

2010 – 2030

Water Resource Plan

Appendix G

December 2009

Appendix G:
July 2009 NDEP Report



REPORT ON AQUIFER STORAGE AND RECOVERY
TRUCKEE MEADOWS HYDROGRAPHIC BASIN

JANUARY 1 THROUGH JUNE, 30 2009

NDEP PERMIT #UNEV92200

and

NDWR PERMIT #R-16

July 2009

Truckee Meadows Water Authority

1355 Capital Boulevard

Reno, Nevada 89520

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1.0 INTRODUCTION

The Truckee Meadows Water Authority's (TMWA) Aquifer-Storage and Recovery program (ASR) injects treated surface water into the groundwater aquifer of the Truckee Meadows hydrographic basin in conformance with provisions set out by the Nevada Division of Water Resources (NDWR) and the Nevada Division of Environmental Protection (NDEP). On October 19, 2006, NDWR issued Permit No R-16 authorizing TMWA to annually inject up to 7,000 acre-feet of treated water into 23 wells located within the Truckee Meadows hydrographic basin. The corresponding water quality permit is NDEP Permit No. UNEV92200. The permits require TMWA to submit semi-annual and annual reports by summarizing injection activities including water quality, water levels, and injected and extracted volumes for the first half of the year and for the whole year. This report covers the period between January 1 and June 30, 2009.

Figure 1 shows the location of TMWA's wells in the Truckee Meadows hydrographic basin where recharge occurred during the first half of 2009.

TMWA's ASR in the Truckee Meadows basin has grown from 81 acre-feet of treated surface water injected in 1993 to 18,587 acre-feet cumulative total as of June 30, 2009 (Table 1). During the first half of 2009 alone, TMWA injected 1,003 acre-feet of treated water into the Truckee Meadows basin aquifer.

Table 2A is the summary of the monthly recharge at each of TMWA's wells. Table 2B summarizes amount of water pumped monthly from each of the injection wells. During the first half of 2009, only 184 acre-feet of water were pumped from the injection wells. Charts of hourly average water levels, injection and extraction rates, and historical water level hydrographs for each recharged well and its respective monitoring wells are shown in the discussion text on each well. Table 3 shows the average, maximum, and minimum monthly injection rates for each well.

Water quality information is contained in the last section of the report.

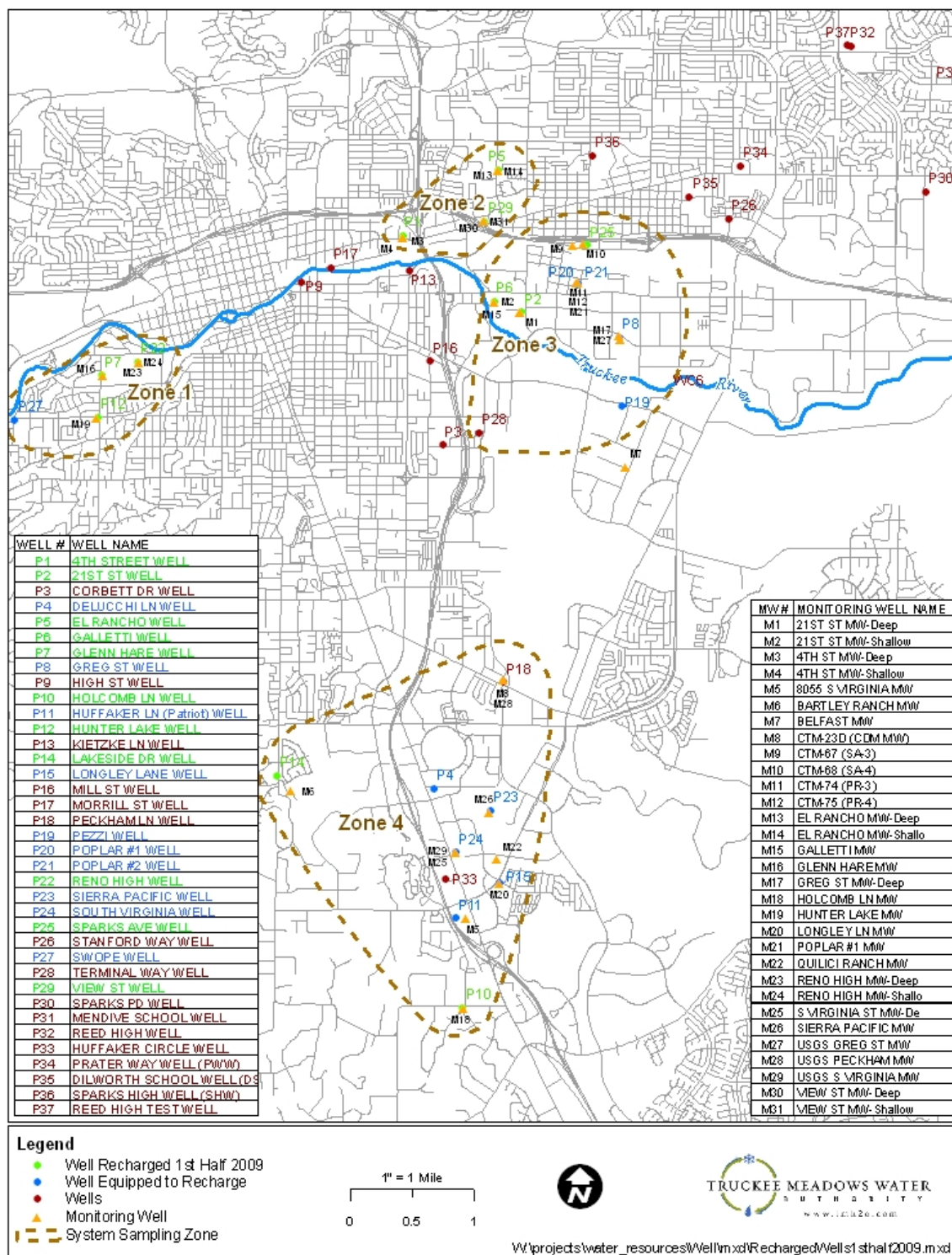


Figure 1. Well Locations, Truckee Meadows Basin

Table 1. Annual Injection in Acre-feet

	1993	1994	1995	1996	1997	1998	1999	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	Jun-09 Total, AF
Lakeside Drive	3	9	116	132	111	377	194	246	258	218	292	194	192	213	148	270	154	3,126
Hunter Lake					196		196	290	332	175	246	34	22	0		122	197	1,614
View Street						173	327	486	433	260	353	598	264	202	179	291	68	3,633
Reno High							61	190	216	142	173	26	50	213	182	256	144	1,652
Poplar #1					22													22
Poplar #2								68	46	70	9	44	37	2				277
Kietzke Lane	26																	26
Morrill Avenue	27																	27
Forth Street	25							39	452	309	152	139	82	113	90	160	107	1,667
Glen Hare								36	117	62	99	15	9	0		62	46	445
Greg Street								76	135	137	177	164	41	0				731
Terminal Way								2										2
El Rancho								121	216	178	255	139	97	103	62	119	22	1,313
Holcomb Lane								21	39	187	123	72	17	137		40	32	667
21 st Street								61	202	193	259	172	108	151	108	154	84	1,490
Galletti Way								81	239	234	262	218	119	175	149	225	138	1,840
Longley Lane									10	14								24
Sparks Avenue																19	11	30
Total - Truckee Meadows	81	9	116	132	133	550	778	1,717	2,693	2,177	2,401	1,815	1,037	1,308	918	1,718	1,003	18,587

Table 2A. Monthly Recharge by Well, Truckee Meadows Basin, First Half 2009

WELL	JAN	FEB	MAR	APR	MAY	JUNE	TOTAL RECHARGE	
							MG	AF
	---a---	-b----	--c----	-d----	--e----	---f---	---g---	---h---
4th	12	9	10	3	0	0	35	107
View	14	8	0	0	0	0	22	68
Sparks Avenue	3	0	0	0	0	0	4	11
Lakeside	16	14	16	4	0	0	50	154
Holcomb	5	4	0	0	0	0	9	27
21st	10	6	9	2	0	0	27	84
Reno High	15	14	14	4	0	0	47	144
El Rancho	6	1	0	0	0	0	7	22
Hunter Lake	20	18	20	5	0	0	64	197
Glen Hare	11	4	0	0	0	0	15	46
Galletti	14	13	14	4	0	0	45	138
	-----	-----	-----	-----	-----	-----	-----	-----
Total Recharge	128	91	84	22	0	0	325	1003

Table 2B. Monthly Production by Recharged Well, Truckee Meadows Basin, First Half 2009

WELL	JAN	FEB	MAR	APR	MAY	JUNE	TOTAL PRODUCTION	
							MG	AF
	---a---	-b----	--c----	-d----	--e----	---f---	---g---	---h---
4th	0	0	0	0	0	0	0	0
View	0	0	0	22	0	0	22	68
Sparks Avenue	0	0	0	0	0	0	0	0
Lakeside	0	0	0	0	4	4	8	25
Holcomb	0	0	0	0	0	0	0	0
21st	0	0	0	17	2	0	19	59
Reno High	0	0	0	0	0	0	0	0
El Rancho	0	0	0	10	1	0	10	32
Hunter Lake	0	0	0	0	0	0	0	0
Glen Hare	0	0	0	0	0	0	0	0
Galletti	0	0	0	0	0	0	0	0
	-----	-----	-----	-----	-----	-----	-----	-----
Total Production	0	0	0	49	7	4	60	184

Table 3. Average, Highest and Lowest Injection Rates (gpm), by Well and Month – 1st 2009

	Lakeside	View	El Rancho	Glen Hare	Hunter Lake	Reno High	Fourth St.	21 st	Galletti	Sparks Av	Holcomb
Average	357	333	175	243	459	345	279	219	321	77	176
Jan-09 Highest	373	357	202	253	471	359	532	238	337	85	219
Lowest	323	177	145	226	449	337	217	187	302	62	149
Average	359	298	196	226	451	337	230	221	319	76	205
Feb-09 Highest	404	445	230	232	460	358	241	262	335	83	216
Lowest	342	105	139	221	441	298	222	184	294	72	198
Average	352				451	317	231	200	320		
Mar-09 Highest	392				458	358	243	219	337		
Lowest	317				444	298	217	186	295		
Average	343				447	314	227	182	308		
Apr-09 Highest	356				451	338	236	187	330		
Lowest	307				443	298	209	174	282		

1.1 Lakeside Well

The Lakeside Well is located in the southeast quarter of the northeast quarter of Section 35, Township 19. TMWA injected a total of 154 acre-feet (50 MG) of treated surface water into the groundwater aquifer at the Lakeside Well during first half of 2009 (see Tables 1 and 2A, and Figure 2A). A total of 25 acre-feet (8 MG) of water were pumped from the Lakeside well during the same period (see Table 2B). The monthly average, highest and lowest injection rates for Lakeside Well as well as other recharged wells are shown in Table 3.

Hourly average flow rates and water levels during injection and pumping for the reporting period are shown in Figure 2A. Historical monthly water level readings for Lakeside Well are shown in Figure 2B. .

A domestic well located at the Bartley Ranch is the monitoring well for the Lakeside Well; its historical monthly water levels are shown in Figure 3. Water levels in Bartley Ranch well follow the same trend as in Lakeside, rising during recharge and dropping during pumping. The general water level in this well has risen by about 40 feet since injection commenced in 1993. This is a positive effect to the aquifer around Lakeside Well. The trend has remained the same since recharge commenced in 1993.

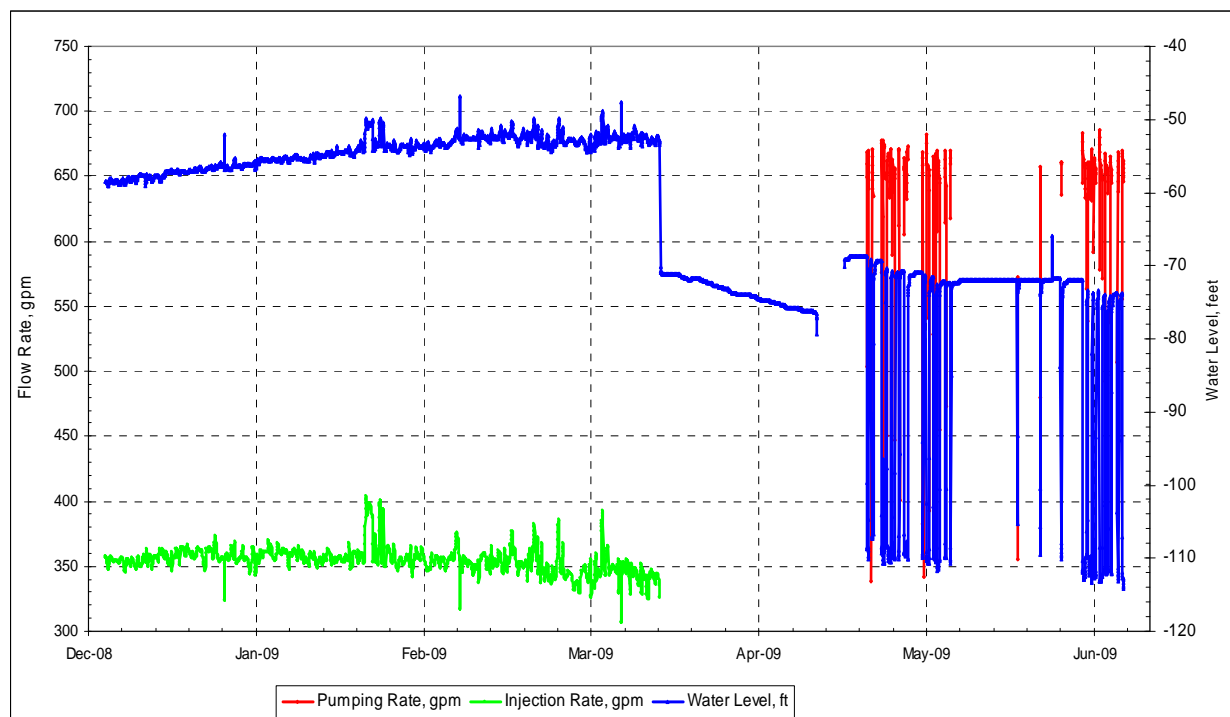


Figure 2A. Lakeside Well - Mean Hourly Water Levels and Flow Rates, First Half 2009

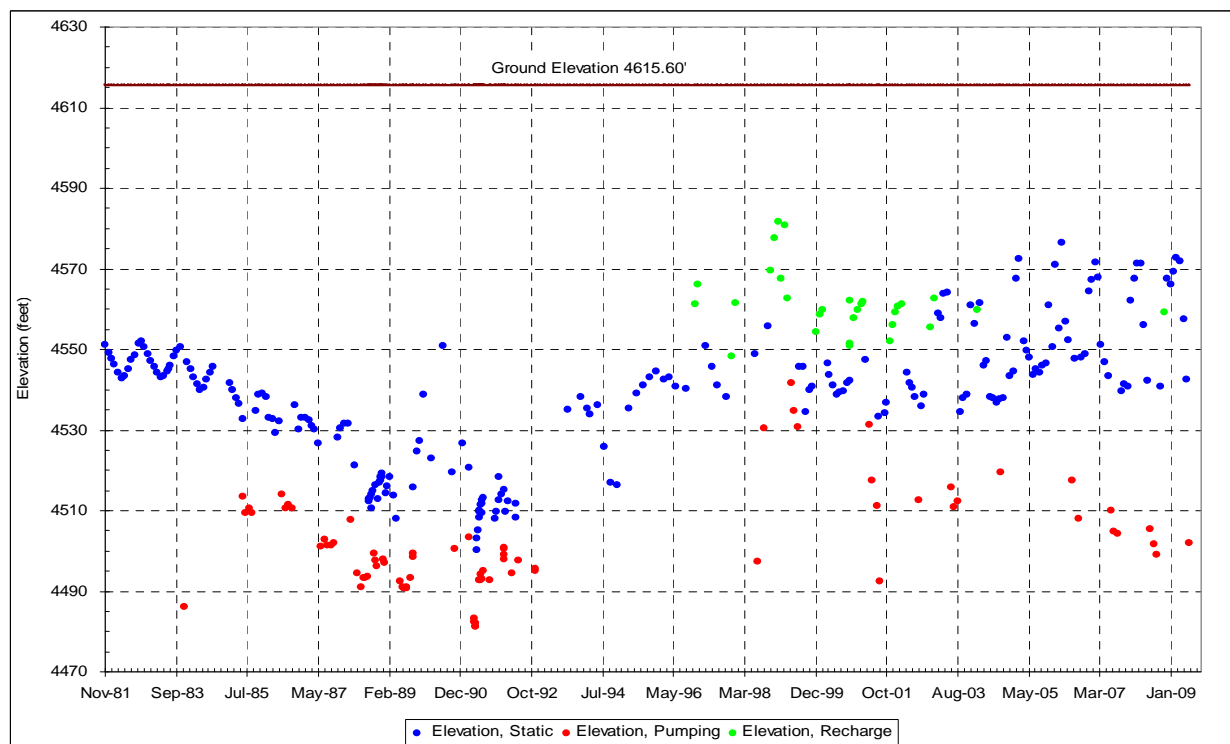


Figure 2B. Lakeside Well, Historical Water Level Elevations

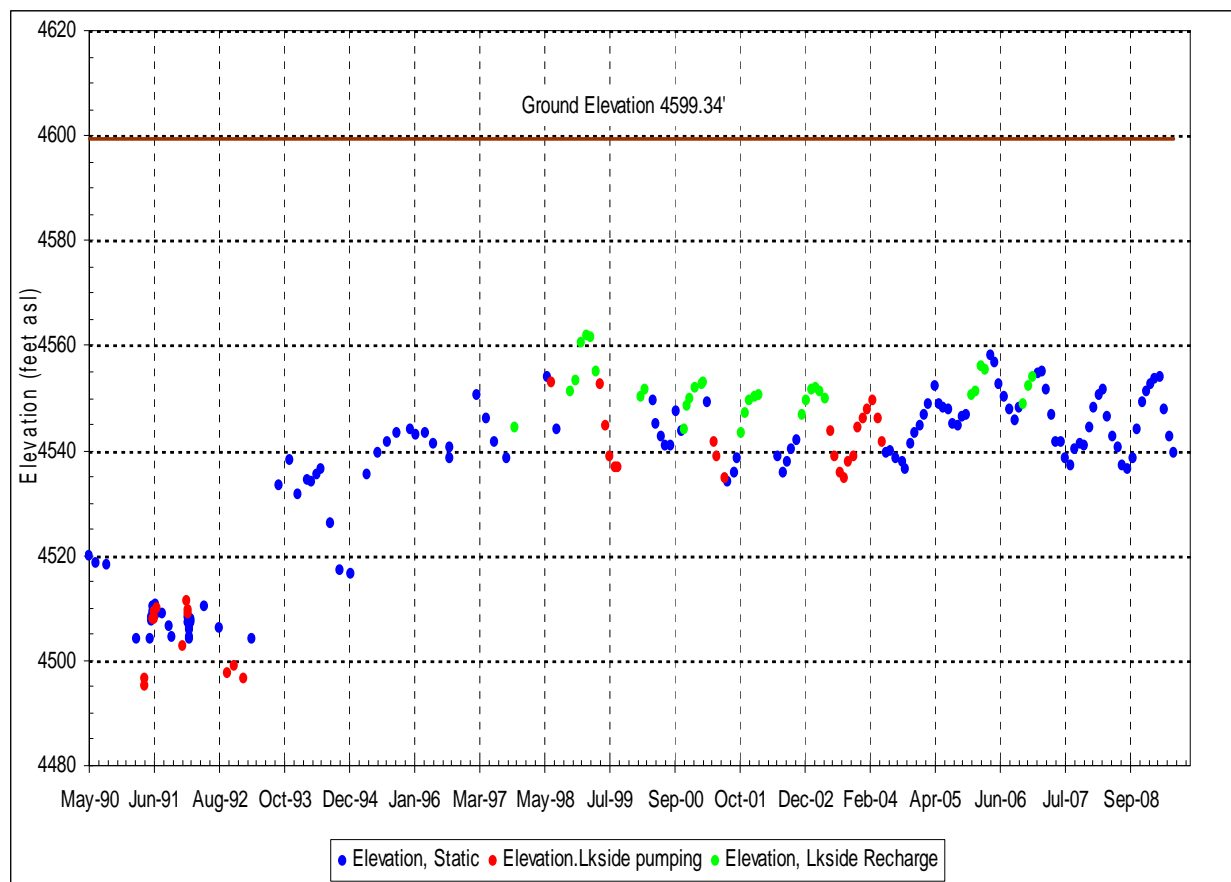


Figure 3. Bartley Ranch, Historical Water Level Elevations

1.2 View Street Well

TMWA's View Street Well is centrally located in the Truckee Meadows, specifically in the northeast quadrant of the I-80 and US 395 junction, adjacent to I-80.

TMWA injected 68 acre-feet (22 MG) of treated surface water into the groundwater aquifer at the View Street Well during the first half of 2009 (Tables 1 and 2A, and Figure 4A). The well was recharged in January and February only because maintenance work that had to be done on the well. During the same period, the same amount of water, 68 acre-feet (22 MG) of water were pumped from View Street well (Table 2B). The monthly average, highest and lowest injection rates are shown in Table 3. Historical monthly water level readings for View Street Well are shown in Figure 4B.

The hydrographs for the injection/production well as well as those for the shallow and deep monitoring wells are shown in Figure 5. It can be seen from the figure that water levels between the injection well and the monitoring wells during injection period are between 30 and 40 feet. During static conditions, water levels in the three wells are almost the same. This indicates that during injection, water forms a mound around the injection well but does not cause similar magnitude of groundwater rise in its immediate vicinity.

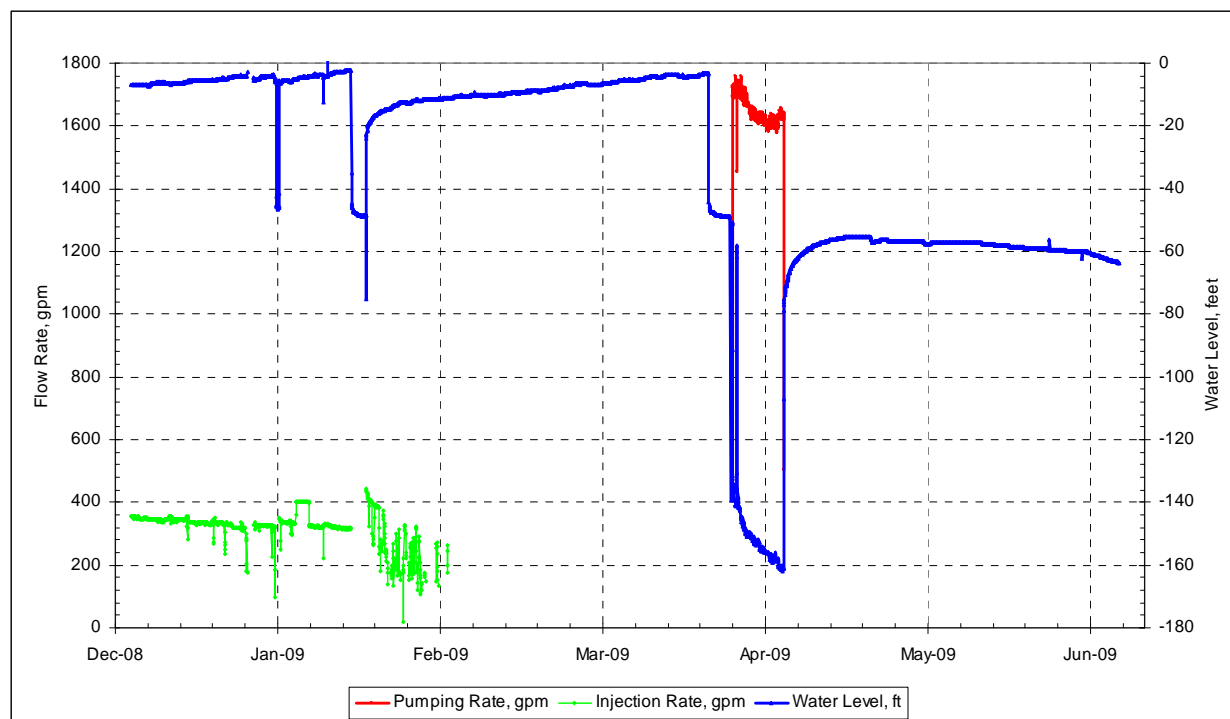


Figure 4A. View Street Well - Mean Hourly Water Levels and Flow Rates,, First Half 2009

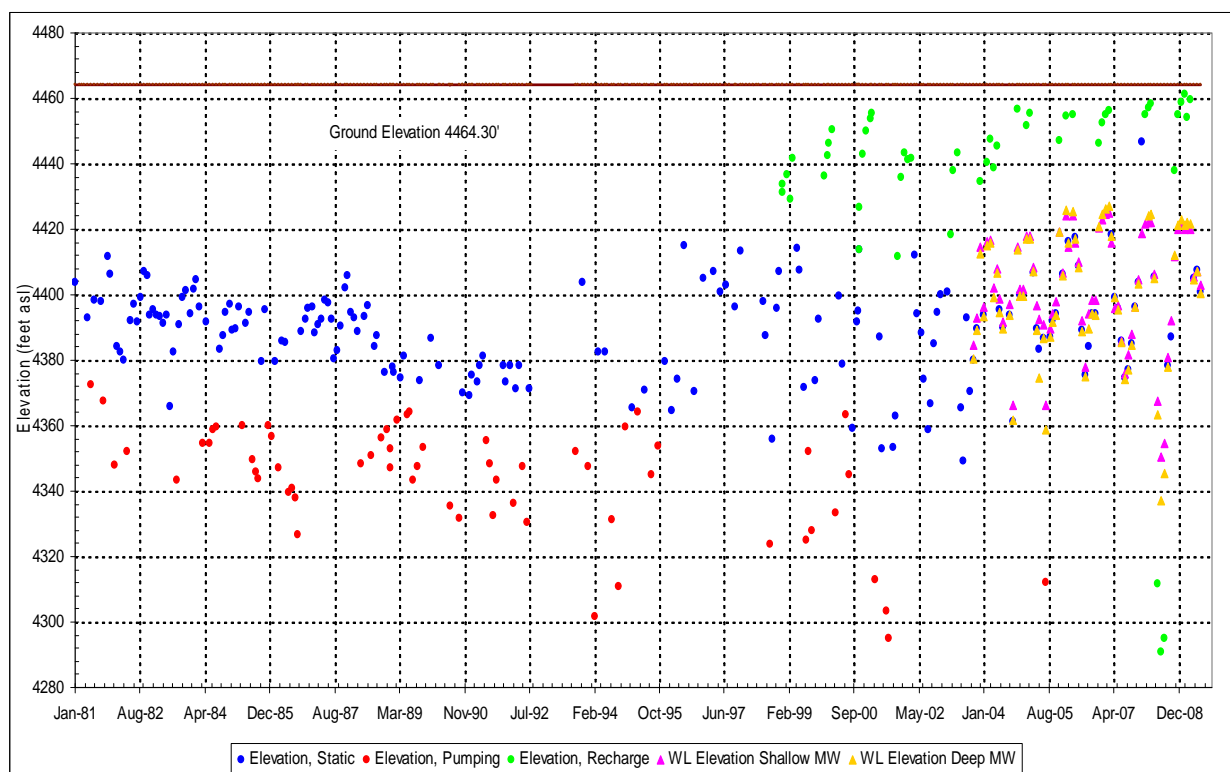


Figure 4B. View Street Production and Monitoring Wells - Water Level Elevations

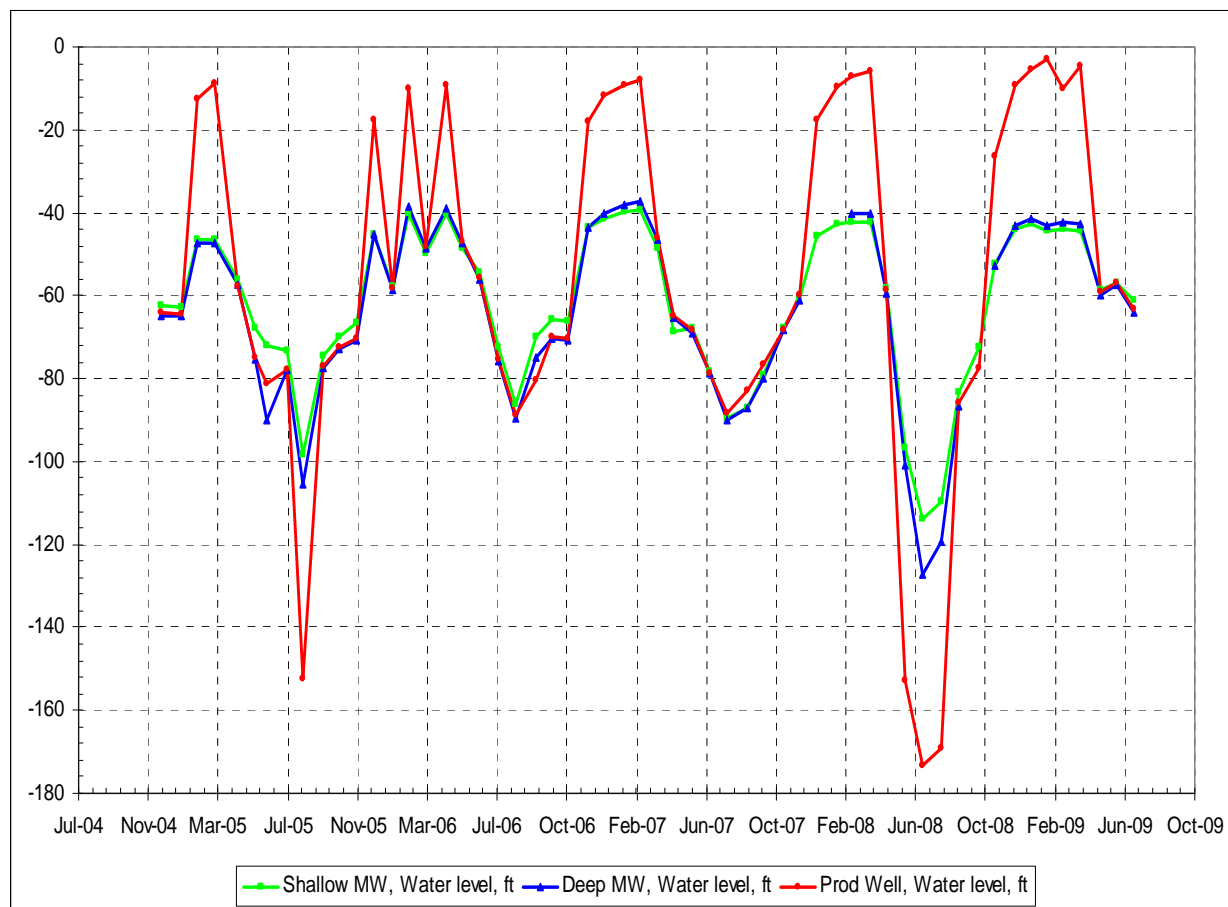


Figure 5. View Street Production and Monitoring Wells, Water Levels

1.3 El Rancho Well

TMWA's El Rancho Well is centrally located in the Truckee Meadows, specifically in the northeast quarter of the southeast quarter of Section 6, Township 19 North, Range 20 East.

TMWA injected a total of 22 acre-feet (7 MG) of treated surface water into the groundwater aquifer at the El Rancho Well during the first half of 2009 (see Tables 1 and 2A, and Figure 6B). During the same period, 32 acre-feet (10 MG) of water were pumped from El Rancho well (see Table 2B). The monthly average, highest and lowest injection rates are shown in Table 3.

Historical monthly water level readings for El Rancho Well are shown in Figure 6B. The hydrographs for the injection/production well as well as those for the shallow and deep monitoring wells are shown in Figure 7. It can be seen from the figure that water levels between the injection well and the monitoring well during injection period are about 36 feet. During static conditions, water levels in the three wells are almost the same. This indicates that during injection, water forms a mound around the injection well but does not cause similar magnitude of groundwater rise in its immediate vicinity.

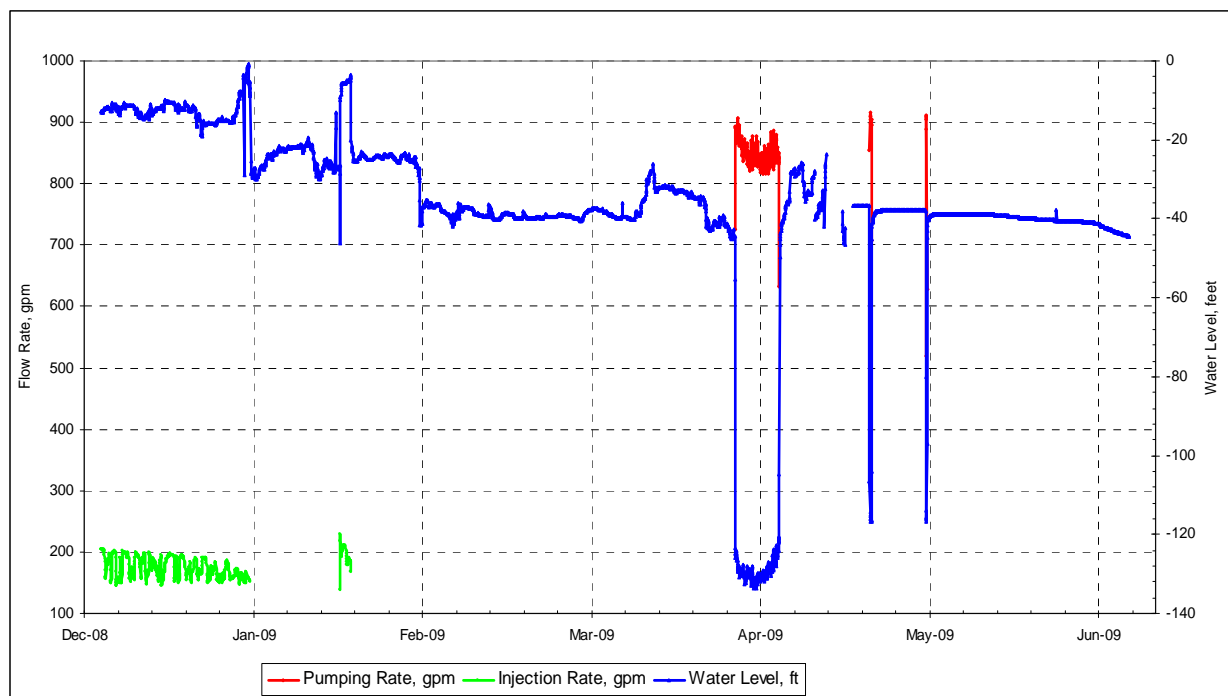


Figure 6A. El Rancho Drive Well - Hourly Water Levels and Flow Rates – 1st Half 2008

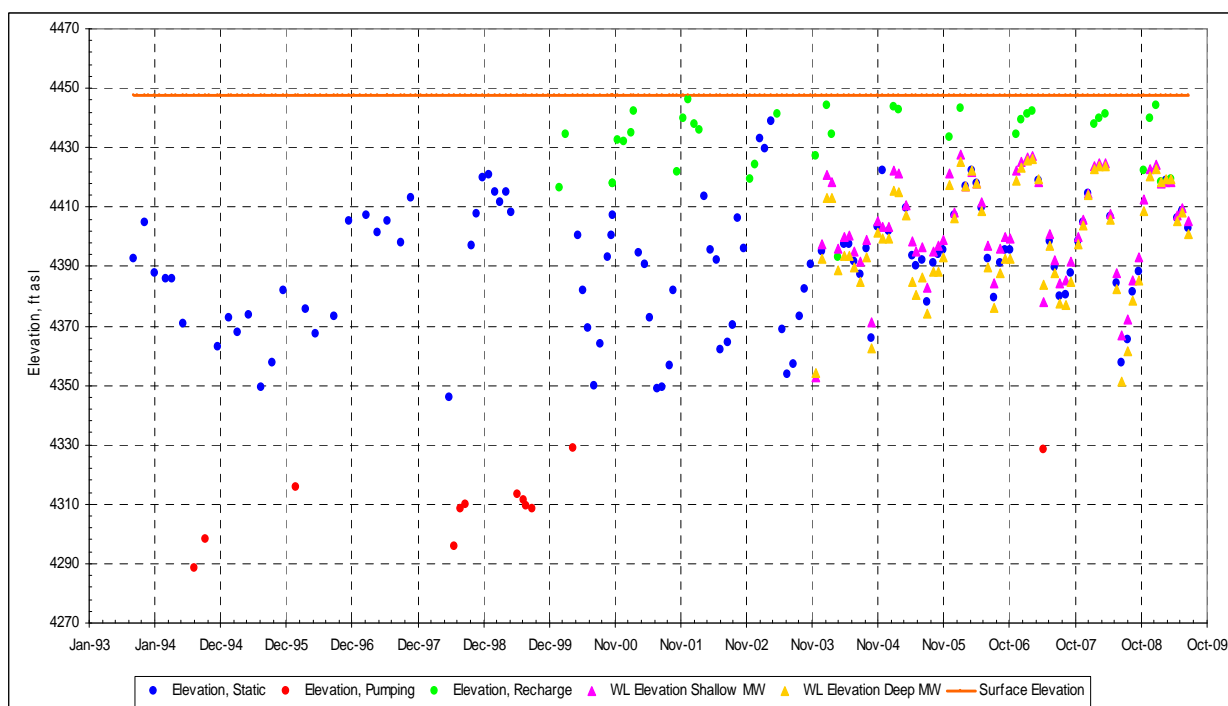


Figure 6B. El Rancho Drive Production and Monitoring Wells, Water Level Elevations

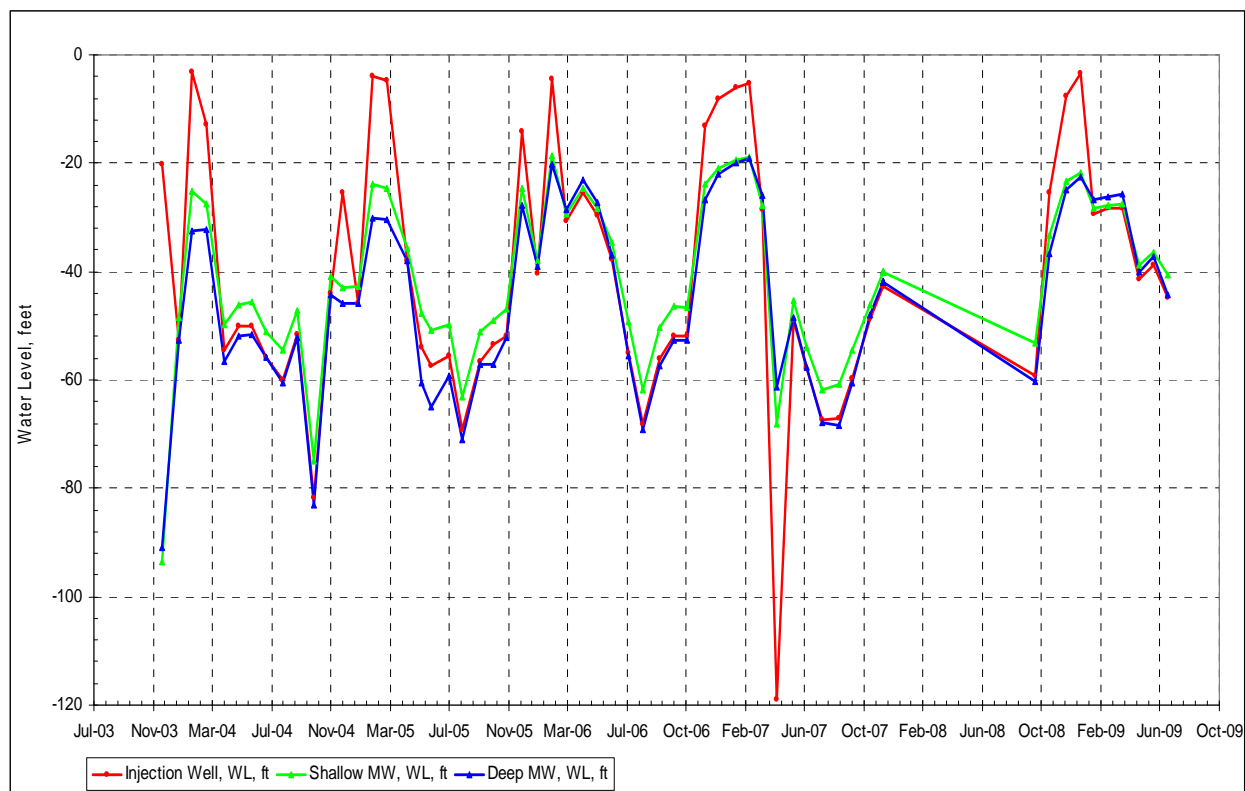


Figure 7. El Rancho Drive Injection and Monitoring Wells - Water Levels

1.4 Reno High Well

Reno High Well is located on Idlewild Drive, north and adjacent to Reno High School.

