2007 Lower Minnesota River Watershed District Fen Well Monitoring Report

Prepared for:
Lower Minnesota River Watershed District

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Introduction

A series of calcareous fens and trout streams runs parallel to the Minnesota River, along the northwestern edge of Dakota County, in an area located roughly between I-494 and Hwy. 77 (Appendix 1). Groundwater monitoring wells have been installed in these fens to determine if groundwater, originating from upland areas, is providing enough cool groundwater to recharge these valuable natural resources.

Several government agencies, including the United States Geological Survey (USGS), the Minnesota Department of Natural Resources (MNDNR), the Metropolitan Council, and the Ft. Snelling State Park have been involved in monitoring groundwater resources in this area. However, in recent years, very little monitoring has taken place within these fens. In an attempt to continue documenting groundwater levels, the Lower Minnesota River Watershed District (LMRWD) provided funding to continue fen well monitoring. In 2007, the LMRWD contracted with the Dakota County Soil and Water Conservation District (DCSWCD) to collect these well measurements.

This report summarizes the results of those monitoring efforts in 2007.

Weather Results

Groundwater levels are often influenced by recent precipitation, especially in relatively shallow wells, similar to those monitored in the LMRWD. As can be observed in Figure 1, 2007 precipitation levels were slightly higher than the 50 year average (28.7 inches). However, it should be mentioned that this area received very little summer precipitation until mid-August. These drought conditions may be reflected in the mid-summer drop observed in subsequent depth-to-water results.

