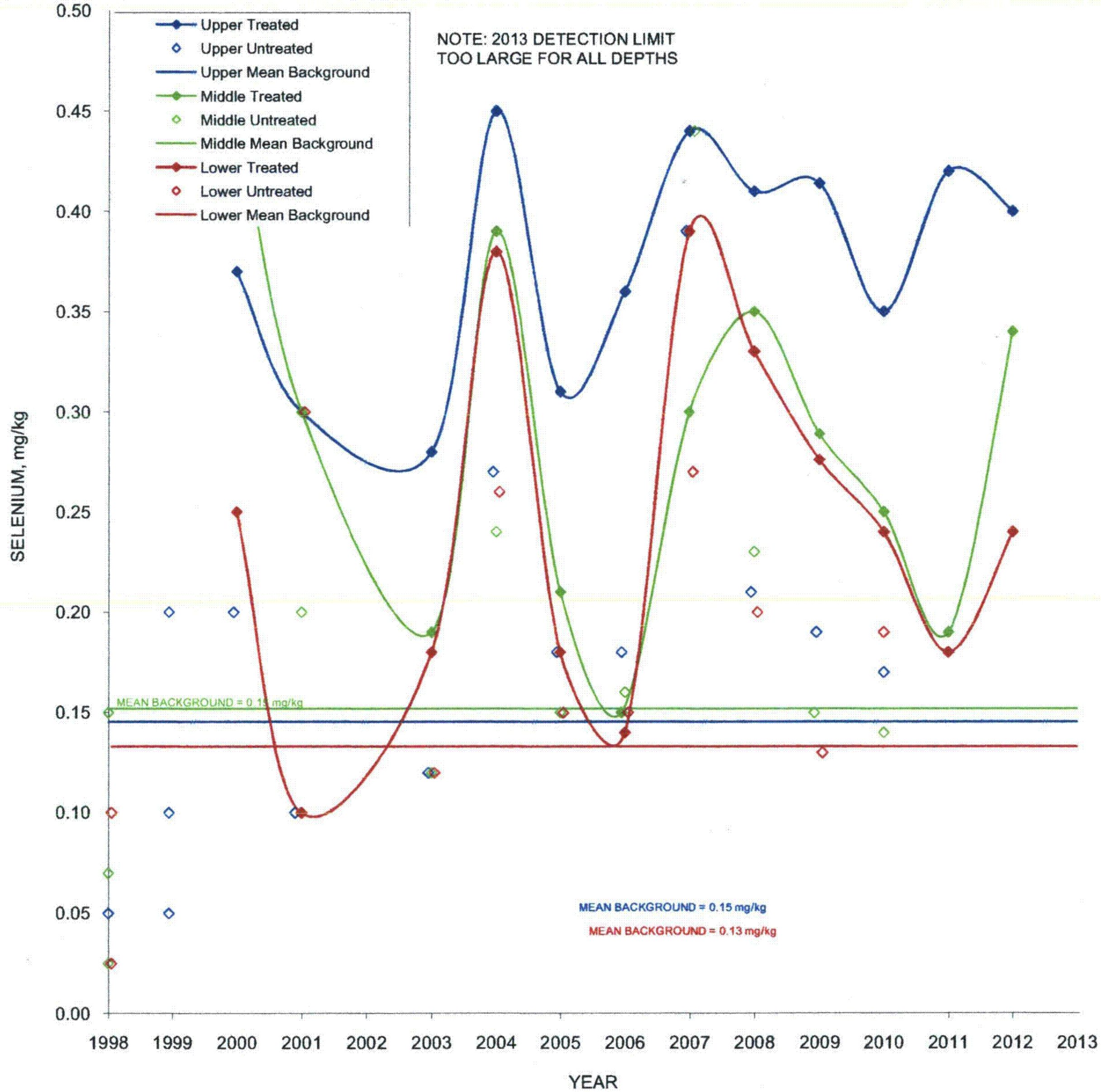


FIGURE 3-18. SELENIUM CONCENTRATIONS VERSUS TIME FOR SECTION 33 CENTER PIVOT SOIL SAMPLES

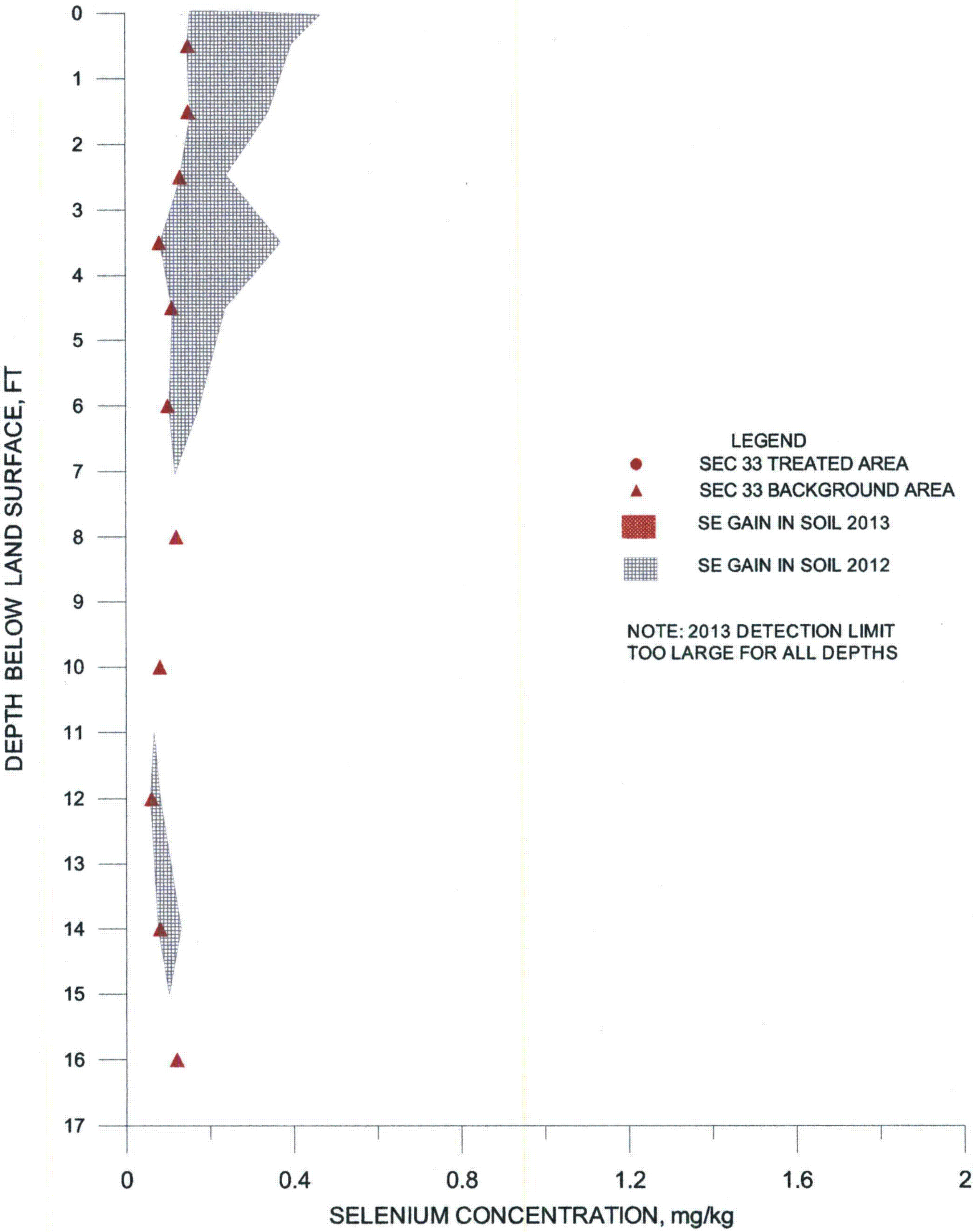


FIGURE 3-19. SELENIUM CONCENTRATION IN THE SOILS WITH DEPTH IN SECTIONS 33 IRRIGATION AREA

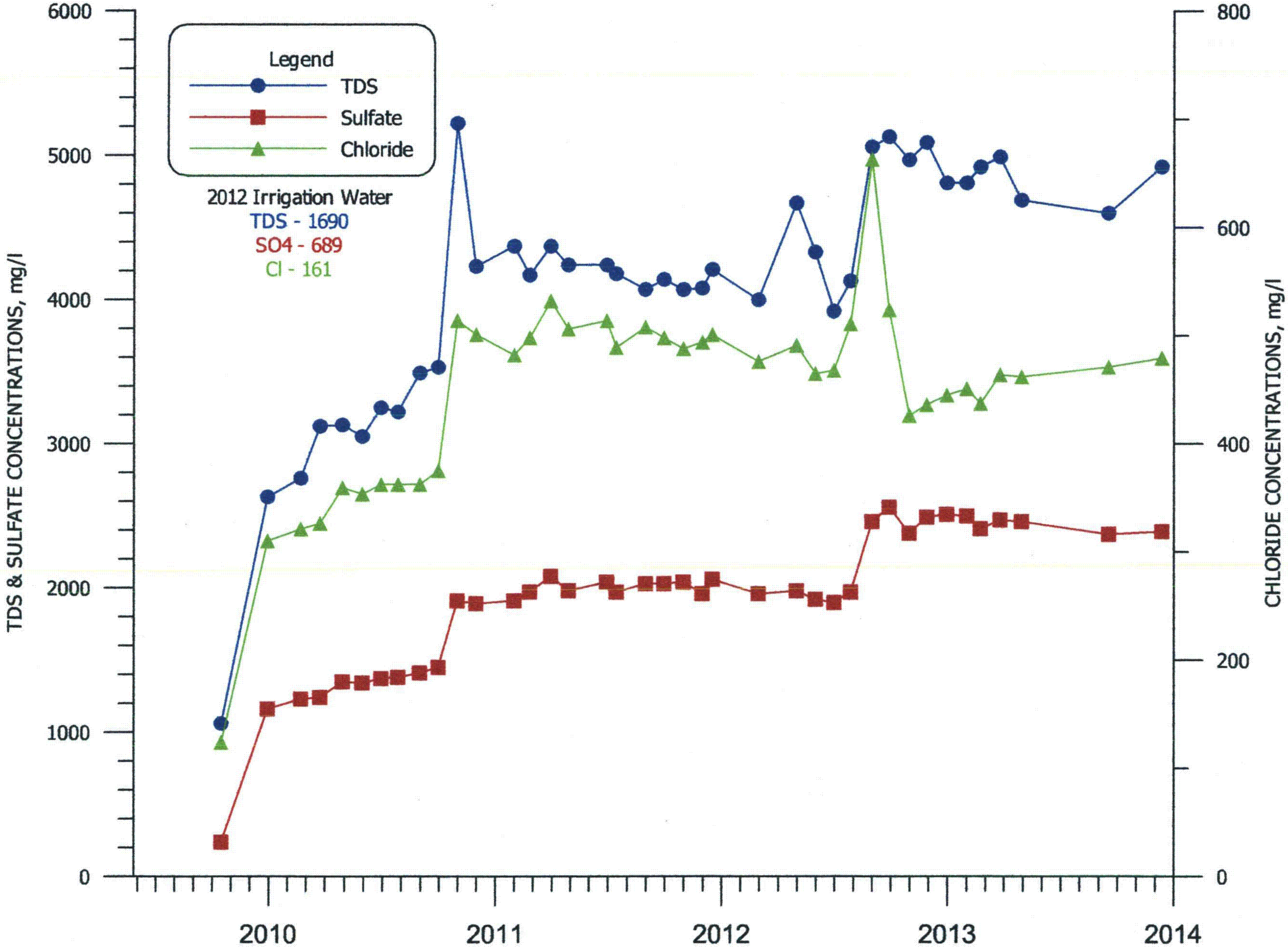


FIGURE 3-20. TDS, SULFATE AND CHLORIDE CONCENTRATIONS FROM LY34-1.

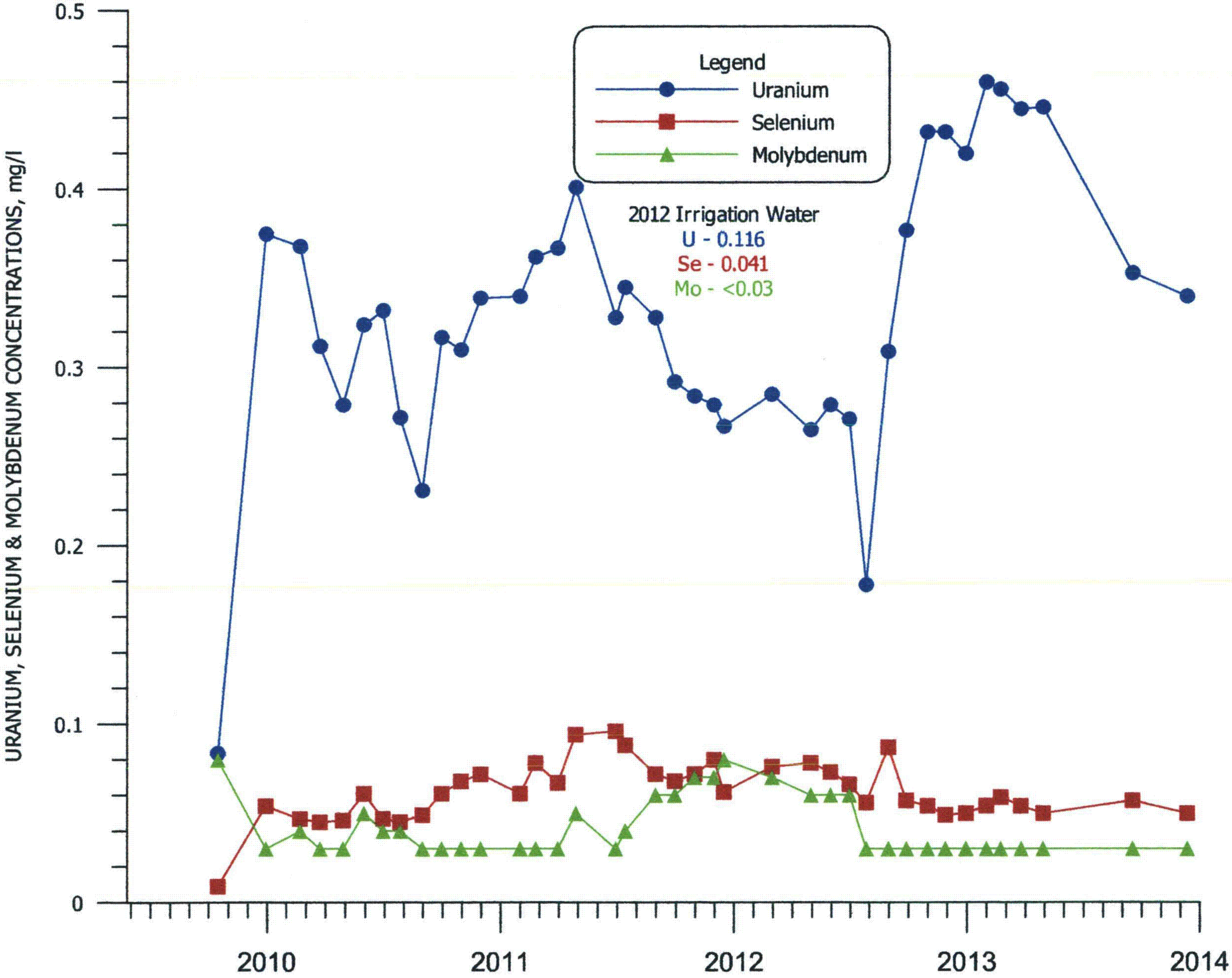


FIGURE 3-21. URANIUM, SELENIUM AND MOLYBDENUM CONCENTRATIONS FROM LY34-1.