TMWA injected a total of 144 acre-feet (47 MG) of treated surface water into the groundwater aquifer at the Reno High Well during the first half of 2009 (see Tables 1 and 2A, and Figure 8A). During the same period, Reno High Well was not pumped (see Table 2B). The monthly average, highest and lowest injection rates are shown in Table 3.

Historical monthly water level readings for Reno High Well are shown in Figure 8B.

The water levels for the injection/production well as well as those for the shallow and deep monitoring wells are shown in Figure 9. It can be seen from the figure that water levels between the injection well and the monitoring wells during injection period are only 9 feet. During static conditions, water levels in the three wells are almost the same. This indicates that during injection, water forms a mound around the injection well but does not cause similar magnitude of groundwater rise in its immediate vicinity.

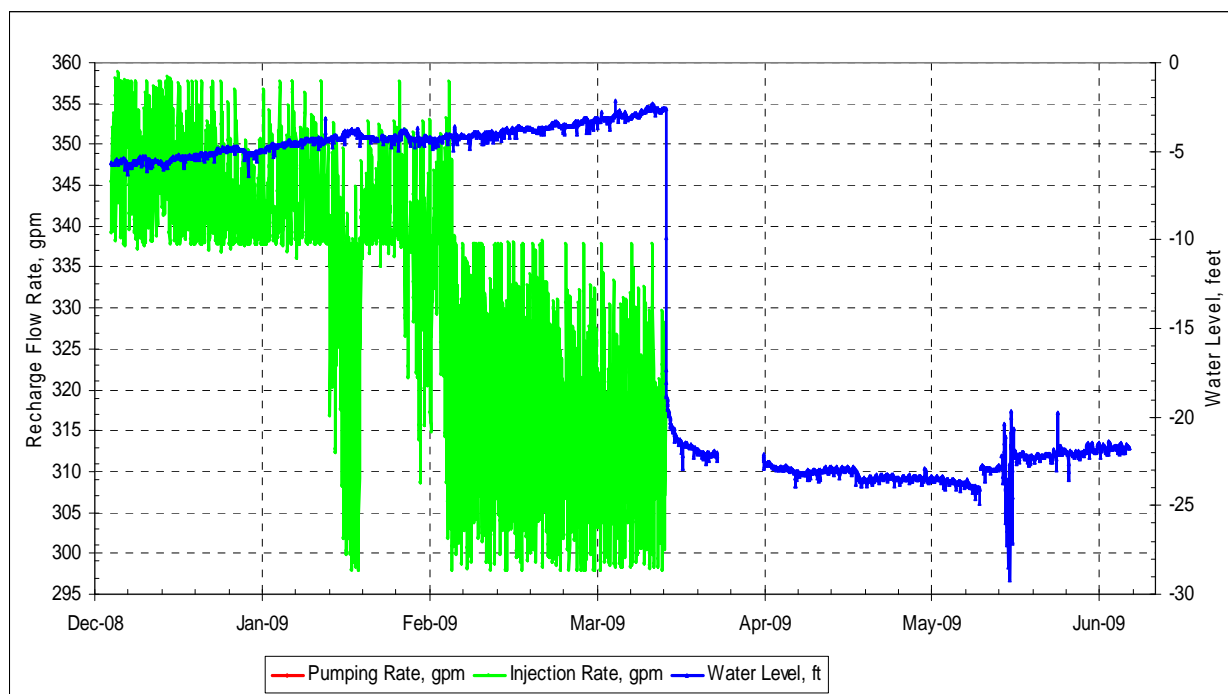


Figure 8A. Reno High Well - Mean Hourly Water Levels and Flow Rates, First Half 2009

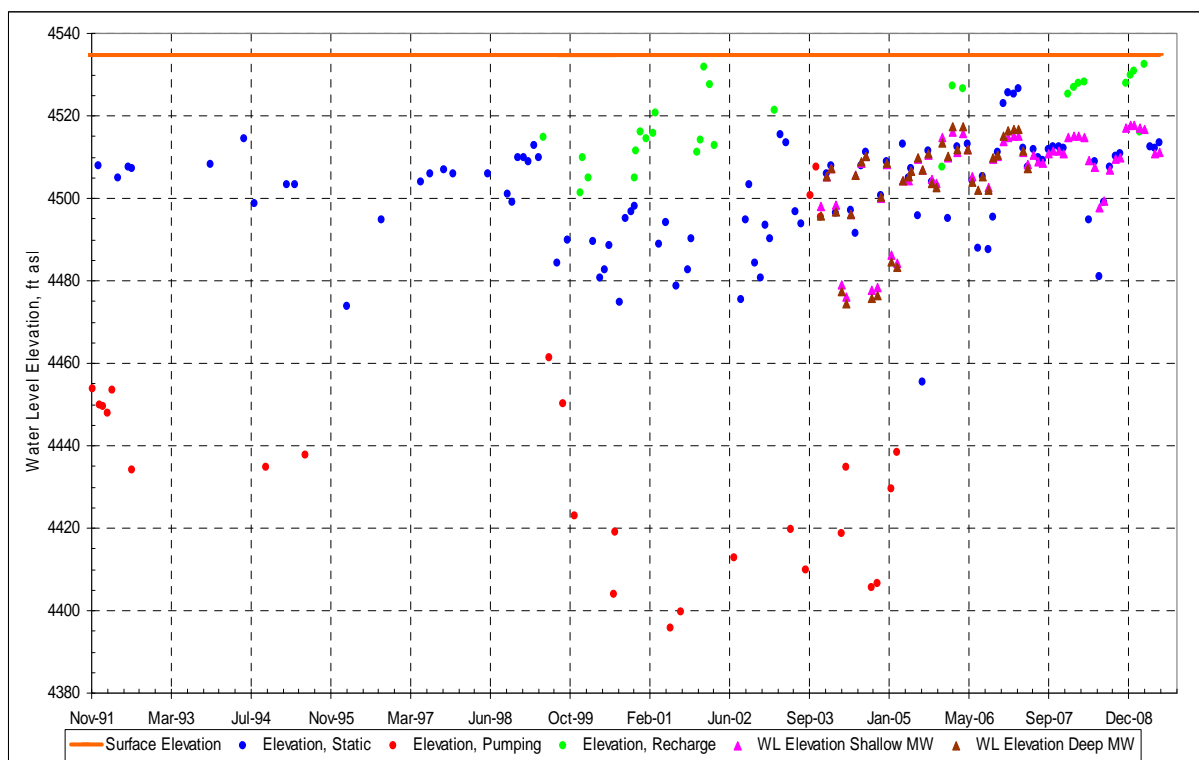


Figure 8B. Reno High Production and Monitoring Wells, Water Level Elevations

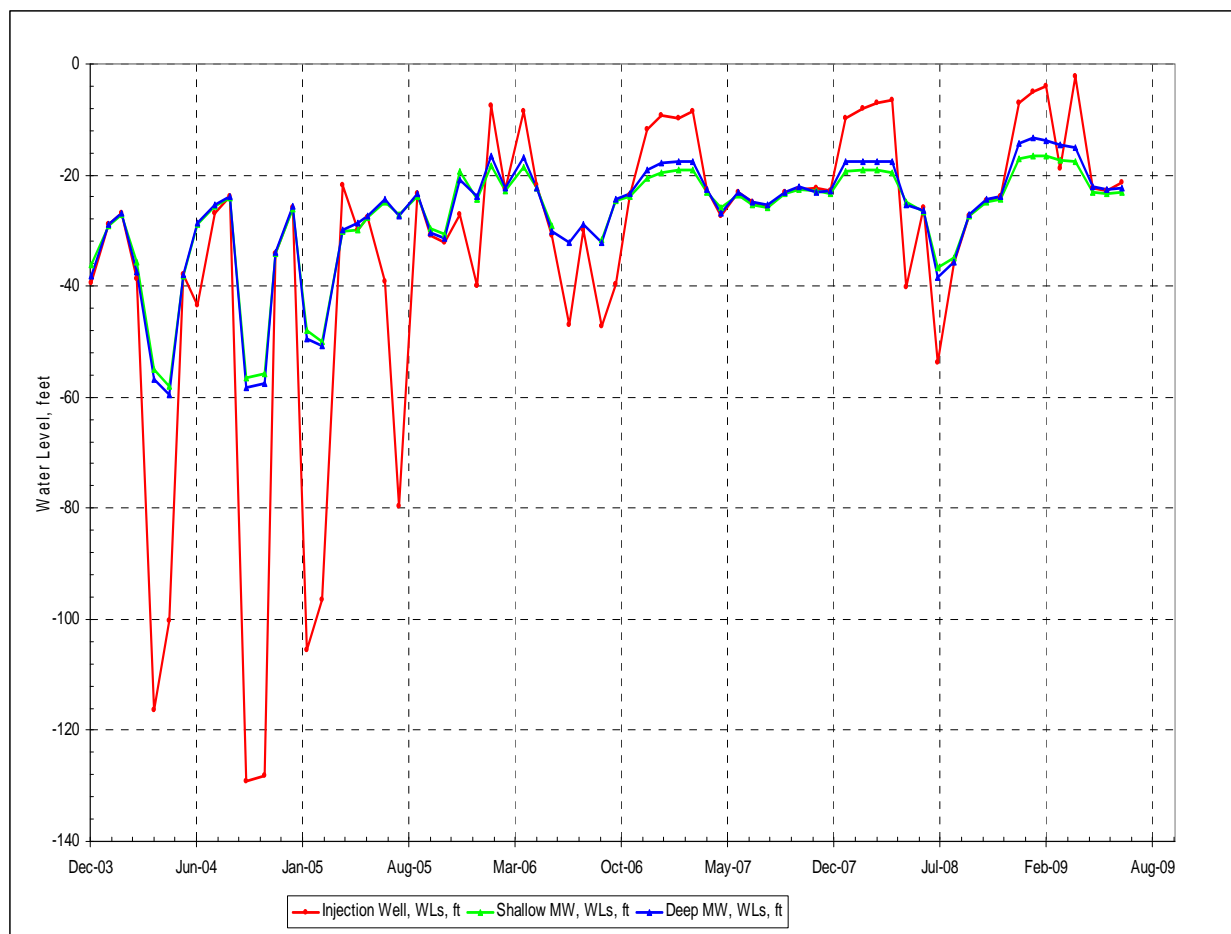


Figure 9. Reno High Injection and Monitoring Wells, Water Levels

1.5 4th Street Well

The 4th Street Well is located in the northeast quarter of northeast quarter of Section 12, Township 19N, Range 19E, in Washoe County, Nevada, at the northeast corner of East 4th Street and Threlkel Street. The 4th Street Well was one of the first wells to be recharged in 1993, but injection was discontinued because of its proximity to wells containing PCE. Recharge of the well was resumed during 2001 in cooperation with Washoe County Water Department Resources Department, which is supervising remediation of PCE near this well.

TMWA injected 107 acre-feet (35 MG) of treated surface water into the groundwater aquifer at the 4th Street Well during the first half of 2009 (see Tables 1 and 2A, and Figure 10A). During the same period, 4th Street Well was not pumped (see Table 2B). The monthly average, highest and lowest injection rates are shown in Table 3.

Figure 10A shows water levels and injection rates for 4th Street Well during the first half of 2009. Historical monthly water level readings for 4th Street well are shown in Figure 10B.

The hydrographs for the injection/production well as well as those for the shallow and deep monitoring wells are shown in Figure 11. It can be seen from the figure that water levels when the well is being injected are 16 feet higher in the injection well than in the shallow monitoring wells. During static conditions and pumping, water levels in all the wells are almost the same.

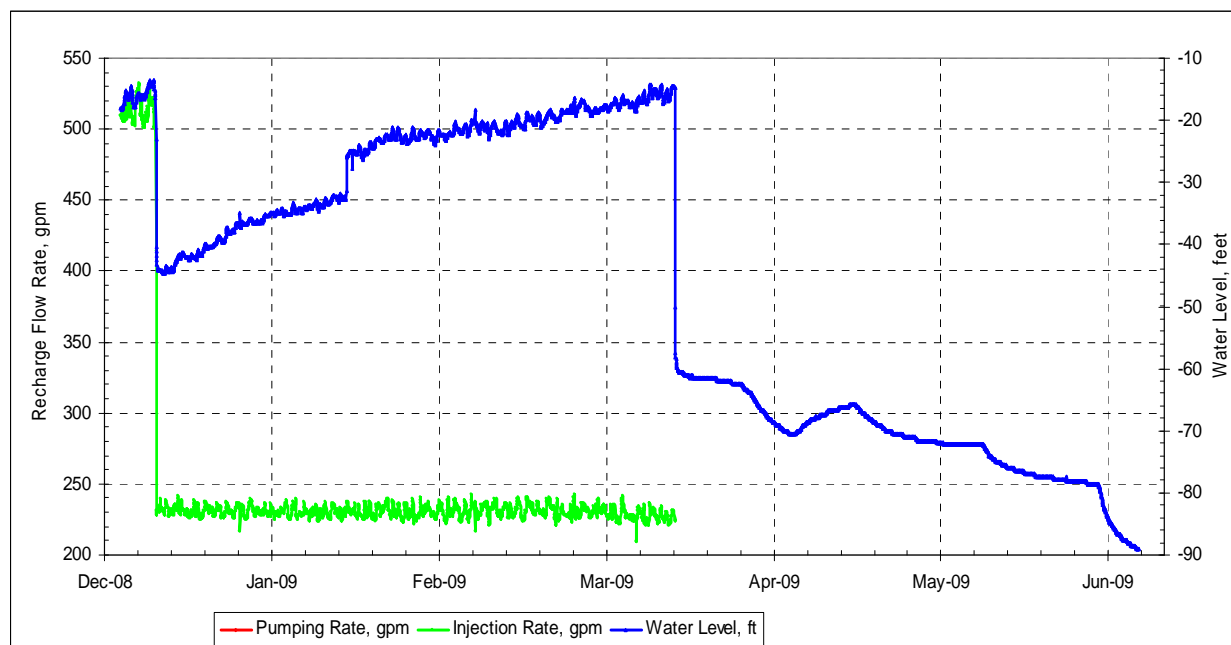


Figure 10A. 4th Street Well - Mean Hourly Water Levels and Injection Rates – 1st 2009

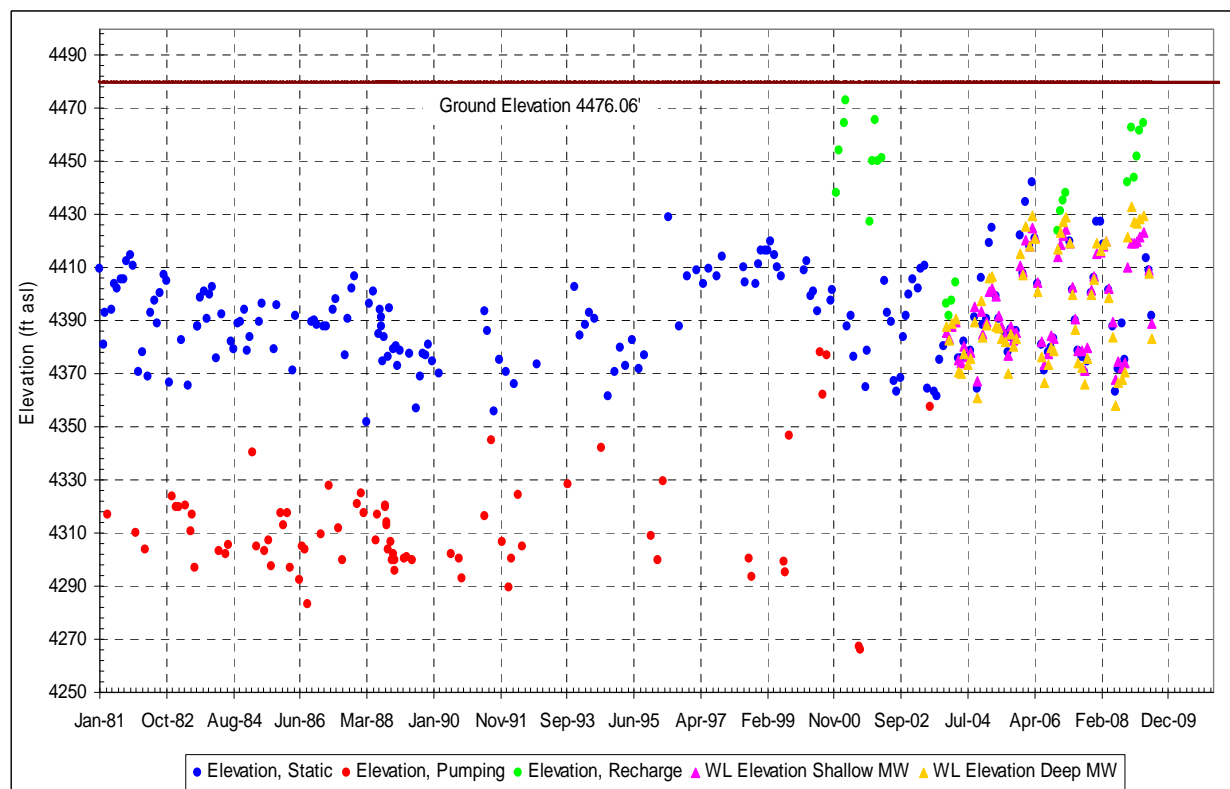


Figure 10B. 4th Street Production and Monitoring Wells, Historical Water Level Elevations

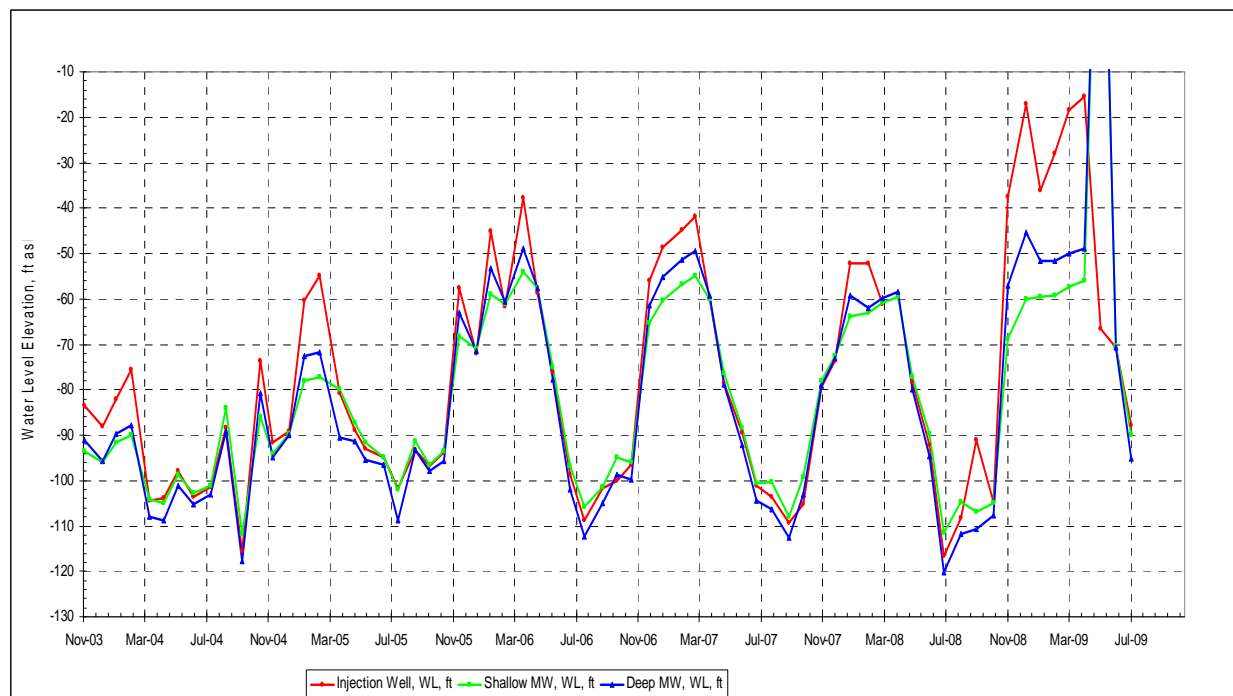


Figure 11. 4th Street Injection and Monitoring Wells, Water Levels

1.6 21st Street Well

The 21st Street Well is located in the northeast quarter of southeast quarter of Section 7, Township 19N, Range 20E, or at a point from which the east quarter corner of said Section 7 bears north 21°41'00" east, a distance of 945.0 feet, in Washoe County, Nevada.

TMWA injected a total of 84 acre-feet (27 MG) of treated surface water into the groundwater aquifer at the 21st Street Well during the first half of 2009 (see Tables 1 and 2A, and Figure 12A). During the same period, 59 acre-feet (619 MG) of water were pumped from this well (see Table 2B). The monthly average, highest and lowest injection rates are shown in Table 3.

Figure 12A shows water levels, injection and extraction rates for 21st Street Well. Historical monthly water level readings for 21st Street Well are shown in Figure 12B.

The hydrographs for the 21st Street Well and its three monitoring wells are shown in Figure 13. The old monitoring well is near the bank of Truckee River and shows seasonal variations in water levels unrelated to injection/extraction activities at 21st Street Well. The shallow monitoring well near the injection well is drilled to 60 feet and shows no water level changes due to injection and pumping in the 21st Street Well. Water levels in the deep monitoring well which is screened in the same interval as the injection well show the same variations as in the injection well. The water levels in the injection/production well are higher than the deep monitoring on by nearly 10 feet during recharge. During pumping period, the water levels in the injection/production well are 40 to 50 feet lower than in the deep monitoring well. The water levels in the two wells are similar during non-pumping or non-injection periods.

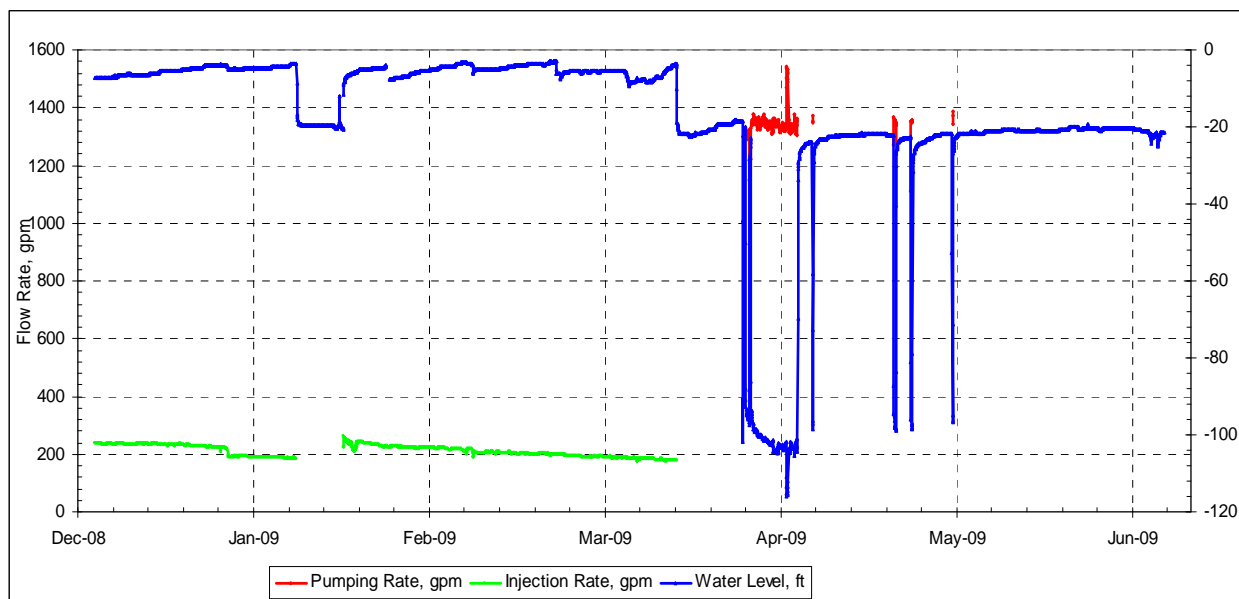


Figure 12A. 21st Street Well - Mean Hourly Water Levels and Flow Rates, First Half 2009

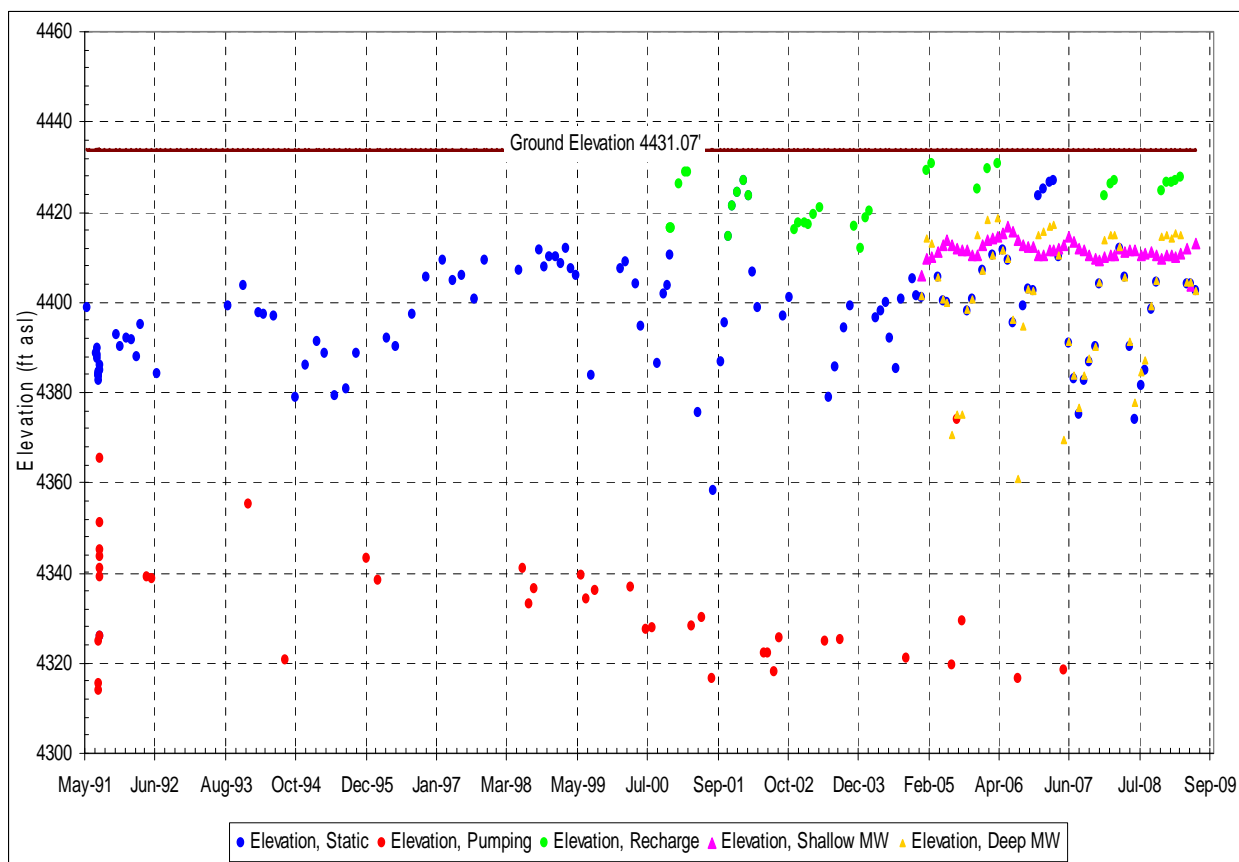


Figure 12B. 21st Street Production and Monitoring Wells, Historical Water Level Elevations

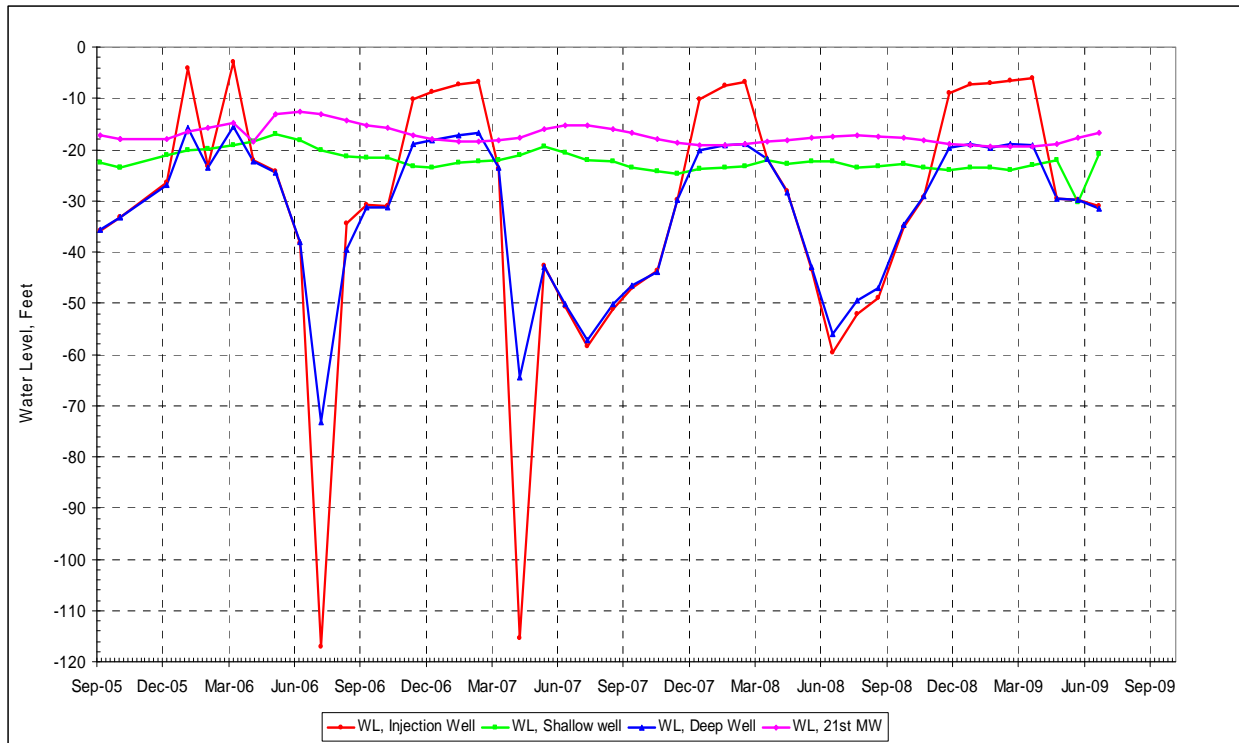


Figure 13. 21st Street Injection and Monitoring Wells, Water Levels

1.7 Galletti Way Well

Galletti Way Well is located in northwest quarter of southeast quarter of Section 7, Township 19N, Range 20E, or at a point which bears south 85 0'0" west from the east quarter corner of said Section 7, a distance of 1572.6 feet, in Washoe County.

TMWA injected a total of 138 acre-feet (45 MG) of treated surface water into the groundwater aquifer at the Galletti Way Well during the first half of 2009 (see Tables 1 and 2A, and Figure 14A). Galletti Way Well was not pumped during the first half of 2009 (Table 2B). The monthly average, highest and lowest injection rates are shown in Table 3.

Galletti Way monitoring well was used as the monitoring well for the Galletti Way production/injection well. Water level elevations for the Galletti Way injection and monitoring wells are shown in Figure 14B. In this figure, water level elevations for the injection well are divided into those during static, injection and pumping conditions. Figure 15 shows actual water levels in the two wells. The chart shows that the production/injection well's water levels are on the average 47 feet lower than the monitoring well ones during pumping. During injection, water levels in the injection well are on the average higher than those of the monitoring well by 10 feet. During non-pumping and non-injection periods, the water levels in the two wells are virtually similar. This indicates that during pumping, the cone of depression around the production well does not spread out very far but during injection, the mound spreads out to the monitoring well. This shows that the two wells are in communication and the aquifer around Galletti Way Well is permeable.

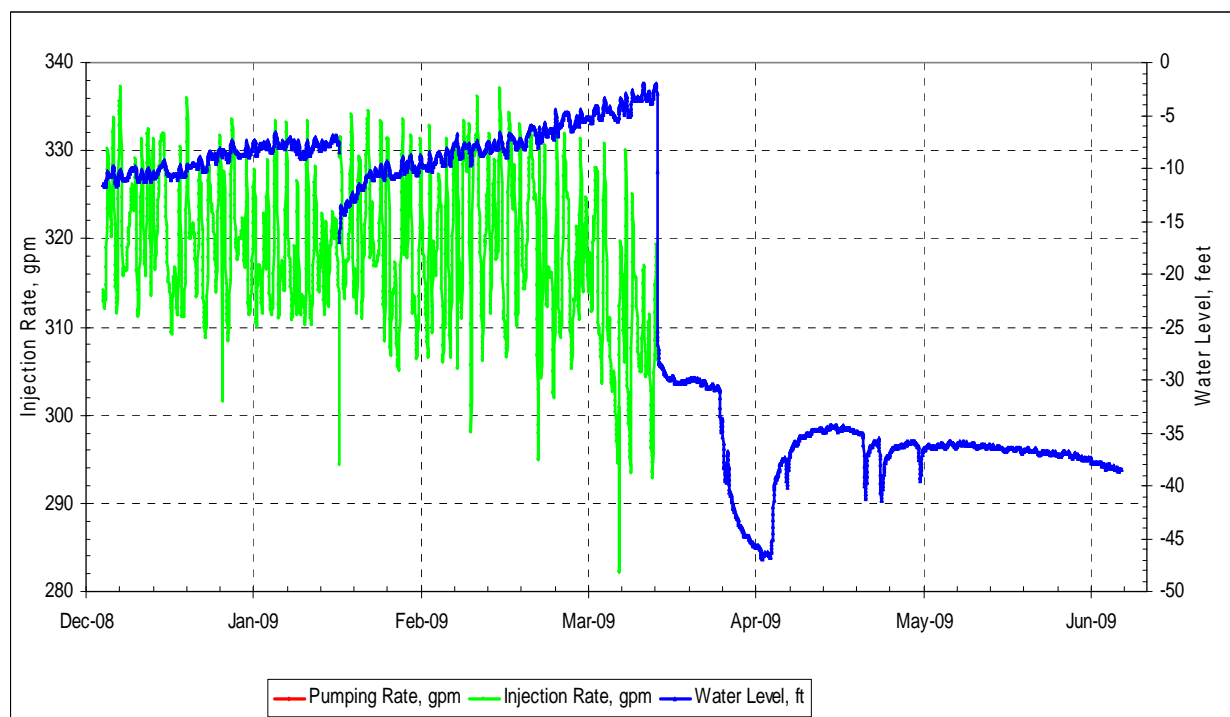


Figure 14A. Galletti Way Well - Mean Hourly Water Levels and injection Rates, 1st 2009

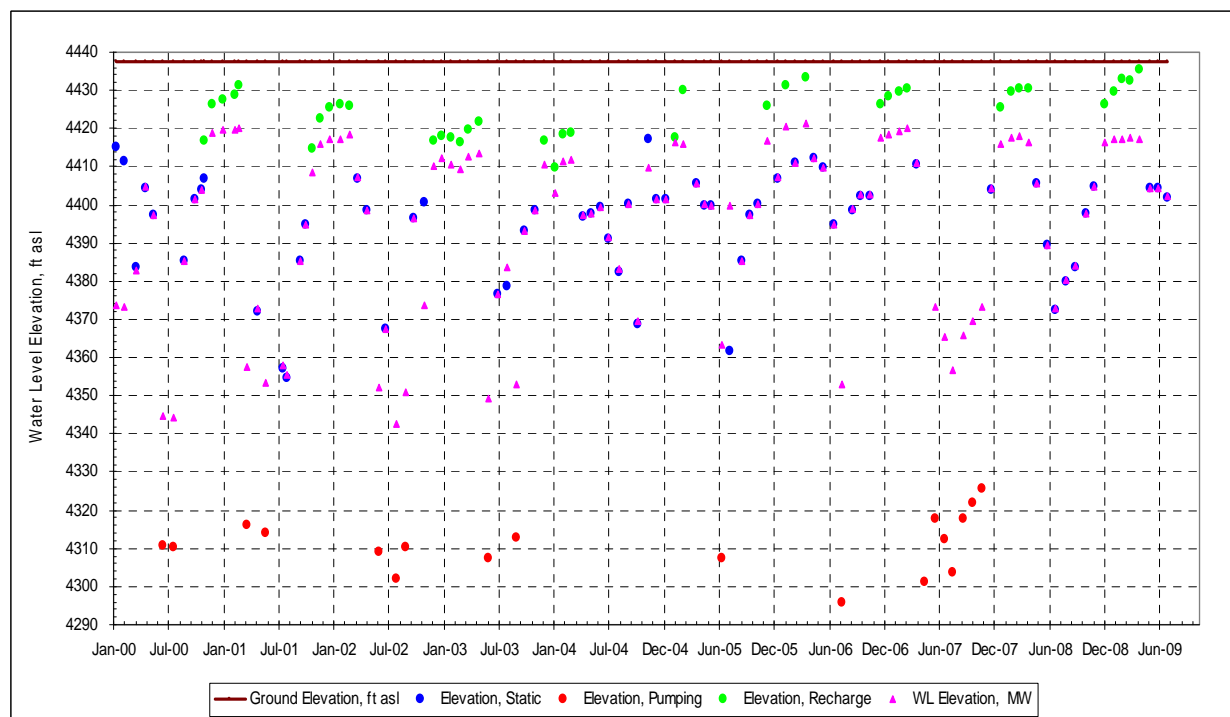


Figure 14B. Galletti Way Production and Monitoring Wells, Water Level Elevations

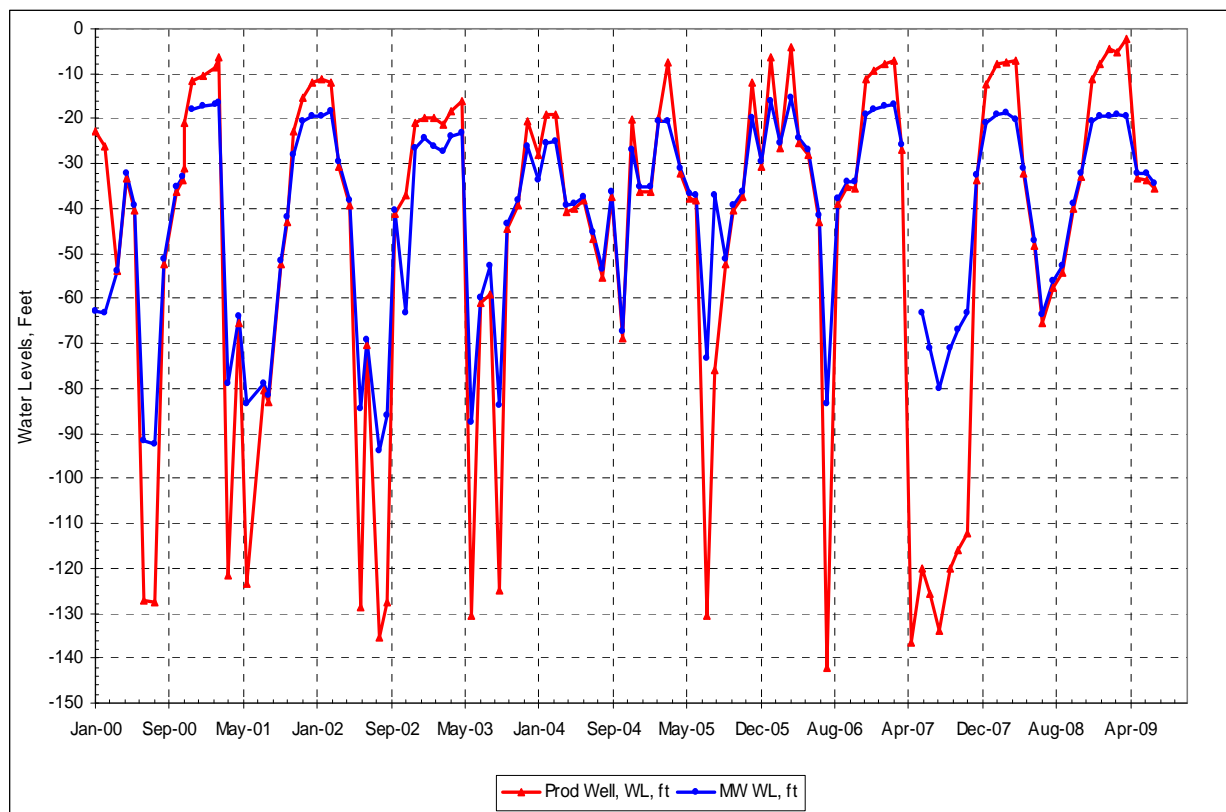


Figure 15. Galletti Way Production and Monitoring Wells, Historical Water Levels

1.8 Hunter Lake Well

The Hunter Lake Well is located on the Hunter Lake Elementary School property, in Reno, Nevada, at the southwest corner of California Avenue and Hunter Lake Drive.

