Continuation of Monitoring in Egin, Idaho: Recharge Experiment Fall 2008 through Spring 2010

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Egin, Idaho: Recharge Experiment

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INTRODUCTION

In June 2009, the Idaho Water Resources Research Institute (IWRRI) and Idaho Department of Water Resources (IDWR) produced a report on the managed recharge project conducted in Egin, Idaho entitled "Monitoring of Egin, Idaho Recharge Experiment, Fall 2008" (Contor et al. 2009). Since June 2009, Water District 01 (WD 01) and the IDWR Eastern office (also referred to as IDWR-Eastern) employees have continued the monitoring effort with some assistance from IWRRI.

The Egin Lakes ponds are located near a Bureau of Land Management recreational site at the end of the Recharge Canal in southwestern Fremont County, approximately 11 miles west of the town of St. Anthony (Figure 1). Several designated monitoring wells and one private well were monitored during the recharge experiment. The study area has historically been considered a potential groundwater recharge site. Previous investigations have been conducted to determine the feasibility of recharge and benefit to the Eastern Snake Plain Aquifer (ESPA). These previous recharge studies along with the Fall 2008 recharge experiment are discussed in detail in the previous Egin report (Contor et al. 2009).

GOALS OF THE 2009-2010 PROJECT

The goal of this project was for WD 01 and IDWR employees to continue monitoring the managed recharge effort in the Egin Lakes study area. WD 01 and IDWR employees maintained a majority of the hand water level measurements in the wells measured during the most recent recharge experiment and measured flow in several canals. IWRRI periodically visited wells installed with transducers and downloaded the data. Bryce Contor of IWRRI spent some of his personal time measuring end of canal spill in the Egin area.

DATA GATHERED

Aquifer Water Levels

Table 1 lists the wells by legal description where hand measurements were collected and indicates which wells have transducers deployed. Most of the measurements began in October or November 2008 when the recharge experiment was initiated; however, some well measurements began later (as indicated in the table) since they were not found until a later date. Note that one well has a barometric transducer deployed in order to correct the transducers water level changes related to barometric pressure effects. Also note that one well (Well No. 21) was not measured at the same frequency as the other wells due to difficulty placing instruments down this well.

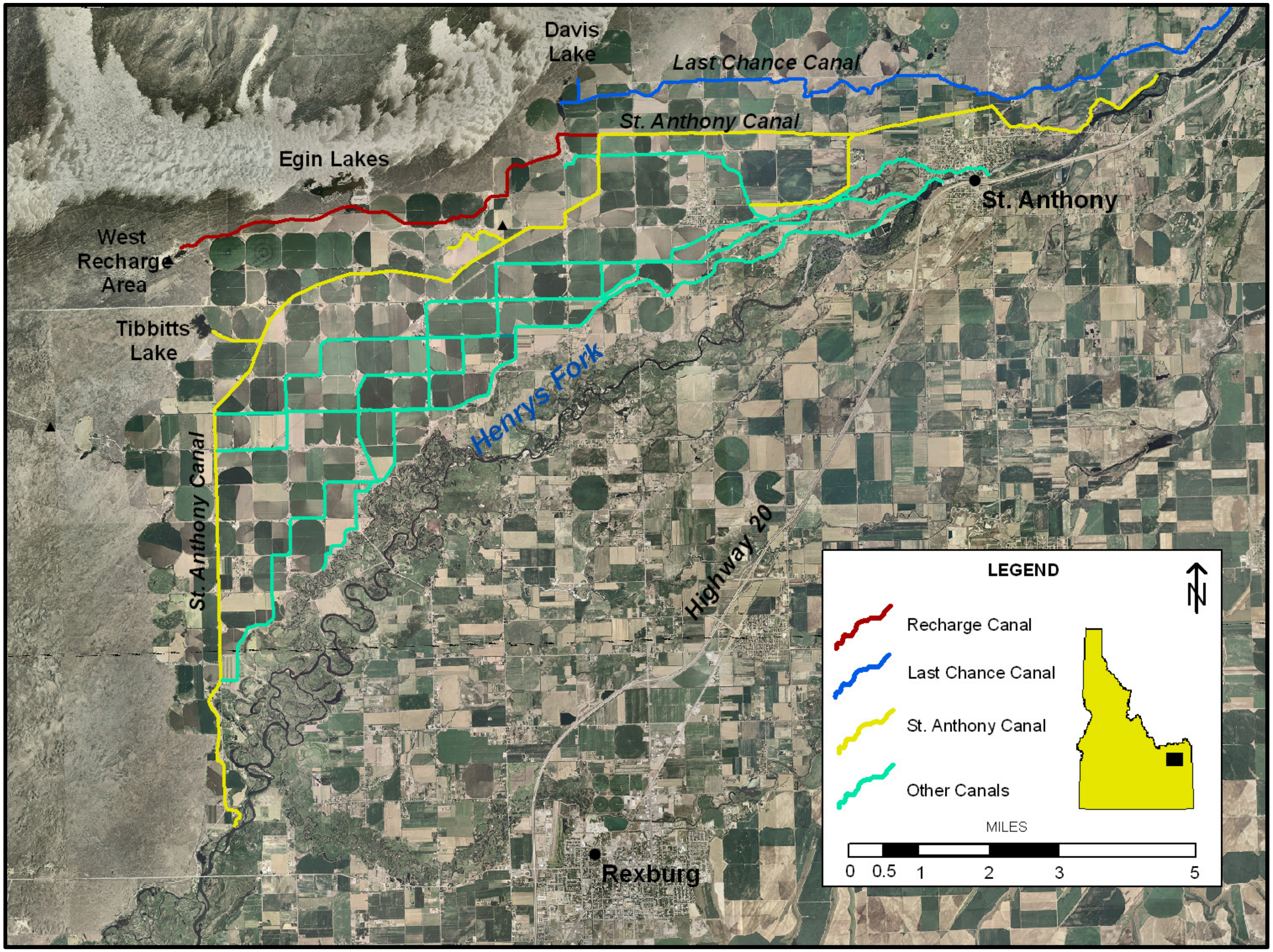

Figure 1. Egin Lakes study area (figure from Contor et al. 2009).

Table 1. Wells with measured water levels.

Well No.	Well (Legal Description)	Regular Measurements collected?	Transducer Serial Number (SN)
1	7N 39E 7BDA1	Yes	SN 142889
2	7N 39E 8DBB	Yes	None
3	7N 39E 16DBB1	Yes	SN 135719
4*	7N 39E 16DBB2	Yes	SN 136128
5	7N 39E 16DBB3	Yes	SN 142887
6	7N 39E 1CCD1	Yes	SN 105241
7	7N 40E 5DBC1	Yes	None
8	6N 38E 2DBD1	Yes	None
9	6N 38E 2DBD2	Yes	None
10	7N 38E 23DBA1	Yes	None
11	7N 38E 23DBA2	Yes	SN 136090
12	7N 40E 2BBB1	Yes	None
13	7N 40E 2 Sub water	Yes	None
14	8N 40E 21DDD2	Yes	None
15	7N 37E 3CCD1	Yes	None
16	7N 40E 19ADD2	Yes; began in Dec 2008	None
17	7N 40E 19ADD3	Yes; began in Dec 2008	None
18	7N 40E 19ADD4	Yes; began in Dec 2008	None
19	7N 39E 34CCB1	Yes; began in Apr 2009	None
20	7N 39E 34CCB2	Yes; began in Apr 2009	None
21	6N 37E 29ACA2	No	None

*Barologger (SN 135194) also in this well at approximately 15 ft below the top of the well casing.

Aquifer water levels were collected at 13 different sites in the Egin vicinity as shown on the map in Figure 2. Some measurements began in October 2008 while monitoring at other sites began later when wells were found. Several of the sites include wells with multiple wells or piezometers with different completion depths.