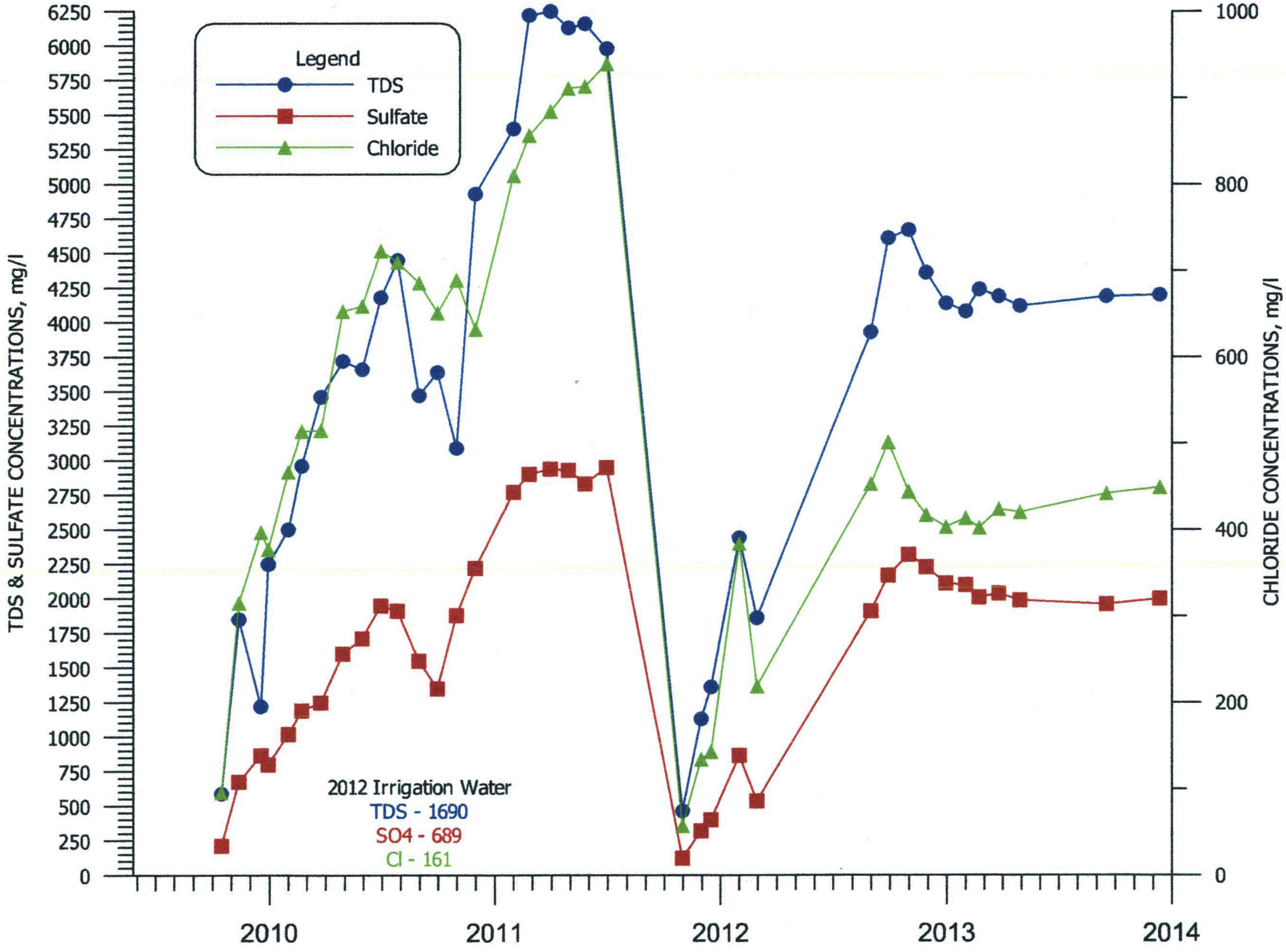


FIGURE 3-22. TDS, SULFATE AND CHLORIDE CONCENTRATIONS FROM LY34-2.

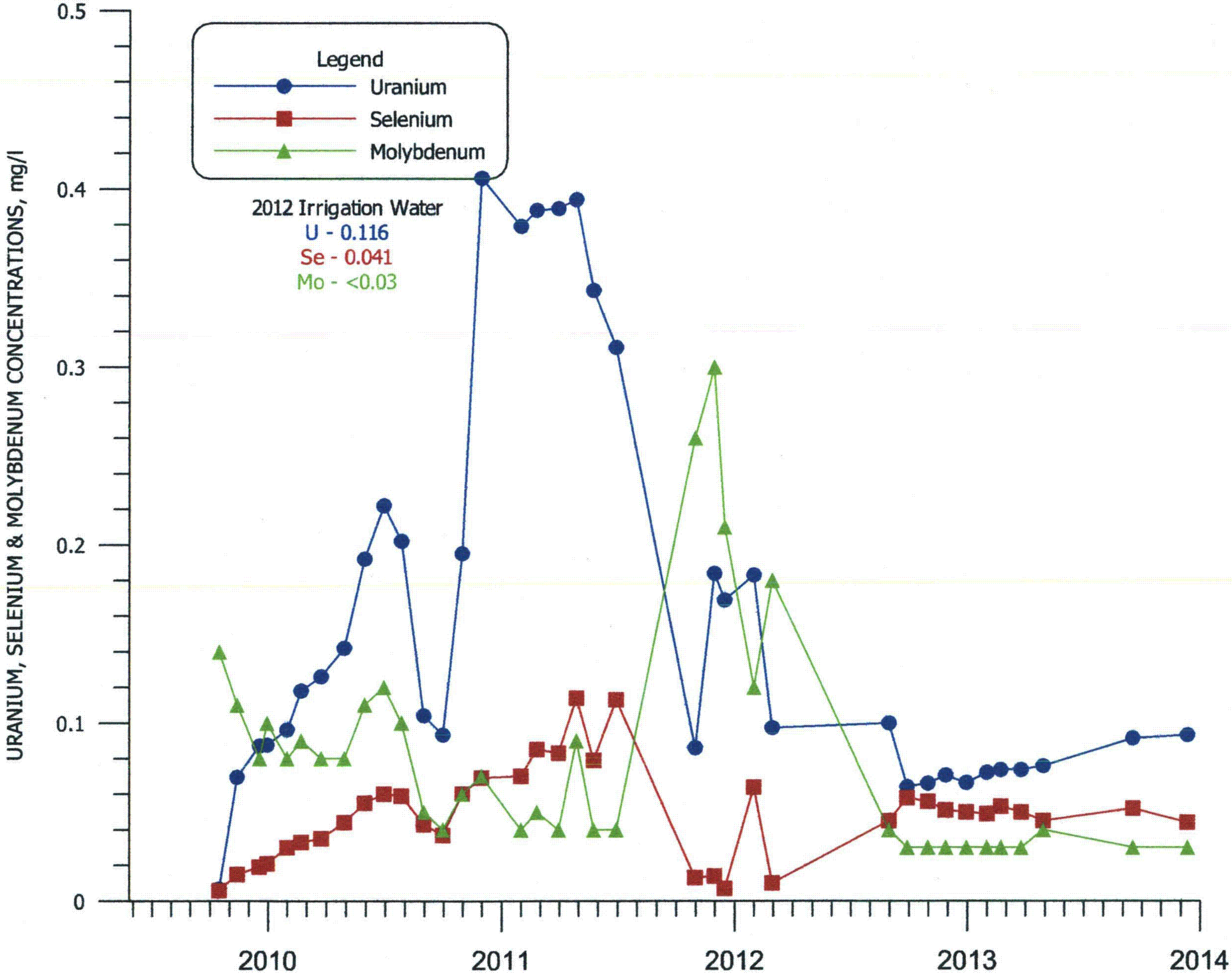


FIGURE 3-23. URANIUM, SELENIUM AND MOLYBDENUM CONCENTRATIONS FROM LY34-2.

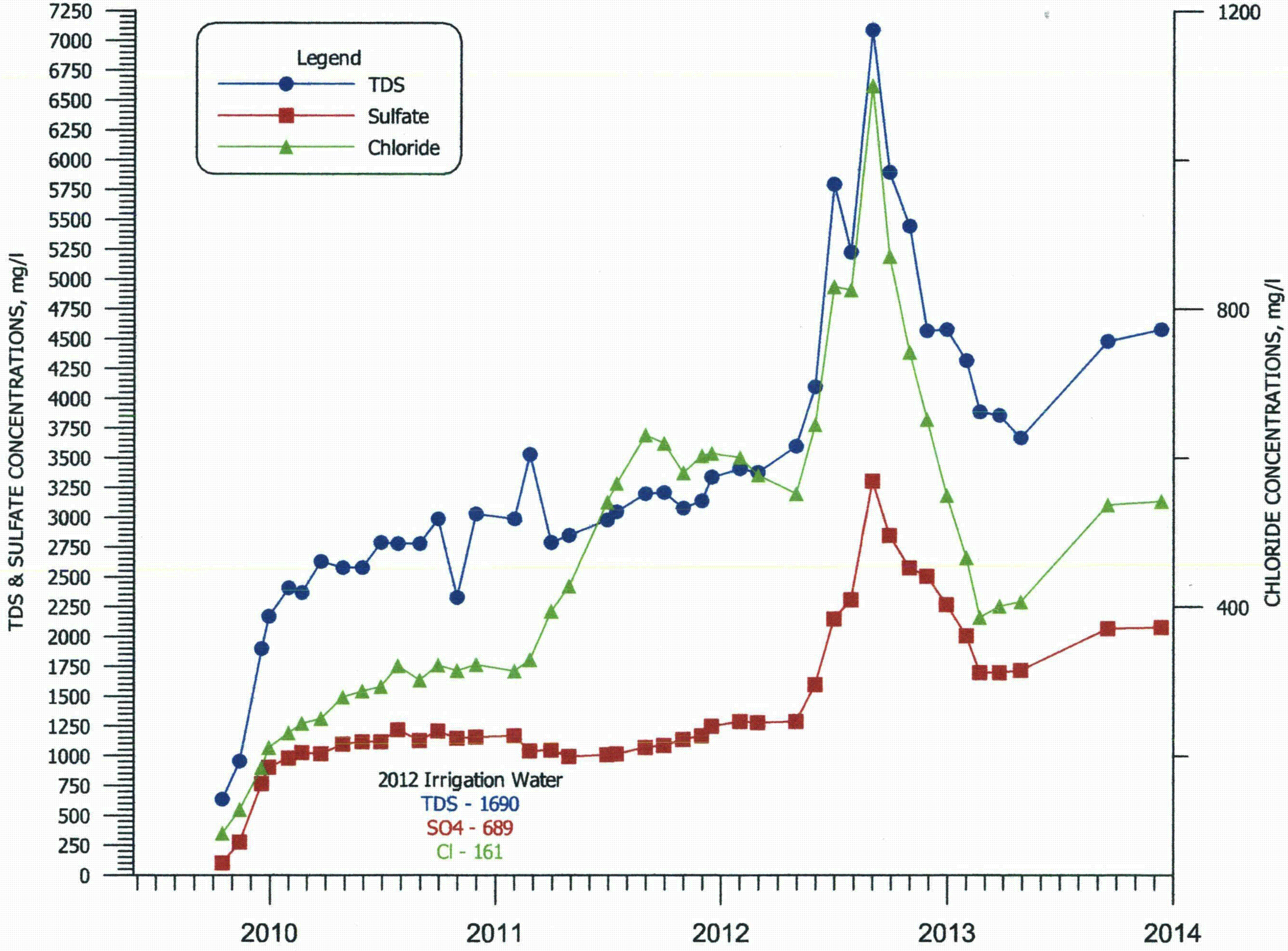


FIGURE 3-24. TDS, SULFATE AND CHLORIDE CONCENTRATIONS FROM LY34-3.