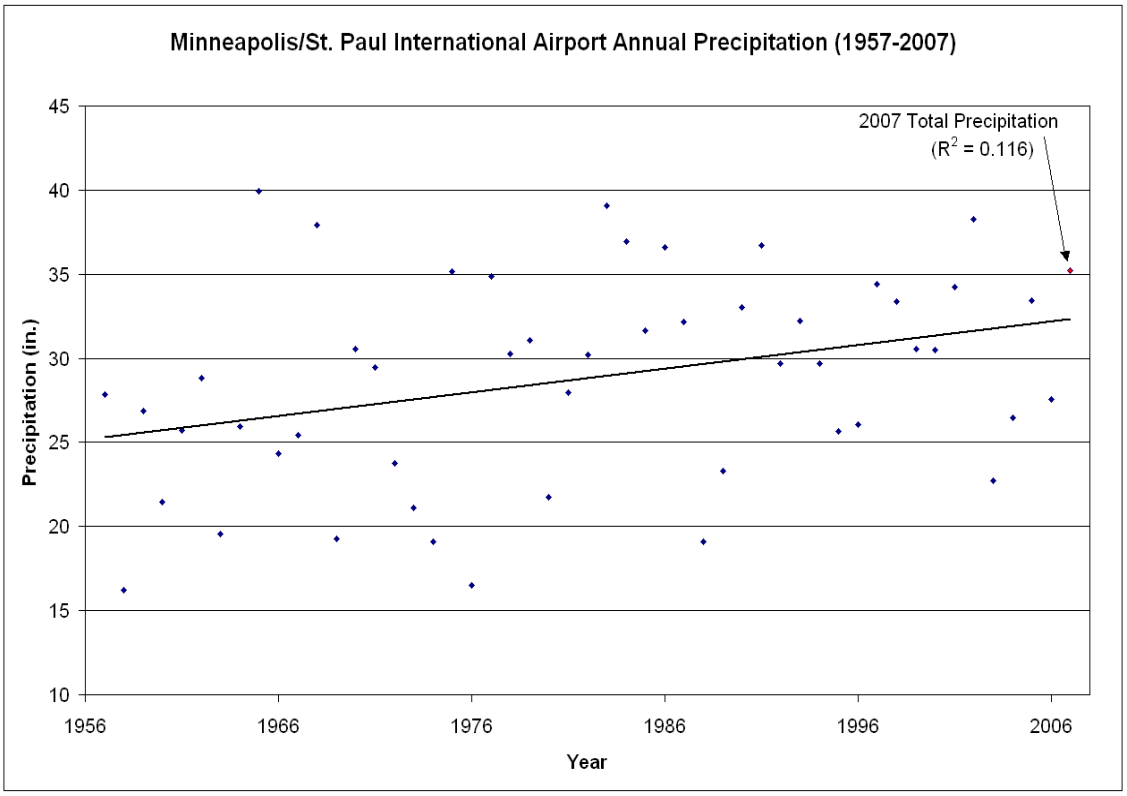

Figure 1. MSP Airport 50 Year Annual Precipitation Record

Quarry Island Fen Results

Table 1. Quarry Island Fen Well Information

Well Name	Unique Well Number	Well Depth (ft)	*Location	Elevation (pipe surveyed)
P1-S		~4	44° 51' 51.0" N / 93° 10' 41.2" W	NA
P1-D		~8	44° 51' 51.0" N / 93° 10' 41.2" W	NA
*Datum-NAD 83				