IWRRI was funded to download periodic transducer data at the sites designated in Figure 2 by the black triangles. The data was then forwarded to IDWR. Exact dates when water reached the West Recharge Area were not available for this analysis to aid in explaining certain changes in the water level data; however, Table 2 is a list of approximate dates providing information on when water was present in key canals, ponds, or lakes.

Figure 3 shows all the water level data collected for entire duration of the recharge experiment from 2008-2010. The lines represent data collected from pressure transducers and the points represent measurements taken by hand. Figures 4 through 9 show the pressure transducer data for each well installed with a transducer. The blue points represent data collected by the pressure transducer in terms of water level elevation in feet. The red points represent data collected by taking hand measurements of the water level.

Table 2. Timeline of events that occurred during the recharge experiment.

Approximate Date	Description of Events
Oct 30, 2008	Water delivered to the West Recharge Area (Figure 1) by the Recharge Canal
Oct 31, 2008	Irrigation season 2008 ended
mid-Dec 2008	Canals essentially empty
May 28, 2009	Water was present in the West Recharge Area
Jun 11, 2009	Water was present in the West Recharge Area
Jun 25, 2009	Water was present in the West Recharge Area
Jul 9, 2009	West Recharge Area reported as dry
Aug 27, 2009	West Recharge Area reported as dry.
Sept 7, 2009	Recharge experiment initiated again and water was released into the recharge canal.
Mar 2010	Water reported in recharge canal, but not yet present at the West Recharge Area; Water reported in Egin area canals; Water reported in Tibbitts Lake
early April 2010	Water in the recharge canal not yet reached the West Recharge Area
mid April 2010	Water reached the West Recharge Area ponds; Water reported in Tibbitts Lake;
Late April 2010	More water continues to enter the West Recharge Area ponds
May 1, 2010	Water continues to fill West Recharge Area ponds

Figure 4 shows the hydrograph of the well at 7N 38E 23DBA2. This well is 110 feet deep and located about 2.5 miles southwest of the ponds at the West Recharge Area. As was discussed in Contor et al. (2009) concerning the Fall 2008 recharge event, it is difficult to visibly find any changes in water level related to the 2008 recharge event since this well may have responded to irrigation season changes, the recharge at the West Recharge Area, or a combination of the two. In May and June 2009, water was at the West Recharge Area ponds; however, the increase in water level in the hydrograph may be related to the start of irrigation season in 2009. In July and August of 2009, the ponds at the West Recharge Area were dry. This change is not visible in the transducer data in Figure 4 since the water levels continue to increase during this time. In September 2009, the recharge process was initiated again (water was in the Recharge Canal) and the water levels in the well continued to rise. In November of 2009, the water levels visibly decline.

The hydrograph for the well at 7N 39E 7BDA1 is found in Figure 5. This well is located approximately 100 ft from the ponds at the West Recharge Area. Water levels appeared to respond to the Fall 2008 recharge event and water levels also declined after the recharge event and irrigation season ended. Water that was present in the ponds in May and June 2009 may have caused the water levels to rise during that time, but then the water levels dropped in July 2009. In August 2009, water levels started to rise steadily until the middle of September 2009 when the slope of the hydrograph declines slightly. At the end of September 2009, the slope of the hydrograph increases again until mid-October when the slope declines as the water level continues to rise. The rising water level falls beginning in mid November 2009.

Figure 6 is the hydrograph for well 7N 39E 1CCD1. In May 2009, the well housing was damaged and resulted in loss of the transducer down the well. Fortunately, WD 01/IDWR-Eastern employees were able to retrieve the transducer from the well. In June 2009, WD 01/IDWR-Eastern placed the transducer back in the well. IWRRI continued to download transducer data and forward the data to IDWR; however, sometime between December 2009 and April 2010 the transducer was again lost in the well again after conditions were improved after the first accident. Bryce Contor was able to retrieve this logger again in the Spring 2010. In Spring 2010, IWRRI was tasked with writing the report for this project and after analyzing the data from the transducer it appears the transducer was not accurately measuring depth in the water. In Figure 6, data is missing from April 2009 to the present. At this time, no transducer is currently measuring this well until the housing of the well casing is further improved. Fortunately, depth to water measurements have still been collected. Based on these hand measurements, it appears the water level increased in the well between June 2009 and October 2009, but it is not clear if this rise in water level is in response to irrigation season recharge or recharge at the West Recharge Area ponds.

Figure 7 shows aquifer water levels in deep well 7N 39E 16DBB1. This well is approximately 444 ft deep. During the 2008 recharge experiment in Egin, this well appeared to respond to changes associated with the recharge canal. Some of the water level changes in this well (Figure 7) are similar to that of well 7N 39E 7BDA1 (Figure 5). Water was present in the ponds in May and June 2009. In July 2009, the slope of the hydrograph decreases and then begins to increase toward the end of the month. Recharge began again in September 2009. The increase in water level between July 2009 and November 2009 could be related to irrigation or the Fall 2009 recharge event or a combination of the two events.

Figure 8 shows the water levels in well 7N 39E 16DBB2. This well is completed to a depth of 107 ft and is about 10 ft south of well 7N 39E 16DBB1. As was discussed in the Fall 2009 report (Contor et al. 2009), this well appeared to respond to the Fall 2008 Egin recharge experiment. This well is located close to the well in Figure 7 (7N 39E 16DBB1); however, it does not show a change in slope possibly related to water being present in the West Recharge Area ponds in May and June 2009. Instead, the slope of the water level increases from May 2009 until November 2009. It is unclear if this increase is due to effects of irrigation or recharge at the West Recharge Area.

Shallow well (38 ft deep) 7N 398E 16DBB3 is shown in Figure 9. It shows several changes in water level, which are likely due to changes in the canal nearby. Based on the hydrograph, it is difficult to visibly find any changes in water level related to the recharge experiment.