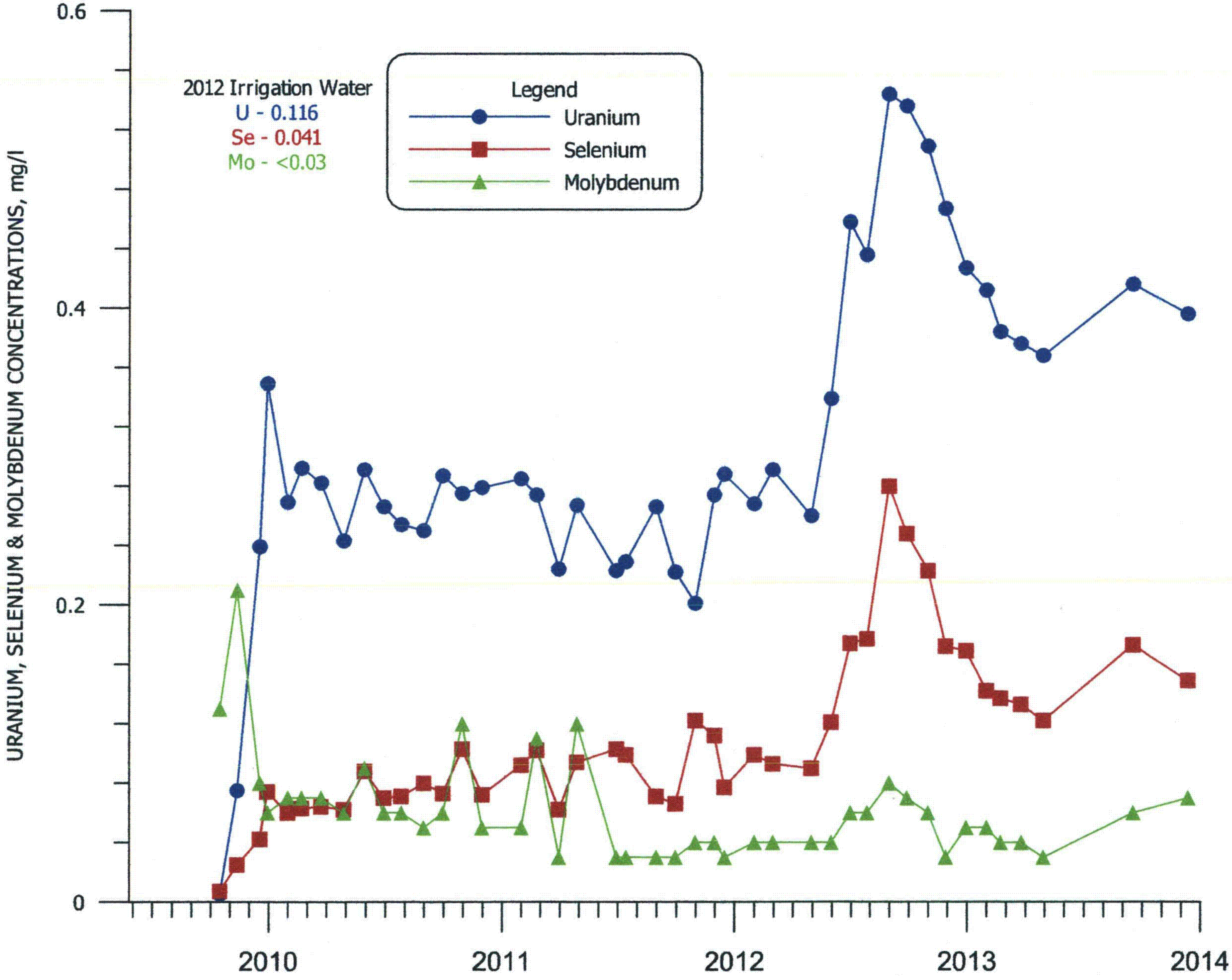


FIGURE 3-25. URANIUM, SELENIUM AND MOLYBDENUM CONCENTRATIONS FROM LY34-3.

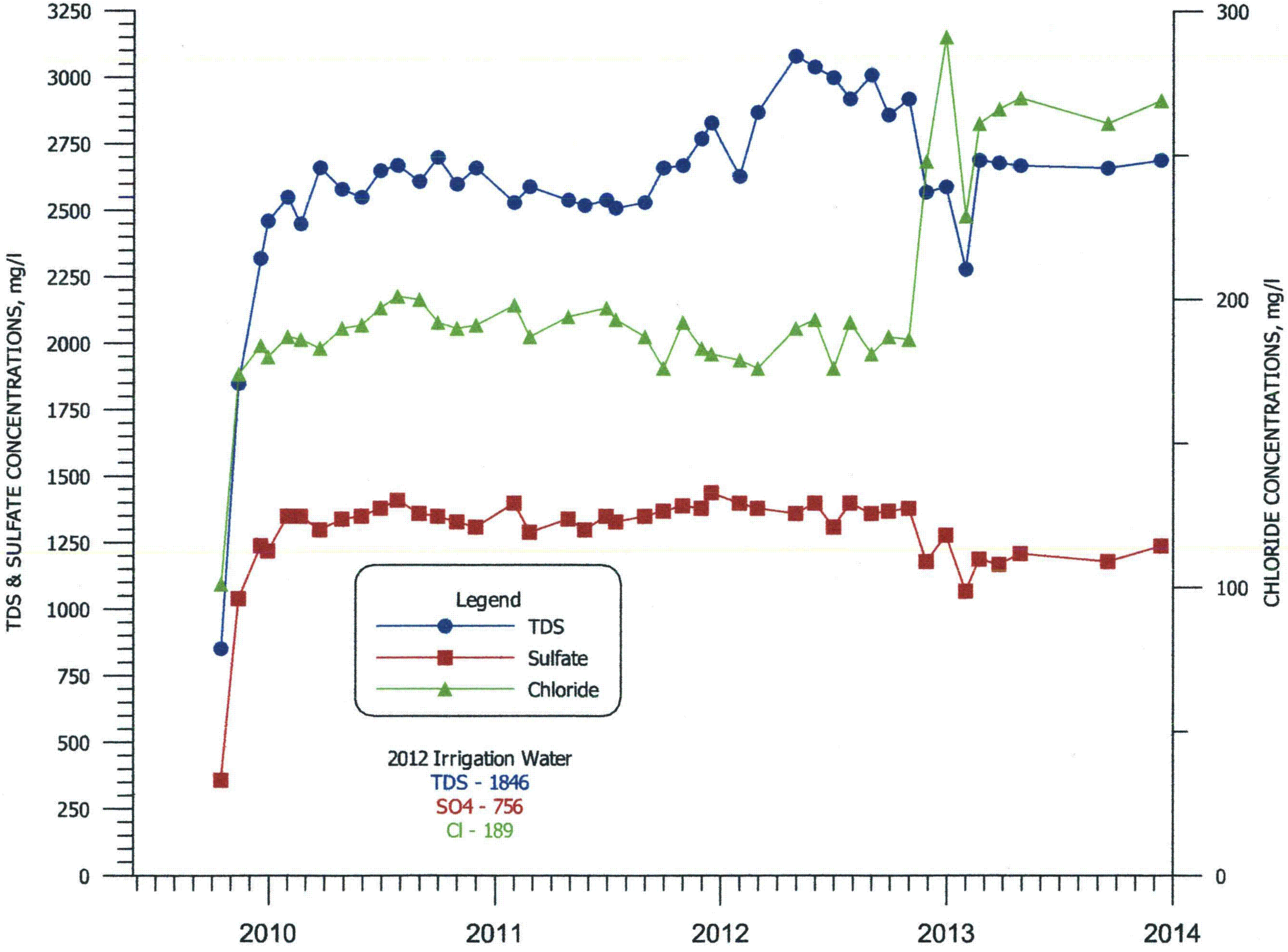


FIGURE 3-26. TDS, SULFATE AND CHLORIDE CONCENTRATIONS FROM LY28-1.

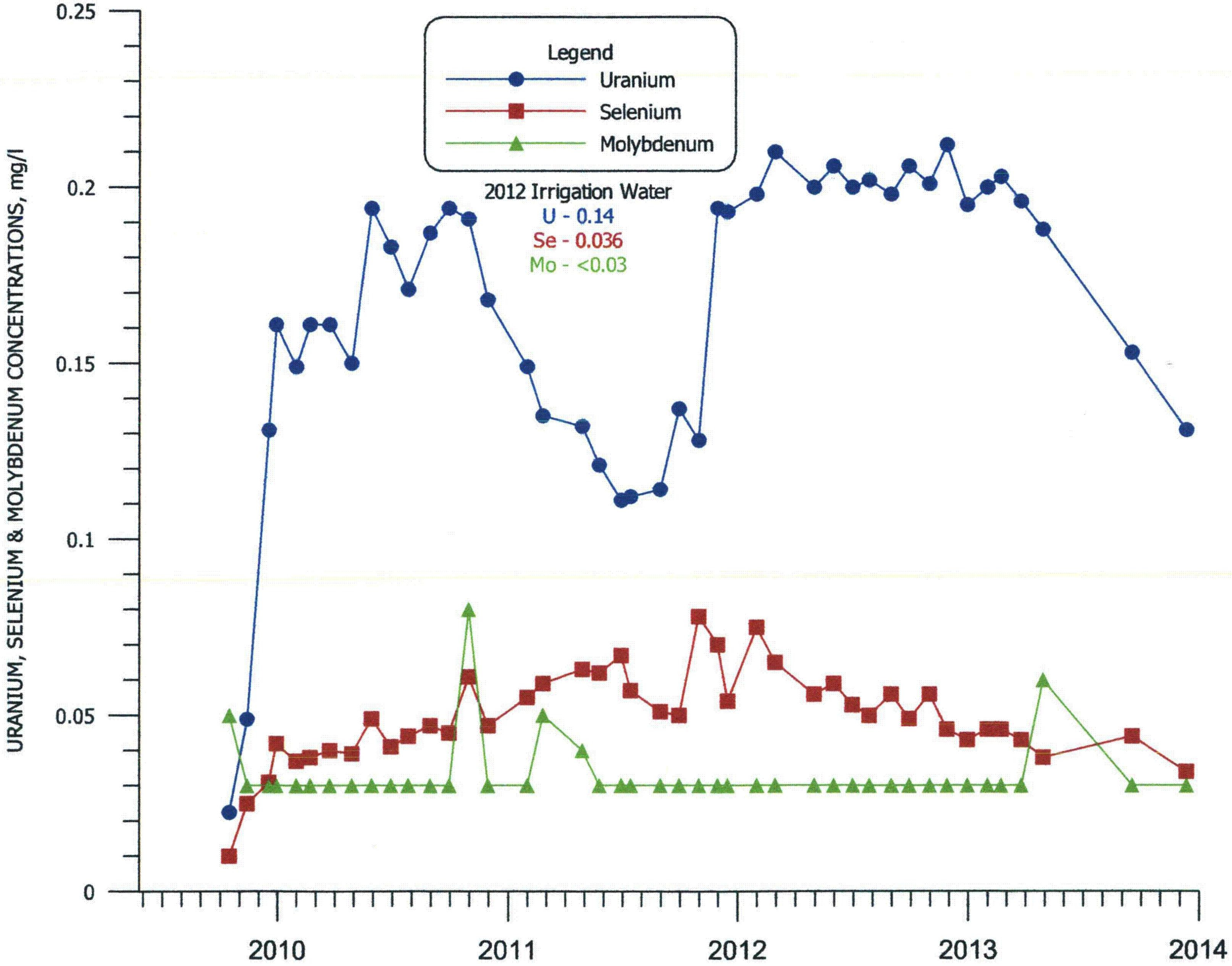


FIGURE 3-27. URANIUM, SELENIUM AND MOLYBDENUM CONCENTRATIONS FROM LY28-1.

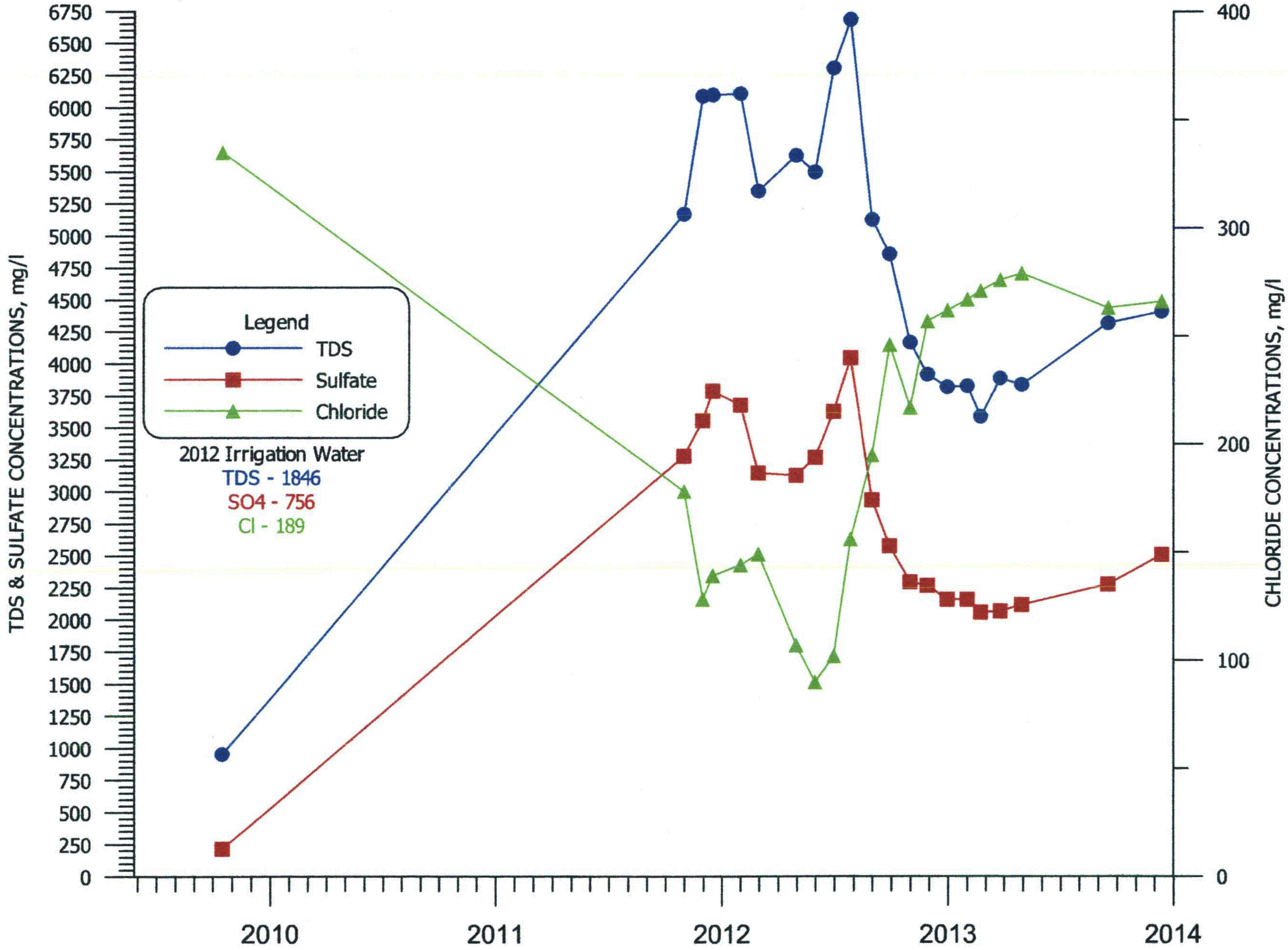


FIGURE 3-28. TDS, SULFATE AND CHLORIDE CONCENTRATIONS FROM LY28-2.