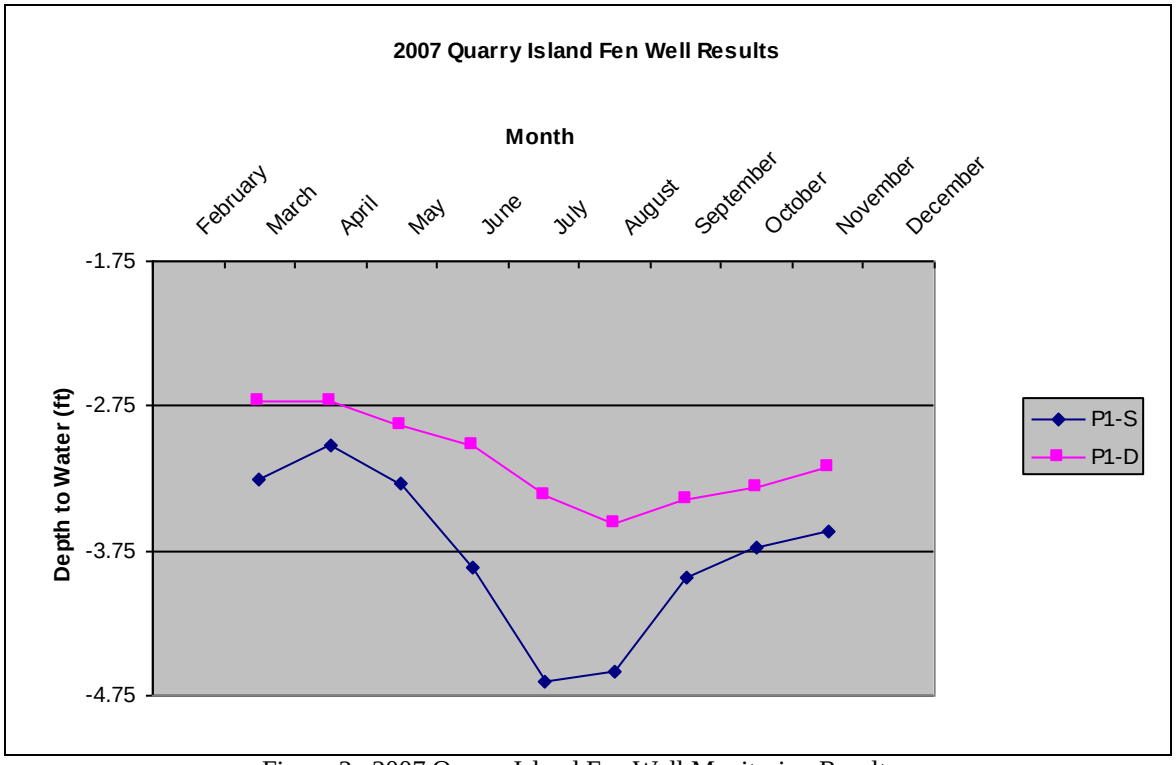

Figure 2. 2007 Quarry Island Fen Well Monitoring Results

Snelling Fen Results

Table 2. Snelling Fen Well Information

Well Name	Unique Well Number	Well Depth (ft)	*Location	**Elevation (pipe surveyed)
N3	484653	45.21	44° 50' 57.6152" N / 93° 09' 56.3074" W	923.90 (PVC)
N4	482156	75.34	44° 50' 57.6152" N / 93° 09' 56.3074" W	924.28 (PVC)
N5	182155	21.69	44° 50' 57.6152" N / 93° 09' 56.3074" W	924.14 (PVC)
W1	482157	77.00	44° 51' 14.4359" N / 93° 10' 52.4898" W	928.47 (PVC)
W2	482154	50.12	44° 51' 14.4359" N / 93° 10' 52.4898" W	928.29 (PVC)
W3	591979	21.83	44° 51' 14.4359" N / 93° 10' 52.4898" W	926.81 (steel)
W4	591980	12.00	44° 51' 14.4359" N / 93° 10' 52.4898" W	927.29 (PVC)
S1	591981	5.35	44° 51' 16.2387" N / 93° 10' 56.6908" W	923.01 (PVC)
S1-USGS	NA	20.67	44° 51' 16.2387" N / 93° 10' 56.6908" W	923.41 (PVC)
S2	591982	5.25	44° 51' 16.9010" N / 93° 11' 00.9901" W	920.92 (PVC)
S2-USGS	NA	27.00	44° 51' 16.9010" N / 93° 11' 00.9901" W	922.37 (PVC)
S3	591983	21.68	44° 51' 16.6124" N / 93° 11' 04.9330" W	914.99 (PVC)
S3-USGS	NA	21.68	44° 51' 16.6124" N / 93° 11' 04.9330" W	914.03 (PVC)
*Datum-NGVD 88				
**Datum-NGVD 1929				