TMWA injected a total of 197 acre-feet (64 MG) of treated surface water into the groundwater aquifer at the Hunter Lake Well during the first 2009 (see Tables 1 and 2A, and Figure 16A). Hunter Lake Well was pumped during the first half of 2009 (Table 2B). The monthly average, highest and lowest injection rates are shown in Table 3.

Historical water levels from monthly water level readings for Hunter Lake well and its monitoring well are shown in Figure 16b.

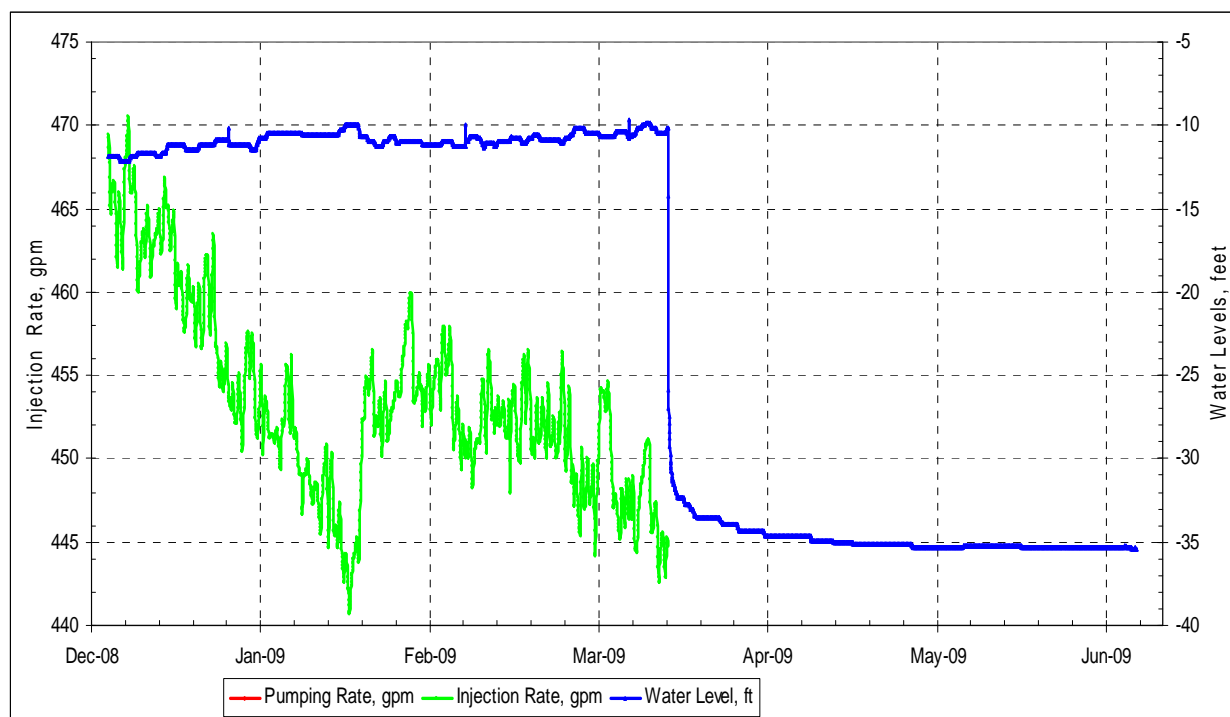


Figure 16A. Hunter Lake Well – Water Levels and Injection Rates, 1st Half 2009

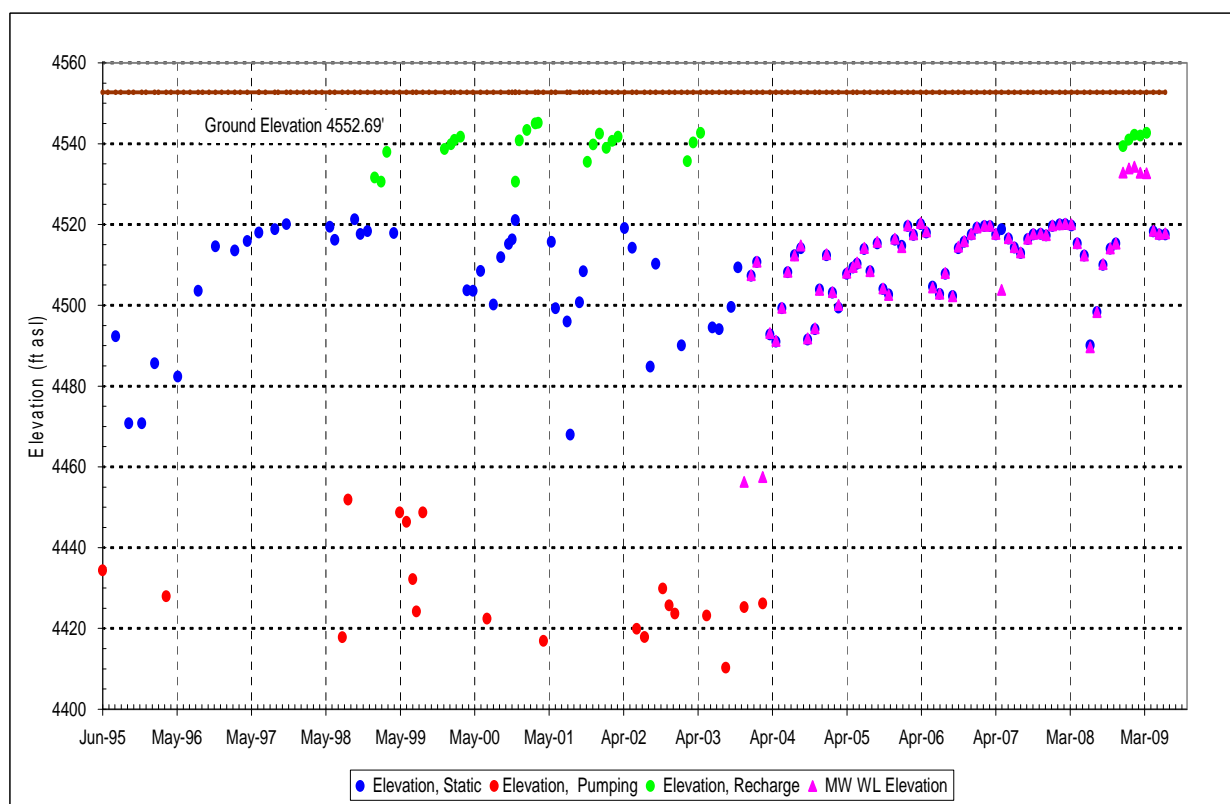


Figure 16B. Hunter Lake Injection and Monitoring Wells - Water Level Elevations`

1.9 Glen Hare Well

Glenn Hare Well is located in the NW $\frac{1}{4}$ of NE $\frac{1}{4}$ of Section 15, T.19N., R.19E., M.D.B. & M., or at a point from which the NE corner of said Section 15 bears North 20° 31' 00" East, a distance of 2502.35 feet, in Washoe County.

TMWA injected a total of 46 acre-feet (15 MG) of treated surface water into the groundwater aquifer at the Glen Hare Well during the first half of 2009 (see Tables 1 and 2A, and Figure 17A). During the same period, the well was not pumped (Table 2B). The monthly average, highest and lowest injection rates in Table 3.

Glen Hare monitoring well was used as the monitoring well for the Glen Hare production/injection well. Water level Elevations for the Glen Hare injection and monitoring wells are shown in Figure 17B while water levels for the two wells are shown in Figure 18. Water levels in the monitoring well have the same trend as the production well which indicates that the two wells are in communication.

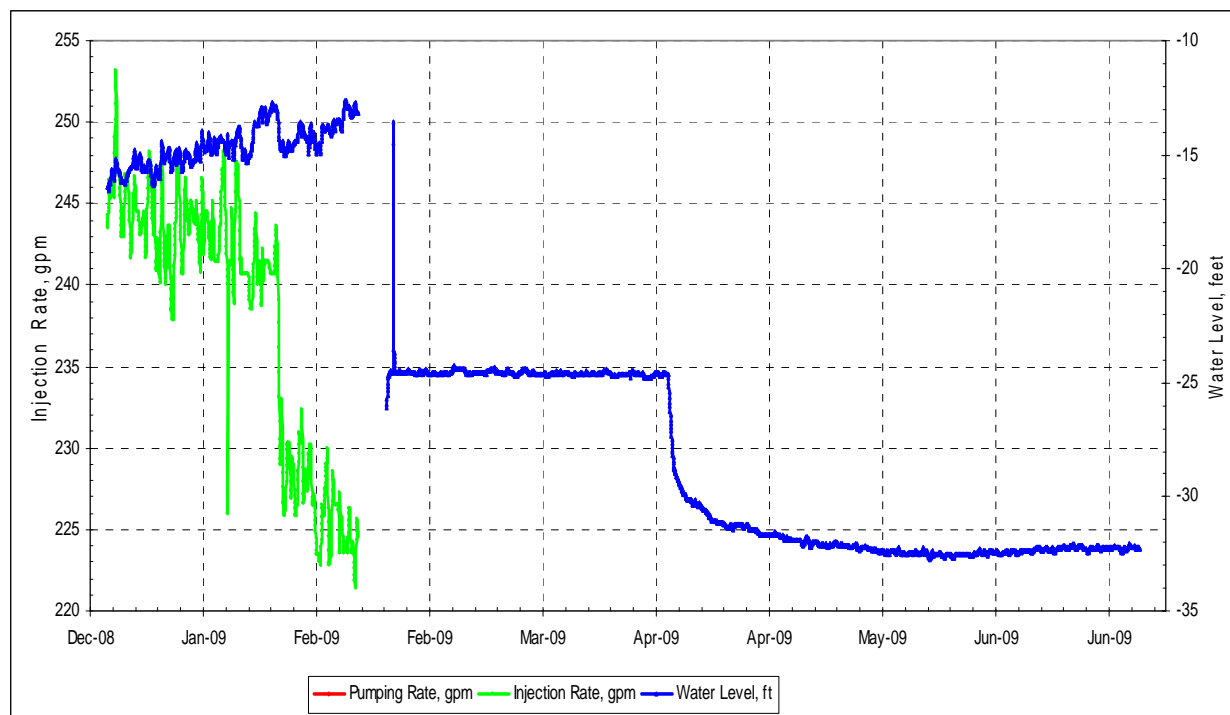


Figure 17A. Glen Hare Well – Water Levels and Injection Rates, 1st Half 2009

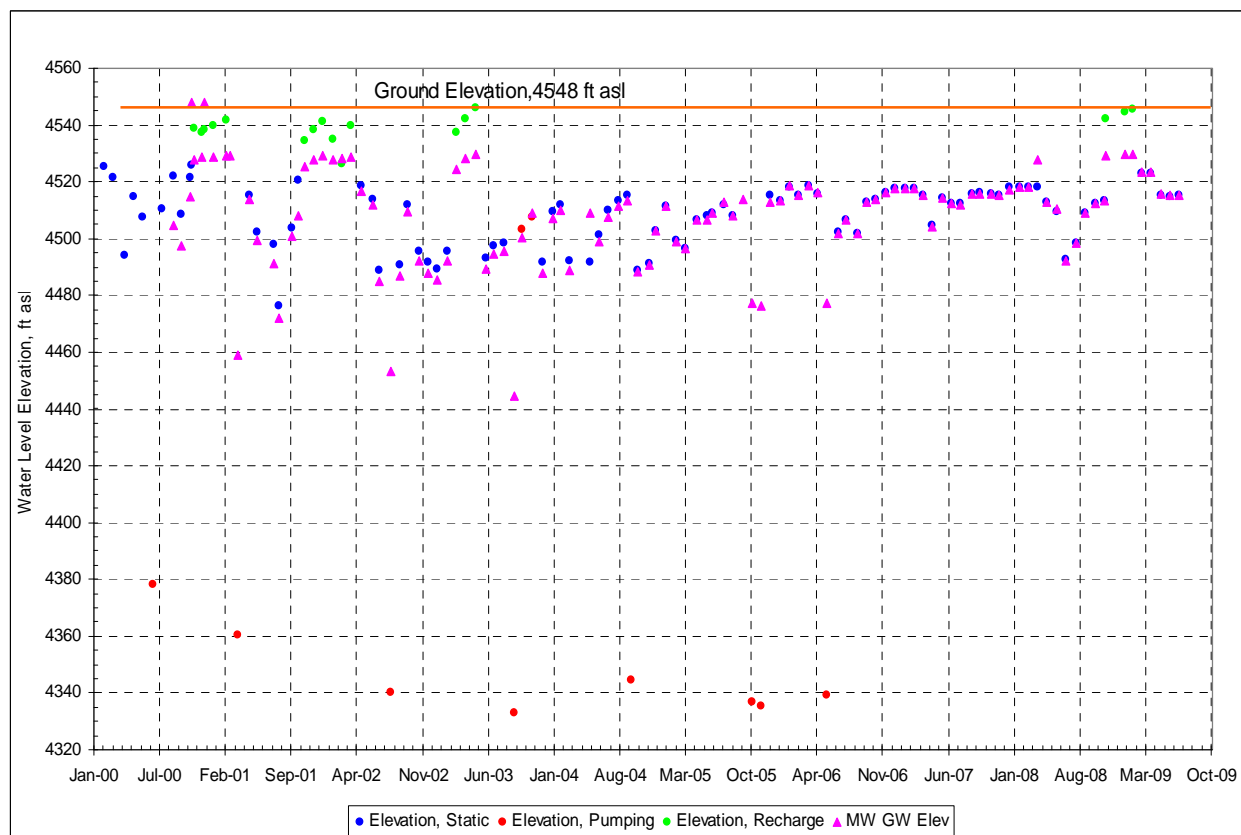


Figure 17B. Glen Hare Injection and Monitoring Wells - Water Level Elevations



Figure 18. Glen Hare Injection and Monitoring Wells - Water Levels

1.10 Holcomb Lane Well

Holcomb Lane Well is located at SE 1/4 SW 1/4 of Section 35, T.19N. R.19E, M.D.B.& M., or at a point from which the SW corner of said Section 35 bears South 68°08'20" West, a distance of 2258.30 feet, in Washoe County, Nevada.

TMWA injected a total of 27 acre-feet (9 MG) of treated surface water into the groundwater aquifer at the Holcomb Lane Well during the first half of 2009 (see Tables 1 and 2A, and Figure 19A). During the same period, the well was not pumped (Table 2B). The monthly average, highest and lowest injection rates are shown in Table 3.

Holcomb Lane monitoring well was used as the monitoring well for the Holcomb Lane production/injection well. Water level Elevations for the Holcomb Lane injection and monitoring wells are shown in Figure 19B. Water levels in the monitoring well have the same trend as the production well which indicates that the two wells are in communication.

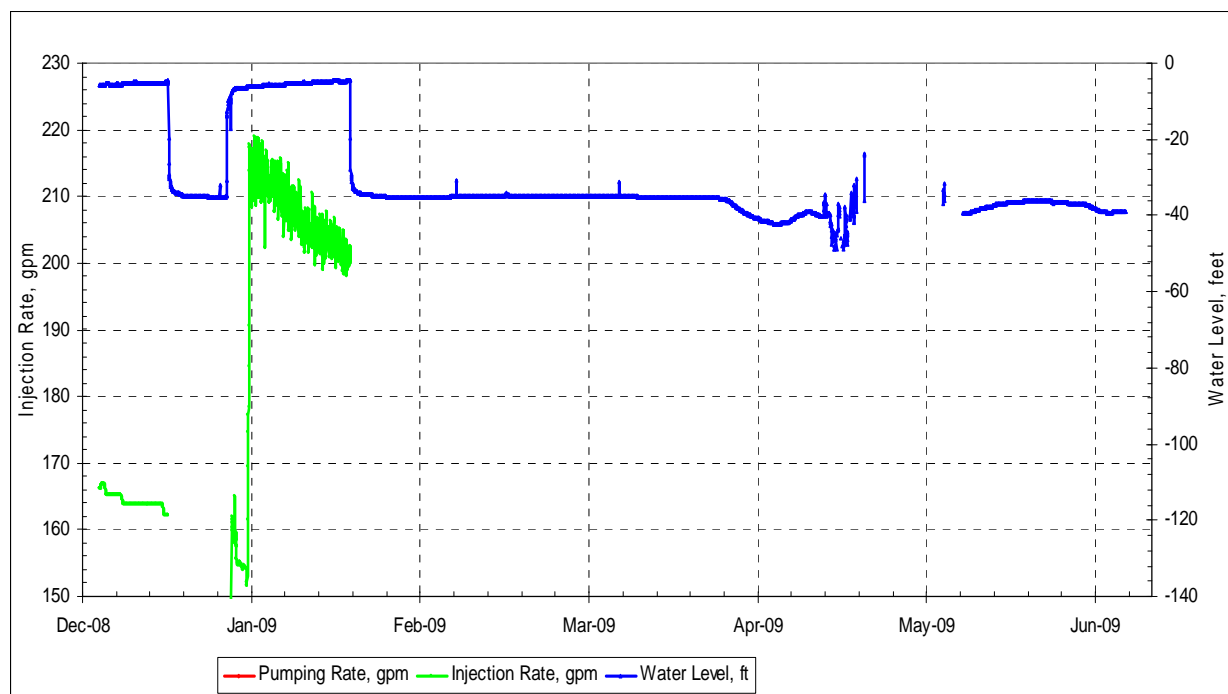


Figure 19A. Holcomb Lane Well – Water Levels and Injection Rates, 1st Half 2009

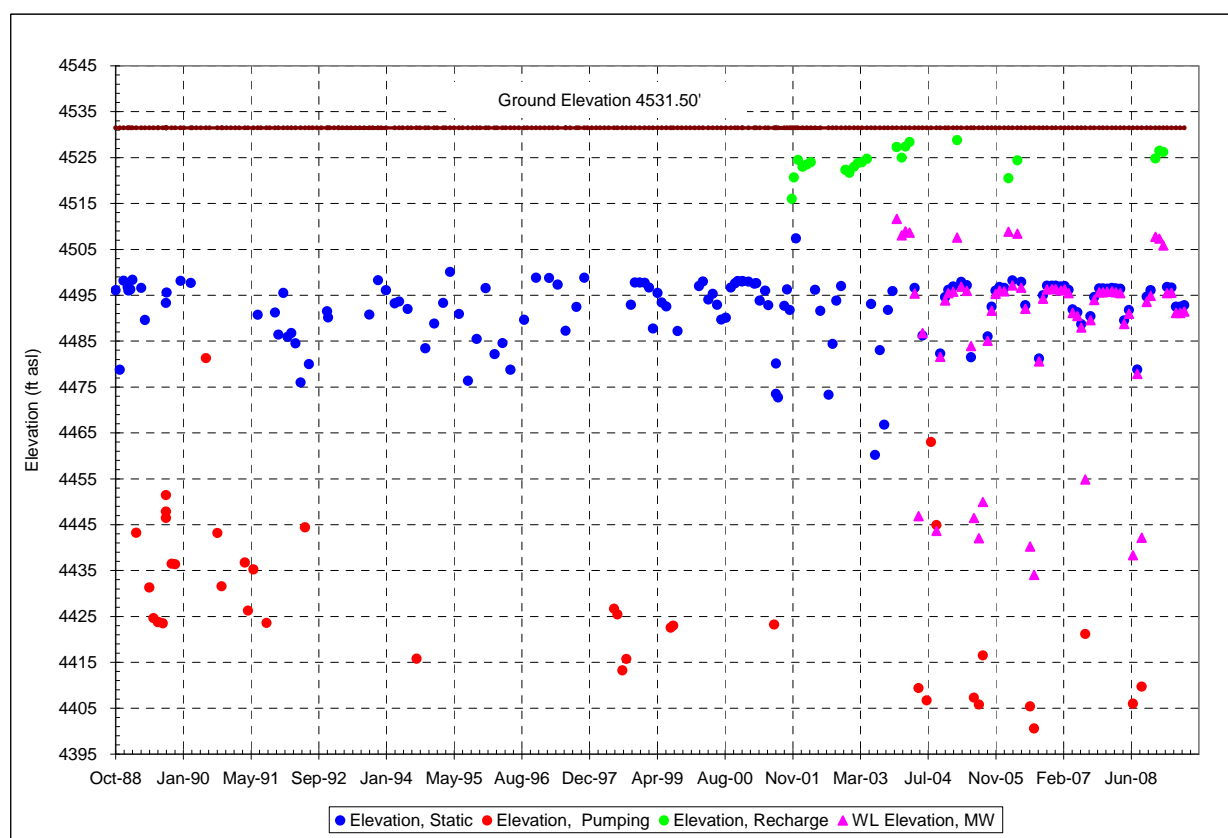


Figure 19B. Holcomb Lane Injection and Monitoring Wells - Water Level Elevations

1.11 Sparks Avenue Well

Sparks Ave Well is located in the NE $\frac{1}{4}$ NW $\frac{1}{4}$ of Section 8, T. 19N., R. 20E., M.D.B.&M., or at a point from which the North $\frac{1}{4}$ corner of said Section 8 bears North $03^{\circ} 01' 25''$ East, a distance of 549.76 feet, in Washoe County, Nevada.

Sparks Avenue well has long been equipped for recharge but never recharged because it used to overflow. Last year, TMWA personnel experimented on controlled injection rates while monitoring the water level rise and were able to maintain injection rates of 78 gpm with water levels around 10 feet below ground surface (bgs). TMWA injected a total of 11 acre-feet (4 MG) of treated surface water into the groundwater aquifer at the Sparks Avenue Well in January and February of 2009 (see Tables 1 and 2A, and Figure 20A). The well was not pumped during the first half of 2009 (Table 2B). The monthly, average highest and lowest injection rates are shown in Table 3. The historical water level elevations of the Sparks Avenue well and its monitoring wells belonging to Central Truckee Meadows Remediation District (CTMRD) are shown in Figure 20B.

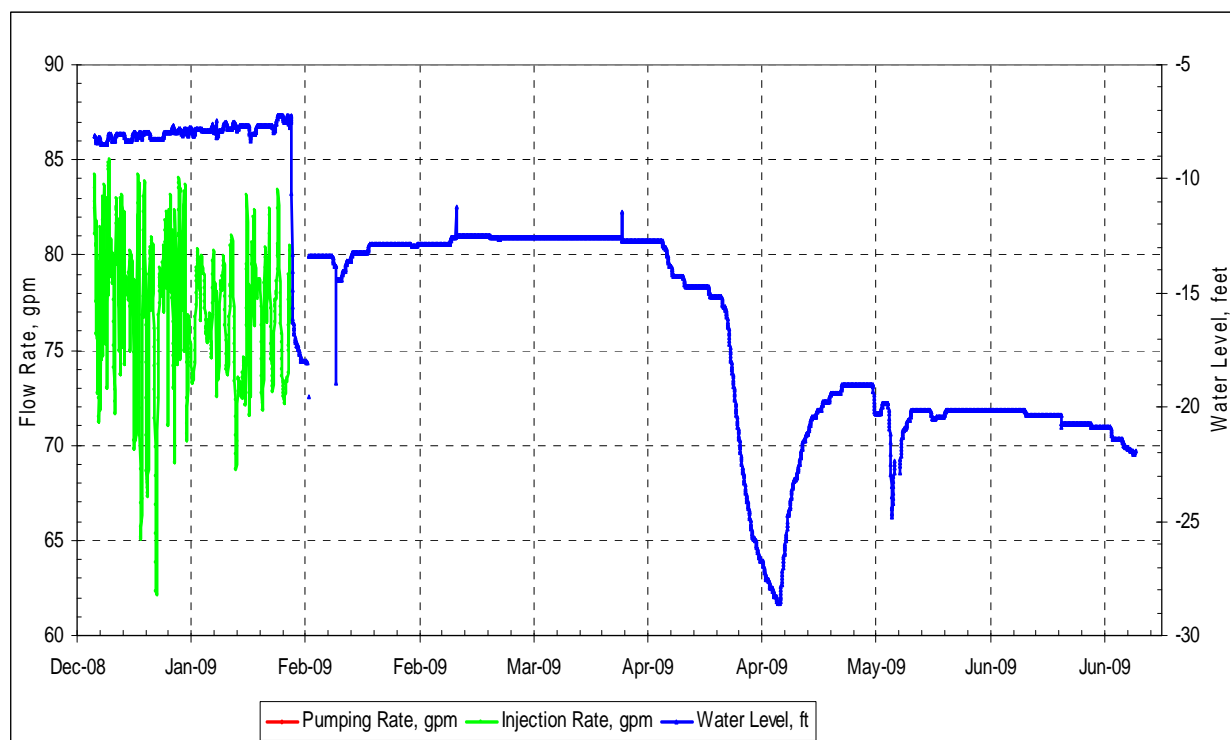


Figure 20A. Sparks Avenue Well – Water Levels and Injection Rates, 1st Half 2009

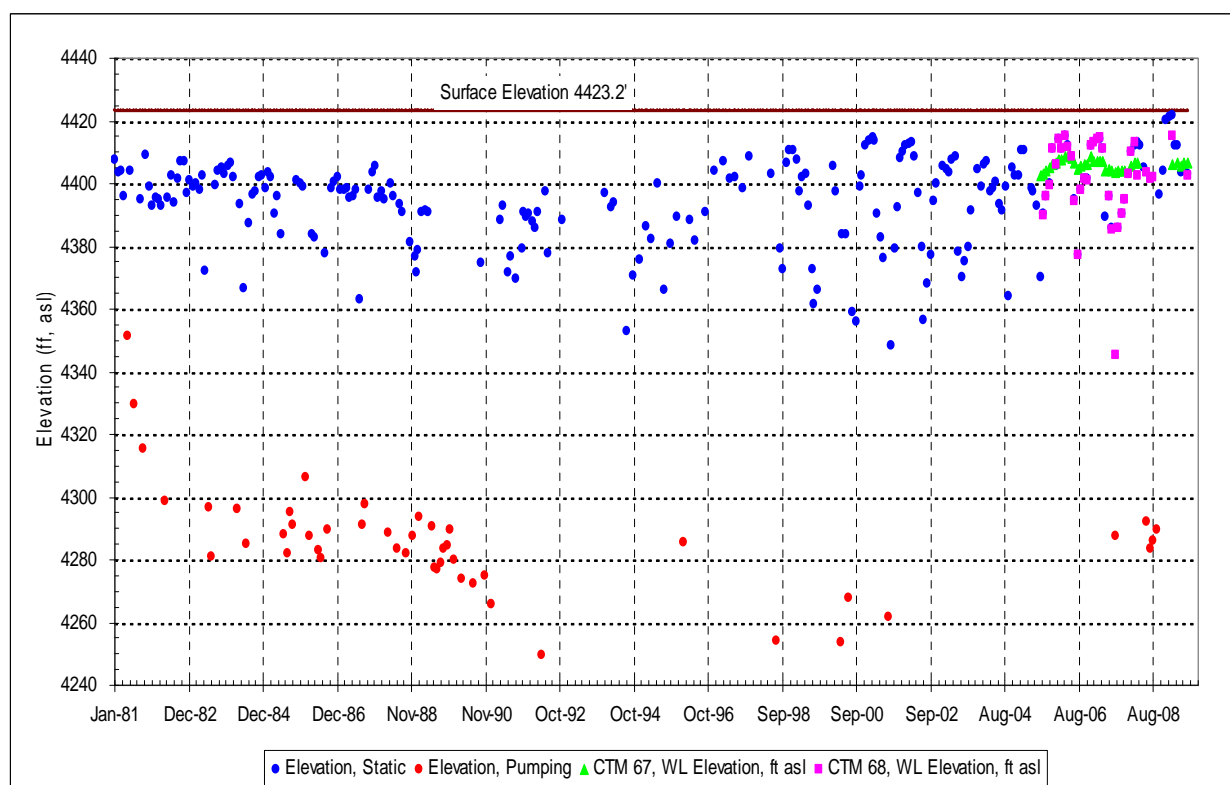


Figure 20B. Sparks Avenue Well and Monitoring Wells - Water Level Elevations

2.0 WATER QUALITY

Tables 4 through 7 show the water quality results of the injected system water for the first quarter of 2008 at the injection well for each of the four zones (see Figure 1 for zone locations).

Tables 8 through 11 show the extracted water quality results from the injection wells for three of the four sampling zones for the second quarter of 2009. Wells in Zone 1 (Glen Hare, Hunter Lake, Reno High and Swope School) were not pumped during the second quarter of 2009.

The chemistry of the extracted water meets the Nevada State Drinking Water Standards and does not show any adverse effects to the aquifer water quality from recharge activities. In addition to improving the water quantity of the basin, the chemistry results are a secondary yet positive benefit of TMWA's ASR program to the Truckee Meadows basin aquifer.

Tables 12 and 13 show Disinfection By-Products (DBPs) concentrations in the system water during the first and second quarters of 2009. As indicated at the bottom of Tables 12 and 13 the system water running annual average concentration for TTHM is 27.2 µg/L and for HAA5 is 18.2 µg/L. These values are below the 100 µg/L and 60 µg/L Maximum Contaminant Limit (MCL) for TTHM and HAA5, respectively

Total Coliform reports from representative sampling points of the distribution system within each Zone for the first half of 2009 are given in Tables 14. All values are within drinking water levels and Total Coliforms are absent at all the sampling points. Residual chlorine from all the system water sampling points varies between 0.6 and 0.9 mg/L. The system water meets the required drinking water standards.

Table 4. Zone 1: Injected Water Chemistry, Hunter Lake Well, First Quarter 2009

Constituent	Symbol	Result (ppm)*	Date Sampled	Time Sampled	Date Analyzed	Method Number	Reporting Limit (ppm)	Analyst	Drinking Water Standard (mg/L)
Alkalinity	mg/L as CaCO ₃	48	3/24/09	1225	3/25/09	2320B	1	DA	--
Aluminum	Al	0.032	3/24/09	1225	4/24/09	200.8	0.01	MNS	0.05 – 0.2 (Advisory Standard)
Antimony	Sb	<0.001	3/24/09	1225	4/24/09	200.8	0.001	MNS	0.006
Arsenic	As	0.00087	3/24/09	1225	3/25/09	200.8	0.0001	MNS	0.01
Barium	Ba	0.022	3/24/09	1225	4/24/09	200.8	0.001	MNS	2
Calcium	Ca	12.0	3/24/09	1225	3/25/09	3500-Ca-D	0.5	DA	--
Chloride	Cl	10.7	3/24/09	1225	3/25/09	300.0	2.0	Wetlab	400
Chromium	Cr	<0.001	3/24/09	1225	4/24/09	200.8	0.001	MNS	0.1
Color	Color units	<2	3/24/09	1225	3/25/09	2120B	2	DA	15
Copper	Cu	<0.005	3/24/09	1225	4/24/09	200.8	0.005	MNS	1.3
Dissolved Oxygen	DO	10.41	3/24/09	1225	3/24/09	360.1	0.1	Wetlab	--
Electrical Conductivity	µS/cm	158	3/24/09	1225	3/25/09	2510B	N/A	DA	--
Fluoride	F	<0.2	3/24/09	1225	3/25/09	300.0	0.20	Wetlab	4
Hardness	mg/L as CaCO ₃	47	3/24/09	1225	3/25/09	2340C	1	DA	--
Iron	Fe	<0.010	3/24/09	1225	4/6/09	200.7	0.010	Wetlab	0.6
Lead	Pb	<0.001	3/24/09	1225	4/24/09	200.8	0.001	MNS	0.015
Magnesium	Mg	4.1	3/24/09	1225	3/25/09	200.7	0.50	Wetlab	150
Manganese	Mn	0.0042	3/24/09	1225	3/25/09	200.8	0.001	MNS	0.1
Mercury	Hg	<0.0005	3/24/09	1225	4/23/09	200.8	0.0005	MNS	0.002
Nickel	Ni	<0.001	3/24/09	1225	4/24/09	200.8	0.001	MNS	0.1
Nitrate as Nitrogen	NO ₃ -N	<0.3	3/24/09	1225	3/25/09	300.0	0.3	Wetlab	10
Nitrite as Nitrogen	NO ₂ -N	<0.2	3/24/09	1225	3/25/09	300.0	0.2	Wetlab	1
pH	Value	7.92	3/24/09	1225	3/24/09	4500-H-B	4	WR	6.5 - 8.5
Potassium	K	1.2	3/24/09	1225	4/6/09	200.7	0.50	Wetlab	--
Total Dissolved Solids ¹	TDS	102	3/24/09	1225	3/25/09	2540C	5	DA	1000
Sodium	Na	13	3/24/09	1225	4/6/09	200.7	0.50	Wetlab	--
Sulfate	SO ₄	10.4	3/24/09	1225	3/25/09	300.0	4	Wetlab	500
Total Suspended Solids	TSS	<5	3/24/09	1225	3/25/09	160.2	5	DA	--
Temperature	°C	8.1	3/24/09	1225	3/24/09	2550B	N/A	WR	--
Zinc	Zn	<0.005	3/24/09	1225	4/24/09	200.8	0.005	MNS	5

¹ TDS value may be calculated from electrical conductivity values.

* Color reported in standard color units, pH reported in standard pH units, conductivity reported in microsiemens per centimeter, temperature reported in degrees celsius

ND = None Detected

NOTE: Zone 1 includes Glen Hare, Hunter Lake, Reno High School and Swope Middle School Wells.

Table 5. Zone 2: Injected Water Chemistry, View Street Well, First Quarter 2009

Constituent	Symbol	Result (ppm)*	Date Sampled	Time Sampled	Date Analyzed	Method Number	Reporting Limit (ppm)	Analyst	Drinking Water Standard (mg/L)
Alkalinity	mg/L as CaCO ₃	48	3/24/09	1300	3/25/09	2320B	1	DA	--
Aluminum	Al	0.016	3/24/09	1300	4/24/09	200.8	0.01	MNS	0.05 – 0.2 (Advisory Standard)
Antimony	Sb	<0.001	3/24/09	1300	4/24/09	200.8	0.001	MNS	0.006
Arsenic	As	0.00080	3/24/09	1300	3/25/09	200.8	0.0001	MNS	0.01
Barium	Ba	0.021	3/24/09	1300	4/24/09	200.8	0.001	MNS	2
Calcium	Ca	12.0	3/24/09	1300	3/25/09	3500-Ca-D	0.5	DA	--
Chloride	Cl	11.1	3/24/09	1300	3/25/09	300.0	2	MNS	400
Chromium	Cr	<0.001	3/24/09	1300	4/24/09	200.8	0.001	MNS	0.1
Color	Color units	<2	3/24/09	1300	3/25/09	2120B	2	DA	15
Copper	Cu	<0.005	3/24/09	1300	4/24/09	200.8	0.005	MNS	1.3
Dissolved Oxygen	DO	10.23	3/24/09	1300	3/4/09	360.1	0.1	Wetlab	--
Electrical Conductivity	µS/cm	160	3/24/09	1300	3/25/09	2510B	N/A	DA	--
Fluoride	F	<0.2	3/24/09	1300	3/25/09	300.0	0.2	MNS	4
Hardness	mg/L as CaCO ₃	49.0	3/24/09	1300	3/25/09	2340C	1	DA	--
Iron	Fe	<0.010	3/24/09	1300	4/6/09	200.7	0.010	Wetlab	0.6
Lead	Pb	<0.001	3/24/09	1300	4/24/09	200.8	0.001	MNS	0.015
Magnesium	Mg	4.6	3/24/09	1300	3/25/09	200.7	0.50	Wetlab	150
Manganese	Mn	0.0025	3/24/09	1300	3/25/09	200.8	0.001	MNS	0.1
Mercury	Hg	<0.0005	3/24/09	1300	4/23/09	200.8	0.0005	MNS	0.002
Nickel	Ni	<0.001	3/24/09	1300	4/24/09	200.8	0.001	MNS	0.1
Nitrate as Nitrogen	NO ₃ -N	<.3	3/24/09	1300	3/25/09	300.0	0.3	MNS	10
Nitrite as Nitrogen	NO ₂ -N	<.2	3/24/09	1300	3/25/09	300.0	0.2	MNS	1
pH	Value	7.99	3/24/09	1300	3/24/09	4500-H-B	4	WR	6.5 - 8.5
Potassium	K	1.3	3/24/09	1300	4/6/09	200.7	0.50	Wetlab	--
Total Dissolved Solids ¹	TDS	104	3/24/09	1300	3/25/09	2540C	5	DA	1000
Sodium	Na	13	3/24/09	1300	4/6/09	200.7	0.50	Wetlab	--
Sulfate	SO ₄	10.4	3/24/09	1300	3/25/09	300.0	4	MNS	500
Total Suspended Solids	TSS	<5	3/24/09	1300	3/25/09	160.2	1	DA	--
Temperature	°C	8.6	3/24/09	1300	3/24/09	2550B	N/A	WR	--
Zinc	Zn	<0.005	3/24/09	1300	4/24/09	200.8	0.005	MNS	5

¹ TDS value may be calculated from electrical conductivity values.