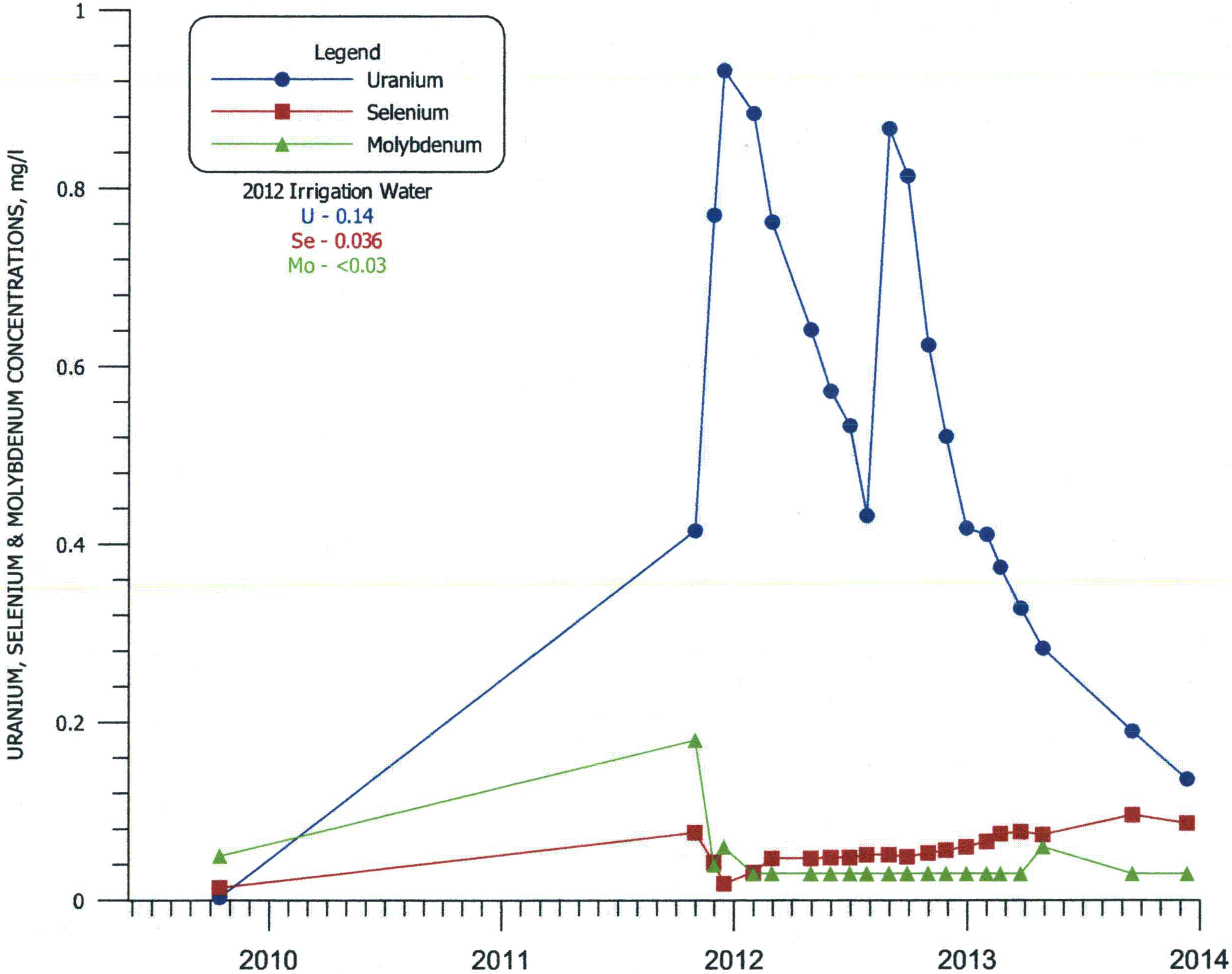


FIGURE 3-29. URANIUM, SELENIUM AND MOLYBDENUM CONCENTRATIONS FROM LY28-2.

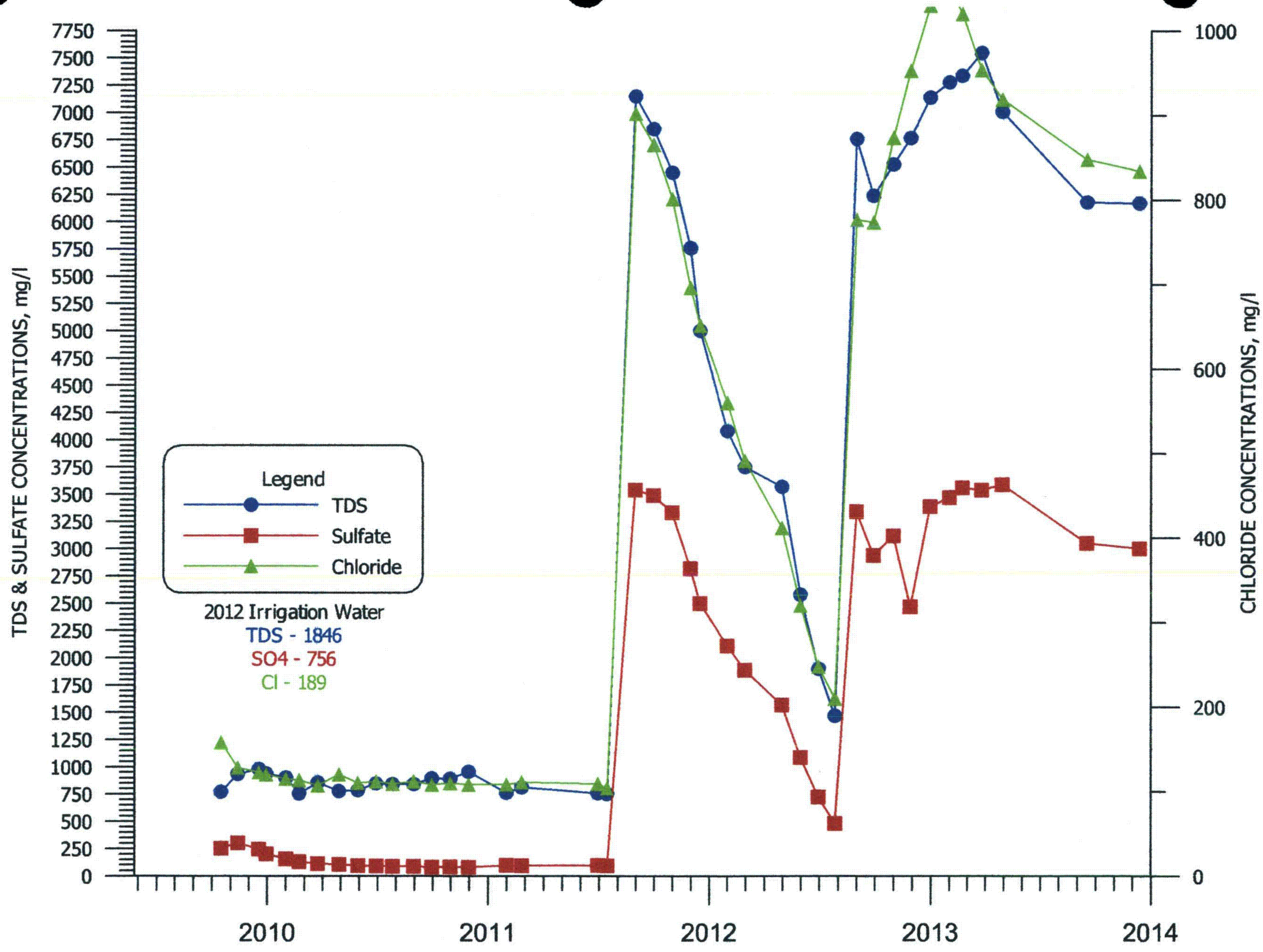


FIGURE 3-30. TDS, SULFATE AND CHLORIDE CONCENTRATIONS FROM LY28-2M.

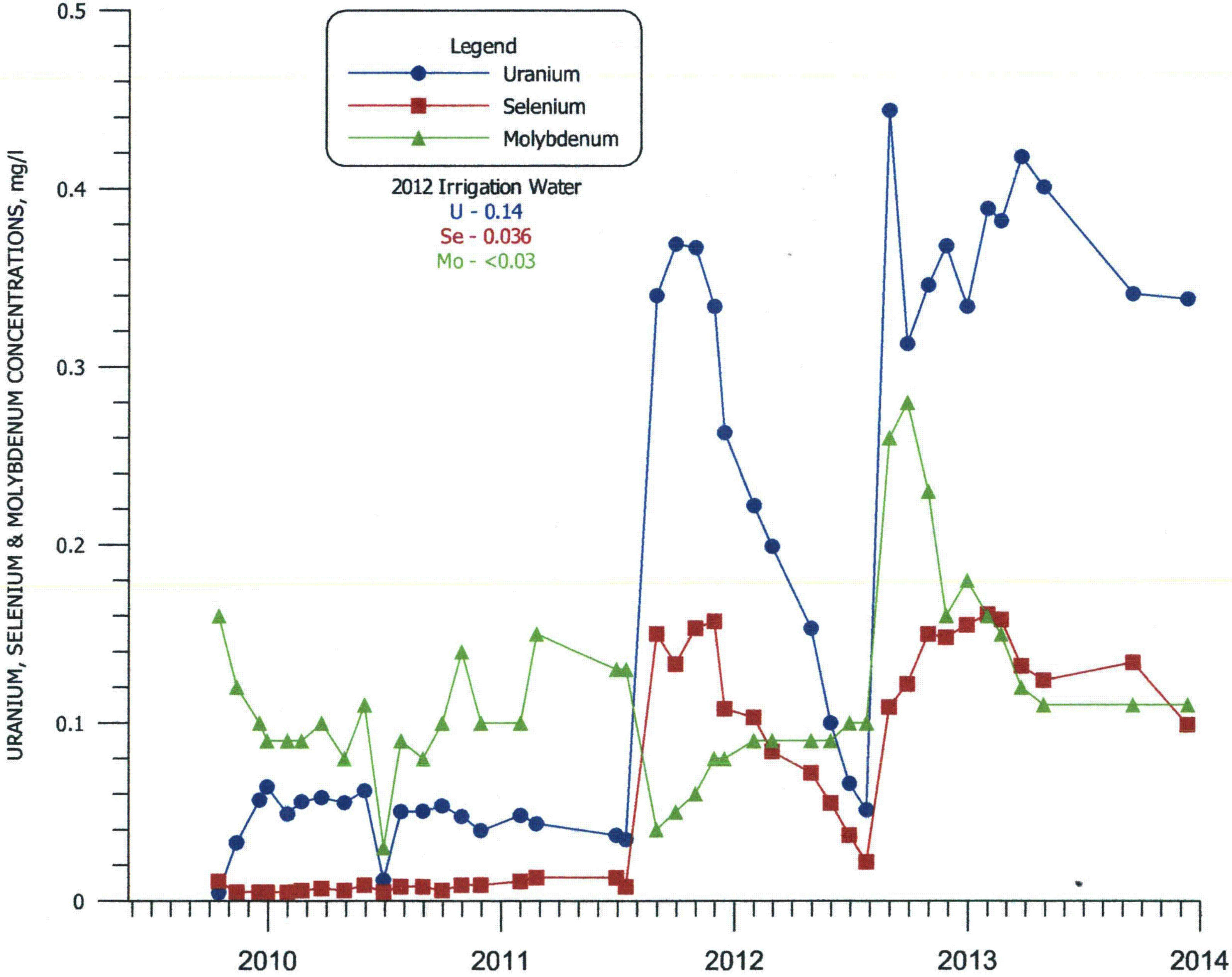


FIGURE 3-31. URANIUM, SELENIUM AND MOLYBDENUM CONCENTRATIONS FROM LY28-2M.

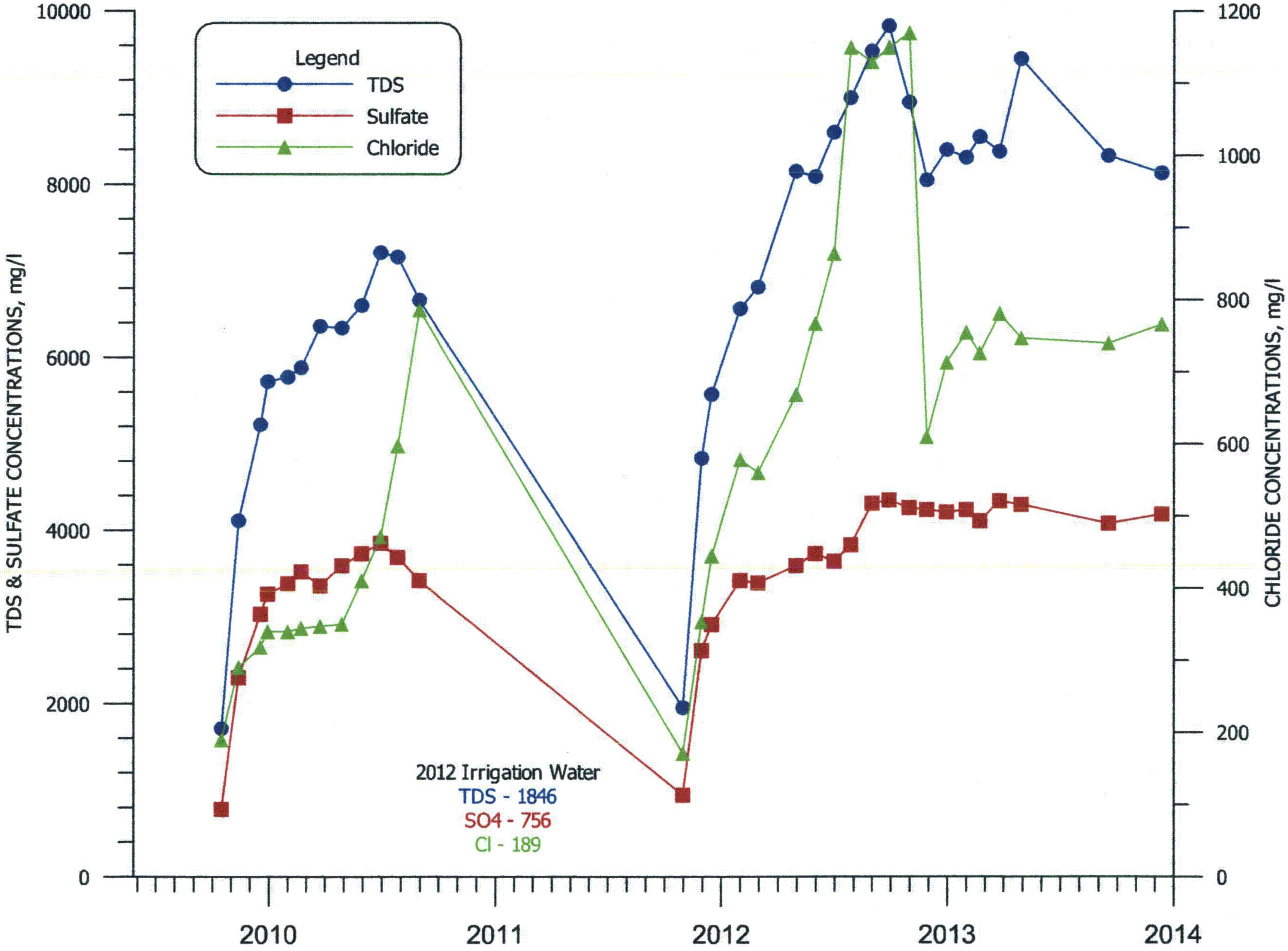


FIGURE 3-32. TDS, SULFATE AND CHLORIDE CONCENTRATIONS FROM LY28-3.