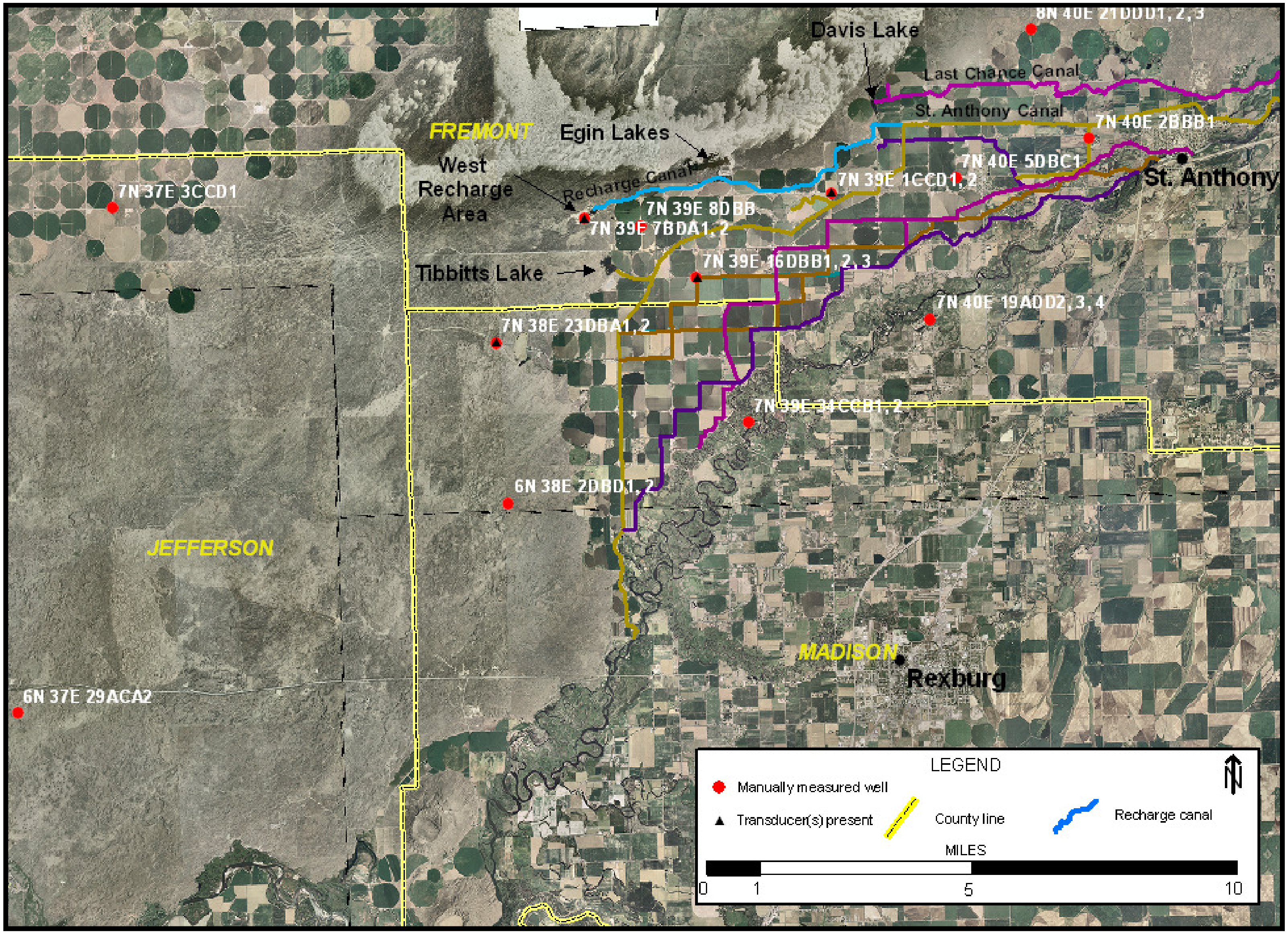

Figure 2. Aquifer sites monitored during the recharge experiment.

Please note that some of these wells remained dry during the recharge experiment and are not listed in Table1.

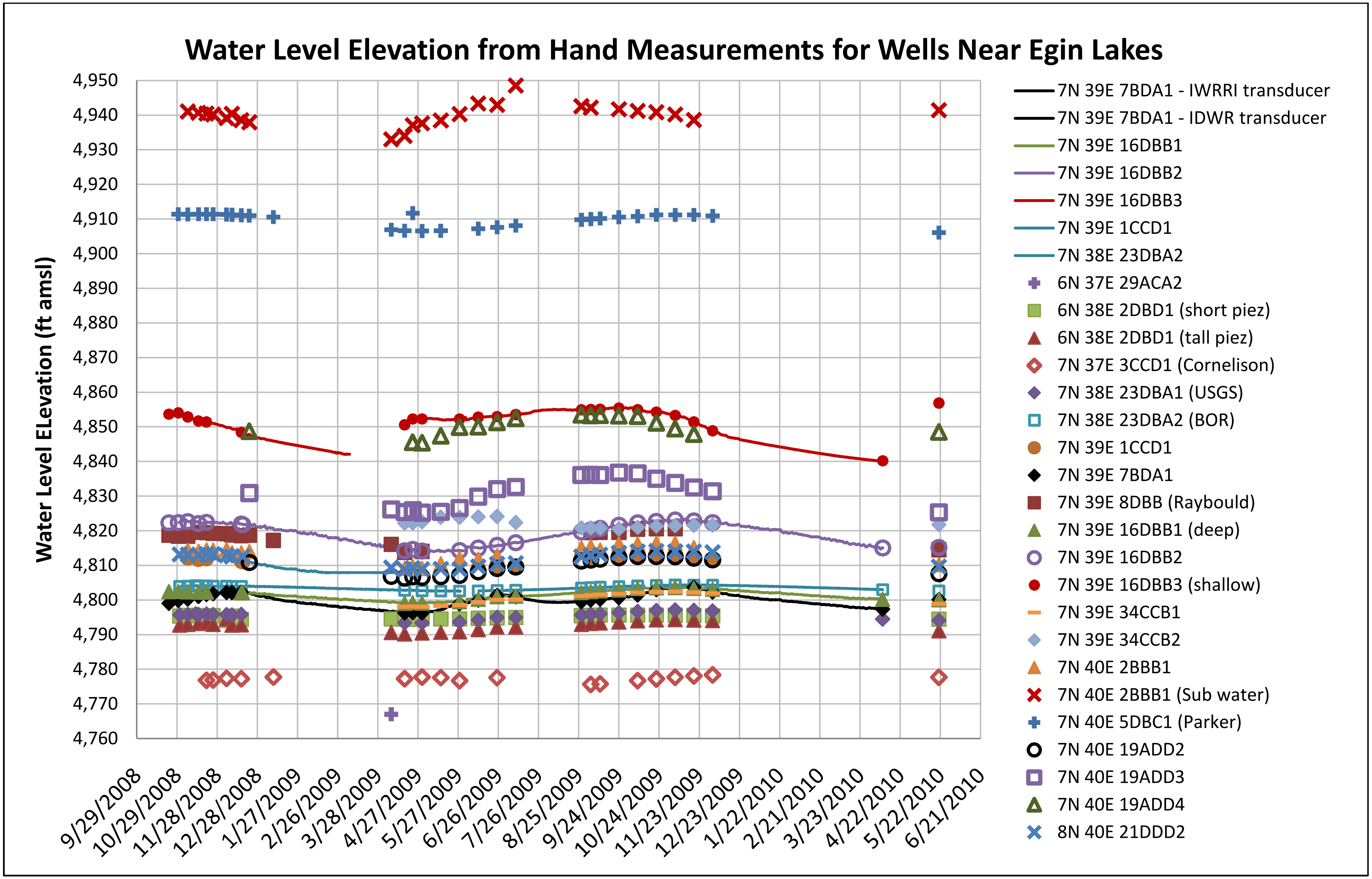

Figure 3. Hydrograph of wells measured during the recharge experiment.