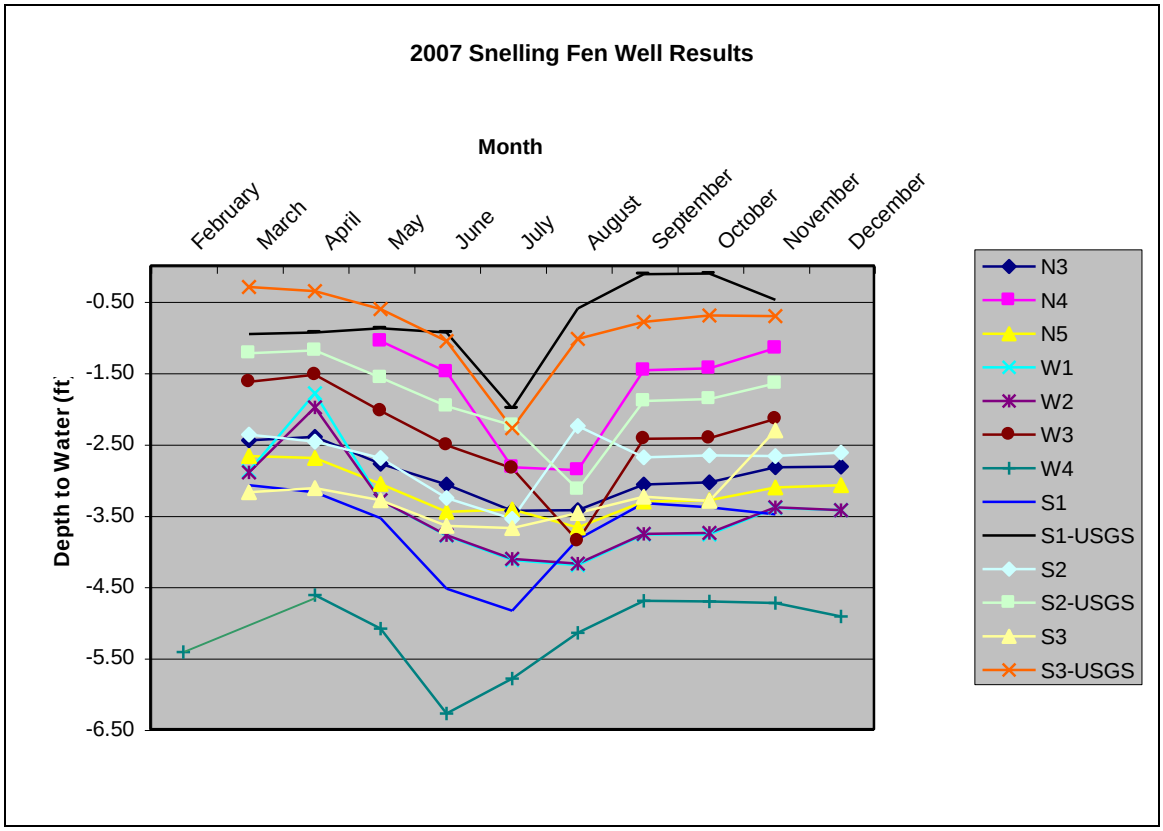

Figure 3. 2007 Snelling Fen Well Monitoring Results

Nichols Fen Results

Table 3. Nichols Fen Well Information

Well Name	**Unique Well Number**	**Well Depth**	***Location**	**Elevation** (pipe surveyed)
1LN	526701	NA	44° 49' 12.1" N / 93° 13' 08.8" W	751.67 (?)
1LS	522299	NA	44° 49' 12.1" N / 93° 13' 08.8" W	751.51 (?)
WN1		NA	44° 49' 23.2" N / 93° 13' 0.82" W	718.00
WN1-USGS		NA	44° 49' 23.2" N / 93° 13' 0.82" W	NA
F3	452924	NA	44° 49' 23.3" N / 93° 13' 08.2" W	720.51 (?)
F4	452925	NA	44° 49' 23.3" N / 93° 13' 0.82" W	720.39 (?)
WN5	540952	NA	44° 49' 24.0" N / 93° 13' 09.1" W	NA
WN5-USGS		NA	44° 49' 24.0" N / 93° 13' 09.1" W	NA
WN2		NA	44° 49' 25.1" N / 93° 13' 0.80" W	NA
WN3		NA	44° 49' 26.1" N / 93° 13' 06.0" W	NA
F1	452922	NA	44° 49' 27.4" N / 93° 13' 02.3" W	714.78 (?)
F2	452923	NA	44° 49' 27.3" N / 93° 13' 02.21" W	714.47 (?)
WN4		NA	44° 49' 27.3" N / 93° 13' 02.3" W	NA
*Datum-NAD 83				