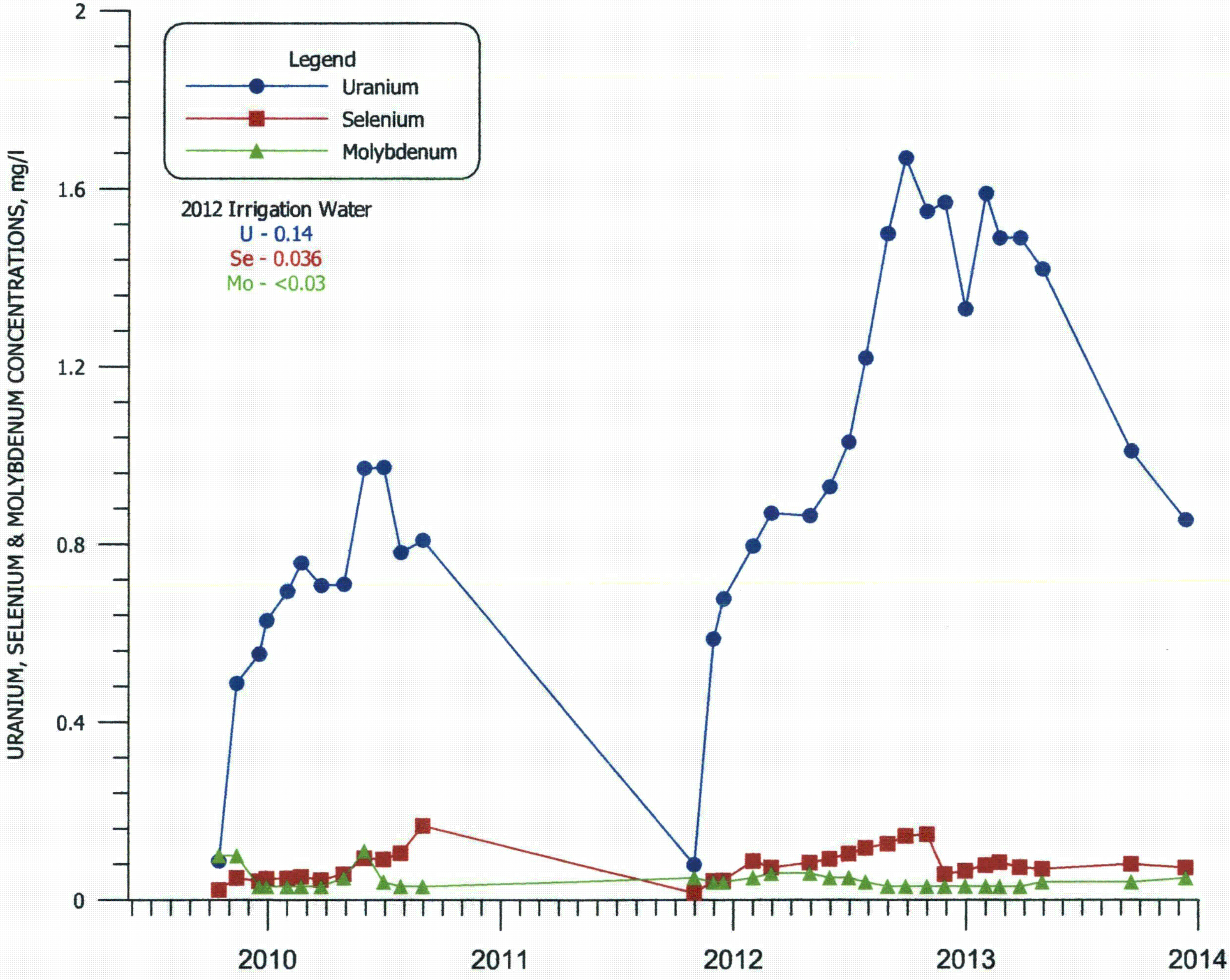


FIGURE 3-33. URANIUM, SELENIUM AND MOLYBDENUM CONCENTRATIONS FROM LY28-3.

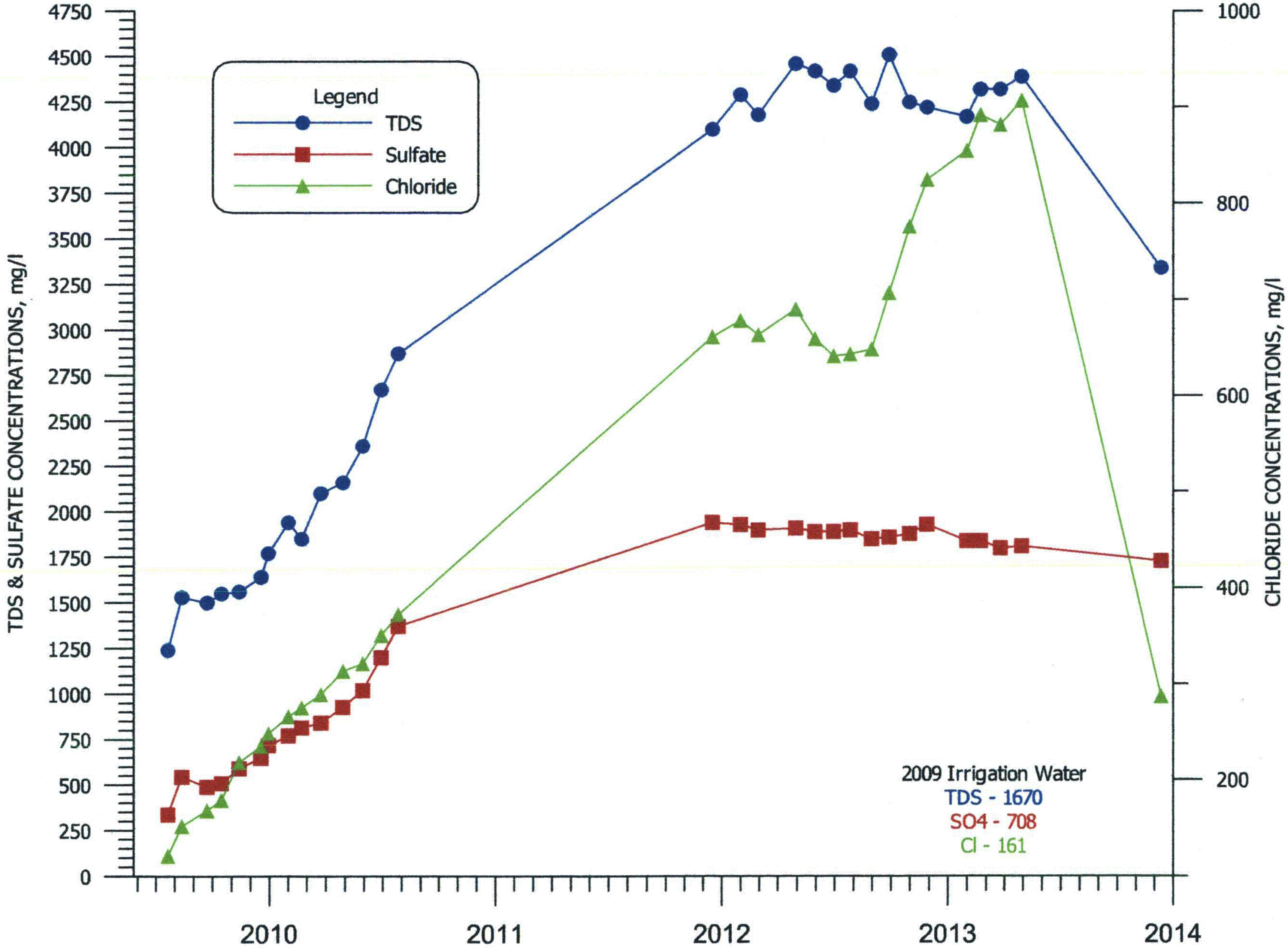


FIGURE 3-34. TDS, SULFATE AND CHLORIDE CONCENTRATIONS FROM LY1.

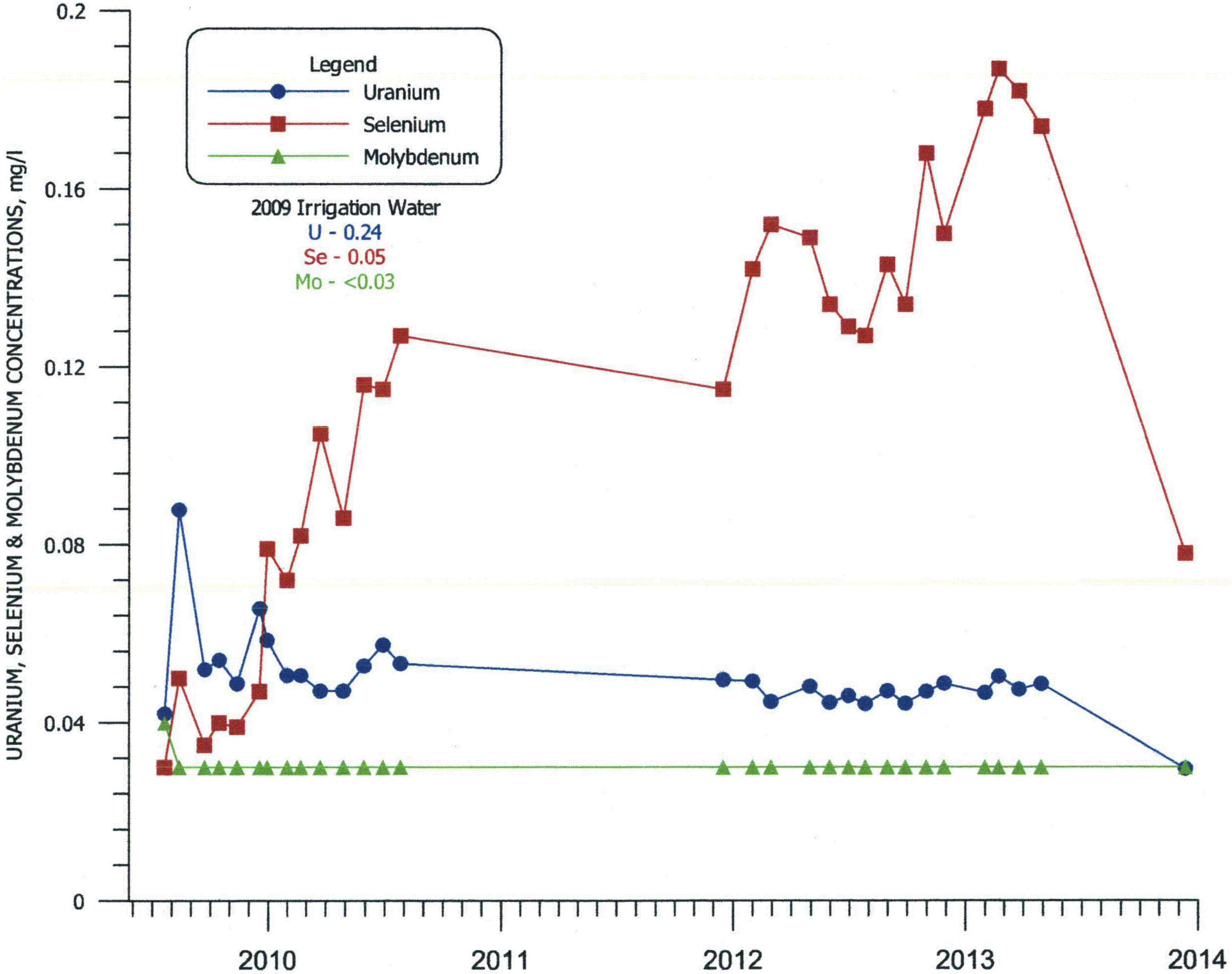


FIGURE 3-35. URANIUM, SELENIUM AND MOLYBDENUM CONCENTRATIONS FROM LY1.

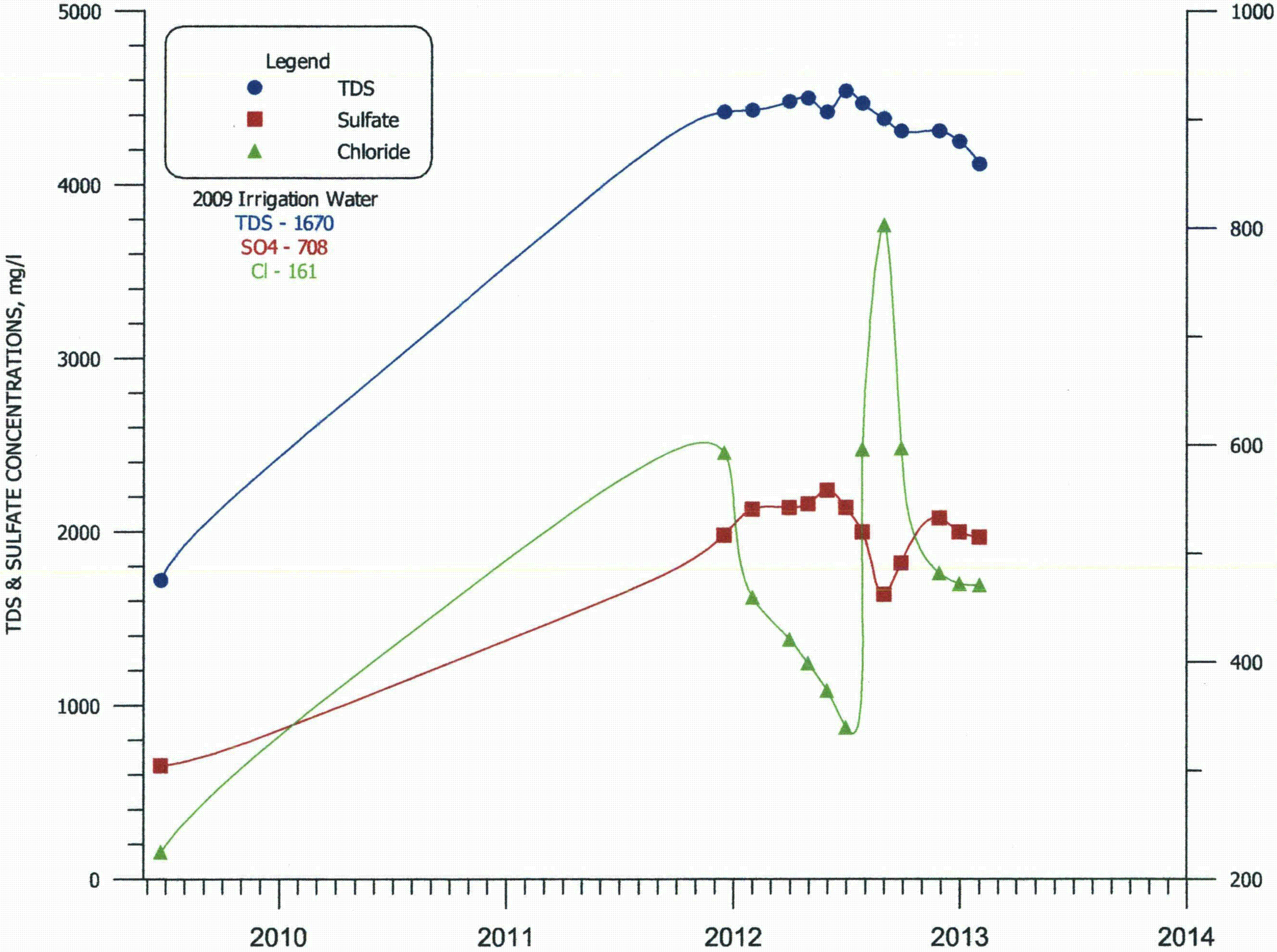


FIGURE 3-36. TDS, SULFATE AND CHLORIDE CONCENTRATIONS FROM LY2.