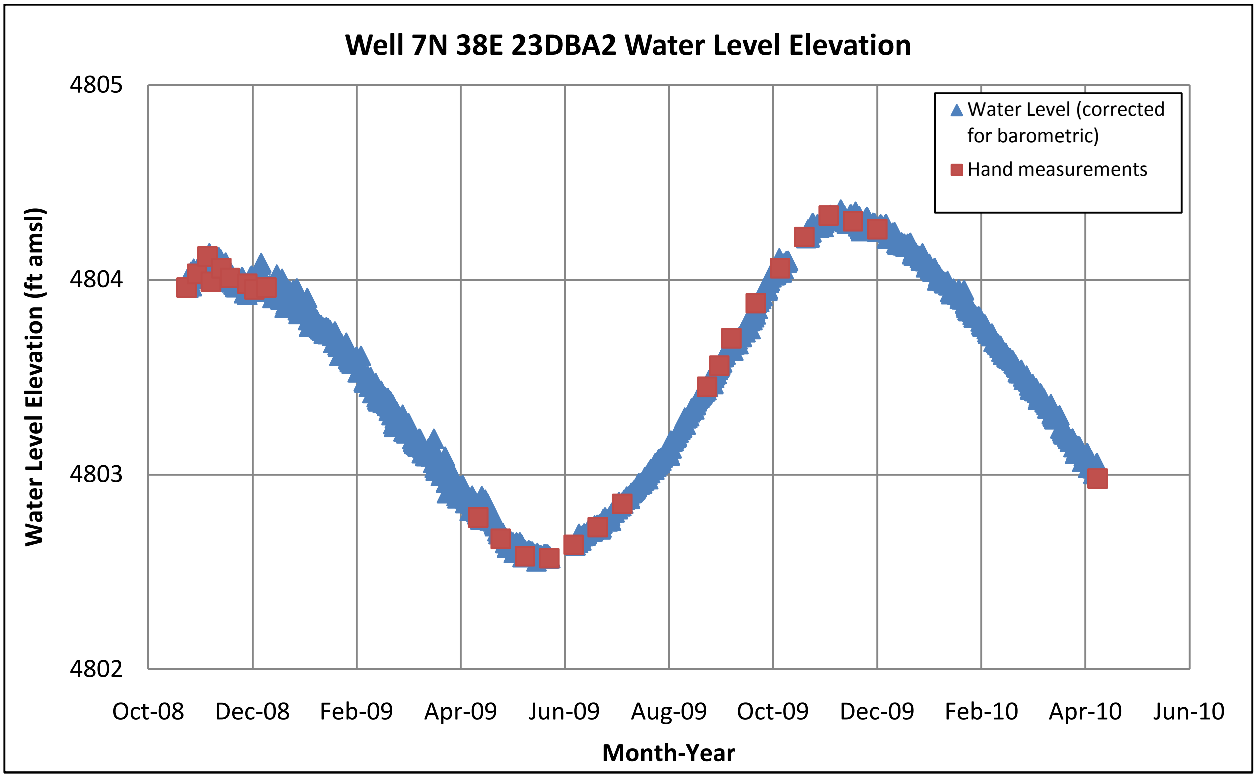

Figure 4. Aquifer water levels recorded by transducer in well 7N 38E 23DBA2.

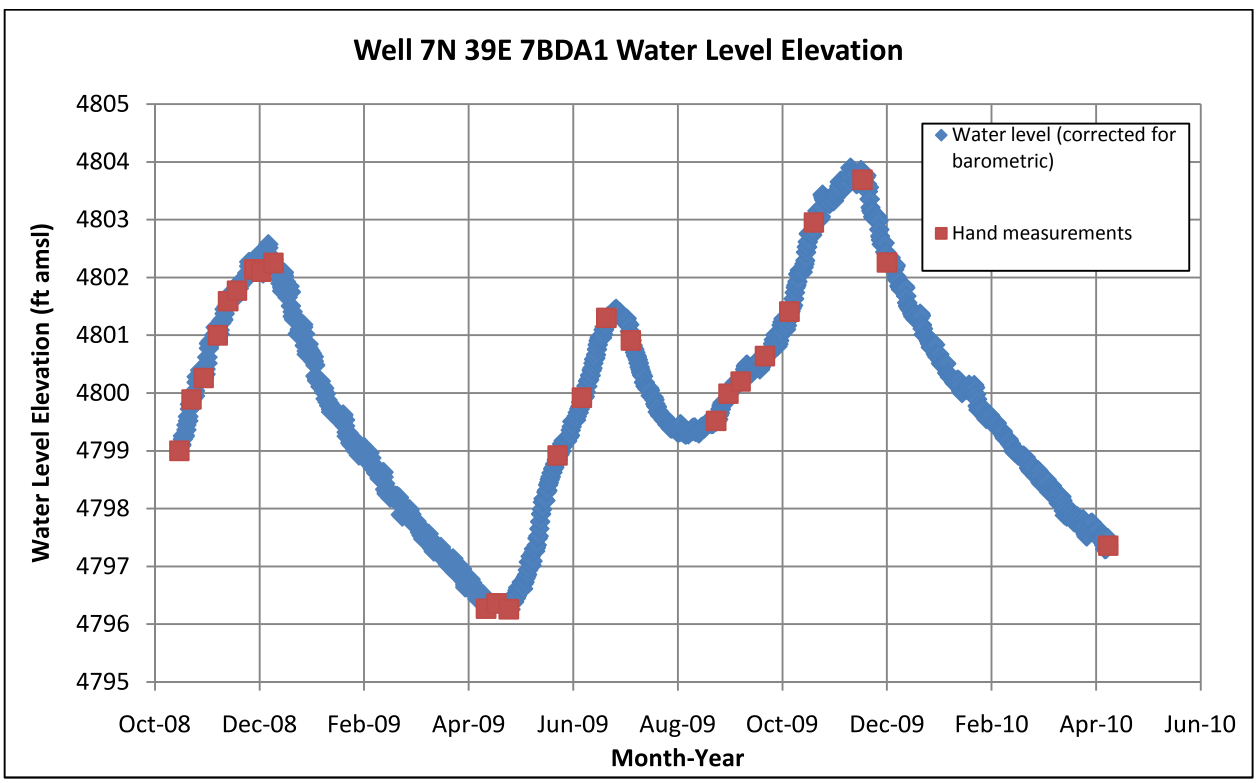

Figure 5. Aquifer water levels recorded by transducer in well 7N 39E 7BDA1.

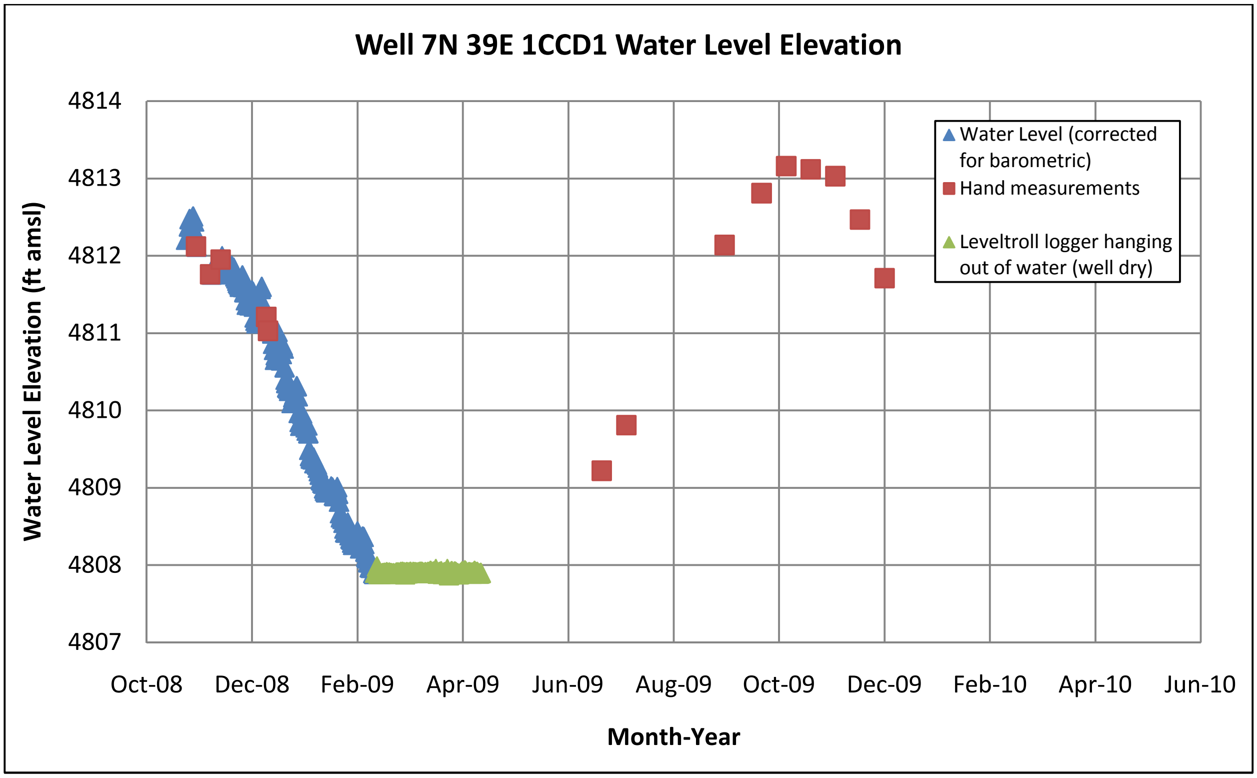

Figure 6. Aquifer water levels recorded by transducer in well 7N 39E 1CCD1.