* Color reported in standard color units, pH reported in standard pH units, conductivity reported in microsiemens per centimeter, temperature reported in degrees celsius

ND = None Detected

NOTE: Zone 2 includes Fourth Street, El Rancho Drive and View Street Wells.

Table 6. Zone 3: Injected Water Chemistry , Galletti Way Well, First Quarter 2009

Constituent	Symbol	Result (ppm)*	Date Sampled	Time Sampled	Date Analyzed	Method Number	Reporting Limit (ppm)	Analyst	Drinking Water Standard (mg/L)
Alkalinity	mg/L as CaCO ₃	51	3/18/09	1440	3/25/09	2320B	1	DA	--
Aluminum	Al	0.037	3/18/09	1440	3/19/09	200.8	0.01	MNS	0.05 – 0.2 (Advisory Standard)
Antimony	Sb	<0.001	3/18/09	1440	3/19/09	200.8	0.001	MNS	0.006
Arsenic	As	0.00086	3/18/09	1440	3/19/09	200.8	0.0001	MNS	0.01
Barium	Ba	0.022	3/18/09	1440	3/19/09	200.8	0.001	MNS	2
Calcium	Ca	12.8	3/18/09	1440	3/25/09	3500-Ca-D	0.5	DA	--
Chloride	Cl	11.8	3/18/09	1440	3/19/09	300.0	1.0	Wetlab	400
Chromium	Cr	0.0026	3/18/09	1440	3/19/09	200.8	0.001	MNS	0.1
Color	Color units	<2	3/18/09	1440	3/18/09	2120B	2	WR	15
Copper	Cu	<0.005	3/18/09	1440	3/19/09	200.8	0.005	MNS	1.3
Dissolved Oxygen	DO	10.22	3/18/09	1440	3/18/09	360.1	0.1	Wetlab	--
Electrical Conductivity	µS/cm	168	3/18/09	1440	3/25/09	2510B	N/A	DA	--
Fluoride	F	<0.2	3/18/09	1440	3/19/09	300.0	0.20	MNS	4
Hardness	mg/L as CaCO ₃	49	3/18/09	1440	3/25/09	2340C	1	DA	--
Iron	Fe	<0.010	3/18/09	1440	3/31/09	200.7	0.010	Wetlab	0.6
Lead	Pb	<0.001	3/18/09	1440	3/19/09	200.8	0.001	MNS	0.015
Magnesium	Mg	4.1	3/18/09	1440	3/25/09	200.7	0.50	Wetlab	150
Manganese	Mn	0.0020	3/18/09	1440	3/19/09	200.8	0.001	MNS	0.1
Mercury	Hg	<0.0005	3/18/09	1440	4/23/09	200.8	0.0005	MNS	0.002
Nickel	Ni	<0.001	3/18/09	1440	3/19/09	200.8	0.001	MNS	0.1
Nitrate as Nitrogen	NO ₃ -N	<0.3	3/18/09	1440	3/19/09	300.0	0.3	MNS	10
Nitrite as Nitrogen	NO ₂ -N	<0.2	3/18/09	1440	3/19/09	300.0	0.200	MNS	1
pH	Value	8.34	3/18/09	1440	3/18/09	4500-H-B	4	WR	6.5 - 8.5
Potassium	K	1.7	3/18/09	1440	3/31/09	200.7	0.50	Wetlab	--
Total Dissolved Solids ¹	TDS	109	3/18/09	1440	3/25/09	2540C	5	DA	1000
Sodium	Na	15	3/18/09	1440	3/31/09	200.7	0.50	Wetlab	--
Sulfate	SO ₄	11.1	3/18/09	1440	3/19/09	300.0	4	MNS	500
Total Suspended Solids	TSS	<5	3/18/09	1440	3/25/09	160.2	5	DA	--
Temperature	°C	10.3	3/18/09	1440	3/18/09	2550B	N/A	WR	--
Zinc	Zn	<0.005	3/18/09	1440	3/19/09	200.8	0.005	MNS	5

¹ TDS value may be calculated from electrical conductivity values.

* Color reported in standard color units, pH reported in standard pH units, conductivity reported in microsiemens per centimeter, temperature reported in degrees celsius

ND = None Detected

NOTE: Zone 3 includes 21st Street, Galletti Way, Greg Street, Poplar 1, Poplar #2, Sparks Avenue and Terminal Way Wells.

Table 7. Zone 4: Injected Water Chemistry, Lakeside Well, First Quarter 2009

Constituent	Symbol	Result (ppm)*	Date Sampled	Time Sampled	Date Analyzed	Method Number	Reporting Limit (ppm)	Analyst	Drinking Water Standard (mg/L)
Alkalinity	mg/L as CaCO ₃	49	3/24/09	1145	3/25/09	2320B	1	DA	--
Aluminum	Al	0.033	3/24/09	1145	4/24/09	200.8	0.01	MNS	0.05 – 0.2 (Advisory Standard)
Antimony	Sb	<0.001	3/24/09	1145	4/24/09	200.8	0.001	MNS	0.006
Arsenic	As	0.0017	3/24/09	1145	3/25/09	200.8	0.0001	MNS	0.01
Barium	Ba	0.024	3/24/09	1145	4/24/09	200.8	0.001	MNS	2
Calcium	Ca	12.0	3/24/09	1145	3/25/09	3500-Ca-D	0.5	DA	--
Chloride	Cl	11.0	3/24/09	1145	3/25/09	300.0	2	MNS	400
Chromium	Cr	<0.001	3/24/09	1145	4/24/09	200.8	0.001	MNS	0.1
Color	Color units	<2	3/24/09	1145	3/25/09	2120B	2	WR	15
Copper	Cu	<0.005	3/24/09	1145	4/24/09	200.8	0.005	MNS	1.3
Dissolved Oxygen	DO	10.32	3/24/09	1145	3/24/09	360.1	0.1	Wetlab	--
Electrical Conductivity	µS/cm	160	3/24/09	1145	3/25/09	2510B	N/A	DA	--
Fluoride	F	<0.2	3/24/09	1145	3/25/09	300.0	0.2	MNS	4
Hardness	mg/L as CaCO ₃	46.0	3/24/09	1145	3/25/09	2340C	1	DA	--
Iron	Fe	<0.010	3/24/09	1145	4/6/09	200.7	0.010	Wetlab	0.6
Lead	Pb	<0.001	3/24/09	1145	4/24/09	200.8	0.001	MNS	0.015
Magnesium	Mg	3.9	3/24/09	1145	3/25/09	200.7	0.50	Wetlab	150
Manganese	Mn	0.0028	3/24/09	1145	3/25/09	200.8	0.001	MNS	0.1
Mercury	Hg	<0.0005	3/24/09	1145	4/23/09	200.8	0.0005	MNS	0.002
Nickel	Ni	<0.001	3/24/09	1145	4/24/09	200.8	0.001	MNS	0.1
Nitrate as Nitrogen	NO ₃ -N	<0.3	3/24/09	1145	3/25/09	300.0	0.3	MNS	10
Nitrite as Nitrogen	NO ₂ -N	<0.2	3/24/09	1145	3/25/09	300.0	0.2	MNS	1
pH	Value	8.03	3/24/09	1145	3/24/09	4500-H-B	4	WR	6.5 - 8.5
Potassium	K	1.3	3/24/09	1145	4/6/09	200.7	0.50	Wetlab	--
Total Dissolved Solids ¹	TDS	104	3/24/09	1145	3/25/09	2540C	5	Wetlab	1000
Sodium	Na	13	3/24/09	1145	4/6/09	200.7	0.50	Wetlab	--
Sulfate	SO ₄	11.0	3/24/09	1145	3/25/09	300.0	4	MNS	500
Total Suspended Solids	TSS	<5	3/24/09	1145	3/25/09	160.2	1	DA	--
Temperature	°C	8.4	3/24/09	1145	3/24/09	2550B	N/A	WR	--
Zinc	Zn	<0.005	3/24/09	1145	4/24/09	200.8	0.005	MNS	5

¹ TDS value may be calculated from electrical conductivity values.

* Color reported in standard color units, pH reported in standard pH units, conductivity reported in microsiemens per centimeter, temperature reported in degrees celsius

ND = None Detected

NOTE: Zone 4 includes Lakeside Drive, Holcomb Lane, Longley Lane, Huffaker Lane, Delucchi Lane, Sierra Plaza and South Virginia Street Wells.

Table 8. Zone 2:Extracted Water Chemistry, El Rancho Drive Well, Second Quarter 2009

Constituent	Symbol	Result (ppm)*	Date Sampled	Time Sampled	Date Analyzed	Method Number	Reporting Limit (ppm)	Analyst	Drinking Water Standard (mg/L)
Alkalinity	mg/L as CaCO ₃	55	4/22/09	1405	4/22/09	2320B	1	DA	--
Aluminum	Al	0.012	4/22/09	1405	4/24/09	200.8	0.01	MNS	0.05 – 0.2 (Advisory Standard)
Antimony	Sb	<0.001	4/22/09	1405	4/24/09	200.8	0.001	MNS	0.006
Arsenic	As	0.0011	4/22/09	1405	5/1/09	200.8	0.0001	MNS	0.01
Barium	Ba	0.020	4/22/09	1405	4/24/09	200.8	0.001	MNS	2
Calcium	Ca	13.2	4/22/09	1405	4/27/09	3500-Ca-D	0.5	DA	--
Chloride	Cl	9.07	4/22/09	1405	4/23/09	300.0	2	MNS	400
Chromium	Cr	0.0043	4/22/09	1405	4/24/09	200.8	0.001	MNS	0.1
Color	Color units	<2	4/22/09	1405	4/22/09	2120B	2	DA	15
Copper	Cu	<0.005	4/22/09	1405	4/24/09	200.8	0.005	MNS	1.3
Dissolved Oxygen	DO	9.77	4/22/09	1405	4/22/09	360.1	0.1	Wetlab	--
Electrical Conductivity	µS/cm	156	4/22/09	1405	4/22/09	2510B	N/A	DA	--
Fluoride	F	<0.2	4/22/09	1405	4/23/09	300.0	0.20	MNS	4
Hardness	mg/L as CaCO ₃	53.0	4/22/09	1405	4/27/09	2340C	1	DA	--
Iron	Fe	0.017	4/22/09	1405	5/5/09	200.7	0.010	Wetlab	0.6
Lead	Pb	<0.001	4/22/09	1405	4/24/09	200.8	0.001	MNS	0.015
Magnesium	Mg	4.9	4/22/09	1405	4/27/09	200.7	0.50	Wetlab	150
Manganese	Mn	0.0010	4/22/09	1405	5/1/09	200.8	0.001	MNS	0.1
Mercury	Hg	<0.0005	4/22/09	1405	4/23/09	200.8	0.0005	MNS	0.002
Nickel	Ni	<0.001	4/22/09	1405	4/24/09	200.8	0.001	MNS	0.1
Nitrate as Nitrogen	NO ₃ -N	<0.3	4/22/09	1405	4/23/09	300.0	0.3	MNS	10
Nitrite as Nitrogen	NO ₂ -N	<0.2	4/22/09	1405	4/23/09	300.0	0.200	MNS	1
pH	Value	7.93	4/22/09	1405	4/22/09	4500-H-B	4	WR	6.5 - 8.5
Potassium	K	1.5	4/22/09	1405	5/5/09	200.7	0.50	Wetlab	--
Total Dissolved Solids ¹	TDS	101	4/22/09	1405	4/22/09	2540C	5	DA	1000
Sodium	Na	12	4/22/09	1405	5/5/09	200.7	0.50	Wetlab	--
Sulfate	SO ₄	14.1	4/22/09	1405	4/23/09	300.0	4	MNS	500
Total Suspended Solids	TSS	<5	4/22/09	1405	4/27/09	160.2	1	DA	--
Temperature	°C	8.2	4/22/09	1405	4/22/09	2550B	N/A	WR	--
Zinc	Zn	<0.001	4/22/09	1405	4/24/09	200.8	0.005	MNS	5

¹ TDS value may be calculated from electrical conductivity values.

TMWA Lab No. 0409-19

* Color reported in standard color units, pH reported in standard pH units, conductivity reported in microsiemens per centimeter, temperature reported in degrees celsius

ND = None Detected

NOTE: Zone 2 includes Fourth Street, El Rancho Drive and View Street School Wells.

Table 9. Zone 2: Extracted Water Chemistry, View Street Well, Second Quarter 2009

Constituent	Symbol	Result (ppm)*	Date Sampled	Time Sampled	Date Analyzed	Method Number	Reporting Limit (ppm)	Analyst	Drinking Water Standard (mg/L)
Alkalinity	mg/L as CaCO ₃	51	4/21/09	0930	4/22/09	2320B	1	DA	--
Aluminum	Al	0.023	4/21/09	0930	4/24/09	200.8	0.01	MNS	0.05 – 0.2 (Advisory Standard)
Antimony	Sb	<0.001	4/21/09	0930	4/24/09	200.8	0.001	MNS	0.006
Arsenic	As	0.011	4/21/09	0930	5/1/09	200.8	0.0001	MNS	0.01
Barium	Ba	0.023	4/21/09	0930	4/24/09	200.8	0.001	MNS	2
Calcium	Ca	11.6	4/21/09	0930	4/27/09	3500-Ca-D	0.5	DA	--
Chloride	Cl	8.81	4/21/09	0930	4/21/09	300.0	2	MNS	400
Chromium	Cr	0.0021	4/21/09	0930	4/24/09	200.8	0.001	MNS	0.1
Color	Color units	<2	4/21/09	0930	4/21/09	2120B	2	DA	15
Copper	Cu	<0.005	4/21/09	0930	4/24/09	200.8	0.005	MNS	1.3
Dissolved Oxygen	DO	9.28	4/21/09	0930	4/21/09	360.1	0.1	Wetlab	--
Electrical Conductivity	µS/cm	153	4/21/09	0930	4/22/09	2510B	N/A	DA	--
Fluoride	F	<0.2	4/21/09	0930	4/21/09	300.0	0.2	MNS	4
Hardness	mg/L as CaCO ₃	45.0	4/21/09	0930	4/27/09	2340C	1	DA	--
Iron	Fe	<0.010	4/21/09	0930	4/24/09	200.7	0.010	Wetlab	0.6
Lead	Pb	<0.001	4/21/09	0930	4/24/09	200.8	0.001	MNS	0.015
Magnesium	Mg	3.9	4/21/09	0930	4/27/09	200.7	0.50	Wetlab	150
Manganese	Mn	<1	4/21/09	0930	5/1/09	200.8	0.001	MNS	0.1
Mercury	Hg	<0.00005	4/21/09	0930	4/23/09	200.8	0.0005	MNS	0.002
Nickel	Ni	<0.001	4/21/09	0930	4/24/09	200.8	0.001	MNS	0.1
Nitrate as Nitrogen	NO ₃ -N	<0.3	4/21/09	0930	4/21/09	300.0	0.3	MNS	10
Nitrite as Nitrogen	NO ₂ -N	<0.2	4/21/09	0930	4/21/09	300.0	0.2	MNS	1
pH	Value	7.85	4/21/09	0930	4/21/09	4500-H-B	4	WR	6.5 - 8.5
Potassium	K	1.5	4/21/09	0930	4/24/09	200.7	0.50	Wetlab	--
Total Dissolved Solids ¹	TDS	99.3	4/21/09	0930	4/22/09	2540C	5	DA	1000
Sodium	Na	13	4/21/09	0930	4/24/09	200.7	0.50	Wetlab	--
Sulfate	SO ₄	10.3	4/21/09	0930	4/21/09	300.0	4	MNS	500
Total Suspended Solids	TSS	<5	4/21/09	0930	4/27/09	160.2	1	DA	--
Temperature	°C	10.9	4/21/09	0930	4/21/09	2550B	N/A	WR	--
Zinc	Zn	<0.001	4/21/09	0930	4/24/09	200.8	0.005	MNS	5

¹ TDS value may be calculated from electrical conductivity values.

TMWA Lab No. 0409-17

* Color reported in standard color units, pH reported in standard pH units, conductivity reported in microsiemens per centimeter, temperature reported in degrees celsius

ND = None Detected

NOTE: Zone 2 includes Fourth Street, El Rancho Drive and View Street Wells.

Table 10. Zone 3: Extracted Water Chemistry, 21st Street Well, Second Quarter 2009

Constituent	Symbol	Result (ppm)*	Date Sampled	Time Sampled	Date Analyzed	Method Number	Reporting Limit (ppm)	Analyst	Drinking Water Standard (mg/L)
Alkalinity	mg/L as CaCO ₃	51.0	4/21/09	0855	4/22/09	2320B	1	DA	--
Aluminum	Al	0.016	4/21/09	0855	4/24/09	200.8	0.01	MNS	0.05 – 0.2 (Advisory Standard)
Antimony	Sb	<0.001	4/21/09	0855	4/24/09	200.8	0.001	MNS	0.006
Arsenic	As	0.00110	4/21/09	0855	5/1/09	200.8	0.0001	MNS	0.01
Barium	Ba	0.024	4/21/09	0855	4/24/09	200.8	0.001	MNS	2
Calcium	Ca	12.0	4/21/09	0855	4/27/09	3500-Ca-D	0.5	DA	--
Chloride	Cl	10.7	4/21/09	0855	4/21/09	300.0	2	MNS	400
Chromium	Cr	<0.001	4/21/09	0855	4/24/09	200.8	0.001	MNS	0.1
Color	Color units	<2	4/21/09	0855	4/21/09	2120B	2	DA	15
Copper	Cu	<0.005	4/21/09	0855	4/24/09	200.8	0.005	MNS	1.3
Dissolved Oxygen	DO	9.56	4/21/09	0855	4/21/09	360.1	0.1	Wetlab	--
Electrical Conductivity	µS/cm	160	4/21/09	0855	4/22/09	2510B	N/A	DA	--
Fluoride	F	<0.2	4/21/09	0855	4/21/09	300.0	0.2	MNS	4
Hardness	mg/L as CaCO ₃	47.0	4/21/09	0855	4/27/09	2340C	1	DA	--
Iron	Fe	<0.010	4/21/09	0855	4/24/09	200.7	0.010	Wetlab	0.6
Lead	Pb	<0.001	4/21/09	0855	4/24/09	200.8	0.001	MNS	0.015
Magnesium	Mg	4.1	4/21/09	0855	4/27/09	200.7	0.50	Wetlab	150
Manganese	Mn	<1	4/21/09	0855	5/1/09	200.8	0.001	MNS	0.1
Mercury	Hg	<0.0005	4/21/09	0855	4/23/09	200.8	0.0005	MNS	0.002
Nickel	Ni	<0.001	4/21/09	0855	4/24/09	200.8	0.001	MNS	0.1
Nitrate as Nitrogen	NO ₃ -N	<0.3	4/21/09	0855	4/21/09	300.0	0.3	MNS	10
Nitrite as Nitrogen	NO ₂ -N	<0.2	4/21/09	0855	4/21/09	300.0	0.2	MNS	1
pH	Value	7.86	4/21/09	0855	4/21/09	4500-H-B	4	WR	6.5 - 8.5
Potassium	K	1.6	4/21/09	0855	4/24/09	200.7	0.50	Wetlab	--
Total Dissolved Solids ¹	TDS	104	4/21/09	0855	4/22/09	2540C	5	DA	1000
Sodium	Na	13	4/21/09	0855	4/24/09	200.7	0.50	Wetlab	--
Sulfate	SO ₄	10.3	4/21/09	0855	4/21/09	300.0	4	MNS	500
Total Suspended Solids	TSS	<5	4/21/09	0855	4/27/09	160.2	5	DA	--
Temperature	°C	10.6	4/21/09	0855	4/21/09	2550B	N/A	WR	--
Zinc	Zn	<0.005	4/21/09	0855	4/24/09	200.8	0.005	MNS	5

¹ TDS value may be calculated from electrical conductivity values.

TMWA Lab No. 0409-18

* Color reported in standard color units, pH reported in standard pH units, conductivity reported in microsiemens per centimeter, temperature reported in degrees celsius

ND = None Detected

NOTE: Zone 3 includes 21st Street, Galletti Way, Greg Street, Poplar 1, Poplar #2, Sparks Avenue and Terminal Way Wells.

Table 11. Zone 4: Extracted Water Chemistry, Lakeside Well, 2nd Quarter 2009

Constituent	Symbol	Result (ppm)*	Date Sampled	Time Sampled	Date Analyzed	Method Number	Reporting Limit (ppm)	Analyst	Drinking Water Standard (mg/L)
Alkalinity	mg/L as CaCO ₃	57	5/27/09	0800	4/6/09	2320B	1	DA	--
Aluminum	Al	0.017	5/27/09	0800	4/14/09	200.8	0.01	MNS	0.05 - 0.2 (Advisory Standard)
Antimony	Sb	<0.001	5/27/09	0800	4/14/09	200.8	0.001	MNS	0.006
Arsenic	As	0.00082	5/27/09	0800	4/14/09	200.8	0.0001	MNS	0.01
Barium	Ba	0.020	5/27/09	0800	4/14/09	200.8	0.001	MNS	2
Calcium	Ca	13.6	5/27/09	0800	4/6/09	3500-Ca-D	0.5	DA	--
Chloride	Cl	6.58	5/26/09	0850	4/3/09	300.0	2	MNS	400
Chromium	Cr	0.0044	5/27/09	0800	4/14/09	200.8	0.001	MNS	0.1
Color	Color units	<2	5/27/09	0800	4/2/09	2120B	2	WR	15
Copper	Cu	<0.005	5/27/09	0800	4/14/09	200.8	0.005	MNS	1.3
Dissolved Oxygen	DO		5/27/09	0800		360.1	0.1	Wetlab	--
Electrical Conductivity	µS/cm	166	5/27/09	0800	4/6/09	2510B	N/A	DA	--
Fluoride	F	<0.2	5/26/09	0850	4/3/09	300.0	0.2	MNS	4
Hardness	mg/L as CaCO ₃	55.0	5/27/09	0800	4/6/09	2340C	1	DA	--
Iron	Fe		5/27/09	0800		200.7	0.010	Wetlab	0.6
Lead	Pb	<0.001	5/27/09	0800	4/14/09	200.8	0.001	MNS	0.015
Magnesium	Mg	5.11	5/27/09	0800	4/6/09	200.7	0.50	Wetlab	150
Manganese	Mn	0.0040	5/27/09	0800	4/14/09	200.8	0.001	MNS	0.1
Mercury	Hg	<0.0005	5/27/09	0800	4/24/09	200.8	0.0005	MNS	0.002
Nickel	Ni	<0.001	5/27/09	0800	4/14/09	200.8	0.001	MNS	0.1
Nitrate as Nitrogen	NO ₃ -N	<0.3	5/26/09	0850	4/3/09	300.0	0.3	MNS	10
Nitrite as Nitrogen	NO ₂ -N	<0.2	5/26/09	0850	4/3/09	300.0	0.2	MNS	1
pH	Value		5/27/09	0800		4500-H-B	4	WR	6.5 - 8.5
Potassium	K		5/27/09	0800		200.7	0.50	Wetlab	--
Total Dissolved Solids ¹	TDS	108	5/27/09	0800	4/6/09	2540C	5	Wetlab	1000
Sodium	Na		5/27/09	0800		200.7	0.50	Wetlab	--
Sulfate	SO ₄	11.1	5/26/09	0850	4/3/09	300.0	4	MNS	500
Total Suspended Solids	TSS	<5	5/27/09	0800	4/7/09	160.2	1	DA	--
Temperature	°C		5/27/09	0800		2550B	N/A	WR	--
Zinc	Zn	<0.001	5/27/09	0800	4/14/09	200.8	0.005	MNS	5

¹ TDS value may be calculated from electrical conductivity values.

TMWA Lab No. 0509-79 & 89

* Color reported in standard color units, pH reported in standard pH units, conductivity reported in microsiemens per centimeter, temperature reported in degrees celsius

ND = None Detected

Zone 4 includes Holcomb Lane, Longley Lane, Huffaker Lane, Delucchi Lane, Sierra Plaza and South Virginia Street Wells.

Table 12. Disinfection By-Products (DBP) Concentrations, 1Q 2009

LAB ID	LOCATION	DATE SAMPLED	TIME SAMPLED	DATE ANALYZED	FREE Cl ₂ , mg/L	pH	TEMP ° C	TTHM µg/L	HAA5 µg/L
0209-31	4250 Norton (Stead WW)	02/19/09	0940	02/28/09	0.7	6.77	6.4	28.6	16.9
0209-32	14005 Mt Vida (Stead FD)	02/19/09	0955	03/02/09	0.7	6.88	7.4	27.4	17.7
0209-33	6060 Silverlakes Road	02/19/09	1005	03/02/09	0.5	7.11	7.1	27.2	17.3
0209-34	1075 N Hills Blvd (Library)	02/19/09	1030	03/02/09	0.5	7.96	8.3	33.1	19.9
0209-13	6600 N Wingfield Pkwy	02/17/09	1320	03/02/09	0.8	7.61	8.9	27.9	19.8
0209-14	Vista Heights (Vista # 3)	02/17/09	1253	03/02/09	0.4	6.91	8.8	31.8	21.6
0209-15	5535 Santa Rosa	02/17/09	1305	03/02/09	0.6	7.33	9.8	26.4	18.6
0209-16	5155 Santa Anita	02/17/09	1337	03/02/09	0.5	7.50	6.8	25.3	19.0
0209-23	10230 Timberwolf	02/18/09	1025	03/02/09	0.5	7.32	6.8	35.7	25.0
0209-24	4995 West 7th Street	02/18/09	1105	03/02/09	0.8	7.33	7.5	28.5	17.4
0209-25	6685 Chesterfield	02/18/09	1045	03/03/09	1.0	7.37	6.3	21.7	15.5
0209-26	1600 Grandview	02/18/09	1115	03/03/09	0.6	7.27	8.9	24.0	16.1
0209-17	1340 Spice Island	02/17/09	1356	03/03/09	0.5	7.88	9.9	36.7	19.4
0209-35	201 Lincoln	02/19/09	1120	03/03/09	1.0	7.68	8.0	15.6	11.5
0209-36	225 Queen Way	02/19/09	1055	03/03/09	0.9	7.53	6.0	17.3	13.2
0209-18	1900 Vassar	02/17/09	1011	03/03/09	0.7	7.10	9.3	19.3	13.8
0209-19	13205 Thunderbolt	02/17/09	1138	03/03/09	0.3	7.03	9.9	39.9	23.6
0209-27	243 South Sierra Street	02/18/09	1155	03/03/09	0.7	7.44	5.6	27.2	17.8
0209-20	6121 Lakeside	02/17/09	1038	03/03/09	0.8	7.32	9.5	25.7	17.1
0209-28	909 Hunter Lake Drive	02/18/09	1140	03/03/09	0.7	7.35	4.7	30.2	20.9
0209-37	2200 Primio Way	02/19/09	1145	03/02/09	0.5	7.61	8.3	28.6	21.0
0209-38	1135 O'Callaghan	02/19/09	1110	03/03/09	0.7	7.68	6.4	21.5	16.4
Average								27.2	18.2

Table 13. 2nd Q 2009 Disinfection By-Products (DBP) Concentrations

LAB ID	LOCATION	DATE SAMPLED	TIME SAMPLED	DATE ANALYZED	FREE Cl ₂ , mg/L	pH	TEMP ⁰ C	TTHM µg/L	HAA5 µg/L
0509-14	4250 Norton (Stead WW)	05/05/09	0955	05/15/09	0.5	7.77	12.2	50.0	47.7
0509-15	14005 Mt Vida (Stead FD)	05/05/09	1010	05/15/09	0.4	8.08	13.2	57.8	44.9
0509-16	6060 Silverlakes Road	05/05/09	1025	05/15/09	0.5	7.96	11.9	47.6	50.9
0509-17	1075 N Hills Blvd (Library)	05/05/09	1050	05/15/09	0.4	8.09	14.2	55.3	35.0
0509-18	6600 N Wingfield Pkwy	05/05/09	1245	05/15/09	0.6	7.69	12.9	54.9	58.0
0509-19	Vista Heights (Vista # 3)	05/05/09	1205	05/15/09	0.5	7.67	12.7	52.5	52.9
0509-20	5535 Santa Rosa	05/05/09	1220	05/15/09	0.7	7.56	13.4	51.1	53.8
0509-21	5155 Santa Anita	05/05/09	1235	05/15/09	0.7	7.69	13.2	45.4	66.0
0509-26	10230 Timberwolf	05/06/09	1030	05/15/09	0.6	7.45	12.0	42.5	52.6
0509-27	4995 West 7th Street	05/06/09	1100	05/15/09	0.7	7.67	12.8	41.8	53.4
0509-28	6685 Chesterfield	05/06/09	1050	05/15/09	0.6	7.51	13.5	51.4	49.4
0509-29	1600 Grandview	05/06/09	1120	05/15/09	0.5	7.68	11.1	48.5	56.6
0509-05	1340 Spice Island	05/04/09	1335	05/15/09	0.4	8.15	15.4	55.9	34.8
0509-22	201 Lincoln	05/05/09	1330	05/15/09	0.7	7.57	12.5	38.0	52.0
0509-30	225 Queen Way	05/06/09	1235	05/15/09	1.0	7.65	11.1	36.9	45.1
0509-06	1900 Vassar	05/04/09	1055	05/15/09	0.7	7.66	16.3	48.4	53.2
0509-07	13205 Thunderbolt	05/04/09	1200	05/15/09	0.5	7.42	14.4	51.6	49.8
0509-08	243 South Sierra Street	05/04/09	1300	05/15/09	0.7	7.55	10.7	26.9	36.1
0509-09	6121 Lakeside	05/04/09	1230	05/15/09	0.7	7.50	12.6	37.3	42.8
0509-31	909 Hunter Lake Drive	05/06/09	1135	05/15/09	0.9	7.59	9.5	29.7	43.2
0509-23	2200 Primio Way	05/05/09	1310	05/15/09	0.5	7.75	13.0	55.0	49.5
0509-32	1135 O'Callaghan	05/06/09	1255	05/15/09	0.9	7.86	12.6	38.4	46.7
Average								46.2	48.8

Table 14. Zone 1: Total Coliform Reports Summary, First Half 2009

Date	ID#	Location	Total Coliforms	Chlorine, Residual (mg/L)	pH	Temp °C	Turbidity, NTU
January-2009							
5-Jan	A4	2300 N. Rock BL. (Alice Mazwell Sch.)-Bulldogs	Absent	0.7	8.09	10.4	0.18
5-Jan	A12	3005 Skyline #110 (Business)	Absent	0.7	8.12	8.0	0.19
6-Jan	B7	100 California Ave (Brick Bldg-Back)	Absent	0.8	8.14	5.0	0.16
8-Jan	C11	6060 Silver Lake Rd -Apt Complex-	Absent	0.7	8.01	9.5	0.19
February-2009							
2-Feb	A4	2300 N. Rock BL. (Alice Mazwell Sch.)-Bulldogs	Absent	0.7	8.03	9.1	0.17
2-Feb	A12	3005 Skyline #110 (Business)	Absent	0.8	8.15	9.7	0.16
3-Feb	B7	100 California Ave (Brick Bldg-Back)	Absent	0.8	8.27	7.8	0.13
5-Feb	C11	6060 Silver Lake Rd -Apt Complex-	Absent	0.7	8.12	12.0	0.16
March-2009							
2-Mar	A4	2300 N. Rock BL. (Alice Mazwell Sch.)-Bulldogs	Absent	0.8	8.10	9.6	0.15
2-Mar	A12	3005 Skyline #110 (Business)	Absent	0.8	8.06	9.0	0.14
3-Mar	B7	100 California Ave (Brick Bldg-Back)	Absent	0.8	8.23	9.5	0.19
12-Mar	C11	6060 Silver Lake Rd -Apt Complex-	Absent	0.7	7.89	10.7	0.19
April-2009							
1-Apr	4	2300 N. Rock BL. (Alice Mazwell Sch.)-Bulldogs	Absent	0.7	8.03	11.5	0.18
1-Apr	12	3005 Skyline #110 (Business)	Absent	0.7	8.07	10.9	0.18
1-Apr	7	100 California Ave (Brick Bldg-Back)	Absent	0.8	8.16	10.5	0.17
7-Apr	11	6060 Silver Lake Rd -Apt Complex-	Absent	0.5	7.98	10.7	0.24
May-2009							
4-May	4	2300 N. Rock BL. (Alice Mazwell Sch.)-Bulldogs	Absent	0.7	8.10	11.5	0.18
4-May	12	3005 Skyline #110 (Business)	Absent	0.7	8.04	9.7	0.18
5-May	7	100 California Ave (Brick Bldg-Back)	Absent	0.8	8.18	10.0	0.16
7-May	11	6060 Silver Lake Rd -Apt Complex-	Absent	0.7	8.01	13.3	0.19
June-2009							
1-Jun	4	2300 N. Rock BL. (Alice Mazwell Sch.)-Bulldogs	Absent	0.7	8.07	17.3	0.17
1-Jun	12	3005 Skyline #110 (Business)	Absent	0.8	8.16	16.0	0.16
2-Jun	7	100 California Ave (Brick Bldg-Back)	Absent	0.7	8.09	15.9	0.15
4-Jun	11	6060 Silver Lake Rd -Apt Complex-	Absent	0.7	8.10	17.3	0.22

Table 15. Zone 2: Total Coliform Reports Summary, First Half 2009

Date	ID#	Location	Total Coliforms	Chlorine, Residual (mg/L)	pH	Temp °C	Turbidity, NTU
January-2009							
12-Jan	D10	11020 Broken hill (house/south)	Absent	0.8	7.89	9.6	0.14
13-Jan	E3	4000 Mayberry (Roy Gomm Sch)-Gophers-	Absent	0.8	8.17	10.8	0.15
13-Jan	E10	445 La Rue Ave (Apts-left side)	Absent	0.8	8.11	7.4	0.13
15-Jan	F11	12995 Echo Ct. (K2 Dist.) (Island/Ht Bx)	Absent	0.5	8.05	9.3	0.15
February-2009							
9-Feb	D10	11020 Broken hill (house/south)	Absent	0.8	8.00	8.8	0.16
10-Feb	E3	4000 Mayberry (Roy Gomm Sch)-Gophers-	Absent	0.7	8.14	9.8	0.17
10-Feb	E10	445 La Rue Ave (Apts-left side)	Absent	0.8	8.10	7.5	0.12
12-Feb	F11	12995 Echo Ct. (K2 Dist.) (Island/Ht Bx)	Absent	0.5	8.07	8.7	0.15
March-2009							
9-Mar	D10	11020 Broken hill (house/south)	Absent	0.8	8.12	7.1	0.13
10-Mar	E3	4000 Mayberry (Roy Gomm Sch)-Gophers-	Absent	0.7	8.16	9.3	0.15
10-Mar	E10	445 La Rue Ave (Apts-left side)	Absent	0.8	8.04	7.1	0.13
11-Mar	F11	12995 Echo Ct. (K2 Dist.) (Island/Ht Bx)	Absent	0.5	7.78	9.4	0.18
April-2009							
2-Apr	10	11020 Broken hill (house/south)	Absent	0.8	8.15	9.5	0.18
6-Apr	3	4000 Mayberry (Roy Gomm Sch)-Gophers-	Absent	0.7	8.15	10.0	0.17
6-Apr	10	445 La Rue Ave (Apts-left side)	Absent	0.8	7.77	10.2	0.12
8-Apr	11	12995 Echo Ct. (K2 Dist.) (Island/Ht Bx)	Absent	0.5	8.02	11.7	0.21
May-2009							
11-May	10	11020 Broken hill (house/south)	Absent	0.7	8.13	8.9	0.16
12-May	3	4000 Mayberry (Roy Gomm Sch)-Gophers-	Absent	0.8	8.20	12.5	0.16
13-May	10	445 La Rue Ave (Apts-left side)	Absent	0.9	8.16	14.0	0.18
14-May	11	12995 Echo Ct. (K2 Dist.) (Island/Ht Bx)	Absent	0.7	7.88	13.1	0.16
June-2009							
8-Jun	10	11020 Broken hill (house/south)	Absent	0.8	8.18	14.0	0.16
9-Jun	3	4000 Mayberry (Roy Gomm Sch)-Gophers-	Absent	0.7	8.01	17.2	0.22
9-Jun	10	445 La Rue Ave (Apts-left side)	Absent	0.7	8.04	16.5	0.15
11-Jun	11	12995 Echo Ct. (K2 Dist.) (Island/Ht Bx)	Absent	0.7	8.09	16.6	0.17

Table 16. Zone 3: Total Coliform Reports Summary, First Half 2009

Date	ID#	Location	Total Coliforms	Chlorine, Residual (mg/L)	pH	Temp °C	Turbidity, NTU
January-2009							
20-Jan	G2	1090 Miami Wy - Bedsmart (Rt Sd/Yd Hydrant)	Absent	0.9	8.08	7.7	0.15
20-Jan	G10	905 Maple Creek Ct. (house)	Absent	0.7	7.90	6.9	0.14
21-Jan	H11	909 Hunter Lake Dr.(Sch)-Dragons-	Absent	0.8	8.05	6.9	0.10
22-Jan	I12	1070 Beckwourth Dr(Smith SchG/V)-Stallions-	Absent	0.7	8.01	12.5	0.18
February-2009							
17-Feb	G2	1090 Miami Wy - Bedsmart (Rt Sd/Yd Hydrant)	Absent	0.8	8.17	7.5	0.14
17-Feb	G10	905 Maple Creek Ct. (house)	Absent	0.8	8.00	7.4	0.17
18-Feb	H11	909 Hunter Lake Dr.(Sch)-Dragons-	Absent	0.8	7.91	7.3	0.11
19-Feb	I12	1070 Beckwourth Dr(Smith SchG/V)-Stallions-	Absent	0.6	8.08	11.5	0.21
March-2009							
16-Mar	G2	1090 Miami Wy - Bedsmart (Rt Sd/Yd Hydrant)	Absent	0.7	8.00	9.7	0.17
16-Mar	G10	905 Maple Creek Ct. (house)	Absent	0.6	7.88	7.7	0.16
17-Mar	H11	909 Hunter Lake Dr.(Sch)-Dragons-	Absent	0.8	8.11	8.7	0.16
19-Mar	I12	1070 Beckwourth Dr(Smith SchG/V)-Stallions-	Absent	0.5	8.01	11.8	0.21
April-2009							
9-Apr	2	1090 Miami Wy - Bedsmart (Rt Sd/Yd Hydrant)	Absent	0.8	8.14	10.2	0.17
9-Apr	10	905 Maple Creek Ct. (house)	Absent	0.6	7.94	10.0	0.15
13-Apr	11	909 Hunter Lake Dr.(Sch)-Dragons-	Absent	0.8	8.19	9.8	0.16
14-Apr	12	1070 Beckwourth Dr(Smith SchG/V)-Stallions-	Absent	0.6	7.86	12.8	0.24
May-2009							
18-May	2	1090 Miami Wy - Bedsmart (Rt Sd/Yd Hydrant)	Absent	0.8	7.97	13.8	0.16
18-May	10	905 Maple Creek Ct. (house)	Absent	0.7	7.80	12.5	0.17
19-May	11	909 Hunter Lake Dr.(Sch)-Dragons-	Absent	0.7	8.21	12.2	0.15
21-May	12	1070 Beckwourth Dr(Smith SchG/V)-Stallions-	Absent	0.7	8.07	17.7	0.22
June-2009							
15-Jun	2	1090 Miami Wy - Bedsmart (Rt Sd/Yd Hydrant)	Absent	0.7	8.22	19.6	0.16
15-Jun	10	905 Maple Creek Ct. (house)	Absent	0.8	8.02	16.8	0.14
16-Jun	11	909 Hunter Lake Dr.(Sch)-Dragons-	Absent	0.8	8.21	14.6	0.15
17-Jun	12	1070 Beckwourth Dr(Smith SchG/V)-Stallions-	Absent	0.7	8.05	21.1	0.23

Table 17. Zone 4: Total Coliform Reports Summary, First Half 2009

Date	ID#	Location	Total Coliforms	Chlorine, Residual (mg/L)	pH	Temp °C	Turbidity, NTU
January-2009							
26-Jan	J3	4875 Air Center Cir-left side outside	Absent	1.0	8.14	10.3	0.15
26-Jan	J8	1900 Sharon Way (Beck Sch)-Bears-	Absent	0.7	8.05	10.8	0.19
27-Jan	K8	475 Hill St (office)	Absent	0.7	8.15	8.3	0.15
27-Jan	K9	1695 Industrial Way (Frnt Faucet)	Absent	0.8	8.19	6.9	0.14
February-2009							
23-Feb	JE	4875 Air Center Cir-left side outside	Absent	0.9	8.10	10.0	0.15
23-Feb	J8	1900 Sharon Way (Beck Sch)-Bears-	Absent	0.7	8.03	11.0	0.15
24-Feb	K8	475 Hill St (office)	Absent	0.6	8.09	10.2	0.19
24-Feb	K9	1695 Industrial Way (Frnt Faucet)	Absent	0.7	7.93	11.7	0.17
March-2009							
23-Mar	JE	4875 Air Center Cir-left side outside	Absent	0.8	7.93	9.3	0.15
23-Mar	J8	1900 Sharon Way (Beck Sch)-Bears-	Absent	0.7	8.08	10.3	0.18
25-Mar	K8	475 Hill St (office)	Absent	0.7	8.17	10.1	0.19
25-Mar	K9	1695 Industrial Way (Frnt Faucet)	Absent	0.7	8.15	9.6	0.23
April-2009							
15-Apr	3	4875 Air Center Cir-left side outside	Absent	0.8	8.24	9.9	0.14
15-Apr	8	1900 Sharon Way (Beck Sch)-Bears-	Absent	0.7	8.09	12.9	0.19
16-Apr	8	475 Hill St (office)	Absent	0.6	8.13	12.0	0.18
16-Apr	9	1695 Industrial Way (Frnt Faucet)	Absent	0.7	8.10	11.7	0.16
May-2009							
26-May	3	4875 Air Center Cir-left side outside	Absent	0.9	8.03	16.2	0.32
26-May	8	1900 Sharon Way (Beck Sch)-Bears-	Absent	0.7	8.00	16.3	0.22
27-May	8	475 Hill St (office)	Absent	0.7	8.09	14.5	0.18
27-May	9	1695 Industrial Way (Frnt Faucet)	Absent	0.6	7.81	15.8	0.16
June-2009							
22-Jun	3	4875 Air Center Cir-left side outside	Absent	0.8	8.02	15.9	0.26
22-Jun	8	1900 Sharon Way (Beck Sch)-Bears-	Absent	0.7	8.08	17.7	0.21
23-Jun	8	475 Hill St (office)	Absent	0.7	8.05	17.7	0.19
23-Jun	9	1695 Industrial Way (Frnt Faucet)	Absent	0.8	8.13	16.1	0.14

3.0 SUMMARY

The number of wells where injection will occur will depend on system operating requirements, facility maintenance schedules, need for water quality mitigation for each particular well, data collection and reporting requirements, and drought/non-drought year conditions. For the period covered in this report, eleven wells were used for injection primarily for mitigation purposes of arsenic and drought storage purposes.