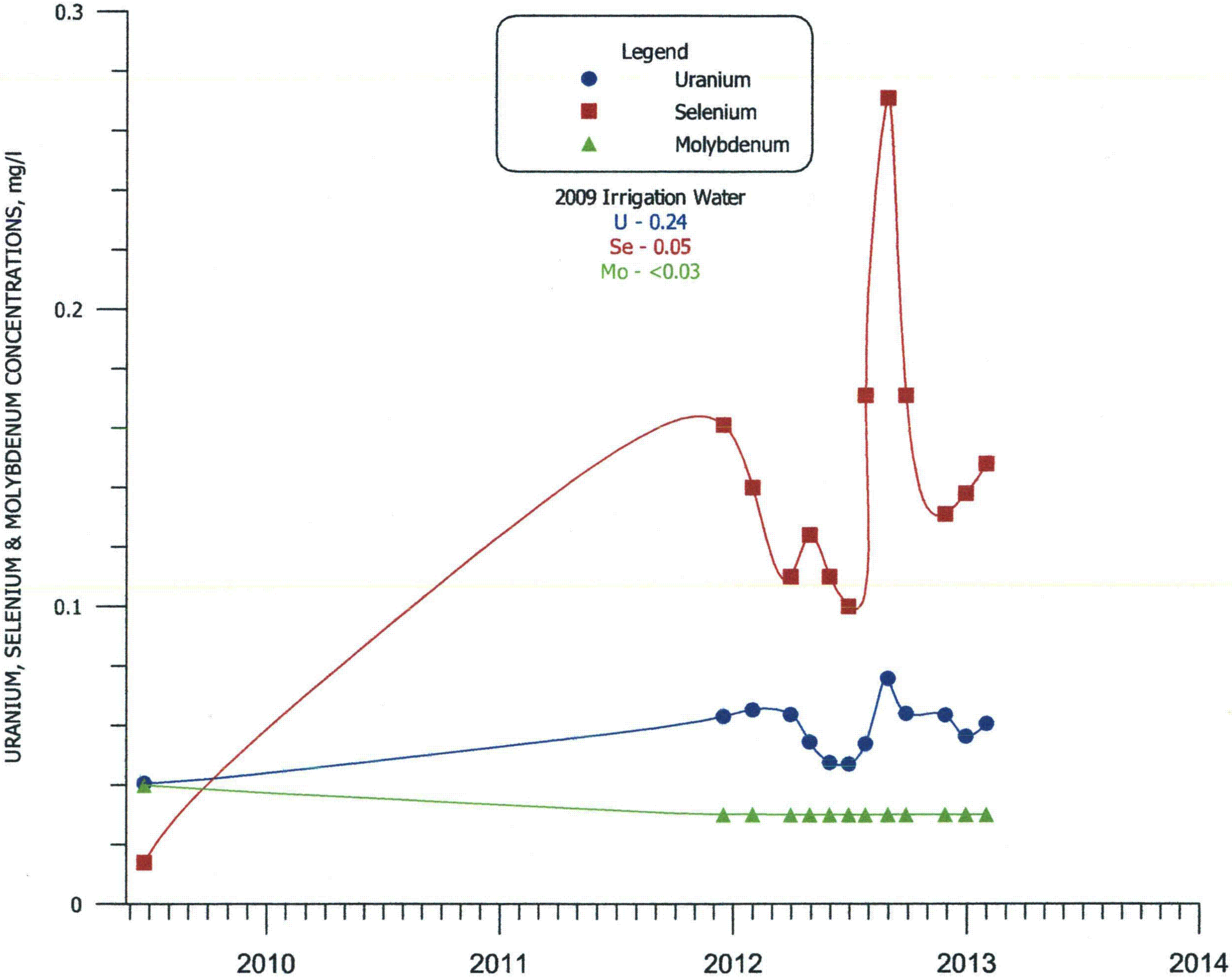


FIGURE 3-37. URANIUM, SELENIUM AND MOLYBDENUM CONCENTRATIONS FROM LY2.

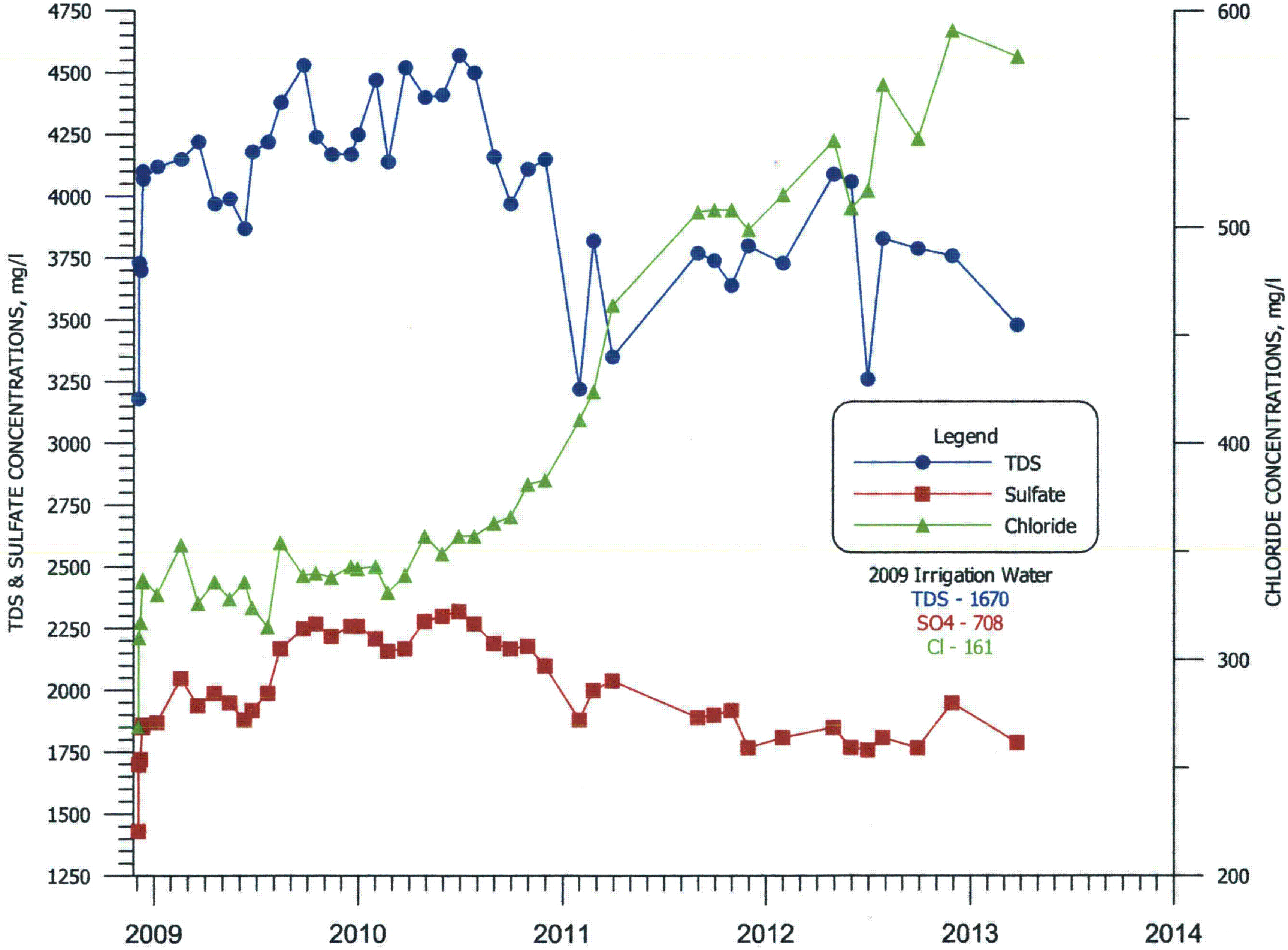


FIGURE 3-38. TDS, SULFATE AND CHLORIDE CONCENTRATIONS FROM LY4.

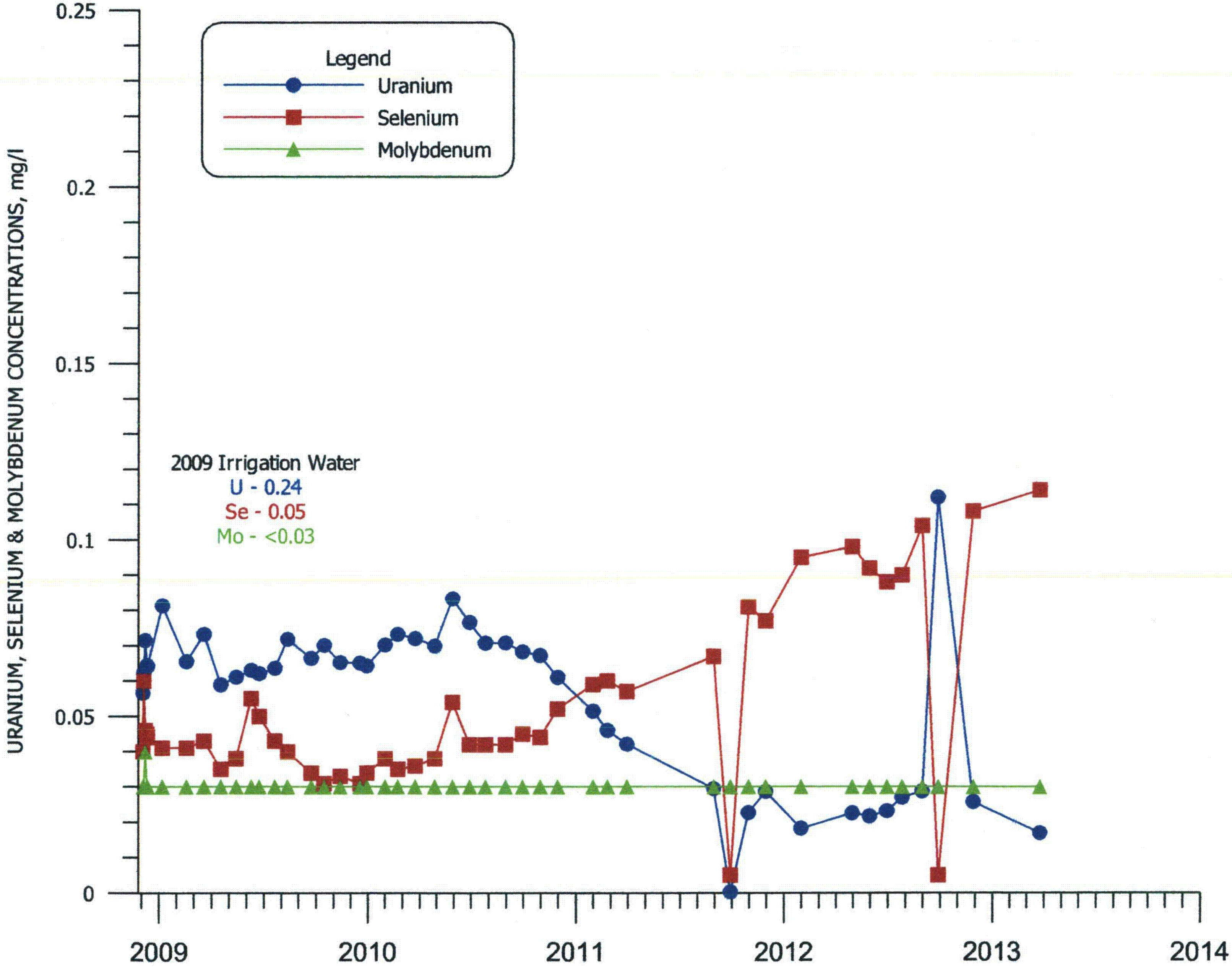


FIGURE 3-39. URANIUM, SELENIUM AND MOLYBDENUM CONCENTRATIONS FROM LY4.