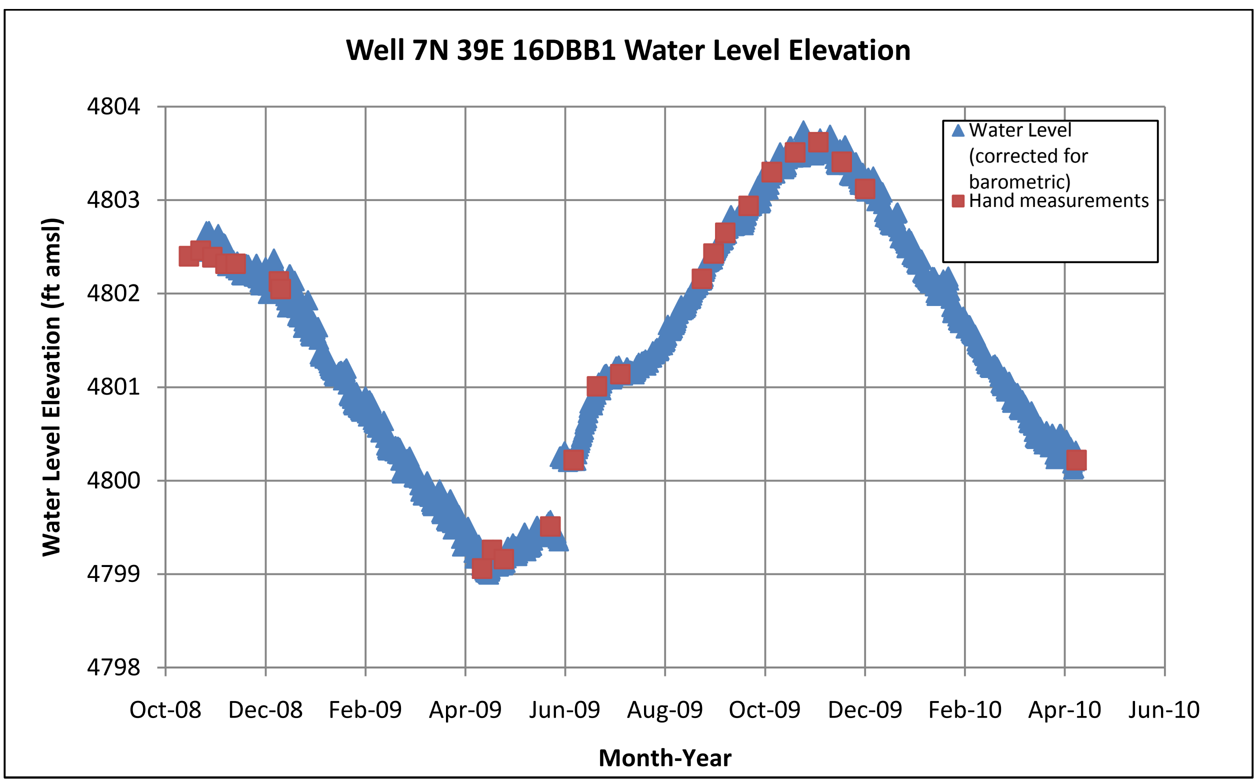

Figure 7. Aquifer water levels recorded by transducer in well 7N 39E 16DBB1.

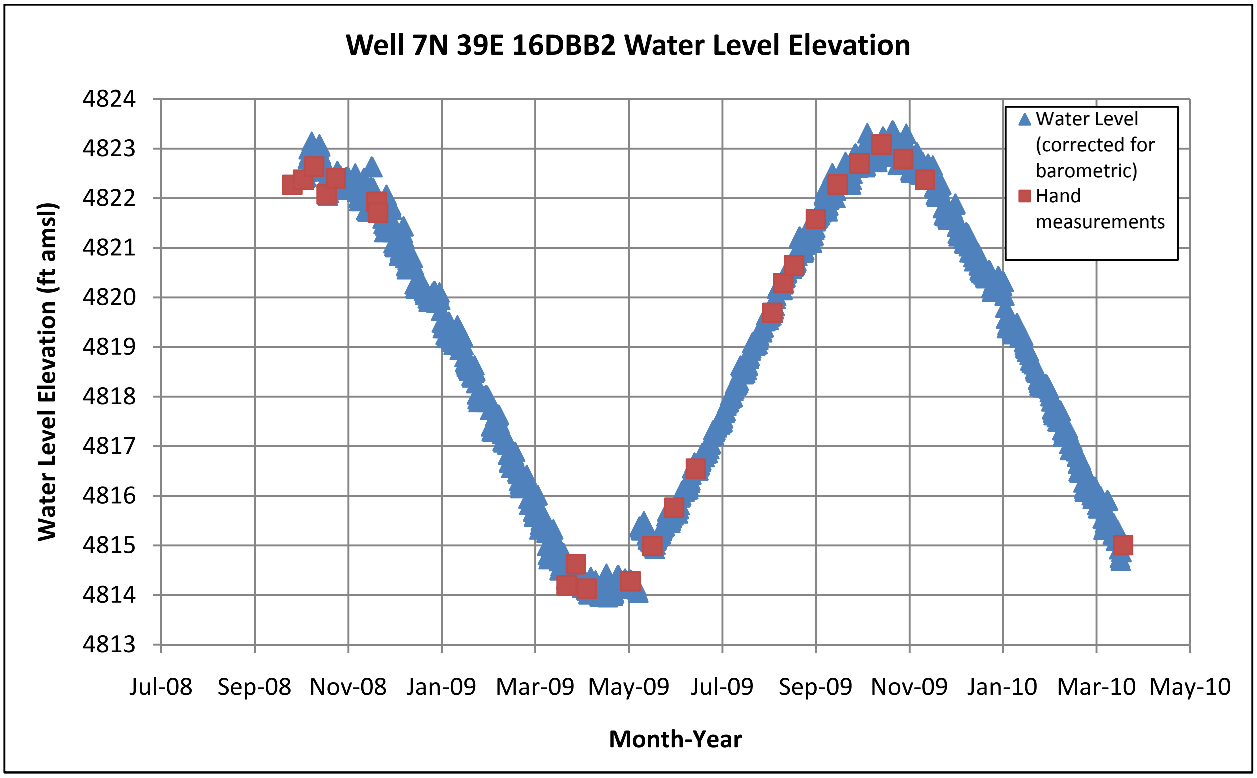

Figure 8. Aquifer water levels recorded by transducer in well 7N 39E 16DBB2.