As shown in this report, TMWA's ASR program has successfully banked 18,587 acre-feet of water in the Truckee Meadows hydrographic basin since the program inception in 1993. By achieving its annual injection target, TMWA's ASR programs aim at enhancing drought supplies, provide opportunity to expand water supply service, and improve chemical quality of the groundwater in the Truckee Meadows, Lemmon Valley and Spanish Springs hydrographic basins.



REPORT ON AQUIFER STORAGE AND RECOVERY
WEST LEMMON VALLEY HYDROGRAPHIC BASIN

JANUARY 1 THROUGH JUNE 30 2009

NDEP PERMIT #UNEV99209

and

NDWR PERMIT #R-15

July 2009

Truckee Meadows Water Authority

1355 Capital Boulevard

Reno, Nevada 89520

www.tmh20.com

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1.0 SUMMARY

Truckee Meadows Water Authority's (TMWA) Aquifer Storage and Recovery program (ASR) activities in the West Lemmon Valley Basin are performed under Nevada Department of Environmental Protection (NDEP) Permit Number UNEV99209 issued in August 28, 2008, and Division of Water Resources (NDWR) Permit # R-15 issued in November 19, 2008. TMWA's ASR in the West Lemmon Valley Basin has grown from 32 acre-feet of treated surface water injected in 2000 to 2,498 acre-feet cumulative total at the end of June 2009 as shown in the table below.

Table 1. Injection History, West Lemmon Valley Basin (in acre-feet)

Year	Army Air Guard	Silver Lake	Silver Knolls	Total
2000		32		32
2001	242	149		391
2002	205	88		293
2003	180	83		263
2004	157	84		241
2005	137	93		230
2006	163	146		309
2007	136	136		272
2008	118	172	32	322
June-09	32	113	0	145
	-----	-----	-----	-----
TOTAL	1,370	1096	32	2,498

Between January 1 and June 30, 2009, TMWA injected 145 acre-feet (47 million gallons) of treated surface water in the west portion of the West Lemmon Valley Basin in TMWA's Army Air Guard (AAW) and Silver Lake Replacement (S2W) Wells (see Table 2A). Silver Knolls Well (SKW) was recharged for about ten hours in February for a total of 0.2 MG. The average flow rate for AAW was 183 gpm, for S2W was 259. Maximum injection rates attained by AAW and S2W were 200 gpm; 264 gpm, respectively. The minimum was 160 gpm for AAW and 191 for S2W. The source was treated Truckee River water from TMWA's surface water treatment plants, delivered to the Stead area through TMWA's distribution system.

During the first half of 2009, 197 acre-feet (64 MG) were pumped from AAW, 31 acre-feet (10 MG) were pumped from S2W. SKW was not pumped during this reporting period. (Table 2B).

Figure 1 is the map of the recharge and monitoring wells. Figures 2, 3 and 4 are the plots of the water levels, and pumping and injection rates in the three production/injection wells.

Table 2A. Monthly Recharge by Well, West Lemmon Valley, 1st Half 2009

Well	JAN	FEB	MAR	APR	MAY	JUNE	TOTAL RECHARGE	
	MG	MG	MG	MG	MG	MG	MG	AF
	---a---	---b---	---c---	---d---	---e---	---f---	---n---	---o---
Silver Knolls	0	0	0	0	0	0	0	0
Airguard	8	2	0	0	0	0	10	32
Silver Lake	12	10	12	3	0	0	37	113
	-----	-----	-----	-----	-----	-----	-----	-----
Totals	20	13	12	3	0	0	47	145

Table 2B. Monthly Production by Well, West Lemmon Valley, 1st Half 2009

Well	JAN	FEB	MAR	APR	MAY	JUNE	TOTAL PRODUCTION	
	MG	MG	MG	MG	MG	MG	MG	AF
	---a---	---b---	---c---	---d---	---e---	---f---	---n---	---o---
Silver Knolls	0	0	0	0	0	0	0	0
Airguard	0	0	0	0	18	46	64	197
Silver Lake	0	0	0	0	10	0	10	31
	-----	-----	-----	-----	-----	-----	-----	-----
Totals	0	0	0	0	28	46	74	228

The chemistry of the injection and extracted water showed no adverse effects to the aquifer as evidenced from the low total trihalomethanes and consistent water quality data from the extracted water.

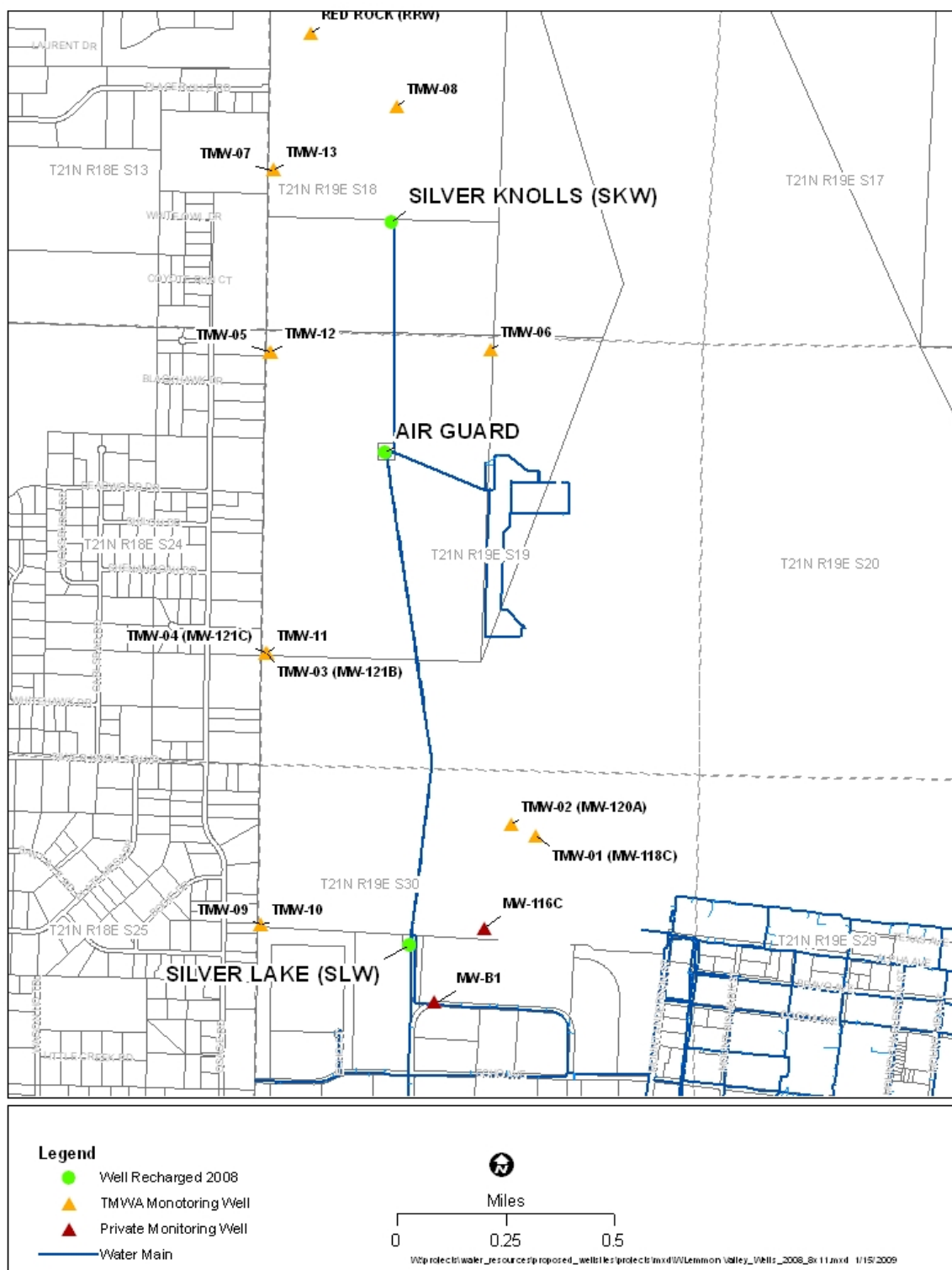


Figure 1. Well Locations, West Lemmon Valley Basin

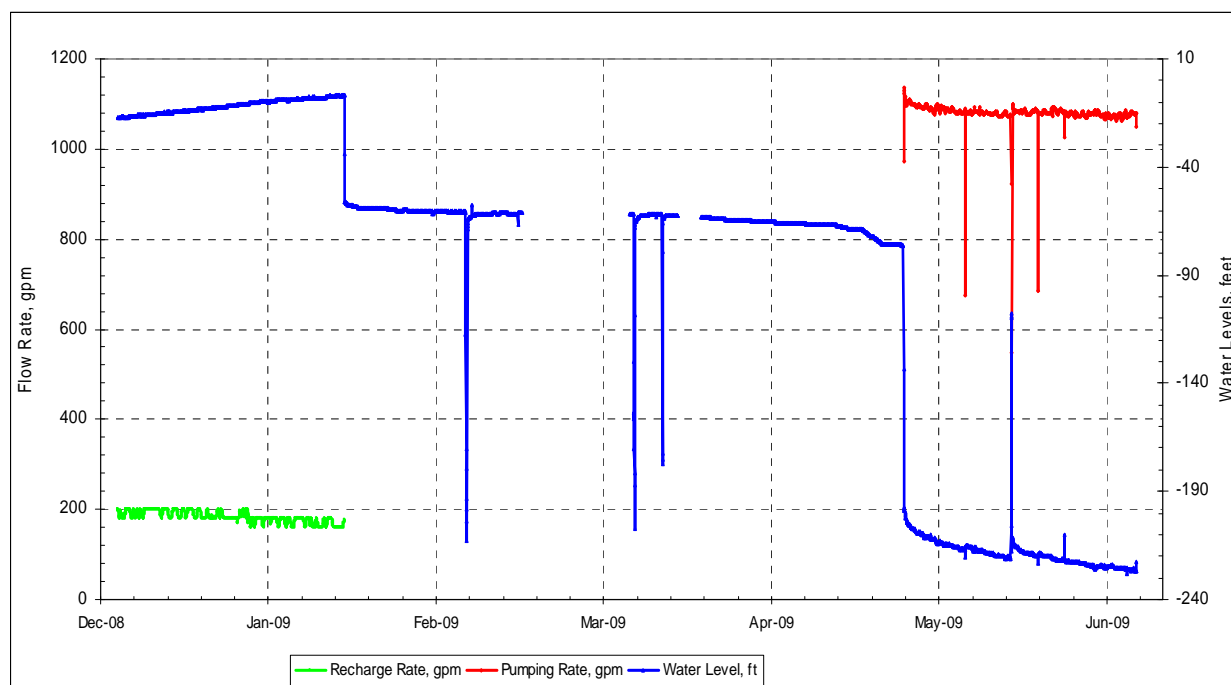


Figure 2. Army Air Guard Well, 1st Half 2009 Flow Rates and Water Levels

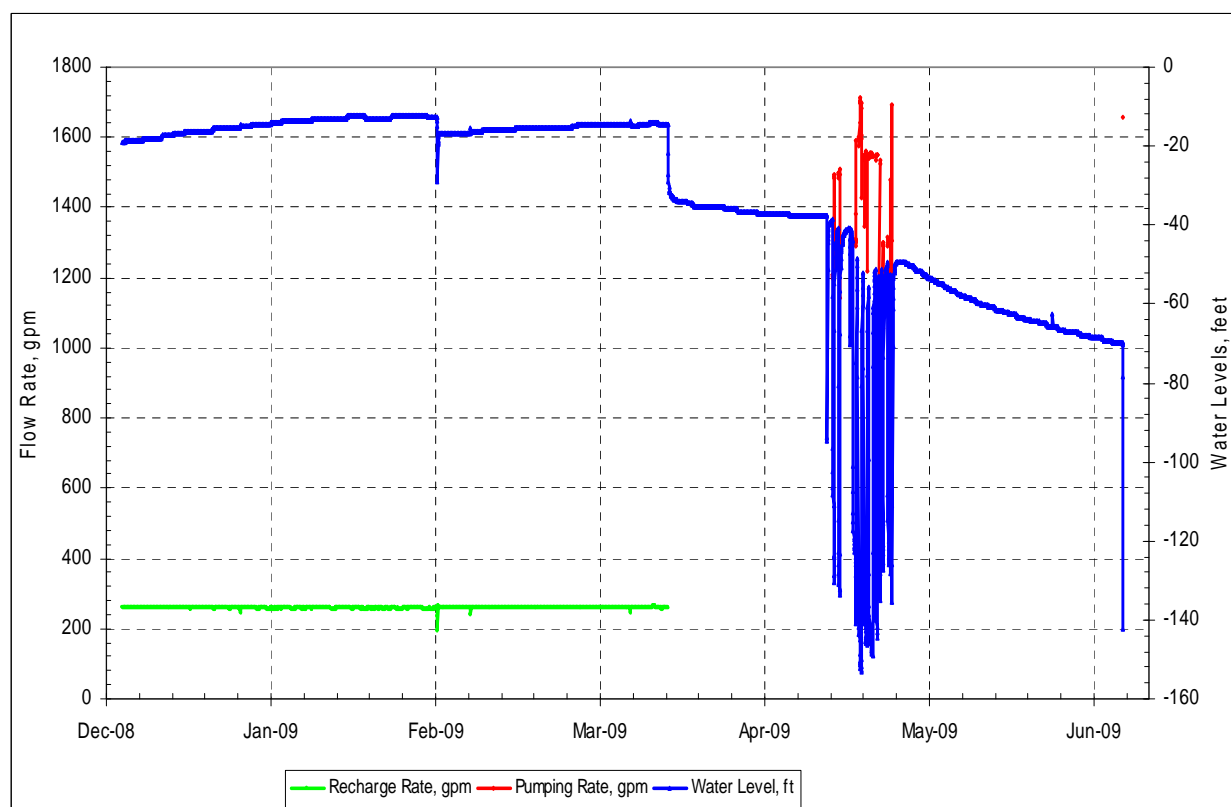


Figure 3. Silver Lake Well, 1st Half 2009 Flow Rates and Water Levels

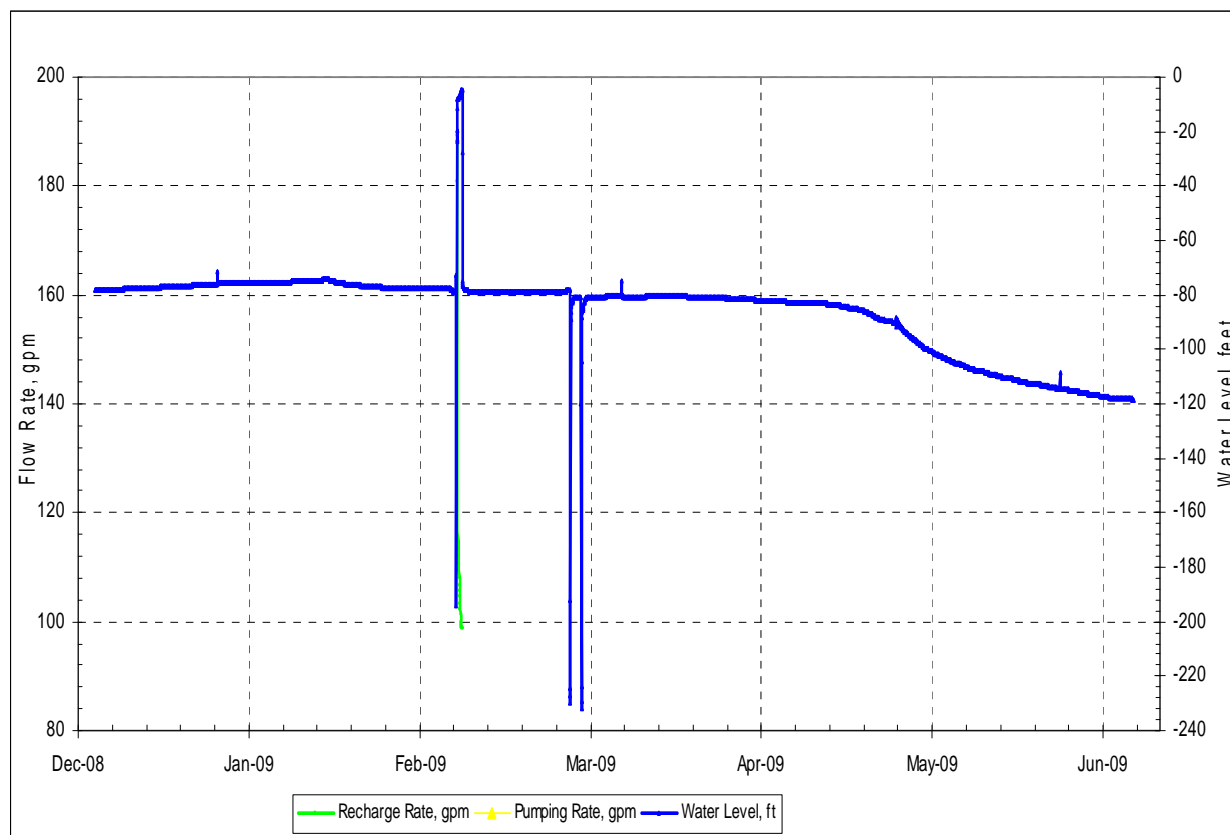


Figure 4. Silver Knolls Well, 1st Half 2009 Flow Rates and Water Levels

2.0 WATER LEVEL MONITORING

TMWA used its ten monitoring wells plus two private monitoring wells (MW-B1 and MW-116C) for monitoring groundwater levels for the ASR program (Figure 1 and Tables 3a&b). Water levels in all the monitoring wells were measured monthly using water level probes, except in months where the roads were too muddy to access some of the wells. Water levels in the injection wells, AAW, S2W and SKW, were measured using both an electronic probe and TMWA's SCADA system.

Figure 5A shows depth to water and Figure 5B shows the water level elevations in the shallow and the deep wells. Figure 6 shows water levels for the monitoring wells to display more clearly the differences in water level variations between shallow and deep monitoring wells. In Figure 6, the four pairs of nested wells are plotted each in the same color with the shallow having triangle and the deep ones diamond data points. The water level changes in the deep monitoring wells between pumping and injection ranges from 34 to 42 feet while in the shallow ones the range is between 0.4 and 6 feet. This shows that the shallow wells are not as responsive to the injection and pumping activities in TMWA's injection/production wells as the deep monitoring wells.

**Table 3A&B. West Lemmon Valley Wells, 1st Half 2009 Water Levels
and Water Level Elevations**

Date	MW-B1	MW-16C	TMW-01 (MW- 118C)	TMW-02 (MW-120A)	TMW-03 (MW- 121B)	TMW-04 (MW- 121C)	TMW-11	TMW-12	TMW-05	TMW-06	TMW-13	TMW-07	TMW-08	AAW	SZW	SKW	RRW
1/6/09	-27	-49	-49	-48.30					-75.30	-67.10	-100.90	-92.90	-85.10	-14.50	-17.0	-76.60	-105.70
2/2/09	-26	-46	-47	-47.00	-38.60	-33.50	-45.30	-82.50					-83.10	-7.30	-12.6	-74.40	-102.60
3/2/09	-25		-46	-45.90					-78.20	-67.30	-93.90	-94.20	-85.10	-60.90	-14.9	-77.10	-102.30
4/1/09	-25		-46	-45.10	-38.10	-32.40	-48.10	-81.80					-97.40		-15.0	-83.00	-102.10
5/4/09	-25	-41	-46	-45.10	-38.90	-33.30	-51.80	-82.00	-81.30	-68.80	-99.90	-96.90	-88.30	-65.20	-38.3	-81.90	-104.20
6/2/09	-25	-46	-48	-46.40	-41.30	-39.10	-79.70	-85.30	-106.60	-77.50	-102.40	-116.00	-110.50	-216.80	-58.4	-106.40	-119.20
Elevation ft asl	4975	4981	4987	4983	4980	4981	4992	5021	5020	5007	5037	5039	5029	5005	4978	5020	5043
Depth, ft	34	124	120	57	100	400	73	115	400	400	148	400	400	840	825	647	672
Top of Screen, ft	30	105	100	37	60	200	54	99	200	200	98	200	200	310	192	218	328

Date	MW-B1	MW-16C	TMW-01 (MW- 118C)	TMW-02 (MW-120A)	TMW-03 (MW- 121B)	TMW-04 (MW- 121C)	TMW-11	TMW-12	TMW-05	TMW-06	TMW-13	TMW-07	TMW-08	AAW	SZW	SKW	RRW
1/6/09	4948	4932	4935	4935	4935	4938	4947	4939	4945	4940	4936	4946	4944	4991	4961	4943	4937
2/2/09	4949	4935	4940	4936	4940	4947	4937	4937	4945	4940	4936	4946	4946	4988	4985	4946	4940
3/2/09	4950		4941	4937	4937	4932	4944	4939	4942	4940	4937	4945	4932	4944	4963	4943	4941
4/1/09	4950	4981	4941	4938	4942	4940	4940	4939	4939	4938	4937	4942	4941	4940	4940	4937	4941
5/4/09	4950	4940	4941	4938	4941	4941	4940	4939	4939	4938	4937	4942	4941	4940	4940	4938	4939
6/2/09	4950	4935	4939	4937	4939	4921	4912	4936	4913	4930	4935	4923	4919	4788	4920	4914	4924
Elevation ft asl	4975	4981	4987	4983	4980	4981	4992	5021	5020	5007	5037	5039	5029	5005	4978	5020	5043
Depth, ft	34	124	120	57	100	400	73	115	400	400	148	400	400	840	825	647	672
Top of Screen, ft	30	105	100	37	60	200	54	99	200	200	98	200	200	310	192	218	328

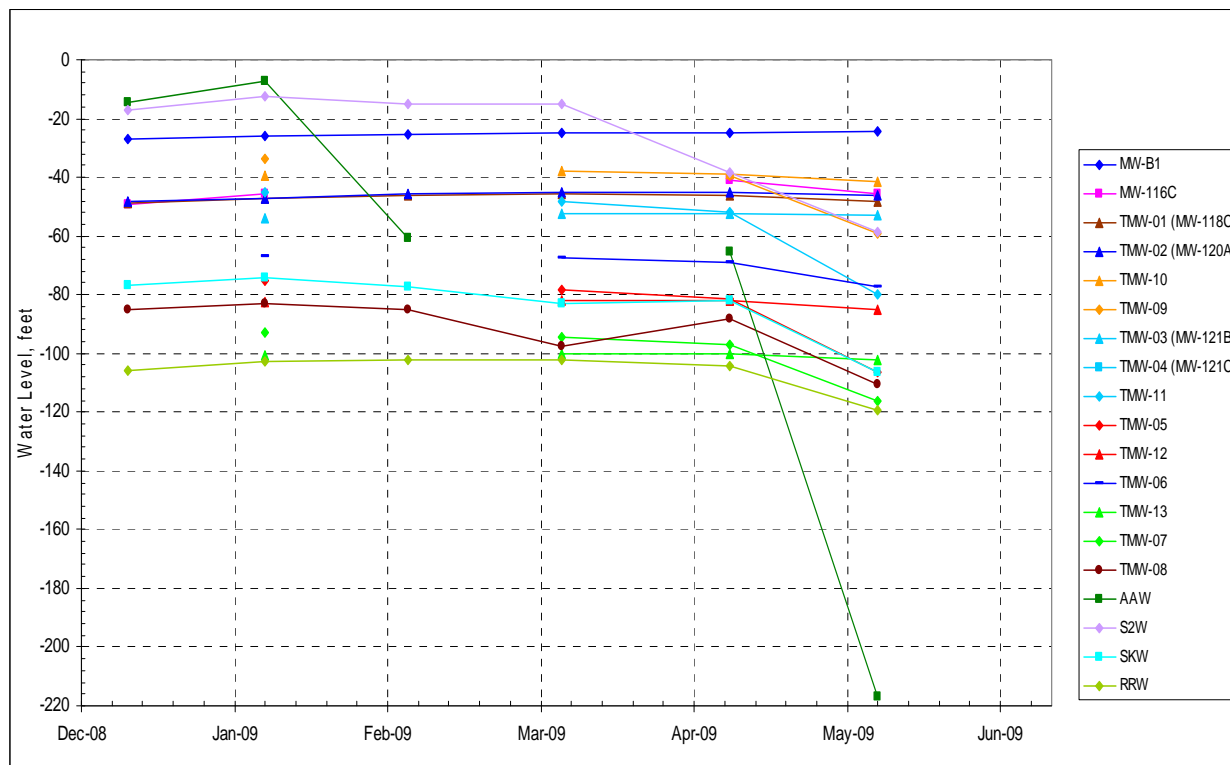


Figure 5A. West Lemmon Valley Wells, 1st Half 2009 Water Levels

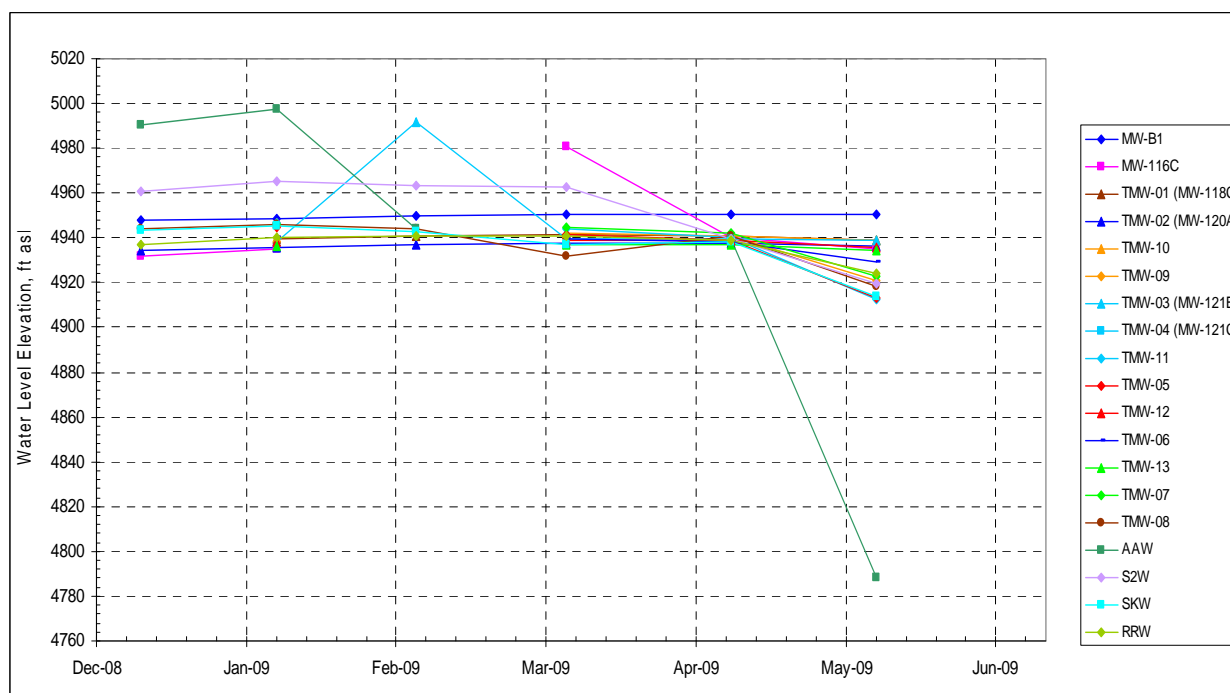


Figure 5B. West Lemmon Valley Wells, 1st Half 2009 Water Level Elevations

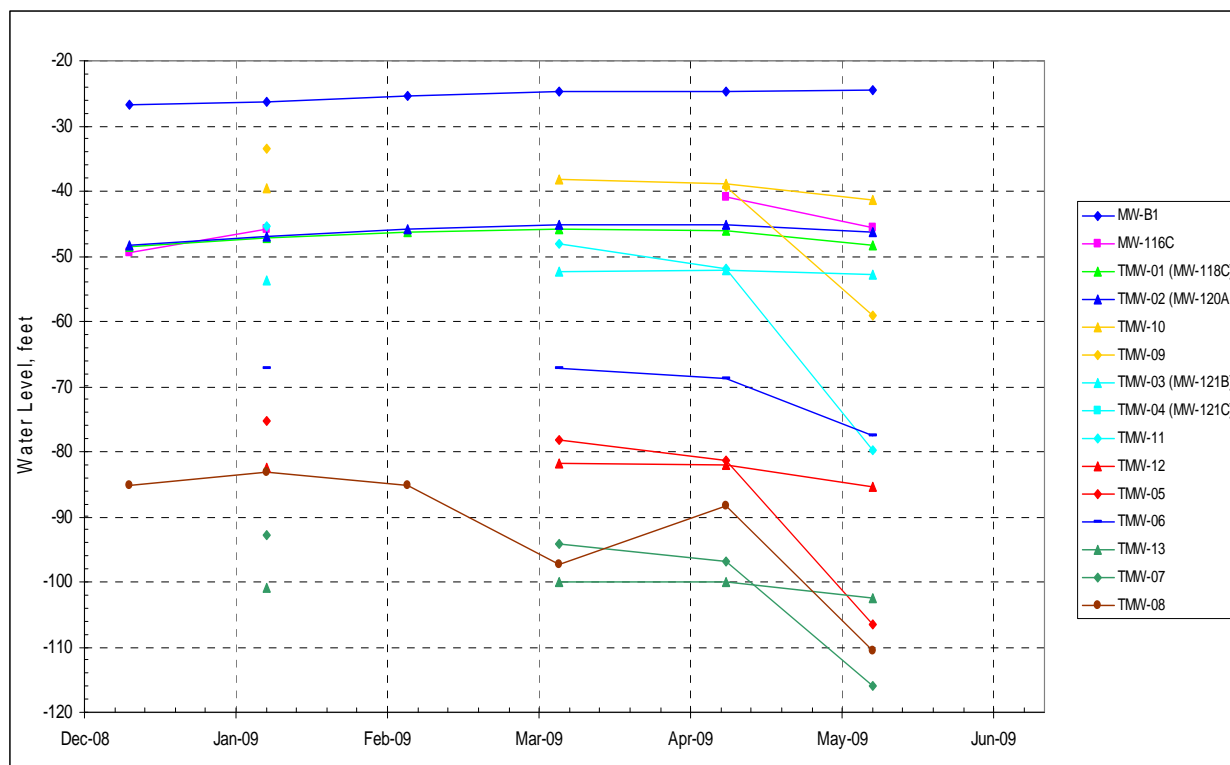


Figure 6. West Lemmon Valley Monitoring Wells, 1st Half 2009 Water Levels

3.0 WATER QUALITY

Samples of treated water from the distribution system were taken during the first quarter of 2009 and the results are shown in Tables 4 and 5 for both AAW and S2W. Extracted water samples were taken during the second quarter of 2009 and the results for both AAW and S2W and the results are shown in Tables 6 and 7. All the elements analyzed are below the Maximum Contaminant Levels (MCL). This indicates that injection water is not adversely affecting the aquifer formation water.

Tables 8 and 9 show the first and second quarters Disinfection By-Products (DBPs) concentrations in TMWA's West Lemmon Valley and Truckee Meadows basins distribution systems. The system averages for the two quarters are below MCL. Total coliform, residual chlorine, pH, and temperature reports for the system water from representative sample points for Zone 5 (West Lemmon Valley Basin) are shown in Table 10. They are all in compliance for the drinking water standards.

Table 4. Zone 5: 1Q 2009 Injected Water Chemistry, Army Air Guard Well

Constituent	Symbol	Result (ppm)*	Date Sampled	Time Sampled	Date Analyzed	Method Number	Reporting Limit (ppm)	Analyst	Drinking Water Standard (mg/L)
Alkalinity	mg/L as CaCO ₃	57	3/3/09	1415	3/4/09	2320B	1	DA	--
Aluminum	Al	0.048	3/3/09	1415	3/13/09	200.8	0.01	MNS	0.05 – 0.2 (Advisory Standard)
Antimony	Sb	<0.001	3/3/09	1415	3/13/09	200.8	0.001	MNS	0.006
Arsenic	As	0.00090	3/3/09	1415	3/13/09	200.8	0.0001	MNS	0.01
Barium	Ba	0.022	3/3/09	1415	3/13/09	200.8	0.001	MNS	2
Calcium	Ca	14.4	3/3/09	1415	3/13/09	3500-Ca-D	0.5	DA	--
Chloride	Cl	8.46	3/3/09	1415	3/4/09	300.0	2	MNS	400
Chromium	Cr	0.002	3/3/09	1415	3/13/09	200.8	0.001	MNS	0.1
Color	Color units	<2	3/3/09	1415	3/4/09	2120B	2	DA	15
Copper	Cu	<0.005	3/3/09	1415	3/13/09	200.8	0.005	MNS	1.3
Dissolved Oxygen	DO	10.37	3/3/09	1415	3/3/09	360.1	0.1	Wetlab	--
Electrical Conductivity	µS/cm	165	3/3/09	1415	3/3/09	2510B	N/A	DA	--
Fluoride	F	<0.2	3/3/09	1415	3/4/09	300.0	0.20	MNS	4
Hardness	mg/L as CaCO ₃	51.0	3/3/09	1415	3/4/09	2340C	1	DA	--
Iron	Fe	0.099	3/3/09	1415	3/18/09	200.7	0.010	Wetlab	0.6
Lead	Pb	<0.001	3/3/09	1415	3/13/09	200.8	0.001	MNS	0.015
Magnesium	Mg	3.7	3/3/09	1415	3/4/09	200.7	0.50	Wetlab	150
Manganese	Mn	0.0071	3/3/09	1415	3/13/09	200.8	0.001	MNS	0.1
Mercury	Hg	<0.0005	3/3/09	1415	4/23/09	200.8	0.0005	MNS	0.002
Nickel	Ni	<0.001	3/3/09	1415	3/13/09	200.8	0.001	MNS	0.1
Nitrate as Nitrogen	NO ₃ -N	<0.3	3/3/09	1415	3/4/09	300.0	0.3	MNS	10
Nitrite as Nitrogen	NO ₂ -N	<0.2	3/3/09	1415	3/4/09	300.0	0.200	MNS	1
pH	Value		3/3/09	1415		4500-H-B	4	WR	6.5 - 8.5
Potassium	K	1.3	3/3/09	1415	3/18/09	200.7	0.50	Wetlab	--
Total Dissolved Solids ¹	TDS	107	3/3/09	1415	3/3/09	2540C	5	DA	1000
Sodium	Na	12	3/3/09	1415	3/18/09	200.7	0.50	Wetlab	--
Sulfate	SO ₄	13.5	3/3/09	1415	3/4/09	300.0	4	MNS	500
Total Suspended Solids	TSS	<5	3/3/09	1415	3/4/09	160.2	5	DA	--
Temperature	°C		3/3/09	1415		2550B	N/A	WR	--
Zinc	Zn	<0.005	3/3/09	1415	3/13/09	200.8	0.005	MNS	5

¹ TDS value may be calculated from electrical conductivity values.