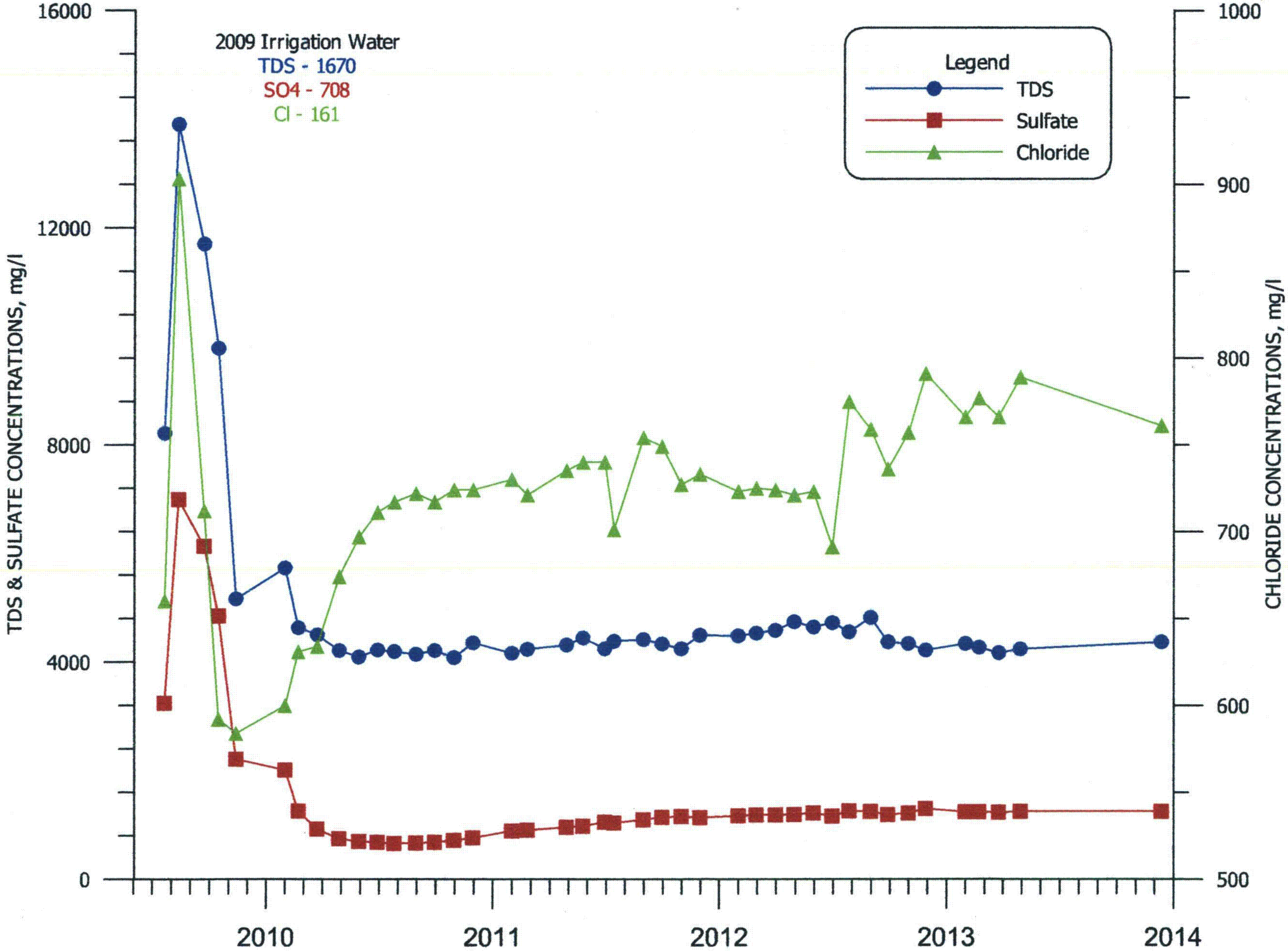


FIGURE 3-40. TDS, SULFATE AND CHLORIDE CONCENTRATIONS FROM LY4MU.

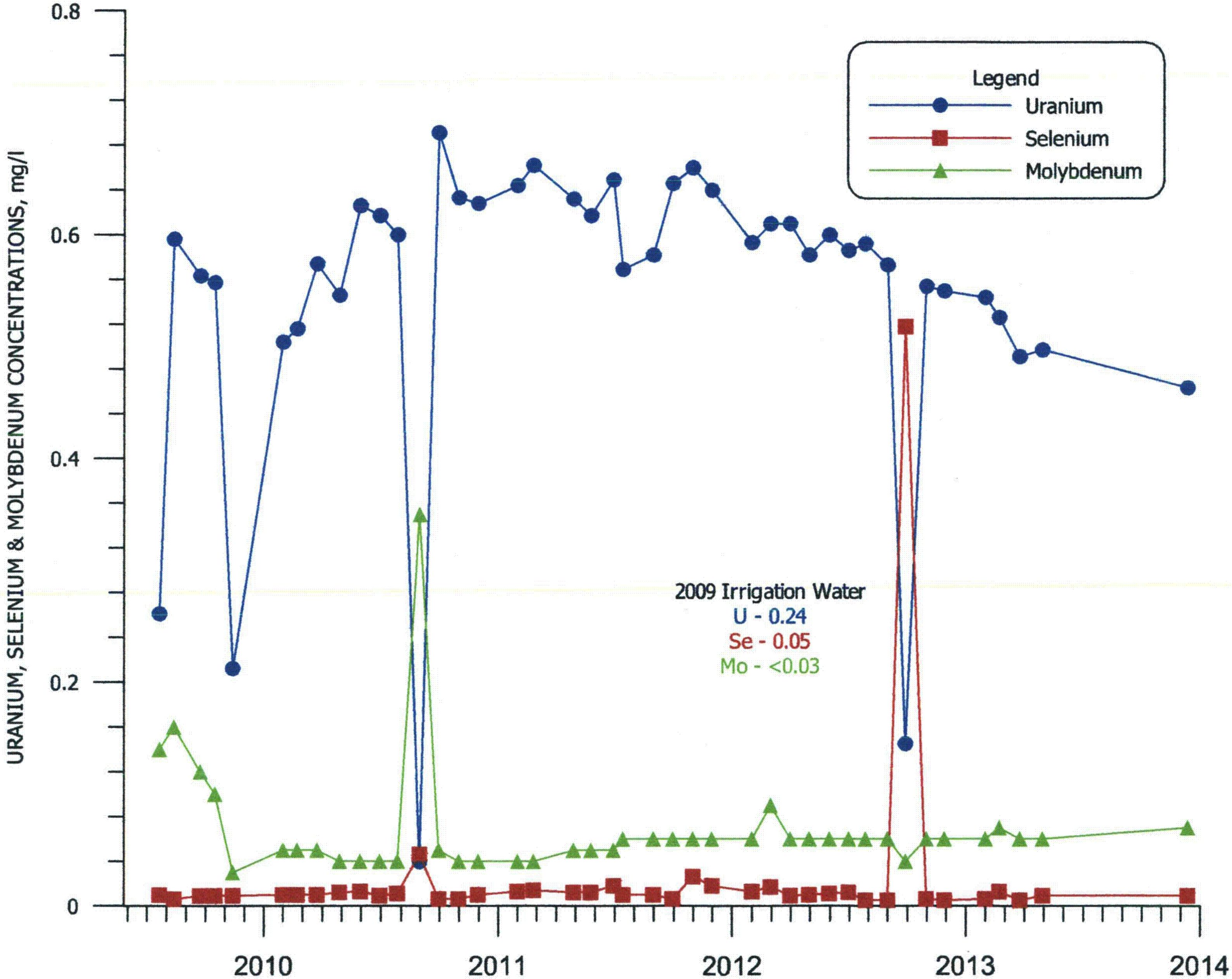


FIGURE 3-41. URANIUM, SELENIUM AND MOLYBDENUM CONCENTRATIONS FROM LY4MU.