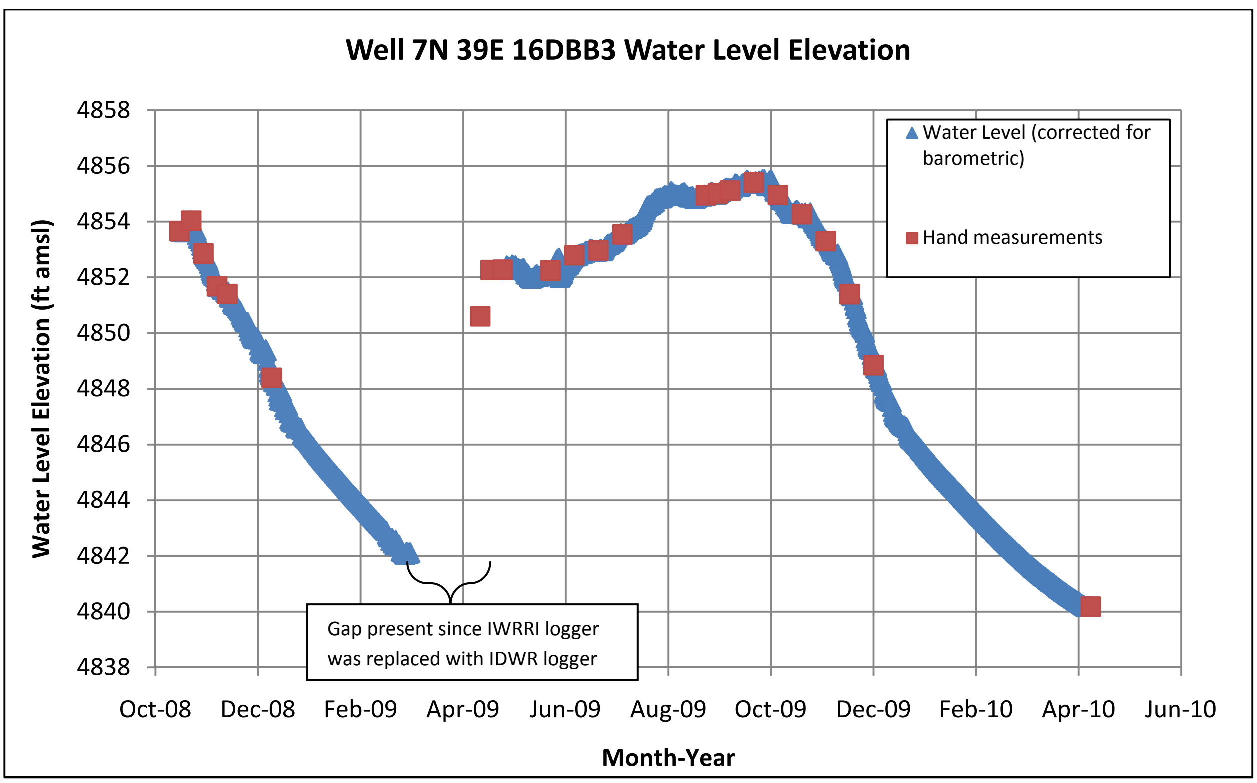

Figure 9. Aquifer water levels recorded by transducer in well 7N 39E 16DBB3.

Accoustic Doppler Current Profiler (ADCP) and Gage Measurements

The IDWR-Eastern office collected ADCP measurements during the Spring and Fall 2009 as detailed in Tables 3, 4, and 5. Gage readings (Table 6) were taken by Gary Crane, who assists Fremont-Madison watermaster, Bob Davis.

Table 3 details the Recharge Canal ADCP measurements near the Egin Lakes outlet.

Table 3. Recharge Canal ADCP Measurements collected by IDWR-Eastern.

Date	Gage Reading (ft)	Mean Discharge (cfs)	Mean Velocity (ft/s)	Mean Distance (ft)	Area (ft^2)
4/6/2009	0.39	8.004	0.665	12.83	--
4/13/2009	0.465	11.7	--	--	--
4/22/2009	0.56	16.4	1.082	17.25	--
10/1/2009	1.7	23.2	0.673	19.6	32.5
10/5/2009	1.58	21.4	0.672	19.4	29.7
10/7/2009	1.5	19.1	0.602	19.3	29.3
10/8/2009	1.72	26.1	0.704	20.36	32.1
10/9/2009	1.7	22.9	0.756	16.62	29
10/13/2009	1.56	21.4	0.68	20.2	29.5
10/21/2009	1.58	20.3	0.627	19.74	30.5

Table 4 details IDWR's ADCP measurements on the Recharge Canal at the bridge near the entrance to Egin Lakes campground. This data was collected periodically by IDWR in an attempt to account for water entering Egin Lakes as recharge during the irrigation season. Unfortunately, daily gage readings during the irrigation season were not collected and a rating table was not completed as a result.

Table 4. Recharge Canal ADCP Measurements collected by IDWR-Eastern.

DATE	Gage Reading (ft)	Mean Discharge (cfs)	Mean Velocity (ft/s)	Mean Distance (ft)	Area (ft^2)
4/6/2009	7.48	--	--	--	--
4/13/2009	7.7	6.7	--	--	--
4/30/2009	8.32	19.99	0.772	14.46	21.6
5/14/2009	8.66	27.67	0.839	16.64	27.9
5/28/2009	8.46	16.16	0.601	15.70	23.3
6/11/2009	8.56	25.3	0.728	13.70	25
8/11/2009	8.41	14.3	0.728	13.70	17.5

Table 5 details IDWR-Eastern's data collected for recharge into Tibbitts Lake. This data was collected to account for recharge into Tibbitts Lake during the irrigation season; however, gage readings were not submitted to IDWR from Fremont-Madison; therefore, a rating table was no completed for this site.

Table 5. Tibbitts Lake recharge measurements collected by IDWR.

Date	Head (ft)	Length (ft)	Discharge (cfs)	Days	Discharge (ac-ft)
4/6/2009	0.220	10.3	3.52	7	48.93
4/13/2009	0.32	10.3	6.17	9.00	110.15
4/22/2009	0.2	10.3	3.06	--	--
10/1/2009	0.2	10.3	3.06	--	--

Table 6 is a summary discharge from the Recharge Canal, Last Chance Canal, and Tibbitts Pond inlet collected by Fremont-Madison Irrigation District. The Last Chance recharge is only an estimate since discharge had to be based off of one measurement.

Table 6. Flow estimates in the Recharge Canal, Last Chance Canal, and Tibbitts Lake inlet.

	Recharge Canal			Last Chance Canal			Tibbitts Lake Inlet		
Day of Month	Gage Reading (ft)	Discharge (cfs)	Volume (ac-ft)	Gage Reading (ft)	Discharge (cfs)	Volume (ac-ft)	Gage Reading (ft)	Discharge (cfs)	Volume (ac-ft)
Sept 2009									
7	1.68	24.15	47.89	1.76	13.73	27.23	0.00	0.00	0
8	1.72	25.28	50.14	1.74	13.57	26.92	0.00	0.00	0
9	1.72	25.28	50.14	1.78	13.88	27.54	0.00	0.00	0
10	1.62	22.49	44.62	1.76	13.73	27.23	0.00	0.00	0
11	1.62	22.49	44.62	2.00	15.60	30.94	0.00	0.00	0
12	1.58	21.42	42.49	2.24	17.47	34.66	0.00	0.00	0
13	1.62	22.49	44.62	2.22	17.32	34.35	0.00	0.00	0
14	1.70	24.71	49.01	2.16	16.85	33.42	0.00	0.00	0
15	1.71	24.99	49.58	2.08	16.22	32.18	0.00	0.00	0
16	1.70	24.71	49.01	1.74	13.57	26.92	0.00	0.00	0
17	1.64	23.04	45.70	2.44	19.03	37.75	0.00	0.00	0
18	1.60	21.95	43.55	2.26	17.63	34.97	0.00	0.00	0
19	1.60	21.95	43.55	2.16	16.85	33.42	0.00	0.00	0
20	1.66	23.59	46.79	2.34	18.25	36.20	0.00	0.00	0
21	1.64	23.04	45.70	2.04	15.91	31.56	0.38	4.28	8.5
22	1.68	24.15	47.89	2.18	17.00	33.73	0.38	4.28	8.5
23	1.70	24.71	49.01	1.64	12.79	25.37	0.28	2.71	5.4
24	1.66	23.59	46.79	2.12	16.54	32.80	0.33	3.47	6.9
25	1.70	24.71	49.01	2.10	16.38	32.49	0.30	3.01	6.0
26	1.70	24.71	49.01	2.20	17.16	34.04	0.32	3.31	6.6
27	1.63	22.76	45.15	2.18	17.00	33.73	0.34	3.63	7.2
28	1.72	25.28	50.14	2.32	18.10	35.89	0.35	3.79	7.5
29	1.74	25.86	51.29	1.80	14.04	27.85	0.48	6.08	12.1
30	1.70	24.71	49.01	2.16	16.85	33.42	0.24	2.15	4.3