* Color reported in standard color units, pH reported in standard pH units, conductivity reported in microsiemens per centimeter, temperature reported in degrees celsius

ND = None Detected

Table 5. Zone 5: 1Q 2009 Injected Water Chemistry, Silver Lake Well

Constituent	Symbol	Result (ppm)*	Date Sampled	Time Sampled	Date Analyzed	Method Number	Reporting Limit (ppm)	Analyst	Drinking Water Standard (mg/L)
Alkalinity	mg/L as CaCO ₃	52	3/18/09	1040	3/25/09	2320B	1	DA	--
Aluminum	Al	0.030	3/18/09	1040	3/19/09	200.8	0.01	MNS	0.05 – 0.2 (Advisory Standard)
Antimony	Sb	<0.001	3/18/09	1040	3/19/09	200.8	0.001	MNS	0.006
Arsenic	As	0.00091	3/18/09	1040	3/19/09	200.8	0.0001	MNS	0.01
Barium	Ba	0.0230	3/18/09	1040	3/19/09	200.8	0.001	MNS	2
Calcium	Ca	12.8	3/18/09	1040	3/25/09	3500-Ca-D	0.5	DA	--
Chloride	Cl	11.8	3/18/09	1040	3/19/09	300.0	2	MNS	400
Chromium	Cr	0.0024	3/18/09	1040	3/19/09	200.8	0.001	MNS	0.1
Color	Color units	<2	3/18/09	1040	3/18/09	2120B	2	WR	15
Copper	Cu	<0.005	3/18/09	1040	3/19/09	200.8	0.005	MNS	1.3
Dissolved Oxygen	DO	10.53	3/18/09	1040	3/18/09	360.1	0.1	Wetlab	--
Electrical Conductivity	µS/cm	168	3/18/09	1040	3/25/09	2510B	N/A	DA	--
Fluoride	F	<0.2	3/18/09	1040	3/19/09	300.0	0.2	MNS	4
Hardness	mg/L as CaCO ₃	50.0	3/18/09	1040	3/25/09	2340C	1	DA	--
Iron	Fe	<0.010	3/18/09	1040	3/31/09	200.7	0.010	Wetlab	0.6
Lead	Pb	<0.001	3/18/09	1040	3/19/09	200.8	0.001	MNS	0.015
Magnesium	Mg	4.4	3/18/09	1040	3/25/09	200.7	0.50	Wetlab	150
Manganese	Mn	0.0020	3/18/09	1040	3/19/09	200.8	0.001	MNS	0.1
Mercury	Hg	<0.0005	3/18/09	1040	4/23/09	200.8	0.0005	MNS	0.002
Nickel	Ni	<0.001	3/18/09	1040	3/19/09	200.8	0.001	MNS	0.1
Nitrate as Nitrogen	NO ₃ -N	<0.3	3/18/09	1040	3/19/09	300.0	0.3	MNS	10
Nitrite as Nitrogen	NO ₂ -N	<0.2	3/18/09	1040	3/19/09	300.0	0.2	MNS	1
pH	Value	8.02	3/18/09	1040	3/18/09	4500-H-B	4	WR	6.5 - 8.5
Potassium	K	1.9	3/18/09	1040	3/31/09	200.7	0.50	Wetlab	--
Total Dissolved Solids ¹	TDS	109	3/18/09	1040	3/25/09	2540C	5	DA	1000
Sodium	Na	15	3/18/09	1040	3/31/09	200.7	0.50	Wetlab	--
Sulfate	SO ₄	12.5	3/18/09	1040	3/19/09	300.0	4	MNS	500
Total Suspended Solids	TSS	<5	3/18/09	1040	3/25/09	160.2	5	DA	--
Temperature	°C	8.3	3/18/09	1040	3/18/09	2550B	N/A	WR	--
Zinc	Zn	<0.005	3/18/09	1040	3/19/09	200.8	0.005	MNS	5

¹ TDS value may be calculated from electrical conductivity values.

* Color reported in standard color units, pH reported in standard pH units, conductivity reported in microsiemens per centimeter, temperature reported in degrees celsius

ND = None Detected

Table 6. Zone 5: 2Q 2009 Extracted Water Chemistry, Army Air Guard Well

Constituent	Symbol	Result (ppm)*	Date Sampled	Time Sampled	Date Analyzed	Method Number	Reporting Limit (ppm)	Analyst	Drinking Water Standard (mg/L)
Alkalinity	mg/L as CaCO ₃	57	4/2/09	1410	4/6/09	2320B	1	DA	--
Aluminum	Al	0.017	4/2/09	1410	4/14/09	200.8	0.01	MNS	0.05 – 0.2 (Advisory Standard)
Antimony	Sb	<0.001	4/2/09	1410	4/14/09	200.8	0.001	MNS	0.006
Arsenic	As	0.00082	4/2/09	1410	4/14/09	200.8	0.0001	MNS	0.01
Barium	Ba	0.020	4/2/09	1410	4/14/09	200.8	0.001	MNS	2
Calcium	Ca	13.6	4/2/09	1410	4/6/09	3500-Ca-D	0.5	DA	--
Chloride	Cl	6.58	4/2/09	1410	4/3/09	300.0	2	MNS	400
Chromium	Cr	0.0044	4/2/09	1410	4/14/09	200.8	0.001	MNS	0.1
Color	Color units	<2	4/2/09	1410	4/2/09	2120B	2	DA	15
Copper	Cu	<0.005	4/2/09	1410	4/14/09	200.8	0.005	MNS	1.3
Dissolved Oxygen	DO					360.1	0.1	Wetlab	--
Electrical Conductivity	mS/cm	166	4/2/09	1410	4/6/09	2510B	N/A	DA	--
Fluoride	F	<0.2	4/2/09	1410	4/3/09	300.0	0.20	MNS	4
Hardness	mg/L as CaCO ₃	55.0	4/2/09	1410	4/6/09	2340C	1	DA	--
Iron	Fe					200.7	0.010	Wetlab	0.6
Lead	Pb	<0.001	4/2/09	1410	4/14/09	200.8	0.001	MNS	0.015
Magnesium	Mg	5.11	4/2/09	1410	4/6/09	200.7	0.50	Wetlab	150
Manganese	Mn	0.0040	4/2/09	1410	4/14/09	200.8	0.001	MNS	0.1
Mercury	Hg	<0.0005	4/2/09	1410	4/24/09	200.8	0.0005	MNS	0.002
Nickel	Ni	<0.001	4/2/09	1410	4/14/09	200.8	0.001	MNS	0.1
Nitrate as Nitrogen	NO ₃ -N	<0.3	4/2/09	1410	4/3/09	300.0	0.3	MNS	10
Nitrite as Nitrogen	NO ₂ -N	<0.2	4/2/09	1410	4/3/09	300.0	0.200	MNS	1
pH	Value					4500-H-B	4	WR	6.5 - 8.5
Potassium	K					200.7	0.50	Wetlab	--
Total Dissolved Solids ¹	TDS	108	4/2/09	1410	4/6/09	2540C	5	DA	1000
Sodium	Na					200.7	0.50	Wetlab	--
Sulfate	SO ₄	11.1	4/2/09	1410	4/3/09	300.0	4	MNS	500
Total Suspended Solids	TSS	<5	4/2/09	1410	4/7/09	160.2	5	DA	--
Temperature	°C					2550B	N/A	WR	--
Zinc	Zn	<0.001	4/2/09	1410	4/14/09	200.8	0.005	MNS	5

¹ TDS value may be calculated from electrical conductivity values.

* Color reported in standard color units, pH reported in standard pH units, conductivity reported in microsiemens per centimeter, temperature reported in degrees celsius

ND = None Detected

Table 7. Zone 5: 2Q 2009 Extracted Water Chemistry, Silver Lake Well

Constituent	Symbol	Result (ppm)*	Date Sampled	Time Sampled	Date Analyzed	Method Number	Reporting Limit (ppm)	Analyst	Drinking Water Standard (mg/L)
Alkalinity	mg/L as CaCO ₃	56	5/14/09	0745	5/18/09	2320B	1	DA	--
Aluminum	Al	0.011	5/14/09	0745	6/8/09	200.8	0.01	MNS	0.05 – 0.2 (Advisory Standard)
Antimony	Sb	<0.001	5/14/09	0745	6/8/09	200.8	0.001	MNS	0.006
Arsenic	As	0.00160	5/14/09	0745	6/8/09	200.8	0.0001	MNS	0.01
Barium	Ba	0.0210	5/14/09	0745	6/8/09	200.8	0.001	MNS	2
Calcium	Ca	12.8	5/14/09	0745	5/19/09	3500-Ca-D	0.5	DA	--
Chloride	Cl	11.4	5/14/09	0745	5/15/09	300.0	2	MNS	400
Chromium	Cr	<0.001	5/14/09	0745	6/8/09	200.8	0.001	MNS	0.1
Color	Color units	<2	5/14/09	0745	5/14/09	2120B	2	WR	15
Copper	Cu	<0.005	5/14/09	0745	6/8/09	200.8	0.005	MNS	1.3
Dissolved Oxygen	DO	8.01	5/14/09	0745	5/14/09	360.1	0.1	Wetlab	--
Electrical Conductivity	mS/cm	175	5/14/09	0745	5/18/09	2510B	N/A	DA	--
Fluoride	F	<0.2	5/14/09	0745	5/15/09	300.0	0.2	MNS	4
Hardness	mg/L as CaCO ₃	49.0	5/14/09	0745	5/19/09	2340C	1	DA	--
Iron	Fe	<0.010	5/14/09	0745	5/21/09	200.7	0.010	Wetlab	0.6
Lead	Pb	<0.001	5/14/09	0745	6/8/09	200.8	0.001	MNS	0.015
Magnesium	Mg	4.14	5/14/09	0745	5/19/09	200.7	0.50	Wetlab	150
Manganese	Mn	<0.001	5/14/09	0745	6/8/09	200.8	0.001	MNS	0.1
Mercury	Hg	<0.0005	5/14/09	0745	6/8/09	200.8	0.0005	MNS	0.002
Nickel	Ni	<0.001	5/14/09	0745	6/8/09	200.8	0.001	MNS	0.1
Nitrate as Nitrogen	NO ₃ -N	<0.3	5/14/09	0745	5/15/09	300.0	0.3	MNS	10
Nitrite as Nitrogen	NO ₂ -N	<0.2	5/14/09	0745	5/15/09	300.0	0.2	MNS	1
pH	Value	7.63	5/14/09	0745	5/14/09	4500-H-B	4	WR	6.5 - 8.5
Potassium	K	1.4	5/14/09	0745	5/21/09	200.7	0.50	Wetlab	--
Total Dissolved Solids ¹	TDS	113	5/14/09	0745	5/19/09	2540C	5	DA	1000
Sodium	Na	14	5/14/09	0745	5/21/09	200.7	0.50	Wetlab	--
Sulfate	SO ₄	10.0	5/14/09	0745	5/15/09	300.0	4	MNS	500
Total Suspended Solids	TSS	<5	5/14/09	0745	5/18/09	160.2	5	DA	--
Temperature	°C	9.9	5/14/09	0745	5/14/09	2550B	N/A	WR	--
Zinc	Zn	0.0060	5/14/09	0745	6/8/09	200.8	0.005	MNS	5

¹ TDS value may be calculated from electrical conductivity values.

TMWA Lab No. 0509-47

* Color reported in standard color units, pH reported in standard pH units, conductivity reported in microsiemens per centimeter, temperature reported in degrees celsius

ND = None Detected

Table 8. Zone 5: 1Q 2009 Disinfection By-Products (DBP) Concentrations

LAB ID	LOCATION	DATE SAMPLED	TIME SAMPLED	DATE ANALYZED	FREE Cl ₂ , mg/L	pH	TEMP C	TTHM µg/L	HAA5 µg/L
0209-31	4250 Norton (Stead WW)	02/19/09	0940	02/28/09	0.7	6.77	6.4	28.6	16.9
0209-32	14005 Mt Vida (Stead FD)	02/19/09	0955	03/02/09	0.7	6.88	7.4	27.4	17.7
0209-33	6060 Silverlakes Road	02/19/09	1005	03/02/09	0.5	7.11	7.1	27.2	17.3
0209-34	1075 N Hills Blvd (Library)	02/19/09	1030	03/02/09	0.5	7.96	8.3	33.1	19.9
0209-13	6600 N Wingfield Pkwy	02/17/09	1320	03/02/09	0.8	7.61	8.9	27.9	19.8
0209-14	Vista Heights (Vista # 3)	02/17/09	1253	03/02/09	0.4	6.91	8.8	31.8	21.6
0209-15	5535 Santa Rosa	02/17/09	1305	03/02/09	0.6	7.33	9.8	26.4	18.6
0209-16	5155 Santa Anita	02/17/09	1337	03/02/09	0.5	7.50	6.8	25.3	19.0
0209-23	10230 Timberwolf	02/18/09	1025	03/02/09	0.5	7.32	6.8	35.7	25.0
0209-24	4995 West 7th Street	02/18/09	1105	03/02/09	0.8	7.33	7.5	28.5	17.4
0209-25	6685 Chesterfield	02/18/09	1045	03/03/09	1.0	7.37	6.3	21.7	15.5
0209-26	1600 Grandview	02/18/09	1115	03/03/09	0.6	7.27	8.9	24.0	16.1
0209-17	1340 Spice Island	02/17/09	1356	03/03/09	0.5	7.88	9.9	36.7	19.4
0209-35	201 Lincoln	02/19/09	1120	03/03/09	1.0	7.68	8.0	15.6	11.5
0209-36	225 Queen Way	02/19/09	1055	03/03/09	0.9	7.53	6.0	17.3	13.2
0209-18	1900 Vassar	02/17/09	1011	03/03/09	0.7	7.10	9.3	19.3	13.8
0209-19	13205 Thunderbolt	02/17/09	1138	03/03/09	0.3	7.03	9.9	39.9	23.6
0209-27	243 South Sierra Street	02/18/09	1155	03/03/09	0.7	7.44	5.6	27.2	17.8
0209-20	6121 Lakeside	02/17/09	1038	03/03/09	0.8	7.32	9.5	25.7	17.1
0209-28	909 Hunter Lake Drive	02/18/09	1140	03/03/09	0.7	7.35	4.7	30.2	20.9
0209-37	2200 Primio Way	02/19/09	1145	03/02/09	0.5	7.61	8.3	28.6	21.0
0209-38	1135 O'Callaghan	02/19/09	1110	03/03/09	0.7	7.68	6.4	21.5	16.4
Average								27.2	18.2

Table 9. Zone 5: 2Q 2009 Disinfection By-Products (DBP) Concentrations

LAB ID	LOCATION	DATE SAMPLED	TIME SAMPLED	DATE ANALYZED	FREE Cl ₂ , mg/L	pH	TEMP °C	TTHM µg/L	HAA5 µg/L
0509-14	4250 Norton (Stead WW)	05/05/09	0955	05/15/09	0.5	7.77	12.2	50.0	47.7
0509-15	14005 Mt Vida (Stead FD)	05/05/09	1010	05/15/09	0.4	8.08	13.2	57.8	44.9
0509-16	6060 Silverlakes Road	05/05/09	1025	05/15/09	0.5	7.96	11.9	47.6	50.9
0509-17	1075 N Hills Blvd (Library)	05/05/09	1050	05/15/09	0.4	8.09	14.2	55.3	35.0
0509-18	6600 N Wingfield Pkwy	05/05/09	1245	05/15/09	0.6	7.69	12.9	54.9	58.0
0509-19	Vista Heights (Vista # 3)	05/05/09	1205	05/15/09	0.5	7.67	12.7	52.5	52.9
0509-20	5535 Santa Rosa	05/05/09	1220	05/15/09	0.7	7.56	13.4	51.1	53.8
0509-21	5155 Santa Anita	05/05/09	1235	05/15/09	0.7	7.69	13.2	45.4	66.0
0509-26	10230 Timberwolf	05/06/09	1030	05/15/09	0.6	7.45	12.0	42.5	52.6
0509-27	4995 West 7th Street	05/06/09	1100	05/15/09	0.7	7.67	12.8	41.8	53.4
0509-28	6685 Chesterfield	05/06/09	1050	05/15/09	0.6	7.51	13.5	51.4	49.4
0509-29	1600 Grandview	05/06/09	1120	05/15/09	0.5	7.68	11.1	48.5	56.6
0509-05	1340 Spice Island	05/04/09	1335	05/15/09	0.4	8.15	15.4	55.9	34.8
0509-22	201 Lincoln	05/05/09	1330	05/15/09	0.7	7.57	12.5	38.0	52.0
0509-30	225 Queen Way	05/06/09	1235	05/15/09	1.0	7.65	11.1	36.9	45.1
0509-06	1900 Vassar	05/04/09	1055	05/15/09	0.7	7.66	16.3	48.4	53.2
0509-07	13205 Thunderbolt	05/04/09	1200	05/15/09	0.5	7.42	14.4	51.6	49.8
0509-08	243 South Sierra Street	05/04/09	1300	05/15/09	0.7	7.55	10.7	26.9	36.1
0509-09	6121 Lakeside	05/04/09	1230	05/15/09	0.7	7.50	12.6	37.3	42.8
0509-31	909 Hunter Lake Drive	05/06/09	1135	05/15/09	0.9	7.59	9.5	29.7	43.2
0509-23	2200 Primio Way	05/05/09	1310	05/15/09	0.5	7.75	13.0	55.0	49.5
0509-32	1135 O'Callaghan	05/06/09	1255	05/15/09	0.9	7.86	12.6	38.4	46.7
Average								46.2	48.8

Table 10. Zone 5: 1st Half 2009 Total Coliform Reports Summary

Date	ID#	Location	Total Coliforms	Chlorine, Residual (mg/L)	pH	Temp °C	Turbidity, NTU
January-2009							
8-Jan	C10	4930 Mt. Vida -Apt Bldg-	Absent	0.7	8.18	10.9	0.16
15-Jan	F9	10580 Stead BL.(Stead Elem Sch)-High Flyers-	Absent	0.7	7.89	11.4	0.19
22-Jan	I11	6559 Ruby Mtn (Hse/Pennicles)	Absent	0.8	8.10	7.9	0.14
28-Jan	L7	7350 Silver Lake BL.-Apts office	Absent	0.7	8.08	9.0	0.19
February-2009							
5-Feb	C10	4930 Mt. Vida -Apt Bldg-	Absent	0.8	8.09	11.2	0.18
12-Feb	F9	10580 Stead BL.(Stead Elem Sch)-High Flyers-	Absent	0.7	7.90	8.9	0.18
19-Feb	I11	6559 Ruby Mtn (Hse/Pennicles)	Absent	0.8	8.16	8.5	0.15
25-Feb	L7	7350 Silver Lake BL.-Apts office	Absent	0.6	8.00	12.2	0.21
March-2009							
12-Mar	C10	4930 Mt. Vida -Apt Bldg-	Absent	0.5	7.73	7.9	0.17
11-Mar	F9	10580 Stead BL.(Stead Elem Sch)-High Flyers-	Absent	0.7	7.90	11.8	0.23
19-Mar	I11	6559 Ruby Mtn (Hse/Pennicles)	Absent	0.8	8.21	8.5	0.15
26-Mar	L7	7350 Silver Lake BL.-Apts office	Absent	0.7	8.15	10.8	0.18
April-2009							
7-Apr	10	4930 Mt. Vida -Apt Bldg-	Absent	0.7	8.15	10.0	0.17
8-Apr	9	10580 Stead BL.(Stead Elem Sch)-High Flyers-	Absent	0.5	8.01	13.6	0.22
14-Apr	11	6559 Ruby Mtn (Hse/Pennicles)	Absent	0.8	8.17	8.4	0.14
28-Apr	7	7350 Silver Lake BL.-Apts office	Absent	0.7	8.01	11.9	0.16
May-2009							
7-May	10	4930 Mt. Vida -Apt Bldg-	Absent	0.8	8.17	11.8	0.16
14-May	9	10580 Stead BL.(Stead Elem Sch)-High Flyers-	Absent	0.7	8.00	13.9	0.23
21-May	11	6559 Ruby Mtn (Hse/Pennicles)	Absent	0.9	8.20	15.2	0.14
28-May	7	7350 Silver Lake BL.-Apts office	Absent	0.5	8.13	18.3	0.16
June-2009							
4-Jun	10	4930 Mt. Vida -Apt Bldg-	Absent	0.8	8.12	16.0	0.16
10-Jun	9	10580 Stead BL.(Stead Elem Sch)-High Flyers-	Absent	0.5	7.89	17.6	0.24
17-Jun	11	6559 Ruby Mtn (Hse/Pennicles)	Absent	0.8	8.20	16.4	0.15
24-Jun	7	7350 Silver Lake BL.-Apts office	Absent	0.7	8.10	17.1	0.22

4.0 CONCLUSION

TMWA's ASR in the West Lemmon Valley Basin has grown from 32 acre-feet of treated surface water injected in 2000 to 2,498 acre-feet cumulative total at the end of June 2009. The results, as discussed above and shown by various data sheets and charts, show that both injection and pumping activities at S2W, AAW and SKW have very little, if any, effects on the shallow wells in the vicinity of S2W. The data show that where the water level changes were experienced in these wells during the tests, the changes were significantly less than the annual historical water level variations in these wells before commencement of the injection tests.

The chemistry of the injection and extracted water shows no adverse effects to the aquifer as evidenced from the low disinfection by-products concentrations and consistent water quality data from the extracted water.



REPORT ON AQUIFER STORAGE AND RECOVERY
SPANISH SPRINGS VALLEY HYDROGRAPHIC BASIN

JANUARY 1 THROUGH JUNE 30 2009

NDEP PERMIT # UNEV2009202T

July 2009

Truckee Meadows Water Authority

1355 Capital Boulevard

Reno, Nevada 89520

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1.0 SUMMARY

On December 11, 2008, the Nevada Division of Environmental Protection, (NDEP), issued one-year Temporary Permit #UNEV2009202T authorizing Truckee Meadows Water Authority (TMWA), to begin its Aquifer and Storage (ASR) activities at TMWA's Hawkings Court Well (HCW) in Spanish Springs hydrographic basin (Appendix 1). The permit was issued to allow TMWA to collect data to get a better understanding of the effects of ASR at the well before issuing the final 5-year permit (Appendix 1, paragraph 1, cover letter). Nevada Department of Water Resources (NDWR) verbally allowed TMWA to proceed with the ASR program under NDEP's temporary permit.

TMWA commenced recharge at HCW on 1/22/2009 through 4/9/2009. Recharge was terminated due to system requirements to pump the well. During the first half of 2009, TMWA injected 229 acre-ft (75 MG) of treated surface water from TMWA's treatment plant at Chuck Bluff into HCW. During the same period, TMWA pumped 80 acre-ft (26 MG) of water from HCW (Table 1). The monthly average, highest and lowest injection rates for Hawkings Court Well are shown in Table 2.

Table 1. Hawkings Court Well – 1st Half 2009 Recharge and Pumping

	JAN	FEB	MAR	APR	MAY	JUNE	TOTAL	
							MG	AF
Recharge	9	27	30	8			75	229
Pumping				11	8	8	26	80

Table 2. Hawkings Court Well – 1st Half 2009 Average, Highest and Lowest Monthly Injection Rates (gpm)

	January	February	March	April
Average	683	680	676	671
Highest	703	696	691	687
Lowest	670	668	625	619

Figure 1 shows the location of Hawkings Court Well and its monitoring wells plus other production wells in its vicinity. Figure 2 shows the water levels, and pumping and injection rates in the well. As shown in Table 2 above, the average injection rate was approximately 680 gpm and yet the water level rose by only 10 feet over the whole injection period. This shows that the aquifer at this well is very permeable and the well should be able to take more water. Figure 3 shows water level elevations in the injection/production well and its four monitoring wells. Apart from the old Tucker well (now Hawkings Court Monitoring Well), TMWA drilled three other monitoring wells to the north and south-east of HCW in April and May 2009 (Figure 1). They are shown in Figure 1 as Red Hawk Deep and Shallow Monitoring Wells and Golden Eagle Park Monitoring Well.

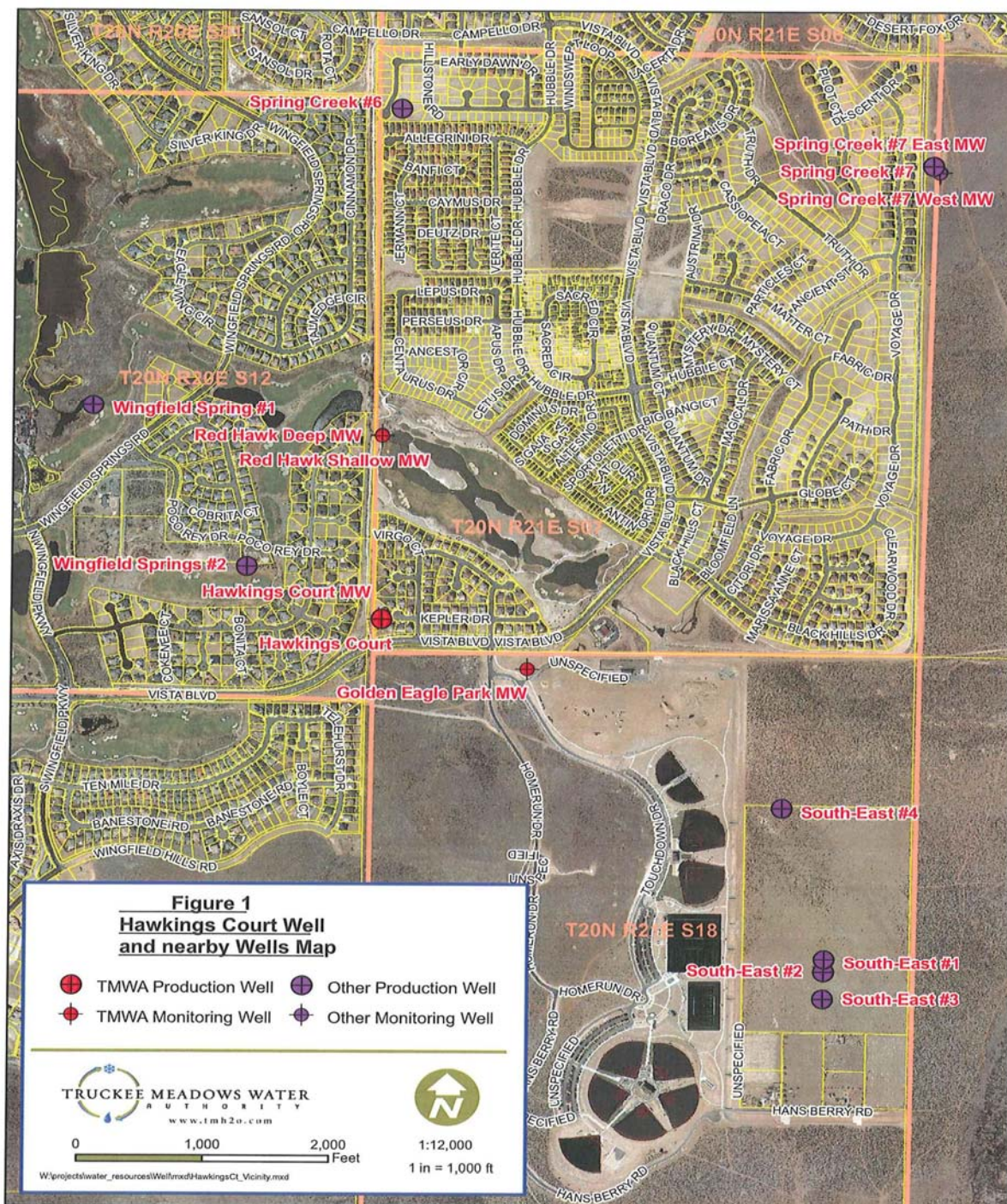


Figure 1. Hawkings Court Well and Nearby Wells

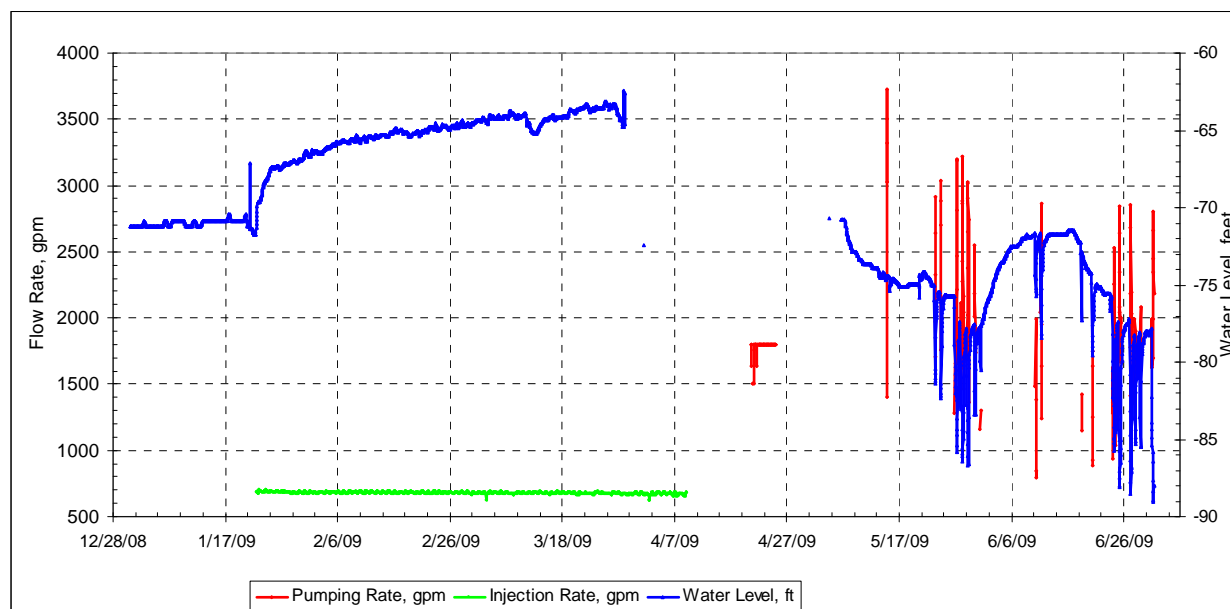


Figure 2. Hawkins Court Well, Mean Hourly Flow Rates and Water Levels, 1st Half 2009

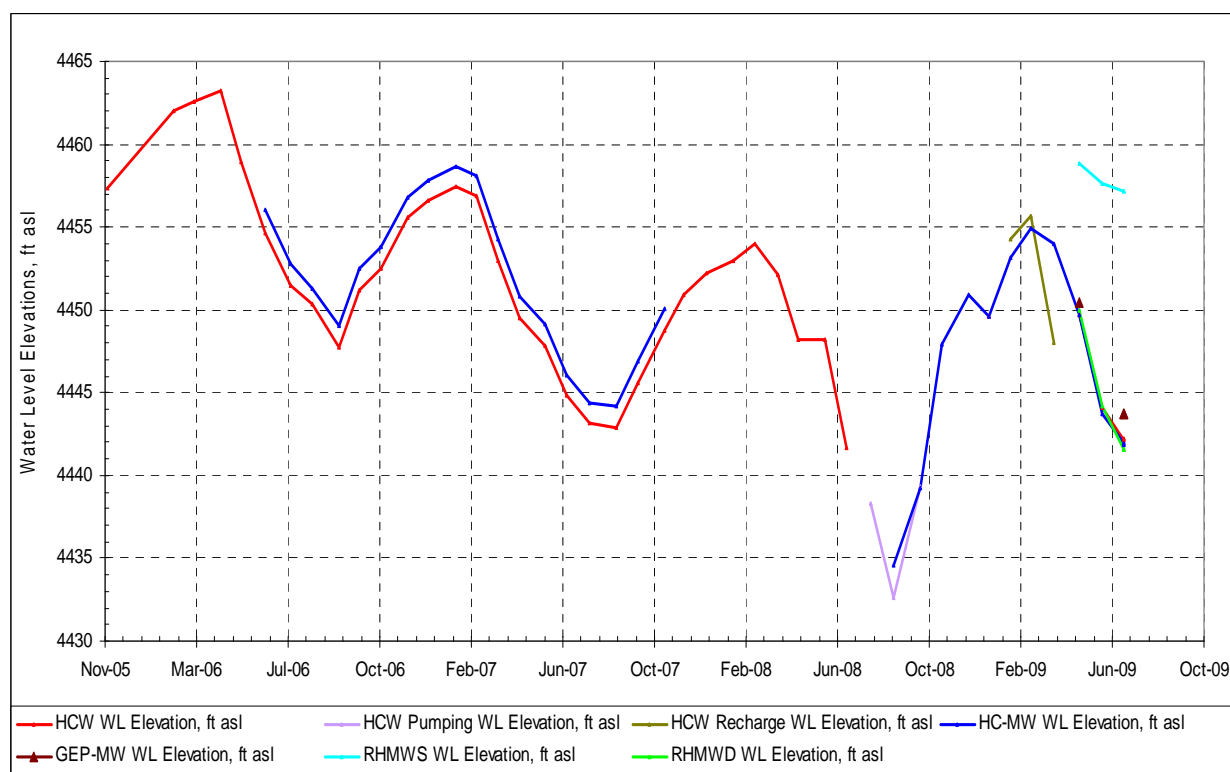


Figure 3. Water Level Elevations for the Hawkins Court Well and its Monitoring Wells

2.0. PRODUCTION WELLS IN EAST SPANISH SPRINGS BASIN

There are four production wells within 6,000 feet radius of HCW. Two of the wells, Wingfield Springs # 1 and #2 are irrigation wells owned by Red Hawk Land Company, LLC. Total production during the first half of 2009 was difficult to estimate as the data given to TMWA shown in Table 3 are incomplete. An estimate of what the two wells pumped during first half of 2009 was made from the weekly production values for weeks of 7/6/09 and 7/13/09, for the period of 4/20/09 to 6/30/09 for Wingfield #1 and 5/11/09 to 6/30/09 for Wingfield #2. Wingfield Springs #1 produced 108 acre-feet (35 MG) and Wingfield #2 produced 36 acre-feet (13 MG), totalling 144 acre-feet (48 MG) during the first half of 2009.

Washoe County Department of Water Resources (WCDWR) owns two municipal wells, Spring Creek #6 and #7 (Figure 1). The two wells pumped 269 acre-feet (88 MG) during the first half of 2009 (Table 4). During the same period TMWA pumped 80 acre-feet (26 MG) and injected 229 acre-feet (75 MG); the total pumped from the East Spanish Springs basin aquifer during the first half of 2009 was 493 acre-feet (162 MG). The net pumping from this aquifer was 264 acre-feet (86 MG) during the first half of 2009.

Table 3. Wingfield Springs Wells – Production and Water Levels, 1st Half 2009

Wingfield Springs #1					Wingfield Springs #2				
Date	Time	Water Level, ft	gpm	Production gallons per week	Date	Time	Water Level, ft	gpm	Production gallons per week
4/13/09	7:00 a.m.	34	0		4/13/09	7:30 a.m.	81	0	
4/20/09	7:00 a.m.	94	800		4/20/09	7:30 a.m.	80	0	
4/27/09	7:00 a.m.	97	800		4/27/09	7:30 a.m.	83	0	
5/4/09	7:00 a.m.	100	850		5/4/09	7:30 a.m.	86	0	
5/11/09	7:00 a.m.	103	850		5/11/09	7:30 a.m.	122	750	
5/18/09	7:00 a.m.	100	850		5/18/09	7:30 a.m.	124	750	
5/25/09	7:00 a.m.	102	875		5/25/09	7:30 a.m.	129	750	
6/1/09	7:00 a.m.	65	0		6/1/09	7:30 a.m.	78	0	
6/8/09	7:00 a.m.	40	0		6/8/09	7:30 a.m.	81	0	
6/15/09	7:00 a.m.	91	850		6/15/09	7:30 a.m.	84	0	
6/22/09	7:00 a.m.	104	1,100		6/22/09	7:30 a.m.	134	750	
6/29/09	7:00 a.m.	110	1,150		6/29/09	7:30 a.m.	141	750	
7/6/09	7:00 a.m.	116	950	3,780,000	7/6/09	7:30 a.m.	146	750	1,570,000
7/13/09	7:00 a.m.	117	1,000	3,150,000	7/13/09	7:30 a.m.	145	750	1,950,000

Table 4. Spring Creek #6 and #7 Wells – Production and Water Levels, 1st Half 2009

DATE	SPRING CREEK #6		SPRING CREEK #7		TOTAL
	Water Level, ft	Volume Pumped, MG	Water Level, ft	Volume Pumped, MG	
1/5/09	-87	2.10	-164		
1/6/09	-160	0.58	-136		
1/16/09	-89	0.65	-138		
1/20/09	-87	1.28	-136		
1/26/09	-88	1.34	-137		
2/6/09	-160	0.58	-136		
2/11/09	-89	0.11	-134		
2/18/09		0.27			
2/23/09	-160	0.42	-163		
3/4/09	-81	0.34	-134		
3/9/09	-84	0.28	-132		
3/17/09	-85	0.49	-134		
3/25/09	-83	0.50	-134		
3/30/09	-84	0.79	-134		
4/6/09	-160	0.88	-134		
4/13/09		1.29	-134		
4/20/09	-78	0.67	-140		
4/27/09	-57	0.01	-136	2.3	
5/4/09	-45	0.20	-136	2.3	
5/11/09	-40	2.37	-137	5.8	
5/18/09	-37	2.42	-170	7.0	
5/27/09	-35	1.42	-171	8.2	
6/2/09	-160	8.26	-169	6.2	
6/8/09	-91	1.52	-142	5.6	
6/15/09	-160	3.92	-171	6.4	
6/22/09	-94	1.01	-172	10.2	
TOTAL, MG		34	54		88
TOTAL, ACRE-FT		103	166		269

3.0 WATER QUALITY

Tables 5 and 6 show water sampling schedules and results from Hawkings Court injection and monitoring wells. The values reported comply with conditions of the UNEV2009202T permit (Appendix 1). Tables 7 through 15 show the results of individual samples taken as per Attachment B of the permit. Table 16 is a time series summary of the results from Tables 5 through 15.

The water quality results from both the injection and monitoring wells during injection and up to 8 days of pumping are below the MCL for Drinking Water Standards (Tables 5 through 16). HAA5 and TTHM from the pumped water are slightly raised but they are still below the MCL. The results show that the injected water at Hawkings Court well does not adversely affect the aquifer in East Spanish Springs basin.