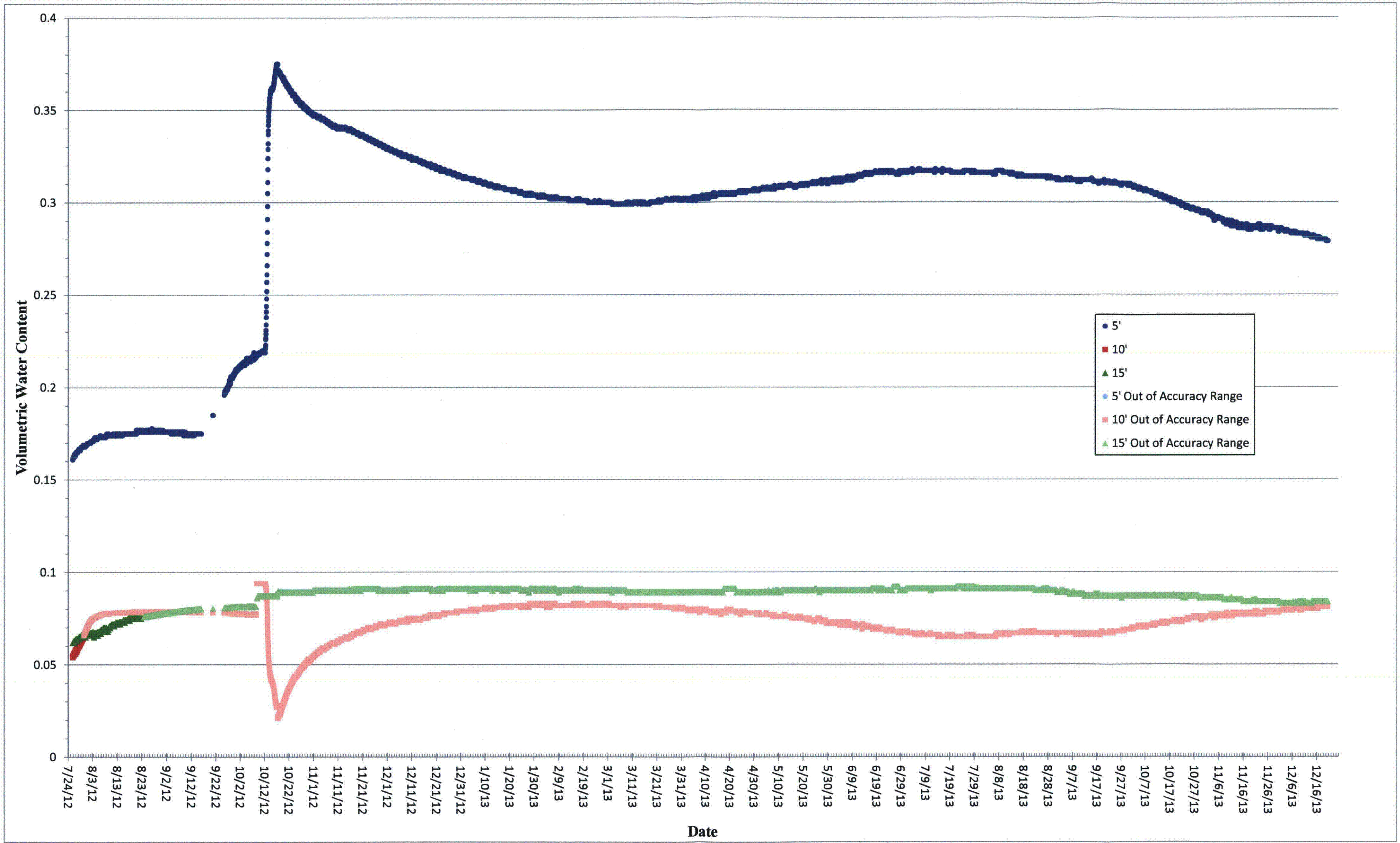


Figure 3-42. Volumetric Water Content, Section 34 Flood Area

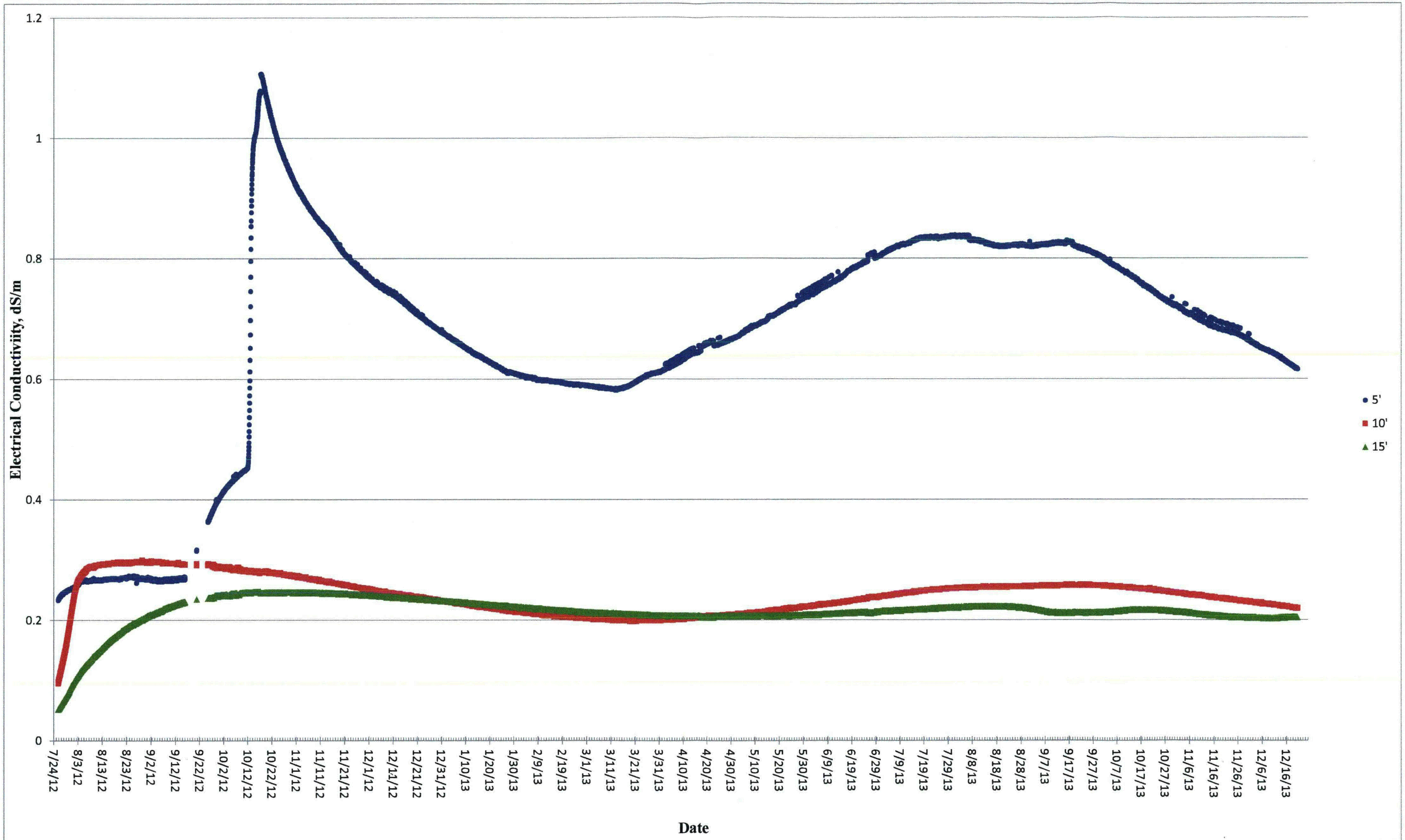


Figure 3-43. Electrical Conductivity, Section 34 Flood Area

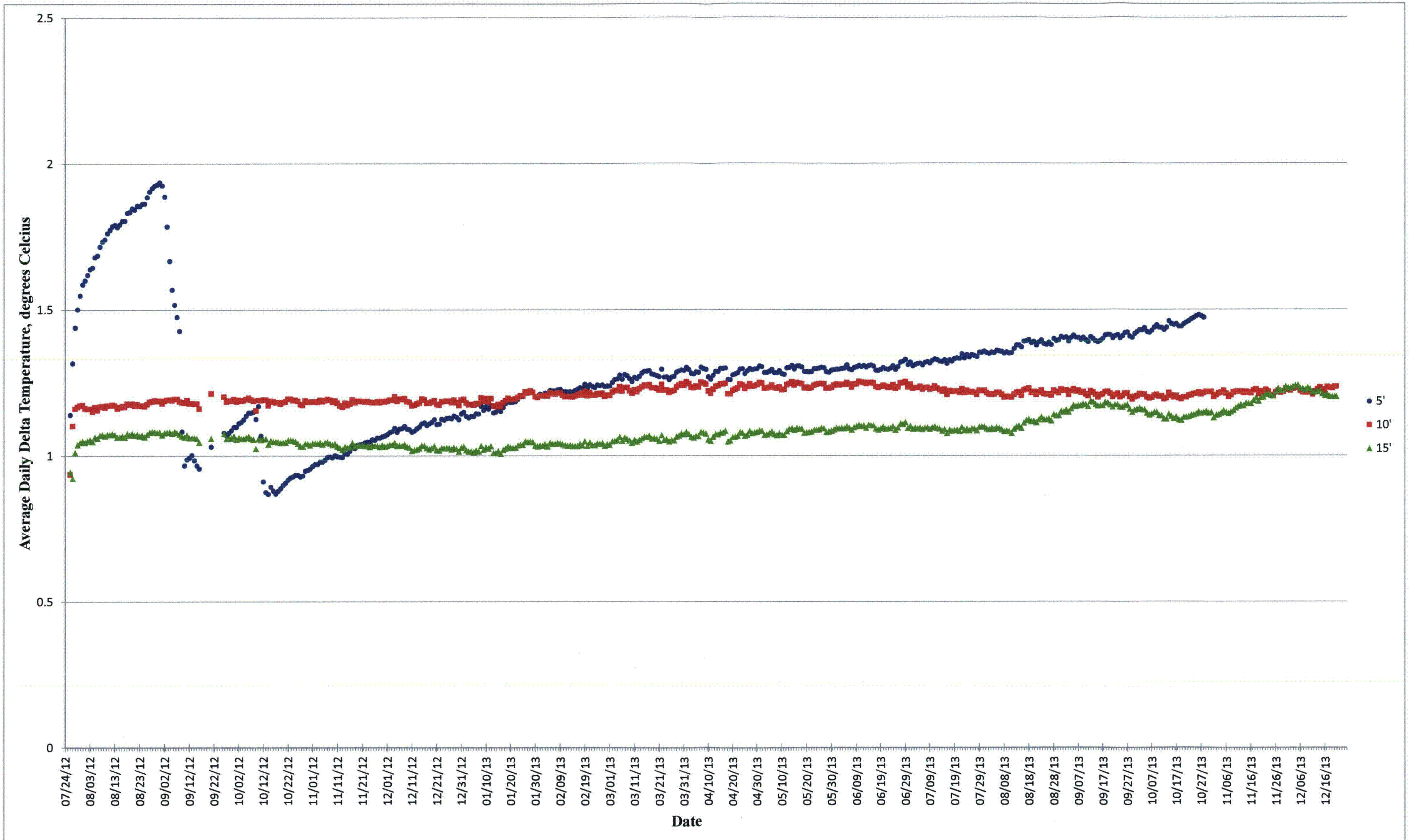


Figure 3-44. Average Daily Delta Temperature, Section 34 Flood Area

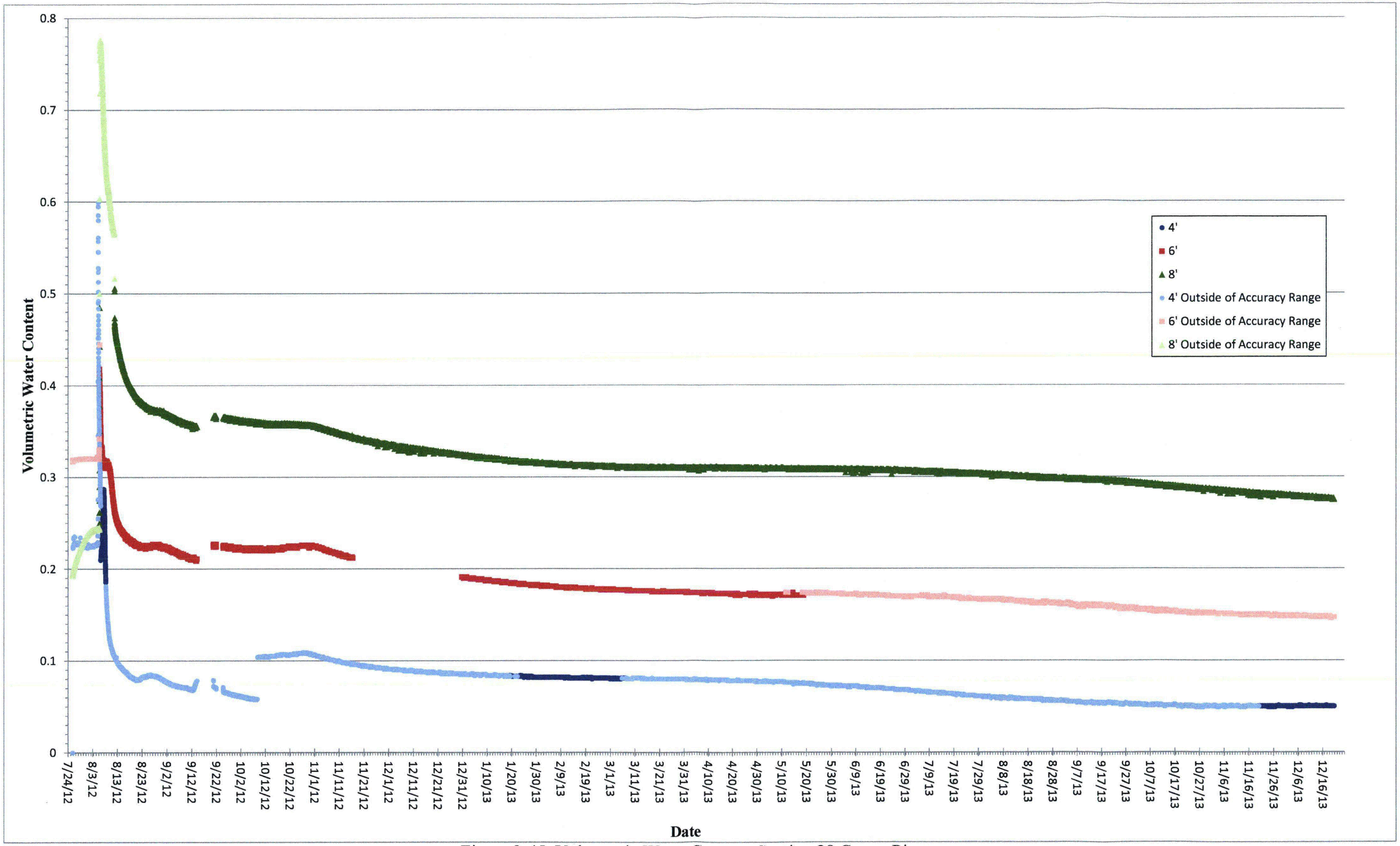


Figure 3-45. Volumetric Water Content, Section 28 Center Pivot

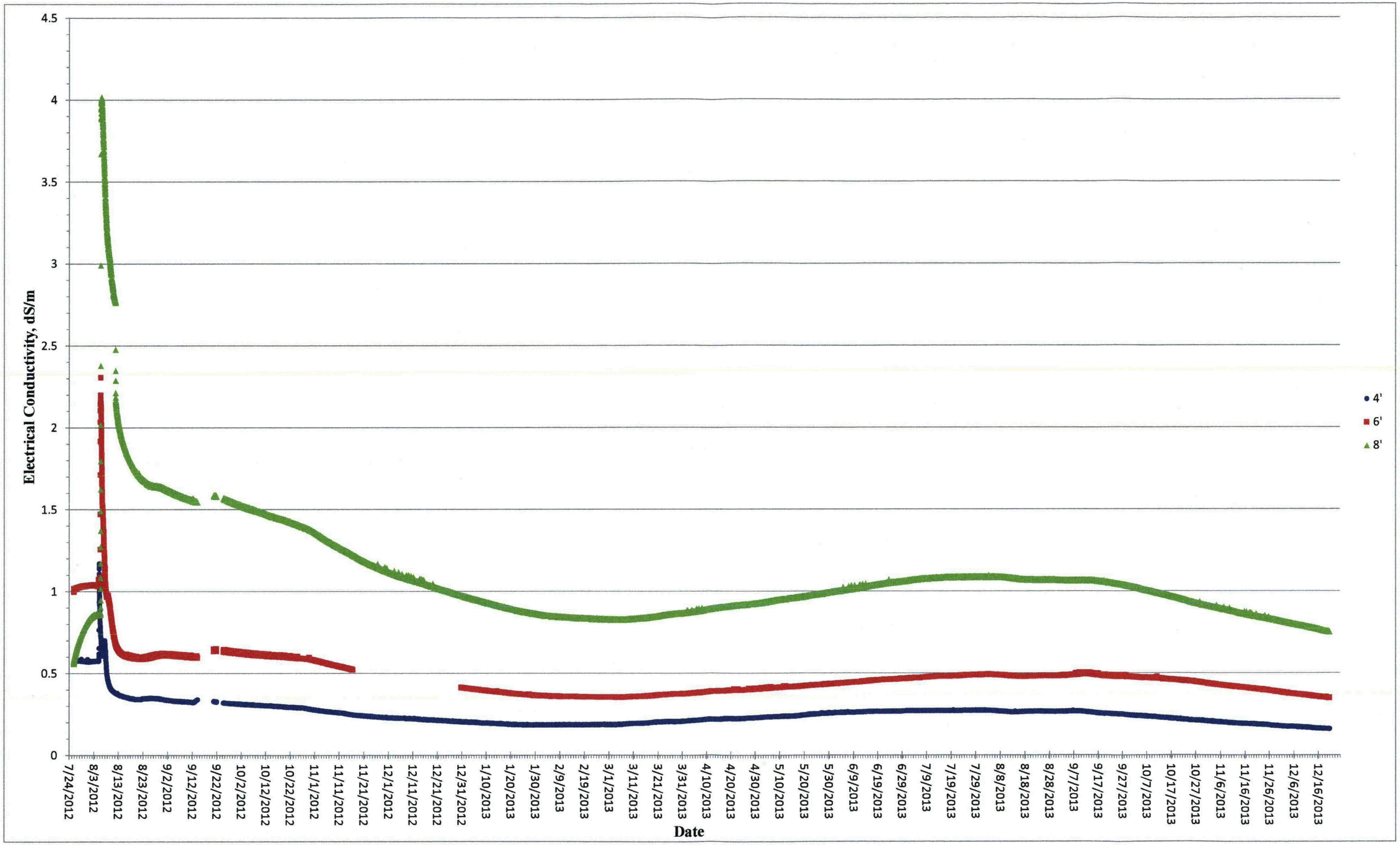


Figure 3-46. Electrical Conductivity, Section 28 Center Pivot

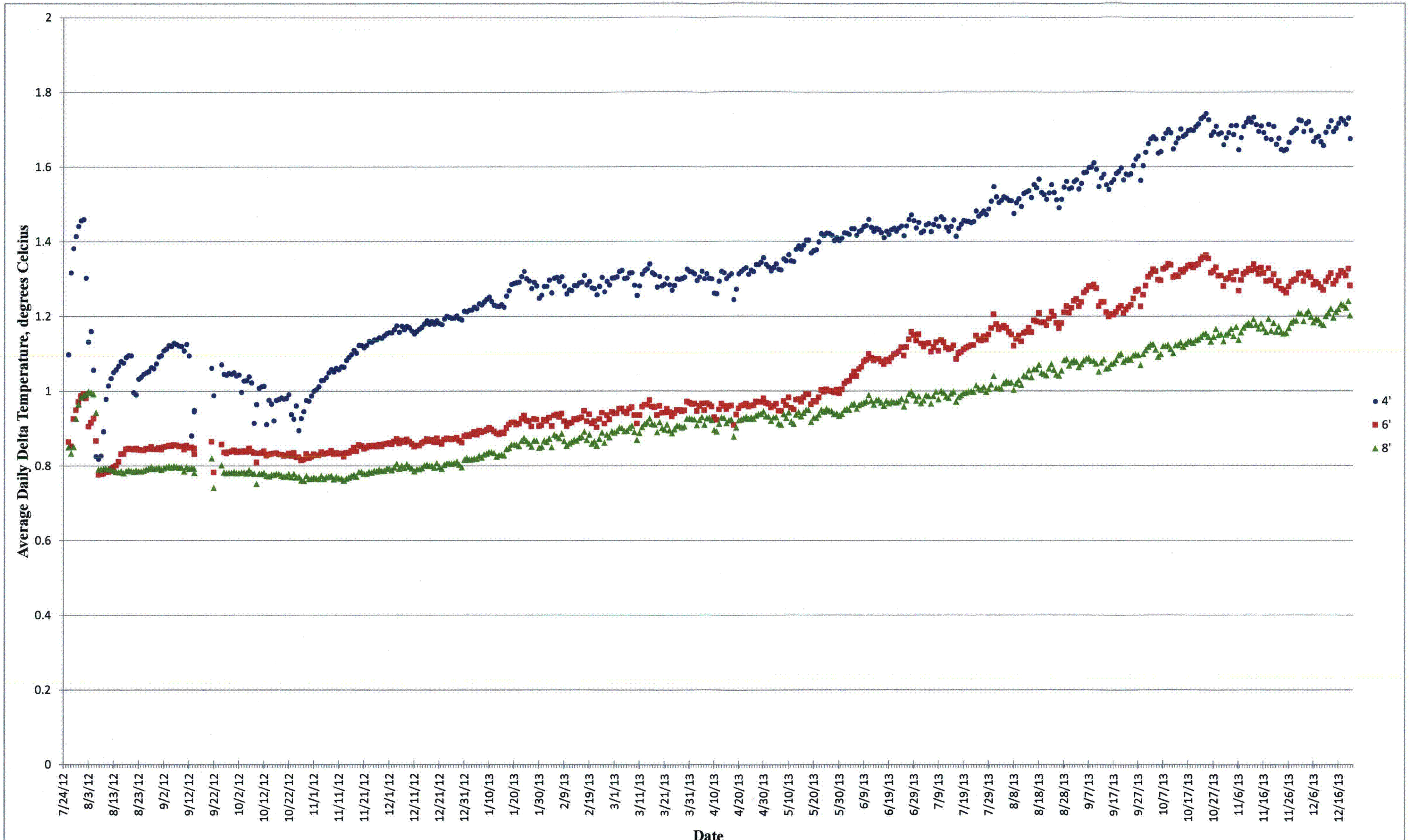


Figure 3-47. Average Daily Delta Temperature, Section 28 Center Pivot