Table 6. (continued)

	Recharge Canal			Last Chance Canal			Tibbitts Lake Inlet		
Day of Month	Gage Reading (ft)	Discharge (cfs)	Volume (ac-ft)	Gage Reading (ft)	Discharge (cfs)	Volume (ac-ft)	Gage Reading (ft)	Discharge (cfs)	Volume (ac-ft)
Oct 2009									
1	1.71	24.99	49.58	2.22	17.32	34.35	0.20	1.64	3.2
2	1.68	24.15	47.89	2.16	16.85	33.42	0.14	0.96	1.9
3	1.66	23.59	46.79	2.20	17.16	34.04	0.16	1.17	2.3
4	1.60	21.95	43.55	2.16	16.85	33.42	0.10	0.58	1.1
5	1.60	21.95	43.55	2.36	18.41	36.51	0.00	0.00	0.0
6	1.56	20.90	41.45	2.04	15.91	31.56	0.00	0.00	0.0
7	1.51	19.61	38.90	2.02	15.76	31.25	0.00	0.00	0.0
8	1.50	19.36	38.40	1.96	15.29	30.32	0.00	0.00	0.0
9	1.72	25.28	50.14	1.90	14.82	29.40	0.00	0.00	0.0
10	1.70	24.71	49.01	2.40	18.72	37.13	0.00	0.00	0.0
11	1.60	21.95	43.55	2.16	16.85	33.42	0.00	0.00	0.0
12	1.60	21.95	43.55	2.16	16.85	33.42	0.23	2.02	4.0
13	1.60	21.95	43.55	1.22	9.52	18.87	0.16	1.17	2.3
14	1.54	20.38	40.42	2.12	16.54	32.80	0.00	0.00	0.0
15	1.54	20.38	40.42	2.06	16.07	31.87	0.00	0.00	0.0
16	1.54	20.38	40.42	2.00	15.60	30.94	0.00	0.00	0.0
17	1.50	19.36	38.40	1.82	14.20	28.16	0.00	0.00	0.0
18	1.52	19.87	39.40	2.10	16.38	32.49	0.24	2.15	4.3
19	1.52	19.87	39.40	2.12	16.54	32.80	0.14	0.96	1.9
20	1.54	20.38	40.42	2.20	17.16	34.04	0.30	3.01	6.0
21	1.58	21.42	42.49	1.78	13.88	27.54	0.36	3.95	7.8
22	1.55	20.64	40.93	1.96	15.29	30.32	0.38	4.28	8.5
23	1.57	21.16	41.97	1.94	15.13	30.01	0.36	3.95	7.8
24	1.58	21.42	42.49	2.14	16.69	33.11	0.44	5.34	10.6
25	1.58	21.42	42.49	2.14	16.69	33.11	0.44	5.34	10.6
26	1.54	20.38	40.42	2.08	16.22	32.18	0.28	2.71	5.4
27	1.54	20.38	40.42	2.30	17.94	35.58	0.34	3.63	7.2
28	1.54	20.38	40.42	2.16	16.85	33.42	0.32	3.31	6.6
29	1.52	19.87	39.40	1.96	15.29	30.32	0.00	--	--
30	1.52	19.87	39.40	1.98	15.44	30.63	0.00	--	--
31	1.52	19.87	39.40	2.02	15.76	31.25	0.00	--	--
Nov 2009									
1	1.51	19.61	38.90	2.02	15.76	31.25	0.00	--	--
2	1.52	19.87	39.40	1.92	14.98	29.70	0.00	--	--
3	1.50	19.36	38.40	2.04	15.91	31.56	0.00	--	--
4	1.50	19.36	38.40	2.00	15.60	30.94	0.00	--	--
5	1.49	19.11	37.90	2.00	15.60	30.94	0.00	--	--
6	1.48	18.86	37.41	2.00	15.60	30.94	0.00	--	--
7	1.46	18.36	36.43	1.96	15.29	30.32	0.00	--	--
8	1.46	18.36	36.43	1.92	14.98	29.70	0.00	--	--
9	1.48	18.86	37.41	1.92	14.98	29.70	0.00	--	--

Table 6. (continued)

	Recharge Canal			Last Chance Canal			Tibbitts Lake Inlet		
Day of Month	Gage Reading (ft)	Discharge (cfs)	Volume (ac-ft)	Gage Reading (ft)	Discharge (cfs)	Volume (ac-ft)	Gage Reading (ft)	Discharge (cfs)	Volume (ac-ft)
Nov 2009									
10	1.48	18.86	37.41	1.92	14.98	29.70	0.00	--	--
	TOTAL VOLUME: 2821 AF			TOTAL VOLUME: 2057 AF			TOTAL VOLUME: 164 AF		
SUM OF TOTAL RECHARGE: 5042.8 AF									

Figure 10 shows the recharge canal rating curves constructed by IDWR-Eastern. These rating curves were used to calculate the discharge for the Recharge Canal. The rating curves are a statistical correlation between gage height and discharge using the power equation as shown in Equation 1 below:

Power Equation: $Q = 8.78*GH^{1.95}$, Equation (1)

where *Q* is the discharge in cubic feet per second (cfs). *GH* is the reading in feet on the installed staff gage.

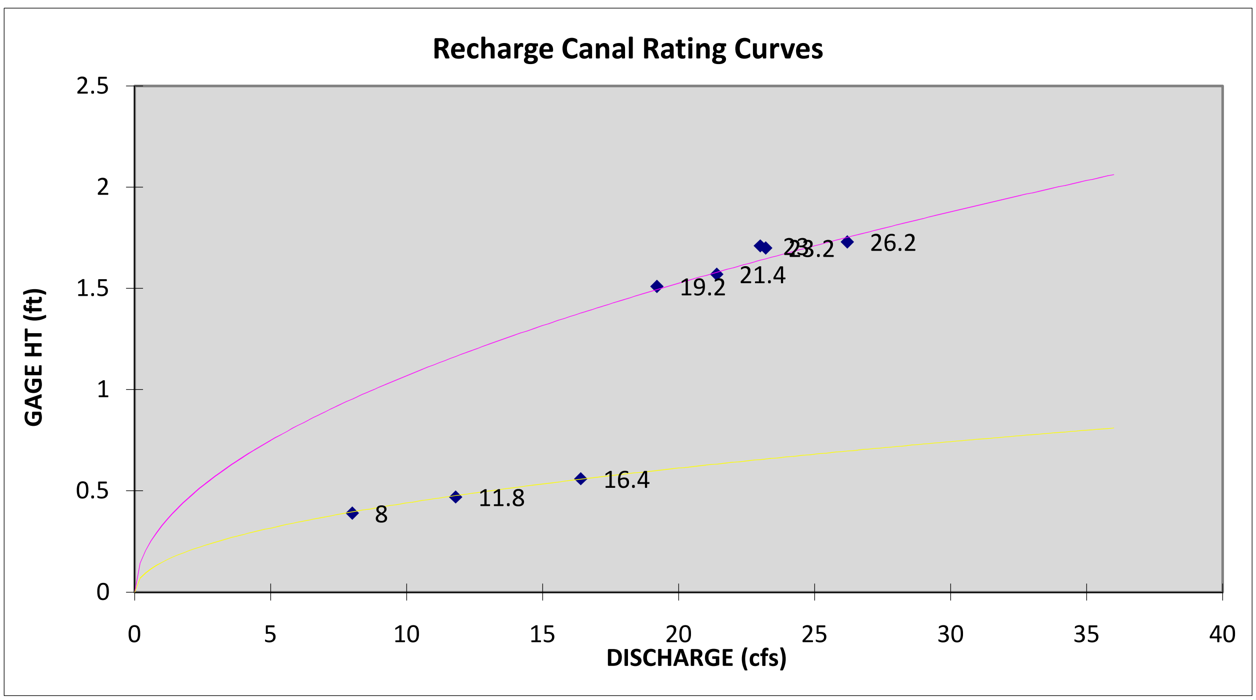

Figure 10. Recharge canal rating curves. (Provided by IDWR-Eastern)