Table 5. Hawkings Court Well – Sampling Schedule and Results, First Half 2009

Sampling Schedule and Results						
Hawkings Court Production Well				Hawkings Court Monitoring Well		
Day 0	Constituent	Result		Day 0	Constituent	Result
Sample Date:				Sample Date:	1/22/09	TOC (ppm)
Sample Time:				Sample Time:	0945	<0.50
Sampling not required						
Day 1	Constituent	Result		Day 1	Constituent	Result
Sample Date:	1/22/09	EC (uS/cm)	175	Sample Date:	1/22/09	EC (uS/cm)
Sample Time:	1420	pH	8.21	Sample Time:	1520	pH
		Temperature (°C)	8.2			Temperature (°C)
		Dissolved Oxygen (ppm)	11.21			Dissolved Oxygen (mg/L)
	Attachment B	HCW1 attachment			Attachment B	TMW1 attachment
	TTHM (ppb)	25.9			Chlorine Residual (ppm)	<0.1
	HAA5 (ppb)	20			TOC (ppm)	0.81
	Chlorine Residual (ppm)	0.5				
	TOC (ppm)	1.02				
Day 7	Constituent	Result		Day 7	Constituent	Result
Sample Date:				Sample Date:	1/28/09	Attachment B
Sample Time:				Sample Time:	1540	TMW7 attachment
Sampling not required						
Day 14	Constituent	Result		Day 14	Constituent	Result
Sample Date:				Sample Date:	2/4/09	Attachment B
Sample Time:				Sample Time:	1400	Chlorine Residual (ppm)
Sampling not required					TOC (ppm)	0.97
Day 30	Constituent	Result				
Sample Date:	2/20/09	TTHM (ppb)	27.2			
Sample Time:	1045	HAA5 (ppb)	18			

Table 6. Hawkings Court Well - Monthly Sampling Schedule, First Half 2009

Hawkings Court Production Well			Hawkings Court Monitoring Well		
January Monitoring			January Monitoring		
Sample Date:	1/22/2009	Constituent	Sample Date:	1/22/2009	Constituent
Sample Time:	1420	EC (uS/cm)	Sample Time:	1520	EC (uS/cm)
		pH			pH
		Temperature (°C)			Temperature (°C)
		Dissolved Oxygen (ppm)			Dissolved Oxygen (ppm)
		Chlorine Residual (ppm)			
		TOC (ppm)			
February Monitoring			February Monitoring		
Sample Date:	2/20/2009	Constituent	Sample Date:	2/4/2009	Constituent
Sample Time:	1045	EC (uS/cm)	Sample Time:	1400	EC (uS/cm)
		pH			pH
		Temperature (°C)			Temperature (°C)
		Dissolved Oxygen (ppm)			Dissolved Oxygen (ppm)
		Chlorine Residual (ppm)			
		TOC (ppm)			
March Monitoring			March Monitoring		
Sample Date:	3/24/2009	Constituent	Sample Date:	3/24/2009	Constituent
Sample Time:	1340	EC (uS/cm)	Sample Time:	1335	EC (uS/cm)
		pH			pH
		Temperature (°C)			Temperature (°C)
		Dissolved Oxygen (ppm)			Dissolved Oxygen (ppm)
		Chlorine Residual (ppm)			
		TOC (ppm)			
April Monitoring			After recharge ceases		
Sample Date:	4/17/2009	Constituent	Sample Date:	4/17/2009	Constituent
Sample Time:	1230	EC (uS/cm)	Sample Time:	1240	EC (uS/cm)
		pH			pH
		Temperature (°C)			Temperature (°C)
		Dissolved Oxygen (ppm)			Dissolved Oxygen (ppm)
		Chlorine Residual (ppm)			
		TOC (ppm)			
Produced water - Day 4			*****After recharge ceases*****		
Sample Date:	4/20/2009	Attachment B			
Sample Time:	1400	THM/HAA			
		Chlorine Residual (ppm)			
*****After production starts*****					
Produced water - Day 8					
Sample Date:	4/24/2009	Attachment B			
Sample Time:	1320	4/24/2009			
		spreadsheet			
*****After production starts*****					

Table 7. Hawkings Court Monitoring Well – Water Quality Before Recharge, 1st Half 2009

Constituent	Symbol	Result (ppm)*	Date Sampled	Time Sampled	Date Analyzed	Method Number	Reporting Limit (ppm)	Analyst	Drinking Water Standard (mg/L)
Alkalinity	mg/L as CaCO ₃	82.0	1/22/09	0945		2320B	1	DA	--
Aluminum	Al	<0.01	1/22/09	0945	2/2/09	200.8	0.01	MNS	0.05 – 0.2 (Advisory Standard)
Antimony	Sb	<0.001	1/22/09	0945	2/2/09	200.8	0.001	MNS	0.006
Arsenic	As	0.0022	1/22/09	0945	2/2/09	200.8	0.0001	MNS	0.01
Barium	Ba	0.005	1/22/09	0945		200.8	0.001	MNS	2
Bicarbonate	HCO ₃	100	1/22/09	0945		2320B	1	DA	--
Boron	B		1/22/09	0945		200.7	0.10	Wetlab	--
Calcium	Ca	10.8	1/22/09	0945		3500-Ca-D	0.5	DA	--
Carbonate	CO ₃	0	1/22/09	0945		2320B	1	DA	--
Chloride	Cl		1/22/09	0945		300.0	1.0	Wetlab	400
Chlorine Residual	Cl ₂		1/22/09	0945				WR	
Chromium	Cr	0.0044	1/22/09	0945	2/2/09	200.8	0.001	MNS	0.1
Color	Color units	<2	1/22/09	0945		2120B	2	WR	15
Copper	Cu	<0.005	1/22/09	0945	2/2/09	200.8	0.005	MNS	1.3
Dissolved Oxygen	DO		1/22/09	0945		360.1	0.1	Wetlab	--
Electrical Conductivity	mS/cm	251	1/22/09	0945		2510B	N/A	DA	--
Fluoride	F		1/22/09	0945		300.0	0.10	Wetlab	4
Hardness	mg/L as CaCO ₃	41.0	1/22/09	0945		2340C	1	DA	--
Iron	Fe		1/22/09	0945		200.7	0.010	Wetlab	0.6
Lead	Pb	<0.001	1/22/09	0945	2/2/09	200.8	0.001	MNS	0.015
Magnesium	Mg	3.4	1/22/09	0945		200.7	0.50	Wetlab	150
Manganese	Mn	0.0013	1/22/09	0945	2/2/09	200.8	0.001	MNS	0.1
Mercury	Hg	<0.0005	1/22/09	0945	2/25/09	200.8	0.0005	MNS	0.002
Nickel	Ni	<0.001	1/22/09	0945	2/2/09	200.8	0.001	MNS	0.1
Nitrate as Nitrogen	NO ₃ -N		1/22/09	0945		300.0	1.0	Wetlab	10
Nitrite as Nitrogen	NO ₂ -N		1/22/09	0945		300.0	0.010	Wetlab	1
pH	Value		1/22/09	0945		4500-H-B	4	WR	6.5 - 8.5
Potassium	K		1/22/09	0945		200.7	0.50	Wetlab	--
Sodium	Na		1/22/09	0945		200.7	0.50	Wetlab	--
Sulfate	SO ₄		1/22/09	0945		300.0	1.0	Wetlab	500
Total Dissolved Solids ¹	TDS	156	1/22/09	0945		2540C	5	DA	1000
Total Organic Carbon	TOC	<0.50	1/22/09	0945		5310B	0.5	DA	--
Total Suspended Solids	TSS	0	1/22/09	0945		160.2	5	DA	--
Temperature	°C		1/22/09	0945		2550B	N/A	WR	--
Turbidity	NTU		1/22/09	0945				WR	--
Zinc	Zn	<0.005	1/22/09	0945	2/2/09	200.8	0.005	MNS	5

¹ TDS value may be calculated from electrical conductivity values.

* Color reported in standard color units, pH reported in standard pH units, conductivity reported in microsiemens per centimeter, temperature reported in degrees celsius, HAA5 and TTHM reported in µg/L

ND = None Detected

Table 8. Hawkings Court Well – Water Quality During Day One of Recharge, 1st Half 2009

Constituent	Symbol	Result (ppm)*	Date Sampled	Time Sampled	Date Analyzed	Method Number	Reporting Limit (ppm)	Analyst	Drinking Water Standard (mg/L)
Alkalinity	mg/L as CaCO ₃	55.0	1/22/09	1420	1/27/09	2320B	1	DA	--
Aluminum	Al	0.034	1/22/09	1420	2/2/09	200.8	0.01	MNS	0.05 – 0.2 (Advisory Standard)
Antimony	Sb	<0.001	1/22/09	1420	2/2/09	200.8	0.001	MNS	0.006
Arsenic	As	0.00077	1/22/09	1420	2/2/09	200.8	0.0001	MNS	0.01
Barium	Ba	21.000	1/22/09	1420	2/2/09	200.8	0.001	MNS	2
Bicarbonate	HCO ₃	67.1	1/22/09	1420	1/27/09	2320B	1	DA	--
Boron	B	<0.10	1/22/09	1420	2/4/09	200.7	0.10	Wetlab	--
Bromide	Br	<0.005	1/22/09	1420	2/13/09	300.1	0.0050	Wetlab	--
Calcium	Ca	14.0	1/22/09	1420	1/27/09	3500-Ca-D	0.5	DA	--
Carbonate	CO ₃	0	1/22/09	1420	1/27/09	2320B	1	DA	--
Chloride	Cl	10	1/22/09	1420	1/23/09	300.0	1.0	Wetlab	400
Chlorine Residual	Cl ₂	0.5	1/22/09	1420	1/23/09	N/A	0.1	WR	
Chromium	Cr	<0.001	1/22/09	1420	2/2/09	200.8	0.001	MNS	0.1
Color	Color units	<2	1/22/09	1420	1/22/09	2120B	2	WR	15
Copper	Cu	<0.005	1/22/09	1420	2/2/09	200.8	0.005	MNS	1.3
Dissolved Oxygen	DO	11.21	1/22/09	1420	1/22/09	360.1	0.1	Wetlab	--
Electrical Conductivity	mS/cm	175	1/22/09	1420	1/27/09	2510B	N/A	DA	--
Fluoride	F	<0.10	1/22/09	1420	1/23/09	300.0	0.10	Wetlab	4
Haloacetic Acid	HAA5	20	1/22/09	1420	2/8/09	552.2	N/A	Alpha	60
Hardness	mg/L as CaCO ₃	53.0	1/22/09	1420	1/27/09	2340C	1	DA	--
Iron	Fe	<0.010	1/22/09	1420	2/4/09	200.7	0.010	Wetlab	0.6
Lead	Pb	<0.001	1/22/09	1420	2/2/09	200.8	0.001	MNS	0.015
Magnesium	Mg	4.1	1/22/09	1420	2/4/09	200.7	0.50	Wetlab	150
Manganese	Mn	0.00013	1/22/09	1420	2/2/09	200.8	0.001	MNS	0.1
Mercury	Hg	<0.0005	1/22/09	1420	2/2/09	200.8	0.0005	MNS	0.002
Nickel	Ni	<0.001	1/22/09	1420	2/2/09	200.8	0.001	MNS	0.1
Nitrate as Nitrogen	NO ₃ -N	<1.0	1/22/09	1420	1/23/09	300.0	1.0	Wetlab	10
Nitrite as Nitrogen	NO ₂ -N	<0.025	1/22/09	1420	1/23/09	300.0	0.010	Wetlab	1
pH	Value	8.21	1/22/09	1420	1/22/09	4500-H-B	4	WR	6.5 - 8.5
Potassium	K	1.3	1/22/09	1420	2/4/09	200.7	0.50	Wetlab	--
Sodium	Na	12	1/22/09	1420	2/4/09	200.7	0.50	Wetlab	--
Sulfate	SO ₄	16	1/22/09	1420	1/23/09	300.0	1.0	Wetlab	500
Total Dissolved Solids ¹	TDS	95	1/22/09	1420	1/27/09	2540C	5	Wetlab	1000
Total Organic Carbon	TOC	1.02	1/22/09	1420	1/26/09	5310B	0.5	DA	--
Total Suspended Solids	TSS	0	1/22/09	1420	1/27/09	160.2	1	Wetlab	--
Total Trihalomethanes	TTHM	25.9	1/22/09	1420	1/27/09	524.2	N/A	Alpha	80
Temperature	°C	8.2	1/22/09	1420	1/22/09	2550B	N/A	WR	--
Turbidity	NTU	0.92	1/22/09	1420	1/22/09	N/A	N/A	WR	--
Zinc	Zn	<0.005	1/22/09	1420	2/2/09	200.8	0.005	MNS	5

¹ TDS value may be calculated from electrical conductivity values.

* Color reported in standard color units, pH reported in standard pH units, conductivity reported in microsiemens per centimeter, temperature reported in degrees celsius, HAA5 and TTHM reported in µg/L

ND = None Detected

Table 9. Hawkings Court Monitoring Well – Water Quality During Day One Recharge, 1st Half 2009

Constituent	Symbol	Result (ppm)*	Date Sampled	Time Sampled	Date Analyzed	Method Number	Reporting Limit (ppm)	Analyst	Drinking Water Standard (mg/L)
Alkalinity	mg/L as CaCO ₃	83.0	1/22/09	1520	1/27/09	2320B	1	DA	--
Aluminum	Al	<0.01	1/22/09	1520	2/2/09	200.8	0.01	MNS	0.05 – 0.2 (Advisory Standard)
Antimony	Sb	<0.001	1/22/09	1520	2/2/09	200.8	0.001	MNS	0.006
Arsenic	As	0.0025	1/22/09	1520	2/2/09	200.8	0.0001	MNS	0.01
Barium	Ba	0.006	1/22/09	1520	2/2/09	200.8	0.001	MNS	2
Bicarbonate	HCO ₃	101	1/22/09	1520	1/27/09	2320B	1	DA	--
Boron	B	<0.10	1/22/09	1520	2/4/09	200.7	0.10	Wetlab	--
Bromide	Br	0.094	1/22/09	1520	2/13/09	300.1	0.0050	Wetlab	--
Calcium	Ca	10.8	1/22/09	1520	1/27/09	3500-Ca-D	0.5	DA	--
Carbonate	CO ₃	0	1/22/09	1520	1/27/09	2320B	1	DA	--
Chloride	Cl	15	1/22/09	1520	1/23/09	300.0	1.0	Wetlab	400
Chlorine Residual	Cl ₂	<0.1	1/22/09	1520	1/22/09	N/A	0.1	WR	
Chromium	Cr	<0.001	1/22/09	1520	2/2/09	200.8	0.001	MNS	0.1
Color	Color units	<2	1/22/09	1520	1/22/09	2120B	2	WR	15
Copper	Cu	<0.005	1/22/09	1520	2/2/09	200.8	0.005	MNS	1.3
Dissolved Oxygen	DO	6.40	1/22/09	1520	1/22/09	360.1	0.1	Wetlab	--
Electrical Conductivity	mS/cm	249	1/22/09	1520	1/27/09	2510B	N/A	DA	--
Fluoride	F	0.18	1/22/09	1520	1/23/09	300.0	0.10	Wetlab	4
Haloacetic Acid	HAA5	1.2	1/22/09	1520	2/5/09	552.2	N/A	Alpha	60
Hardness	mg/L as CaCO ₃	41.0	1/22/09	1520	1/27/09	2340C	1	DA	--
Iron	Fe	0.093	1/22/09	1520	2/4/09	200.7	0.010	Wetlab	0.6
Lead	Pb	<0.001	1/22/09	1520	2/2/09	200.8	0.001	MNS	0.015
Magnesium	Mg	3.4	1/22/09	1520	2/4/09	200.7	0.50	Wetlab	150
Manganese	Mn	0.0038	1/22/09	1520	2/2/09	200.8	0.001	MNS	0.1
Mercury	Hg	<0.0005	1/22/09	1520	2/25/09	200.8	0.0005	MNS	0.002
Nickel	Ni	<0.001	1/22/09	1520	2/2/09	200.8	0.001	MNS	0.1
Nitrate as Nitrogen	NO ₃ -N	1.1	1/22/09	1520	1/23/09	300.0	1.0	Wetlab	10
Nitrite as Nitrogen	NO ₂ -N	<0.025	1/22/09	1520	1/23/09	300.0	0.010	Wetlab	1
pH	Value	8.07	1/22/09	1520	1/22/09	4500-H-B	4	WR	6.5 - 8.5
Potassium	K	5.5	1/22/09	1520	2/4/09	200.7	0.50	Wetlab	--
Sodium	Na	28	1/22/09	1520	2/4/09	200.7	0.50	Wetlab	--
Sulfate	SO ₄	18	1/22/09	1520	1/23/09	300.0	1.0	Wetlab	500
Total Dissolved Solids ¹	TDS	152	1/22/09	1520	1/27/09	2540C	5	DA	1000
Total Organic Carbon	TOC	0.81	1/22/09	1520	1/27/09	5310B	0.5	DA	--
Total Suspended Solids	TSS	0	1/22/09	1520	1/27/09	160.2	5	DA	--
Total Trihalomethanes	TTHM	18.3	1/22/09	1520	1/27/09	524..2	N/A	Alpha	80
Temperature	°C	16.8	1/22/09	1520	1/22/09	2550B	N/A	WR	--
Turbidity	NTU	0.87	1/22/09	1520	1/22/09	N/A	N/A	WR	
Zinc	Zn	<0.005	1/22/09	1520	2/2/09	200.8	0.005	MNS	5

¹ TDS value may be calculated from electrical conductivity values.

* Color reported in standard color units, pH reported in standard pH units, conductivity reported in microsiemens per centimeter, temperature reported in degrees celsius, HAA5 and TTHM reported in µg/L

ND = None Detected

Table 10. Hawkings Court Monitoring Well – Water Quality After 7 Days Recharge, 1st Half 2009

Constituent	Symbol	Result (ppm)*	Date Sampled	Time Sampled	Date Analyzed	Method Number	Reporting Limit (ppm)	Analyst	Drinking Water Standard (mg/L)
Alkalinity	mg/L as CaCO ₃	65.0	1/28/09	1540	2/3/09	2320B	1	DA	--
Aluminum	Al	<0.01	1/28/09	1540	2/2/09	200.8	0.01	MNS	0.05 – 0.2 (Advisory Standard)
Antimony	Sb	<0.001	1/28/09	1540	2/2/09	200.8	0.001	MNS	0.006
Arsenic	As	0.0015	1/28/09	1540	2/2/09	200.8	0.0001	MNS	0.01
Barium	Ba	0.004	1/28/09	1540	2/2/09	200.8	0.001	MNS	2
Bicarbonate	HCO ₃	79.3	1/28/09	1540	2/3/09	2320B	1	DA	--
Boron	B	<0.10	1/28/09	1540	2/2/09	200.7	0.10	Wetlab	--
Bromide	Br	0.014	1/28/09	1540	2/3/09	300.1	0.0050	Wetlab	--
Calcium	Ca	8.0	1/28/09	1540	2/3/09	3500-Ca-D	0.5	DA	--
Carbonate	CO ₃	0.0	1/28/09	1540	2/3/09	2320B	1	DA	--
Chloride	Cl	12	1/28/09	1540	1/29/09	300.0	1.0	Wetlab	400
Chlorine Residual	Cl ₂	0.1	1/28/09	1540	1/28/09	N/A	0.1	WR	4.0
Chromium	Cr	<0.001	1/28/09	1540	2/2/09	200.8	0.001	MNS	0.1
Color	Color units	<2	1/28/09	1540	1/28/09	2120B	2	WR	15
Copper	Cu	<0.005	1/28/09	1540	2/2/09	200.8	0.005	MNS	1.3
Dissolved Oxygen	DO	8.41	1/28/09	1540	1/28/09	360.1	0.1	Wetlab	--
Electrical Conductivity	mS/cm	201	1/28/09	1540	2/3/09	2510B	N/A	DA	--
Fluoride	F	0.13	1/28/09	1540	1/29/09	300.0	0.10	Wetlab	4
Hardness	mg/L as CaCO ₃	40.0	1/28/09	1540	2/3/09	2340C	1	DA	--
Iron	Fe	0.036	1/28/09	1540	2/2/09	200.7	0.010	Wetlab	0.6
Lead	Pb	<0.001	1/28/09	1540	2/2/09	200.8	0.001	MNS	0.015
Magnesium	Mg	3.5	1/28/09	1540	2/2/09	200.7	0.50	Wetlab	150
Manganese	Mn	0.0019	1/28/09	1540	2/2/09	200.8	0.001	MNS	0.1
Mercury	Hg	<0.0005	1/28/09	1540	2/25/09	200.8	0.0005	MNS	0.002
Nickel	Ni	<0.001	1/28/09	1540	2/2/09	200.8	0.001	MNS	0.1
Nitrate as Nitrogen	NO ₃ -N	<1.0	1/28/09	1540	1/29/09	300.0	1.0	Wetlab	10
Nitrite as Nitrogen	NO ₂ -N	<0.010	1/28/09	1540	1/29/09	300.0	0.010	Wetlab	1
pH	Value	8.02	1/28/09	1540	1/28/09	4500-H-B	4	WR	6.5 - 8.5
Potassium	K	5.6	1/28/09	1540	2/2/09	200.7	0.50	Wetlab	--
Sodium	Na	27	1/28/09	1540	2/2/09	200.7	0.50	Wetlab	--
Sulfate	SO ₄	16	1/28/09	1540	1/29/09	300.0	1.0	Wetlab	500
Total Dissolved Solids ¹	TDS	131	1/28/09	1540	2/3/09	2540C	5	DA	1000
Total Suspended Solids	TSS	0	1/28/09	1540	2/3/09	160.2	5	DA	--
Temperature	°C	16.1	1/28/09	1540	1/28/09	2550B	N/A	WR	--
Turbidity	NTU	0.38	1/28/09	1540	1/28/09	N/A	N/A	WR	--
Zinc	Zn	<0.005	1/28/09	1540	2/2/09	200.8	0.005	MNS	5

¹ TDS value may be calculated from electrical conductivity values.

* Color reported in standard color units, pH reported in standard pH units, conductivity reported in microsiemens per centimeter, temperature reported in degrees celsius, HAA5 and TTHM reported in µg/L

ND = None Detected

Table 11. Hawkings Court Monitoring Well – Water Quality After 14 Days Recharge, 1st Half 2009

Constituent	Symbol	Result (ppm)*	Date Sampled	Time Sampled	Date Analyzed	Method Number	Reporting Limit (ppm)	Analyst	Drinking Water Standard (mg/L)
Alkalinity	mg/L as CaCO ₃	63.0	2/4/09	1400	2/9/09	2320B	1	DA	--
Aluminum	Al	<0.001	2/4/09	1400	2/18/09	200.8	0.01	MNS	0.05 – 0.2 (Advisory Standard)
Antimony	Sb	<0.001	2/4/09	1400	2/18/09	200.8	0.001	MNS	0.006
Arsenic	As	0.0017	2/4/09	1400	2/18/09	200.8	0.0001	MNS	0.01
Barium	Ba	0.004	2/4/09	1400	2/18/09	200.8	0.001	MNS	2
Bicarbonate	HCO ₃	76.8	2/4/09	1400	2/9/09	2320B	1	DA	--
Boron	B	<0.10	2/4/09	1400	2/17/09	200.7	0.10	Wetlab	--
Bromide	Br	0.014	2/4/09	1400	2/5/09	300.1	0.0050	Wetlab	--
Calcium	Ca	8.01	2/4/09	1400	2/9/09	3500-Ca-D	0.5	DA	--
Carbonate	CO ₃	0.00	2/4/09	1400	2/9/09	2320B	1	DA	--
Chloride	Cl	12	2/4/09	1400	2/4/09	300.0	1.0	Wetlab	400
Chlorine Residual	Cl ₂	0.1	2/4/09	1400	2/4/09	N/A	0.1	WR	
Chromium	Cr	0.0017	2/4/09	1400	2/18/09	200.8	0.001	MNS	0.1
Color	Color units	<2	2/4/09	1400	2/4/09	2120B	2	WR	15
Copper	Cu	<0.005	2/4/09	1400	2/18/09	200.8	0.005	MNS	1.3
Dissolved Oxygen	DO	8.78	2/4/09	1400	2/4/09	360.1	0.1	Wetlab	--
Electrical Conductivity	mS/cm	189	2/4/09	1400	2/9/09	2510B	N/A	DA	--
Fluoride	F	0.14	2/4/09	1400	2/4/09	300.0	0.10	Wetlab	4
Hardness	mg/L as CaCO ₃	35	2/4/09	1400	2/9/09	2340C	1	DA	--
Iron	Fe	<0.010	2/4/09	1400	2/17/09	200.7	0.010	Wetlab	0.6
Lead	Pb	<0.001	2/4/09	1400	2/18/09	200.8	0.001	MNS	0.015
Magnesium	Mg	3.2	2/4/09	1400	2/17/09	200.7	0.50	Wetlab	150
Manganese	Mn	0.0016	2/4/09	1400	2/18/09	200.8	0.001	MNS	0.1
Mercury	Hg	<0.0005	2/4/09	1400	2/25/09	200.8	0.0005	MNS	0.002
Nickel	Ni	<0.001	2/4/09	1400	2/18/09	200.8	0.001	MNS	0.1
Nitrate as Nitrogen	NO ₃ -N	<1.0	2/4/09	1400	2/4/09	300.0	1.0	Wetlab	10
Nitrite as Nitrogen	NO ₂ -N	<0.025	2/4/09	1400	2/4/09	300.0	0.010	Wetlab	1
pH	Value	7.13	2/4/09	1400	2/4/09	4500-H-B	4	WR	6.5 - 8.5
Potassium	K	4.7	2/4/09	1400	2/17/09	200.7	0.50	Wetlab	--
Sodium	Na	21	2/4/09	1400	2/17/09	200.7	0.50	Wetlab	--
Sulfate	SO ₄	16	2/4/09	1400	2/4/09	300.0	1.0	Wetlab	500
Total Dissolved Solids ¹	TDS	123	2/4/09	1400	2/9/09	2540C	5	DA	1000
Total Organic Carbon	TOC	0.97	2/4/09	1400	2/9/09	5310B	0.5	DA	--
Total Suspended Solids	TSS	<10	2/4/09	1400	2/5/09	160.2	5	Wetlab	--
Temperature	°C	15.5	2/4/09	1400	2/4/09	2550B	N/A	WR	--
Turbidity	NTU	0.57	2/4/09	1400	2/4/09	N/A	N/A	WR	--
Zinc	Zn	<0.005	2/4/09	1400	2/18/09	200.8	0.005	MNS	5

¹ TDS value may be calculated from electrical conductivity values.

* Color reported in standard color units, pH reported in standard pH units, conductivity reported in microsiemens per centimeter, temperature reported in degrees celsius, HAA5 and TTHM reported in µg/L

ND = None Detected

Table 12. Hawkings Court Well – Water Quality After 30 Days Recharge, 1st Half 2009

Constituent	Symbol	Result (ppm)*	Date Sampled	Time Sampled	Date Analyzed	Method Number	Reporting Limit (ppm)	Analyst	Drinking Water Standard (mg/L)
Alkalinity	mg/L as CaCO ₃		2/20/09	1045		2320B	1	DA	--
Aluminum	Al	0.030	2/20/09	1045	3/2/09	200.8	0.01	MNS	0.05 – 0.2 (Advisory Standard)
Antimony	Sb	<0.001	2/20/09	1045	3/2/09	200.8	0.001	MNS	0.006
Arsenic	As		2/20/09	1045	3/2/09	200.8	0.0001	MNS	0.01
Barium	Ba	0.018	2/20/09	1045	3/2/09	200.8	0.001	MNS	2
Bicarbonate	HCO ₃		2/20/09	1045		2320B	1	DA	--
Boron	B		2/20/09	1045		200.7	0.10	Wetlab	--
Bromide	Br		2/20/09	1045		300.1	0.0050	Wetlab	--
Calcium	Ca		2/20/09	1045		3500-Ca-D	0.5	DA	--
Carbonate	CO ₃		2/20/09	1045		2320B	1	DA	--
Chloride	Cl		2/20/09	1045		300.0	1.0	Wetlab	400
Chlorine Residual	Cl ₂	0.5	2/20/09	1045			0.1	WR	
Chromium	Cr	0.0032	2/20/09	1045	3/2/09	200.8	0.001	MNS	0.1
Color	Color units		2/20/09	1045		2120B	2	WR	15
Copper	Cu	<0.005	2/20/09	1045	3/2/09	200.8	0.005	MNS	1.3
Dissolved Oxygen	DO	11.26	2/20/09	1045	2/20/09	360.1	0.1	Wetlab	--
Electrical Conductivity	mS/cm	159	2/20/09	1045		2510B	N/A	DA	--
Fluoride	F		2/20/09	1045		300.0	0.10	Wetlab	4
Haloacetic Acid	HAA5	18	2/20/09	1045	3/5/09	552.2	N/A	Alpha	60
Hardness	mg/L as CaCO ₃		2/20/09	1045		2340C	1	DA	--
Iron	Fe		2/20/09	1045		200.7	0.010	Wetlab	0.6
Lead	Pb	<0.001	2/20/09	1045	3/2/09	200.8	0.001	MNS	0.015
Magnesium	Mg		2/20/09	1045		200.7	0.50	Wetlab	150
Manganese	Mn	0.0012	2/20/09	1045	3/2/09	200.8	0.001	MNS	0.1
Mercury	Hg		2/20/09	1045		200.8	0.0005	MNS	0.002
Nickel	Ni	<0.001	2/20/09	1045	3/2/09	200.8	0.001	MNS	0.1
Nitrate as Nitrogen	NO ₃ -N		2/20/09	1045		300.0	1.0	Wetlab	10
Nitrite as Nitrogen	NO ₂ -N		2/20/09	1045		300.0	0.010	Wetlab	1
pH	Value	7.61	2/20/09	1045		4500-H-B	4	WR	6.5 - 8.5
Potassium	K		2/20/09	1045		200.7	0.50	Wetlab	--
Sodium	Na		2/20/09	1045		200.7	0.50	Wetlab	--
Sulfate	SO ₄		2/20/09	1045		300.0	1.0	Wetlab	500
Total Dissolved Solids ¹	TDS	103	2/20/09	1045		2540C	5	DA	1000
Total Organic Carbon	TOC	1.2	2/20/09	1045		5310B	0.5	DA	--
Total Suspended Solids	TSS		2/20/09	1045		160.2	5	Wetlab	--
Temperature	°C	6.8	2/20/09	1045		2550B	N/A	WR	--
Total Trihalomethanes	TTHM	27.2	2/20/09	1045				Alpha	80
Turbidity	NTU	0.83	2/20/09	1045				WR	--
Zinc	Zn	<0.005	2/20/09	1045	3/2/09	200.8	0.005	MNS	5

¹ TDS value may be calculated from electrical conductivity values.

* Color reported in standard color units, pH reported in standard pH units, conductivity reported in microsiemens per centimeter, temperature reported in degrees celsius, HAA5 and TTHM reported in µg/L

ND = None Detected

Table 13. Hawkings Court Well – Extracted Water Quality After 4 Days pumping, 1st Half 2009

Constituent	Symbol	Result (ppm)*	Date Sampled	Time Sampled	Date Analyzed	Method Number	Reporting Limit (ppm)	Analyst	Drinking Water Standard (mg/L)
Alkalinity	mg/L as CaCO ₃	55.0	4/20/09	1400	4/22/08	2320B	1	DA	--
Aluminum	Al	0.0162	4/20/09	1400	4/28/09	200.8	0.01	MNS	0.05 – 0.2 (Advisory Standard)
Antimony	Sb	<0.001	4/20/09	1400	4/28/09	200.8	0.001	MNS	0.006
Arsenic	As	0.0011	4/20/09	1400	4/20/09	200.8	0.0001	MNS	0.01
Barium	Ba	0.016	4/20/09	1400	4/28/09	200.8	0.001	MNS	2
Bicarbonate	HCO ₃	67.1	4/20/09	1400	4/22/09	2320B	1	DA	--
Boron	B	<0.10	4/20/09	1400	4/29/09	200.7	0.10	Wetlab	--
Bromide	Br	0.012	4/20/09	1400	4/29/09	300.1	0.0050	Wetlab	--
Calcium	Ca	12.0	4/20/09	1400	4/27/09	3500-Ca-D	0.5	DA	--
Carbonate	CO ₃	ND	4/20/09	1400	4/22/09	2320B	1	DA	--
Chloride	Cl	10.9	4/20/09	1400	4/22/09	300.0	1.0	Wetlab	400
Chlorine Residual	Cl ₂	0.1	4/20/09	1400	4/20/09	N/A	0.1	WR	
Chromium	Cr	0.0038	4/20/09	1400	4/28/09	200.8	0.001	MNS	0.1
Color	Color units	<2	4/20/09	1400	4/20/09	2120B	2	WR	15
Copper	Cu	<0.005	4/20/09	1400	4/28/09	200.8	0.005	MNS	1.3
Dissolved Oxygen	DO	9.65	4/20/09	1400	4/20/09	360.1	0.1	Wetlab	--
Electrical Conductivity	mS/cm	174	4/20/09	1400	4/22/09	2510B	N/A	DA	--
Fluoride	F	<0.2	4/20/09	1400	4/22/09	300.0	0.10	Wetlab	4
Haloacetic Acid	HAA5	32	4/20/09	1400	4/30/09	552.2	N/A	Alpha	60
Hardness	mg/L as CaCO ₃	49.0	4/20/09	1400	4/27/09	2340C	1	DA	--
Iron	Fe	<0.010	4/20/09	1400	4/29/09	200.7	0.010	Wetlab	0.6
Lead	Pb	<0.001	4/20/09	1400	4/28/09	200.8	0.001	MNS	0.015
Magnesium	Mg	4.6	4/20/09	1400	4/27/09	200.7	0.50	Wetlab	150
Manganese	Mn	<0.001	4/20/09	1400	4/20/09	200.8	0.001	MNS	0.1
Mercury	Hg	<0.0005	4/20/09	1400	4/23/09	200.8	0.0005	MNS	0.002
Nickel	Ni	<0.001	4/20/09	1400	4/28/09	200.8	0.001	MNS	0.1
Nitrate as Nitrogen	NO ₃ -N	<0.3	4/20/09	1400	4/22/09	300.0	1.0	Wetlab	10
Nitrite as Nitrogen	NO ₂ -N	<0.2	4/20/09	1400	4/22/09	300.0	0.010	Wetlab	1
pH	Value	8.21	4/20/09	1400	4/20/09	4500-H-B	4	WR	6.5 - 8.5
Potassium	K	1.7	4/20/09	1400	4/29/09	200.7	0.50	Wetlab	--
Sodium	Na	14	4/20/09	1400	4/29/09	200.7	0.50	Wetlab	--
Sulfate	SO ₄	11.9	4/20/09	1400	4/22/09	300.0	1.0	Wetlab	500
Total Dissolved Solids ¹	TDS	113	4/20/09	1400	4/22/09	2540C	5	DA	1000
Total Organic Carbon	TOC	1.05	4/20/09	1400	4/20/09	5310B	0.5	DA	--
Total Suspended Solids	TSS	<5	4/20/09	1400	4/27/09	160.2	5	Wetlab	--
Temperature	°C	11.5	4/20/09	1400	4/20/09	2550B	N/A	WR	--
Total Trihalomethanes	TTHM	48.7	4/20/09	1400	4/24/09	524.2	0.005	CM	80
Turbidity	NTU	0.18	4/20/09	1400	4/20/09	N/A	N/A	WR	--
Zinc	Zn	<0.005	4/20/09	1400	4/28/09	200.8	0.005	MNS	5

¹ TDS value may be calculated from electrical conductivity values.

* Color reported in standard color units, pH reported in standard pH units, conductivity reported in microsiemens per centimeter, temperature reported in degrees celsius, HAA5 and TTHM reported in µg/L

ND = None Detected

**Table 14. Hawkings Court Monitoring Well –Water Quality After 8 Days
Injection/Production Well Pumping, 1st Half 2009**

Constituent	Symbol	Result (ppm)*	Date Sampled	Time Sampled	Date Analyzed	Method Number	Reporting Limit (ppm)	Analyst	Drinking Water Standard (mg/L)
Alkalinity	mg/L as CaCO ₃	82.0	4/24/09	1315	4/27/09	2320B	1	DA	--
Aluminum	Al	<0.01	4/24/09	1315	4/28/09	200.8	0.01	MNS	0.05 – 0.2 (Advisory Standard)
Antimony	Sb	<0.001	4/24/09	1315	4/28/09	200.8	0.001	MNS	0.006
Arsenic	As	0.00047	4/24/09	1315	4/28/09	200.8	0.0001	MNS	0.01
Barium	Ba	0.010	4/24/09	1315	4/28/09	200.8	0.001	MNS	2
Bicarbonate	HCO ₃	100.0	4/24/09	1315	4/28/09	2320B	1	DA	--
Boron	B	<0.10	4/24/09	1315	5/5/09	200.7	0.10	Wetlab	--
Bromide	Br		4/24/09	1315		300.1	0.0050	Wetlab	--
Calcium	Ca	10.0	4/24/09	1315	4/27/09	3500-Ca-D	0.5	DA	--
Carbonate	CO ₃	ND	4/24/09	1315	4/27/09	2320B	1	DA	--
Chloride	Cl	14.3	4/24/09	1315	4/27/09	300.0	1.0	Wetlab	400
Chlorine Residual	Cl ₂		4/24/09	1315			0.1	WR	
Chromium	Cr	0.0027	4/24/09	1315	4/28/09	200.8	0.001	MNS	0.1
Color	Color units	<2	4/24/09	1315	4/24/09	2120B	2	WR	15
Copper	Cu	<0.005	4/24/09	1315	4/28/09	200.8	0.005	MNS	1.3
Dissolved Oxygen	DO	6.04	4/24/09	1315	4/23/09	360.1	0.1	Wetlab	--
Electrical Conductivity	mS/cm	255	4/24/09	1315	4/27/09	2510B	N/A	DA	--
Fluoride	F	<0.2	4/24/09	1315	4/27/09	300.0	0.10	Wetlab	4
Haloacetic Acid	HAA5		4/24/09	1315		552.2	N/A	Alpha	60
Hardness	mg/L as CaCO ₃	43.0	4/24/09	1315	4/27/09	2340C	1	DA	--
Iron	Fe	0.075	4/24/09	1315	5/5/09	200.7	0.010	Wetlab	0.6
Lead	Pb	<0.001	4/24/09	1315	4/28/09	200.8	0.001	MNS	0.015
Magnesium	Mg	4.38	4/24/09	1315	4/27/09	200.7	0.50	Wetlab	150
Manganese	Mn	<0.001	4/24/09	1315	4/28/09	200.8	0.001	MNS	0.1
Mercury	Hg	<0.0005	4/24/09	1315	4/28/09	200.8	0.0005	MNS	0.002
Nickel	Ni	<0.001	4/24/09	1315	4/28/09	200.8	0.001	MNS	0.1
Nitrate as Nitrogen	NO ₃ -N	0.967	4/24/09	1315	4/27/09	300.0	1.0	Wetlab	10
Nitrite as Nitrogen	NO ₂ -N	<0.2	4/24/09	1315	4/27/09	300.0	0.010	Wetlab	1
pH	Value		4/24/09	1315		4500-H-B	4	WR	6.5 - 8.5
Potassium	K	6.2	4/24/09	1315	5/5/09	200.7	0.50	Wetlab	--
Sodium	Na	35	4/24/09	1315	5/5/09	200.7	0.50	Wetlab	--
Sulfate	SO ₄	19.4	4/24/09	1315	4/27/09	300.0	1.0	Wetlab	500
Total Dissolved Solids ¹	TDS	166	4/24/09	1315	4/29/09	2540C	5	DA	1000
Total Organic Carbon	TOC	0.638	4/24/09	1315	4/29/09	5310B	0.5	DA	--
Total Suspended Solids	TSS	<5	4/24/09	1315	4/27/09	160.2	5	Wetlab	--
Temperature	°C		4/24/09	1315		2550B	N/A	WR	--
Total Trihalomethanes	TTHM		4/24/09	1315		524.2	0.005	CM	80
Turbidity	NTU		4/24/09	1315				WR	--
Zinc	Zn	<0.005	4/24/09	1315	4/28/09	200.8	0.005	MNS	5

¹ TDS value may be calculated from electrical conductivity values.