End of Canal Spill Measurements

Bryce Contor of IWRRI conducted a field reconnaissance on his own time to estimate end of canal spill from the Egin canals. Figure 11 shows the location of his measurements, located north of highway 33 and southwest of Egin, Idaho in legal section SW of the SW of section 17, Township 6N Range 39E. Table 7 details Contor's measurements (IWRRI measurements). Contor used the following rating equation (Equation 2) to calculate discharge at the end of canal spill location:

$$\text{Rating equation: } Q = (76.1) * (h - 0.54)^{1.75}, \qquad \text{Equation (2)}$$

where Q is the discharge in cubic feet per second (cfs), h is the reading in feet on the installed staff gage. The above equation is valid only when there is one check board in the structure. This was rated when a board with a 45-degree bevel was installed, with the sharp edge downstream. The effective height of the checkboard structure is 0.54 feet. The rating was based on flows ranging from 5 to 60 cfs.

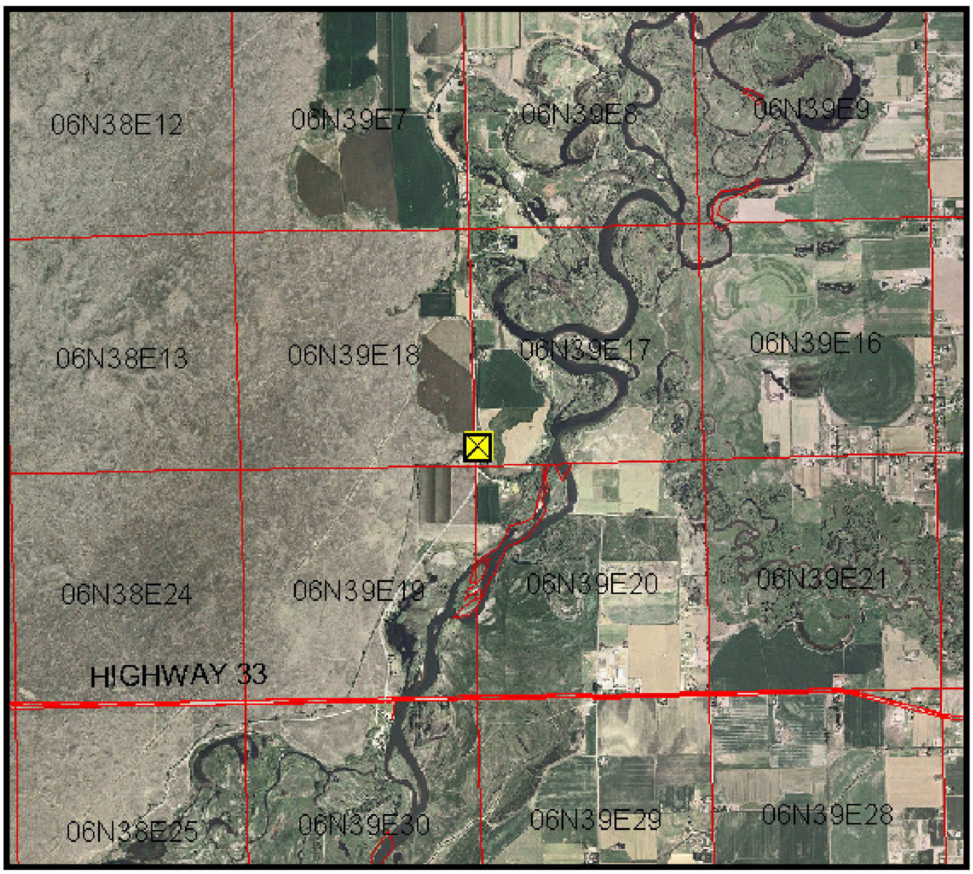

Figure 11. Measurement location (indicated by the yellow square) for end of canal spill in Egin area.

Table 7. Discharge measurements for end of canal spill in the Egin area.

Date	Discharge (cfs)	Notes/Comments
4/6/2009	28	Weir-equation rating, one check board, based on IWRRI measurements
4/17/2009	58	Weir-equation rating, one check board, based on IWRRI measurements
5/12/2009	51	Weir-equation rating, one check board, based on IWRRI measurements
5/21/2009	35	Weir-equation rating, one check board, based on IWRRI measurements
5/29/2009	7	Weir-equation rating, one check board, based on IWRRI measurements
5/30/2009	5	Weir-equation rating, one check board, based on IWRRI measurements
6/5/2009	28	Weir-equation rating, one check board, based on IWRRI measurements
6/15/2009	50	Weir-equation rating, one check board, based on IWRRI measurements
6/20/2009	50	Weir-equation rating, one check board, based on IWRRI measurements
7/2/2009	10	Leakage only; no flow over boards. Estimated w/ velocity-head-rod measurements on downstream apron, accuracy at best +/- 30%? Result "looked reasonable." 2 check boards.
7/4/2009	12	Weir estimate + leakage from 2 July, 2 check boards
7/11/2009	26	Weir estimate + leakage from 2 July, 2 check boards
8/27/2009	35	Weir estimate + reduced leakage (looked less than on 2 July), 2 check boards
9/4/2009	40	Weir estimate + reduced leakage (looked less than on 2 July), 2 check boards
9/10/2009	99	Weir-equation rating, but this flow is beyond range of rating meas.
3/6/2010 to 3/26/2010	0	
4/2/2010	43-45	
4/9/2010	55-70	Challenging measurement
4/16/2010	56-61	Weir-stick measurement; difficult measurement due to trash near check board structure
4/26/2010	73-75	Weir-stick measurement

SUMMARY AND CONCLUSIONS

The monitoring of aquifer water levels and discharge continues to provide valuable information regarding benefits of recharge and timing of benefits. The Eastern Snake Plain Comprehensive Aquifer Management Plan (ESPA CAMP) has recommended the Egin recharge site as one of two constructed recharge sites to receive funding for development and/or expansion. Fremont-Madison Irrigation District has proposed increasing the current Egin recharge capacity from approximately 10,000 ac-ft/yr to approximately 30,000 ac-ft/yr. In view of expected continued and increased recharge in the future, it is recommended that long term monitoring continue since long term data provides beneficial information on recharge benefits relative to changes in water levels caused by irrigation. As discussed in Contor et al. (2009), quantitative recharge benefits are difficult to estimate with monitoring alone and without the use of a computer aquifer model.

During the last recharge project, transducer data seemed to suggest that the recharge experiment benefited the deeper aquifer system. Based on changes in water levels during the Fall 2009 experiment in deep wells, it may be essential to video log deep wells (such as 7N 39E 7BDA1 and 7N 39E 16DBB1) to ensure that the casing has not been damaged over time. Damaged well casings can lead to water cascading from a shallow aquifer system to the deep aquifer system, falsely showing benefits to the deep aquifer.

REFERENCES

Contor, B. A., S.L. Taylor, and G.W. Quinn. 2009. Monitoring of the Egin, Idaho Recharge Experiment, Fall 2008. Idaho Water Resources Research Institute Technical Completion Report 200901. 37p.