* Color reported in standard color units, pH reported in standard pH units, conductivity reported in microsiemens per centimeter, temperature reported in degrees celsius, HAA5 and TTHM reported in µg/L

ND = None Detected

Table 15. Hawkings Court Well –Water Quality After 8 Days Pumping, 1st Half 2009

Constituent	Symbol	Result (ppm)*	Date Sampled	Time Sampled	Date Analyzed	Method Number	Reporting Limit (ppm)	Analyst	Drinking Water Standard (mg/L)
Alkalinity	mg/L as CaCO ₃	60.0	4/24/09	1320	4/27/09	2320B	1	DA	--
Aluminum	Al	0.015	4/24/09	1320	4/28/09	200.8	0.01	MNS	0.05 – 0.2 (Advisory Standard)
Antimony	Sb	<0.001	4/24/09	1320	4/28/09	200.8	0.001	MNS	0.006
Arsenic	As	0.00059	4/24/09	1320	4/28/09	200.8	0.0001	MNS	0.01
Barium	Ba	0.019	4/24/09	1320	4/28/09	200.8	0.001	MNS	2
Bicarbonate	HCO ₃	73.2	4/24/09	1320	4/27/09	2320B	1	DA	--
Boron	B	<0.10	4/24/09	1320	5/5/09	200.7	0.10	Wetlab	--
Bromide	Br		4/24/09	1320		300.1	0.0050	Wetlab	--
Calcium	Ca	11.6	4/24/09	1320	4/27/09	3500-Ca-D	0.5	DA	--
Carbonate	CO ₃	ND	4/24/09	1320	4/27/09	2320B	1	DA	--
Chloride	Cl	11.1	4/24/09	1320	4/27/09	300.0	1.0	Wetlab	400
Chlorine Residual	Cl ₂	ND	4/24/09	1320	4/24/09		0.1	WR	
Chromium	Cr	0.0023	4/24/09	1320	4/28/09	200.8	0.001	MNS	0.1
Color	Color units	<2	4/24/09	1320	4/24/09	2120B	2	WR	15
Copper	Cu	<0.005	4/24/09	1320	4/28/09	200.8	0.005	MNS	1.3
Dissolved Oxygen	DO	8.92	4/24/09	1320	4/23/09	360.1	0.1	Wetlab	--
Electrical Conductivity	mS/cm	184	4/24/09	1320	4/27/09	2510B	N/A	DA	--
Fluoride	F	<0.2	4/24/09	1320	4/27/09	300.0	0.10	Wetlab	4
Haloacetic Acid	HAA5		4/24/09	1320		552.2	N/A	Alpha	60
Hardness	mg/L as CaCO ₃	50.0	4/24/09	1320	4/27/09	2340C	1	DA	--
Iron	Fe	0.022	4/24/09	1320	5/5/09	200.7	0.010	Wetlab	0.6
Lead	Pb	<0.001	4/24/09	1320	4/28/09	200.8	0.001	MNS	0.015
Magnesium	Mg	5.1	4/24/09	1320	4/27/09	200.7	0.50	Wetlab	150
Manganese	Mn	<0.001	4/24/09	1320	4/28/09	200.8	0.001	MNS	0.1
Mercury	Hg	<0.0005	4/24/09	1320	4/28/09	200.8	0.0005	MNS	0.002
Nickel	Ni	<0.001	4/24/09	1320	4/28/09	200.8	0.001	MNS	0.1
Nitrate as Nitrogen	NO ₃ -N	<0.3	4/24/09	1320	4/27/09	300.0	1.0	MNS	10
Nitrite as Nitrogen	NO ₂ -N	<0.2	4/24/09	1320	4/27/09	300.0	0.010	MNS	1
pH	Value	8.61	4/24/09	1320	4/24/09	4500-H-B	4	WR	6.5 - 8.5
Potassium	K	2.2	4/24/09	1320	5/5/09	200.7	0.50	Wetlab	--
Sodium	Na	18	4/24/09	1320	5/5/09	200.7	0.50	Wetlab	--
Sulfate	SO ₄	12.7	4/24/09	1320	4/27/09	300.0	1.0	Wetlab	500
Total Dissolved Solids ¹	TDS	120	4/24/09	1320	4/27/09	2540C	5	DA	1000
Total Organic Carbon	TOC	1.11	4/24/09	1320	4/29/09	5310B	0.5	DA	--
Total Suspended Solids	TSS	<5	4/24/09	1320	4/27/09	160.2	5	Wetlab	--
Temperature	°C	12.5	4/24/09	1320	4/27/09	2550B	N/A	WR	--
Total Trihalomethanes	TTHM		4/24/09	1320		524.2	0.005	CM	80
Turbidity	NTU	0.45	4/24/09	1320	4/24/09			WR	--
Zinc	Zn	<0.001	4/24/09	1320	4/28/09	200.8	0.005	MNS	5

¹ TDS value may be calculated from electrical conductivity values.

* Color reported in standard color units, pH reported in standard pH units, conductivity reported in microsiemens per centimeter, temperature reported in degrees celsius, HAA5 and TTHM reported in µg/L

ND = None Detected

Table 16. Hawkings Court Injection and Monitoring Wells –Time Series Water Quality Comparison, 1st Half 2009

Constituent	Symbol	MCL (mg/L)	Hawkings Court Monitoring Well					Hawkings Court Well			
			Before rchg, 1/22/09*	1 day rchg, 1/22/09*	7 days rchg, 1/28/09*	14 days rchg, 2/4/09*	8 days pumping, 4/24/09*	1 day rchg, 1/22/09*	30 days rchg, 2/4/09*	4 days pumping, 4/20/09*	8 days pumping, 4/24/09*
Alkalinity	mg/L as CaCO ₃		82.0	83.0	65.0	63.0	82.0	55.0		55.0	60.0
Aluminum	Al	0.05-0.2	<0.01	<0.01	<0.01	<0.001	<0.01	0.034	0.030	0.0162	0.015
Antimony	Sb	0.006	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001
Arsenic	As	0.010	0.0022	0.0025	0.0015	0.0017	0.00047	0.00077		0.0011	0.00059
Barium	Ba	2.000	0.005	0.006	0.004	0.004	0.010	21.000	0.018	0.016	0.019
Bicarbonate	HCO ₃		100	101	79.3	76.8	100.0	67.1		67.1	73.2
Boron	B			<0.10	<0.10	<0.10	<0.10	<0.10		<0.10	<0.10
Bromide	Br			0.094	0.014	0.014		<0.005		0.012	
Calcium	Ca		10.8	10.8	8.0	8.01	10.0	14.0		12.0	11.6
Carbonate	CO ₃		0	0	0.0	0.00	ND	0		ND	ND
Chloride	Cl	250-400		15	12	12	14.3	10		10.9	11.1
Chlorine Residual	Cl ₂			<0.1	0.1	0.1		0.5	0.5	0.1	ND
Chromium	Cr	0.1	0.0044	<0.001	<0.001	0.0017	0.0027	<0.001	0.0032	0.0038	0.0023
Color	Color units	15	<2	<2	<2	<2	<2	<2		<2	<2
Copper	Cu	1.0-1.3	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005
Dissolved Oxygen	DO			6.40	8.41	8.78	6.04	11.21	11.26	9.65	8.92
Electrical Conductivity	mS/cm		251	249	201	189	255	175	159	174	184
Fluoride	F	2.0-4.0		0.18	0.13	0.14	<0.2	<0.10		<0.2	<0.2
Haloacetic Acid	HAA5	0.06		1.2				20	18	32	
Hardness	mg/L as CaCO ₃		41.0	41.0	40.0	35	43.0	53.0		49.0	50.0
Iron	Fe	0.3-0.6		0.093	0.036	<0.010	0.075	<0.010		<0.010	0.022
Lead	Pb	0.015	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001
Magnesium	Mg	125-150		3.4	3.4	3.5	3.2	4.38		4.6	5.1
Manganese	Mn	0.1	0.0013	0.0038	0.0019	0.0016	<0.001	0.00013	0.0012	<0.001	<0.001
Mercury	Hg	0.002	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005		<0.0005	<0.0005
Nickel	Ni	0.1	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001
Nitrate as Nitrogen	NO ₃ -N	10		1.1	<1.0	<1.0	0.967	<1.0		<0.3	<0.3
Nitrite as Nitrogen	NO ₂ -N	1		<0.025	<0.010	<0.025	<0.2	<0.025		<0.2	<0.2
pH	Value	6.5-8.5		8.07	8.02	7.13		8.21	7.61	8.21	8.61
Potassium	K			5.5	5.6	4.7	6.2	1.3		1.7	2.2
Sodium	Na			28	27	21	35	12		14	18
Sulfate	SO ₄	250-500		18	16	16	19.4	16		11.9	12.7
Total Dissolved Solids ¹	TDS	1000	156	152	131	123	166	95	103	113	120
Total Organic Carbon	TOC		<0.50	0.81		0.97	0.638	1.02	1.2	1.05	1.11
Total Suspended Solids	TSS		0	0	0	<10	<5	0		<5	<5
Temperature	°C			18.3	16.1	15.5		25.9	6.8	11.5	12.5
Total Trihalomethanes	TTHM	0.08		16.8				8.2	27.2	48.7	
Turbidity	NTU			0.87	0.38	0.57		0.92	0.83	0.18	0.45
Zinc	Zn	5	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.001

¹ TDS value may be calculated from electrical conductivity values.

* Color reported in standard color units, pH reported in standard pH units, conductivity reported in microsiemens per centimeter, temperature reported in degrees celsius, HAA5 and TTHM reported in µg/L (ppb) and the rest of the constituents are reported in mg/L (ppm)

ND = None Detected

4.0 CONCLUSIONS

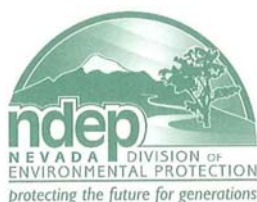
Following receipt of temporary ASR permit from NDEP, TMWA injected 229 acre-feet (75 MG) of treated surface water in Hawkings Court Well between January 22 and April 9, 2009. By the end of June, 2009, TMWA had pumped 80 acre-feet (26 MG) of water from the Hawkings Court Well, which is 35% of what was injected. The results, as discussed above and shown by various data sheets and charts, show that both injection and pumping activities at HCW have very little effect, if any, on the East Spanish Springs aquifer.

The chemistry of the injection and extracted water shows no adverse effects to the aquifer as evidenced by the results summarized in Table 16.

TMWA plans to start injection activities in HCW as early as possible in the Fall of 2009 depending on the customer water demands using the existing Temporary Permit.

Based on these ASR test results shown in this report, TMWA recommends that NDEP and NDWR issue permanent five-year renewable ASR permits to TMWA.

APPENDIX 1: UNEV2009202T TEMPORARY PERMIT AND COVER LETTER



STATE OF NEVADA

Department of Conservation & Natural Resources

DIVISION OF ENVIRONMENTAL PROTECTION

Jim Gibbons, Governor

Allen Biaggi, Director

Leo M. Drozdoff, P.E., Administrator

December 11, 2008

John A. Erwin
Director, Resource Planning and Development
Truckee Meadows Water Authority
P.O. Box 30013
Reno, NV 89510

RE: Underground Injection Control (UIC) Permits UNEV2009202
Issuance of Temporary UIC Permit UNEV2009202T
Spanish Springs - Hawkings Court Well ASR Project

Mr. Erwin:

Pursuant to Nevada Administrative Code (NAC) 445A.890, the Nevada Division of Environmental Protection (NDEP) has finished our initial review of the UIC application for the Hawkings Court Well ASR Project, and has enclosed a signed copy of the UIC Temporary Permit UNEV2009202 that covers activities for a period of one (1) year. NDEP is issuing this temporary permit to help expedite activities at this project. This permit is being issued for a period of one year to collect data and to allow TMWA to get a better understanding of how this well will be used in the future so more details may be provided in the application for the final 5-year permit.

The public notice for this permit is required to be sent out within ten days of issuance of any temporary permit. If any comments are received during the comments period, these will be forwarded to TMWA as soon as possible.

This temporary permit is identified by a "T" in the number, and will be removed for issuance of final permit. All monitoring, sampling and reporting shall be carried out in association with this permit and specific number.

The NDEP would like to point out some areas where the UIC permit application was deficient or limited in details, and requires these items be submitted by February 6, 2009:

1. **By Feb 6**, resubmit a map with all wells in Area of Review. All wells are not listed in application under Attachment D. The application states all wells in area; this includes wells not directly used by the applicant. Only wells with publically available data are required. NDEP identified another fifteen wells that may be within the AOR.
2. **By Feb 6**, resubmit cross sections only show select wells, please include wells identified in Item 1.
3. Considerable information provided for Hawkings Court well on construction and history of production testing, but little information provided on operational activities of well (recharge or production), future testing of well, etc. Also, no discussion in application on whether the Hawkings Court well will be pumped following recharge, including when pumping will start, duration of pumping, etc. **By Feb 6**, provide summary.

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December 11, 2008
UIC Temporary Permit UNEV2009202T

4. **By Feb 6**, some discussion on historical and future use of Tucker monitoring well would be helpful.
 - a. What is the current water level in the well?
 - b. Was it used for domestic use When?
 - c. Will it be pumped in the future or is it strictly a monitoring well?
5. **By Feb 6**, - clarify if sample with 11/9/05 date in application was taken from HC or Tucker well (HC is deeper, 604'/165')
6. NDEP requested mineralogy information – was pointed to lithology log, however no mineralogy on log. Without data, metals samples needed from well.
7. No monitoring program included under Attachment L, references other TMWA UIC permits monitoring – not appropriate for this new well located in different geological environment, so specific sampling requirements have been set by NDEP.
8. **By Feb 6**, update the UIC O&M Manual to include the following:
 - a. UIC sampling and monitoring requirements;
 - b. Should mention no field filtering for metal samples;
 - c. Information on water treatment and conveyance to recharge well, including how chlorine is maintained, how water is pumped to well, how pressure and injection rates are controlled;
 - d. How injection rates and pressure are measured and where they are recorded and stored for reporting purposes, reference Construction Diagrams in Attachment 8;
 - e. Any standard operating procedures that occur before, during and after recharge season.

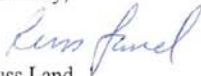
Please note if the above items are not provided by February 6, 2009, the NDEP will require injection to cease into well until such time as items are provided.

It should also be noted that before injection may begin, the following shall occur:

1. Total organic carbon sample taken from Hawkings Court or Tucker well;
2. UIC Temporary Permit reviewed for monitoring and sampling requirements, especially for items required before or on the first few days of injection.

Contact me with any questions at 775-687-9428 or e-mail at rland@ndep.nv.gov.

Sincerely,



Russ Land
Underground Injection Control Program
Bureau of Water Pollution Control

Enclosure: copy of temporary UIC permit UNEV2009202T

cc: Jon Palm PhD PE, Chief, NDEP BWPC (w/o enclosure)
Ryan Clark, Division of Water Resources (w/o enclosure)
Jennifer Carr P.E., Chief, NDEP Bureau of Safe Drinking Water (w/o enclosure)
File UNEV2009202
GWP Branch Reader File

UNEV2009202T TMWA Spanish Springs ASR Permit
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STATE OF NEVADA
DIVISION OF ENVIRONMENTAL PROTECTION

Temporary Authorization To Inject

In compliance with the provisions of the Nevada Revised Statutes (NRS 445A) and the Nevada Underground Injection Control Regulations (NAC 445A.810 thru 445A.925), the following Permittee is authorized to dispose from a facility described below in accordance with limitations, requirements and other conditions set forth in Parts I and II hereof.

Permit Number: UNEV2009202T

Facility Name: Spanish Springs Aquifer Storage and Recovery (ASR) Project
Facility Address: 3661 Hawkings Court, Spanish Springs, Washoe County

Permittee: Truckee Meadows Water Authority (TMWA)
Permittee Address: 1155 Corporate Blvd., PO Box 30013, Reno Nevada

Property Owner: TMWA
Owner Address: 1155 Corporate Blvd. Reno Nevada

Legal Description: T.20N.,R21E., SW SW Section 7, MDB&M Washoe County, Nevada.

Number of Permitted Wells: One (1)

Other Permits: NDWR permit not issued

Reporting Frequency: Semi-Annual (see Part I.A.6)

Facility Description

The Hawkings Court production well is located at 3661 Hawkings Court. Treated water from the Truckee River will be used for injection/recharge.

Any additional wells to be added to this permit or exchanged for the above well shall require approval through the UIC Program, and public notice

NOTE: Reference the permit fact sheet for specific details on the facility and wells, and permit history.

Permit issued as temporary permit on: **December 10, 2008**

This permit shall become effective: December 10, 2008

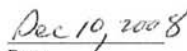
This permit shall expire at midnight: December 10, 2009

Annual Fee Due: **July 1st of each year**



Russ Land

Underground Injection Control Program
Bureau of Water Pollution Control



Date

PART I**A. EFFLUENT LIMITATIONS, MONITORING AND OTHER REQUIREMENTS**

1. During the period beginning on the effective date of this permit and lasting through the expiration date, the permittee is **authorized to inject water piped through the distribution system to well(s) approved above.**

Table 1 – Approved Injection Wells and Associated Monitoring Wells

INJECTION WELL	ASSOCIATED MONITORING WELL(S)
Hawkings Court well	Tucker well

2. All wells to be used for injection must receive written approval prior to use. To receive written approval, the permittee shall submit the following for each newly constructed well:
- Well location map
 - Well construction details
 - Construction plans for any future wells
 - As-builts for existing wells to be converted
 - Water quality analysis
 - Well use plan (How will this well fit into the entire system?)
3. Extraction, conveyance, and injection must be accomplished in a completely closed system so as to not allow the introduction of any foreign materials to the treated water prior to injection.
4. No chemical additives shall be added to the injection wells without prior written authorization from the Division.
5. The injectate and affected groundwater shall be limited and monitored by the Permittee as specified below and in Table 2, 3 and 4, and reported to the Division pursuant to Part I.A.6.
- All analysis shall conform to the schedule provided in Tables 2, 3, and 4. An aquifer sample shall be taken at the appropriate frequency (Table 3 and 4). Approved injection and associated monitoring wells are listed in Table 1.
 - The application states an injection rate of 400-800 gallons per minute (gpm). The Permittee is required to notify NDEP in writing in five (5) days if the injection rate exceeds 800 gpm. Non-notification is a violation of this permit.
 - The Permittee is constrained to inject only water that meets all chemical, physical and biological drinking water standards after treatment and before injection, and is below 2 ppm in chlorine. Injection practices shall not cause groundwater and/or injected water to surface at or near the injection points, not cause any surface or subsurface hazards, nor cause any physical, biological, or chemical degradation of groundwater (including trace metals and inorganic constituents) pursuant to UIC regulations – for this project since ground water meets primary and secondary standards - degradation means exceeding a primary or enforceable secondary standard.

UNEV2009202T TMWA Spanish Springs ASR Permit
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- d. In the event the Permittee becomes aware of any constituent in the injected waters that exceeds a drinking water standard or ground water degrades above a standard or baseline value, whichever is higher, the Permittee shall immediately cease injection and notify the Division by the end of the following working day.
- e. The injection pressure measured at the wellhead shall not exceed that which is calculated to initiate new fractures or propagate existing fractures in the zone of injection or the confining formation between the zone for injection and any aquifer system. Maximum injection pressure must be calculated by using the formulas as specified in NAC 445A.911 and shall be measured at the injection wellhead, and **shall not exceed 5 psig on the main casing at the surface.**
- f. A laboratory certified by the State of Nevada must perform all analyses. Testing methods for constituents must be EPA or Division approved. **The UIC Program requires inorganic analyses of metals for "Total Metals" in which samples are not filtered and are preserved with an acid in the field. Any exceptions to this policy must be requested and pre-approved by the UIC program prior to sampling. It must be clearly stated on all reports which analyses were used.**
- g. The analytical method detection limits for all chemical constituents must be at least as low as primary or enforceable secondary drinking water standards when applicable.
- h. The Division may decrease or increase the monitoring of any parameter or frequency for good cause. Requests by Permittee to change any sampling and/or monitoring requirements must be done so in writing.
- i. The injection pressure and injection rate measurements shall be taken as close to the same time as possible.

6. Semi-Annual Reporting Requirements

The Permittee shall submit an **annual report by January 31st** of each year, for the **12-month reporting period ending December 31st** and a **semiannual update report by July 31st** for the **previous 6 months ending June 30th**. Each report should:

- a. Contain a completed UIC Monitoring Report Summary and Check List form attached to this permit; including all parameters listed as part of this checklist.
- b. Reporting shall be completed as specified in Part I.A.9.

Monitoring results and other requirements obtained during the previous six months shall be summarized for each month and reported no later than the last day of the month following the completed reporting period. Refer to the reporting checklist included as "Attachment B" of this permit. Signed copies of these, and all other reports required herein, shall be submitted to the UIC Program Officer at the following address:

Division of Environmental Protection
Bureau of Water Pollution Control
ATTN: UIC Program
901 South Stewart Street, Suite 4001
Carson City, NV 89701

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7. All facilities and ancillaries encompassed by this permit shall conform to the plans and specifications filed with the Division of Environmental Protection and shall be maintained in good working order at all times.
8. The Permittee shall comply with all provisions of the UIC regulations, Nevada Administrative Code (NAC) 445A.810 through 445A.925, and all other pertinent laws and regulations. Nothing in this permit relieves the permittee from responsibilities, liabilities or penalties established by any other State, Federal or local jurisdiction.
9. The Permittee shall submit the annual review and services fee in accordance with NAC 445A.872 no later than July 1st of every year thereafter following permit issuance until the permit is terminated. This fee applies to the forthcoming State fiscal year.

B. SCHEDULE OF COMPLIANCE

1. The permittee shall achieve compliance with the conditions, limitations and requirements of the permit at the commencement of relevant activity.
2. The Administrator may, upon the request of the permittee, and after public notice, revise or modify a schedule of compliance in an issued permit if he determines good and valid cause (such as an act of God, a strike, materials shortage or other event over which the permittee has little or no control) exists for such revision.

PART II**A. MONITORING AND RECORDKEEPING**

1. Samples and measurements taken as required herein shall be representative of the volume and/or nature of the subject of interest.

2. Test Procedures

Test Procedures for the analyses of required constituents shall comply with applicable analytical methods cited and described in tables IA - IE of 40 CFR part 136 or in appendix III of 40 CFR part 261, under which such procedures may be required, unless the Administrator approves other procedures. A laboratory certified by the State of Nevada must perform all analyses conducted pursuant to permit requirements.

3. Recording of Results

For each measurement or sample taken pursuant to the requirements of this permit, the permittee shall record the following information:

- a. The exact place, date, and time of sampling;
- b. The dates the analyses were performed;
- c. The person(s) who performed the analyses;
- d. The analytical techniques or methods used;
- e. The results of all required analyses; and
- f. The precision and accuracy of the analytical data (to be accessible through laboratory).

4. Additional Monitoring by Permittee

If the permittee monitors any constituent at the locations(s) designated herein more frequently than required by this permit, or monitors additional constituents than required by this permit, using approved analytical methods as specified above, the results of such monitoring results shall be made available to the Division upon request.

5. Records Retention

All records and information resulting from the monitoring activities required by this permit, including all records and analyses performed and calibration and maintenance of instrumentation and recordings from continuous monitoring instrumentation, shall be retained for a minimum of three (3) years, or longer if required by the Director.

6. Modification of Monitoring Frequency, Location and Sample Type

After considering monitoring data, stream flow, discharge flow and receiving water conditions, the Division may, for just cause, modify the monitoring frequency, location and/or sample type by issuing an Order to the permittee.

B. MANAGEMENT REQUIREMENTS

1. Changes in Effluents or Discharge

All effluents or discharges authorized herein shall be consistent with the terms and conditions of this permit. The discharge of any constituent identified in this permit more frequently than or at a level in excess of that authorized shall constitute a violation of the permit. Any anticipated facility expansions, or treatment modifications which will result in new, different, or increased effluents or discharges must be reported by submission of a new application or, if such changes will not violate the limitations specified in this permit, by notice to the permit issuing authority of such changes. Following such notice, the permit may be modified to specify and limit any constituents not previously limited.

2. Noncompliance Notification

If, for any reason, the permittee does not comply with or will be unable to comply with the conditions, requirements and limitations specified in this permit, the permittee shall provide the Director with the following information, in writing, within five (5) days of becoming aware of such conditions:

- a. A description of the noncompliance or violation.
- b. The period of noncompliance, including exact dates and times, or if not corrected, the anticipated time the noncompliance is expected to continue, and steps being taken to reduce, eliminate and prevent recurrence of the noncompliance.
- c. Notification shall be provided verbally as soon as possible but not later than the end of the first working day after learning of the violation, and in writing within five days of becoming aware of such conditions.

3. Facilities Operation

The permittee shall at all times maintain in good working order and operate as efficiently as possible, all treatment or control facilities, devices or systems installed or used by the permittee to achieve compliance with the terms and conditions of this permit.

4. Adverse Impact

The permittee shall take all reasonable steps, including such accelerated or additional monitoring as necessary to determine the nature and impact of the non-complying effluent or discharge, to minimize any adverse impact to waters of the State resulting from noncompliance with any limitations specified in this permit.

5. Bypassing

Any diversion from or bypass of facilities necessary to maintain compliance with the terms and conditions of this permit is prohibited except where unavoidable to prevent loss of life or severe property damage. The Division will have the final authority in the determination of whether a discharge is deemed unavoidable. The permittee shall promptly notify the Director in writing, of each such diversion or bypass, in accordance with the procedure specified in Part II.A.2 above.

C. RESPONSIBILITIES

1. Right of Entry

The permittee shall allow the Director and/or his authorized representatives, upon the presentation of credentials:

- a. To enter upon the Permittee's premises where a source is located or in which any records are required to be kept under the terms and conditions of this permit;
- b. To have access to, and to copy any records required to be kept under the terms and conditions of this permit;
- c. To inspect any monitoring equipment or monitoring method required in this permit; and
- d. To perform any necessary sampling to determine compliance with this permit or to sample any effluent or discharge.

2. Transfer of Ownership or Control

In the event of any change in ownership or control, the Permittee shall notify the succeeding owner of the existence of this permit, in writing, at the earliest possible date to allow sufficient time for the succeeding owner to demonstrate financial responsibility to the Division within 30 days prior to transfer of ownership. The letter shall include the date agreed upon by both parties for the transfer of ownership. A copy of the letter shall be forwarded to the Administrator. The Administrator may require modification, or revocation with subsequent reissuance of the permit, to change the name of the new Permittee and incorporate additional requirements as deemed necessary due to any changes made to the injection wells or system by the new Permittee. The Administrator of the Division of Environmental Protection shall

approve all transfers of permits.

3. Availability of Reports

Except for data determined to be confidential under NRS 445A.665, all reports prepared in accordance with the terms of this permit shall be available for public inspection. Knowingly making any false statement on any such report may result in the imposition of criminal penalties as provided for in NRS 445A.710.

4. Permit Modification, Suspension or Revocation

After notice and opportunity for a hearing, this permit may be modified, suspended, or revoked in whole or in part during its term for cause including, but not limited to, the following:

- a. Violation of any terms or conditions of this permit;
- b. Obtaining this permit by misrepresentation or failure to disclose fully all relevant facts; or
- c. A change in any condition that requires either a temporary or permanent reduction or elimination of the effluent or discharge.

5. Civil and Criminal Liability

- a. Nothing in this permit shall be construed to relieve the permittee from civil or criminal penalties for noncompliance.
- b. Nothing in this permit shall be construed to preclude the institution of any legal action or relieve the permittee from any responsibilities, liabilities, or penalties established pursuant to any applicable State law or regulation.
- c. The issuance of this permit does not convey any property rights, in either real or personal property, or any exclusive privileges, nor does it authorize any injury to private property or any invasion of personal rights, nor any infringement of Federal, State or local laws or regulations.

ATTACHMENT A
UIC Monitoring Requirements and Check List
 (Submit with every report)

TABLE 2 – Injected Water/Injection Well Schedule

<u>PARAMETER</u>	<u>LOCATION</u>	<u>MONITORING FREQUENCY</u>	<u>LIMITATIONS</u>
Electrical Conductivity, pH, Temperature, Dissolved Oxygen (DO) (all collected in the field as close together as possible)	Injectate	Day 1 of injection, monthly until end of injection, and once during the last week of injection.	pH - $\geq 6.5 \leq 8.5$ baseline = ~ 7.88
Constituents as listed under Attachment "B" of this permit	Injectate	Day 1 of injection	Not exceed enforceable state and federal primary and secondary drinking water regulations
Total Trihalomethanes (TTHM's) Haloacetic Acids (HAA5)	Injectate	Day 1 and 30 of injection	Not exceed state and federal primary regulations
Chlorine Concentration; Total Organic Carbon (TOC)	Injectate	Day 1 and monthly thereafter during injection	Chlorine may not exceed 4.0 mg/L
Groundwater Elevations and Depth to Water Level within Well	Injection Well	Continuous using SCADA (data acquisition system) during recharge and non-recharge periods	Monitor and Report
Average, lowest, and highest Injection Rate (gpm) and Cumulative Volume injected (gal)	Totalizing flow meter with capability for instantaneous flow rate. Meter to be located on the injection pipe line between the injection pump and the wellhead.	Continuous during recharge, report lowest injection rate, not zero if injection did not occur	Monitor and Report

TABLE 3 – Monitoring well (Tucker) Schedule

<u>PARAMETER</u>	<u>LOCATION</u>	<u>MONITORING FREQUENCY</u>	<u>LIMITATIONS</u>
Electrical Conductivity, pH, and Dissolved Oxygen (DO) (all collected in the field as close together as possible)	Tucker well	Day 1 of injection, then monthly thereafter through injection cycle.	Monitor and Report baseline GW – 8.4
Constituents as listed under Attachment "B" of this permit	Tucker well	Day 1, 7 & 14 after injection begins ¹ ; Day 1, 7 & 14 after injection ceases for season	Not exceed enforceable state and federal primary and secondary drinking water regulations
Chlorine and Total Organic Carbon (TOC)	Tucker well	TOC sample from Tucker/HC well before injection, then Day 1 & 14 of injection	Chlorine < 2 ppm
Groundwater Elevations and Depth to Water Level within well.	Tucker well	Daily for one week, weekly thereafter during injection, via SCADA or manual	Monitor and Report
1. Modified this requirement in January 09 per conversation with TMWA to include sampling after injection begins.			

TABLE 4 – Produced Water Schedule

<u>PARAMETER</u>	<u>LOCATION</u>	<u>MONITORING FREQUENCY</u>	<u>LIMITATIONS</u>
Constituents as listed under Attachment "B" of this permit	Produced water from Hawkings Court well	Day 1, 7 & 14 of pump back	Not exceed enforceable state and federal primary and secondary drinking water regulations
Total Trihalomethanes (TTHM's); Haloacetic Acids (HAA5); Chlorine Concentration	Produced water from Hawkings Court well, flow line from wellhead	Day 1 & 14 of pump back	Not exceed primary drinking water standards, Chlorine < 2 ppm
Average, lowest, and highest Production Rate (gpm) and Cumulative Volume injected (gal)	Totalizing flow meter with capability for instantaneous flow rate. Meter to be located on the injection pipe line between the injection pump and the wellhead.	Continuous during production	Monitor and Report
Note: Days 1 & 14 may be different for Tucker well samples versus Produced Water samples, depending on pump back activity			

Annual report is due by August 31st of each year with the following (for the reporting period ending June 30th), and semiannual update report is due by January 31st for the period ending December 31st:

Note: the annual report submitted August 31 shall contain all injection data for the previous recharge cycle, from fall of previous year to summer of current year. The semiannual report shall contain as much data as available through December 31.

- _____ The results of chemical and physical analyses as required by Attachment A and associated Tables for the injectate during recharge.
- _____ The results of chemical and physical analyses as required by Attachment A and associated Tables for the aquifer (produced or monitoring well water) during production.
- _____ The results from any and all biological and organic testing of treated water during the year. This data is required to be collected from routine drinking water sampling of distribution water and submitted with the UIC report.
- _____ For each month, the total volume of fluid injected (in gal/month) for each well.
- _____ For each month, the average, lowest and highest injection rate for each well reported in gpm. Lowest shall be lowest operating rate, not zero if not operational, unless the well did not run at all during month.
- _____ For each month, the average, lowest and highest injection pressure for each well reported in psig. Lowest shall be lowest operating pressure, not zero if not operational, unless the well did not run at all during month.
- _____ For the reporting period, a graph of the water levels for each recharge well. This graph shall cover at least a one-year period and indicate the beginning and end of each injection and production period.
- _____ A table showing all required water level measurements, on a monthly frequency, for the recharge wells and all monitoring wells.
- _____ Summary narrative analysis of monitoring activities for that 12 month period. Narrative shall include, but not be limited to, any problems encountered that could or did affect the recharge well or the water quality, and the type of action taken, any spills or releases at the site, all tests performed on the wells within the project area, reasons wells could not be sampled, etc.

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ATTACHMENT B – Adjusted UIC Sample List 2

Note: crossed out items in gray are not required

Nevada Division of Environmental Protection					
Underground Injection Control Program - Sampling and Monitoring Report Form					
Facility Name :			Depth of sampled water's origin :		
Facility Owner:			County:		
NDEP UIC Permit # :			Location :		Latitude Longitude
Well ID # :			Sampler :		
Type of Well : Monitor Production Injection			Date Sampled :		
Modified UIC Sample List 2- Inorganic Extended			Name of Laboratory :		
Parameter	Units	DW Standards	Initial Measured Values	Method	Method Description
total dissolved solids	mg/L	500 - 1000		EPA 180.1	
pH	standard units	6.5 - 8.5		EPA 150.1	
chloride	mg/L	250 - 400		EPA 300.0	Ion Chromatography
fluoride	mg/L	4		EPA 300.0	Ion Chromatography
sulfate	mg/L	250 - 500		EPA 300.0	Ion Chromatography
nitrate (as nitrogen)	mg/L	10		EPA 300.0	Ion Chromatography
nitrite (as nitrogen)	mg/L	1		EPA 300.0	Ion Chromatography
aluminum	mg/L	0.05-0.2		EPA 200.8	ICP-MS
antimony	mg/L	0.006		EPA 200.8	ICP-MS
arsenic	mg/L	0.01*		EPA 200.8	ICP-MS
barium	mg/L	2		EPA 200.8	ICP-MS
beryllium	mg/L	0.004		EPA 200.8	ICP-MS
cadmium	mg/L	0.005		EPA 200.8	ICP-MS
chromium	mg/L	0.1		EPA 200.8	ICP-MS
copper	mg/L	1.0-1.3		EPA 200.8	ICP-MS
lead	mg/L	0.015		EPA 200.8	ICP-MS
iron	mg/L	0.3 - 0.6		EPA 200.7	ICP
magnesium	mg/L	125 - 150		EPA 200.7	ICP
manganese	mg/L	0.1		EPA 200.8	ICP-MS
mercury	mg/L	0.002		EPA 245.1	AA Cold Vapor
nickel	mg/L	0.1		EPA 200.8	ICP-MS
seleinkum	mg/L	0.05		EPA 200.8	ICP-MS
silver	mg/L	0.05		EPA 200.8	ICP-MS
thallium	mg/L	0.002		EPA 200.8	ICP-MS
zinc	mg/L	5		EPA 200.8	ICP-MS
adjusted gross alpha	pCi/L	15		EPA 900	
gross beta	dpm	4		EPA 900	
alkalinity (CaCO3)	mg/L	-		SM 2320 B	
bicarbonate	mg/L	-		SM 2320 B	
boron	mg/L	-		EPA 200.8	
calcium	mg/L	-		EPA 200.7	
carbonate	mg/L	-		SM 2320 B	
color	color units	-			
dissolved oxygen	% saturation	-			
EC	umhos/cm	at 25 degC		SM 2510 B	
hardness	mg/L	-		EPA 200.8	
iodide	mg/L	-			
potassium	mg/L	-		EPA 200.8	
sodium	mg/L	-		EPA 200.7	
temperature	°F				
total suspended solids	mg/L	-		EPA 160.2	
turbidity	NTU	-			
Comments:					

Rev 7/2008

Note: Detection limits must be at least as low as primary or secondary drinking water standards where applicable.

Please indicate detection limit instead of stating "Non-Detect". Initial Measured Values are the first values collected under the application.

Metals shall be sampled and analyzed as total metals. **Adjusted gross alpha particle activity doesn't include radon and uranium activity.

APPENDIX 2: TMWA'S RESPONSE TO NDEP'S COVER LETTER

February 11, 2009

Russ Land, PE

Supervisor

Nevada Division of Environmental Protection

Underground Injection Control Program

Bureau of Water Pollution Control

901 South Stewart Street, Suite 4001

Carson City, NV 89701-5249

RE: Underground Injection Control (UIC) Permit UNEV2009202T - Hawkings Court Well (HCW), Spanish Springs Valley

Dear Russ:

This letter comes in response to your letter of December 11, 2008 to John Erwin regarding the above permit.

1. I have attached a map showing the location of 33 wells within and outside the Area of Review. The wells are identified by NDWR log numbers. Information on the wells is shown on the map and the attached table.
2. Three cross sections are attached and shown on the map in Item 1. Cross section #1 runs NW-SE, #2 runs N-S and #3 runs W-E.
3. The well will be operated the same way as TMWA's wells in Truckee Meadows and West Lemmon Valley basins. It was commissioned on June 19, 2008. It will typically be pumped during May through September and then recharged October through March or April each year. The timing of pumping and injection may vary from year to year depending on weather conditions and system demand requirements. A chart showing 2008 pumping is attached.
4. Hawkings Court Monitoring Well (HC-MW), formerly known as "Tucker Well", has not been pumped by TMWA except in 2000 when a pump test was performed. The well has 14-inch casing about one foot below ground with a plate welded over it and two feet, 8-inch pipe welded to the plate. The 8-inch pipe has a cap and 2-nipple and cap on it (see attached photo of the well). The well will be used for water level readings and water quality sampling as per temporary

permit (UNEV2009202T) requirements. A chart showing monthly water levels in this well since 2006 is attached.

5. The sample on 11/9/05 was taken during 48-hours 3,026 gpm constant flow pump test of HCW. A copy of the report was provided to you in 2008 with the application.
6. The 11/9/05 water quality report also shows metal concentrations in the well water at different times during constant flow pump test. Water quality sampling has been conducted according to permit requirements as outlined in Attachment A of the permit. Once results are back from external laboratories a spreadsheet will be populated to reflect required sample results and forwarded to you. Before recharge commenced, TOC samples collected on 1/22/08 at Tucker Monitoring Well showed a result of <0.50 mg/L.
7. The monitoring program will include continuous water level and injection or pumping recording using TMWA's SCADA system and monthly water level readings using an electronic probe. In addition, TMWA is working with Red Hawk Golf Course and Washoe County Department of Water Resources staff to receive monthly readings of water levels and pumping rates from their production wells. TMWA is planning to drill monitoring wells to the north and south-east of HCW to monitor the water levels in addition to HC-MW and monitoring well #4 to the far south-east.
8. The UIC O&M Manual update to include the points you requested are given in the attached Appendix.

Please contact me at 834-8028 or email: bojiambo@tmwa.net in case you require additional information on this application.

Thank you.

Sincerely

Bwire S. Ojiambo, Ph.D.
Senior Planner Groundwater Resources