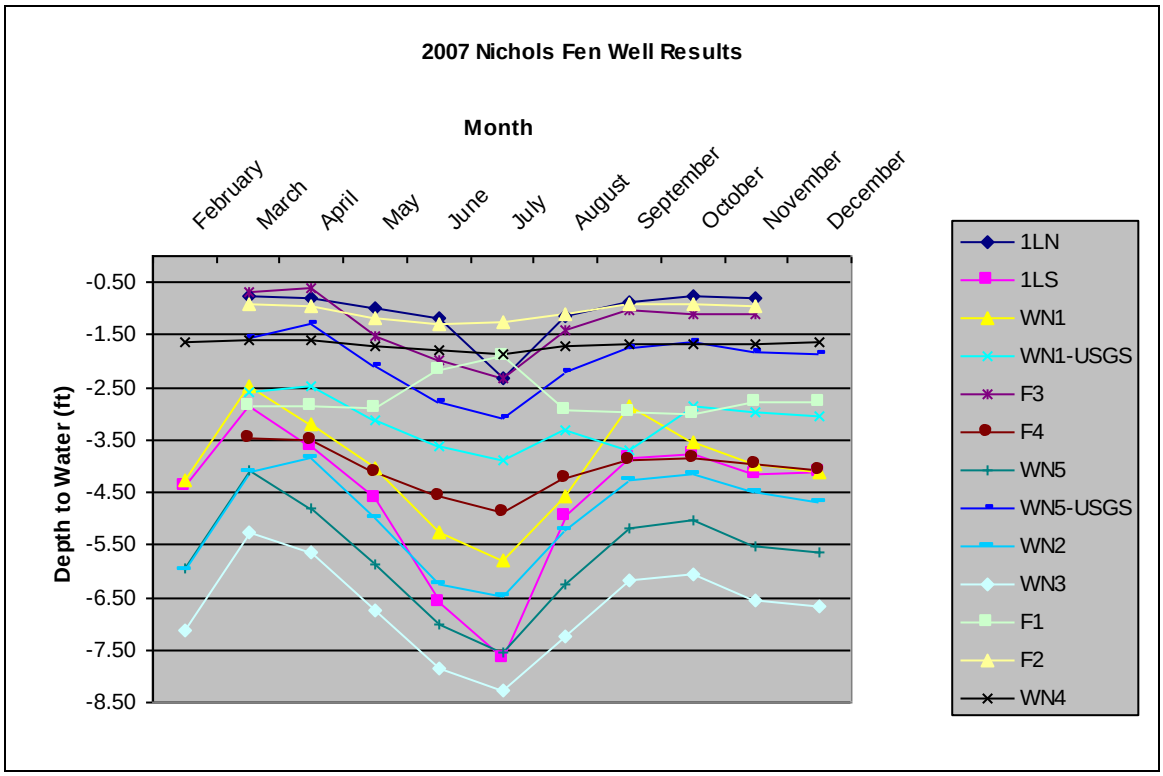

Figure 4. 2007 Nichols Fen Well Monitoring Results

Conclusions

Beginning in February of 2007, Dakota County Soil and Water Conservation staff were successful in collecting monthly "depth to water" measurements at all fen monitoring wells. In some cases, wells were frozen during the February 2007 measurement, but thawed quickly in the early spring months. Several wells were beginning to freeze during the early December measurement.

The one obvious trend that can be observed from the monitoring results is the apparent drop in water elevation in mid-summer. This likely corresponds with the near drought conditions experienced in the region during June and July. The only exception to this trend was observed in well F1. The water level in this well actually increased during the hot, dry summer months. No explanation for this result could be determined.

In general, these results highlight the interconnectedness between local precipitation and groundwater levels in the fen areas.

Suggestions for future monitoring:

- Survey in elevations of all wells. Several of the wells have never been surveyed, and some of the historical survey results appear contradictory. Not only would a current survey update all well elevations, but it would also allow all wells to be compared against the Mean Sea Level elevation standard.

- Review historical monitoring data from the area to compare against 2007 measurements. This may enable watershed management to determine if recent development has had any impact on groundwater levels in the fens.

- Consider registering all wells with the State of Minnesota and obtain unique state well numbers for each of the monitored wells. This will create a permanent record of all wells involved in this study, and allow future investigations to locate historical information regarding these wells.

- Submit monitoring results to the MNDNR Observation Well database.

- Continue collecting monthly measurements to help identify annual, as well as long term trends.

Appendix 2. Raw data from 2007 LMRWD Fen Well Monitoring Project

Location	P1-S	P1-D	N3	N4	N5	W1	W2	W3	W4	S1	S1-USGS	S2	S2-USGS	S3	S3-USGS	1LN	1LS	WN1	WN1-USGS	F3	F4	WN5	WN5-USGS	WN2	WN3	F1	F2	WN4
2/8/07									-5.42								-4.39	-4.28				-5.96		-5.97	-7.11			-1.62
3/28/07	-3.26	-2.72	-2.45		-2.67	-2.88	-2.90	-1.63		-3.08	-0.96	-2.37	-1.23	-3.18	-0.30	-0.76	-2.84	-2.48	-2.59	-0.69	-3.47	-4.06	-1.55	-4.12	-5.25	-2.87	-0.92	-1.60
4/26/07	-3.02	-2.72	-2.40		-2.70	-1.79	-1.99	-1.53	-4.62	-3.18	-0.94	-2.47	-1.19	-3.12	-0.36	-0.80	-3.62	-3.19	-2.49	-0.60	-3.49	-4.80	-1.31	-3.85	-5.65	-2.85	-0.97	-1.60
5/30/07	-3.29	-2.89	-2.78	-1.06	-3.06	-3.29	-3.29	-2.04	-5.09	-3.54	-0.88	-2.70	-1.57	-3.29	-0.61	-1.01	-4.61	-4.03	-3.12	-1.53	-4.10	-5.87	-2.09	-5.00	-6.74	-2.88	-1.19	-1.71
6/21/07	-3.87	-3.02	-3.07	-1.49	-3.45	-3.79	-3.78	-2.52	-6.28	-4.53	-0.94	-3.26	-1.97	-3.65	-1.06	-1.17	-6.58	-5.25	-3.62	-2.00	-4.57	-7.01	-2.77	-6.25	-7.86	-2.17	-1.28	-1.80
7/13/07	-4.65	-3.37	-3.44	-2.83	-3.42	-4.13	-4.11	-2.84	-5.79	-4.84	-2.00	-3.55	-2.24	-3.68	-2.28	-2.32	-7.68	-5.81	-3.87	-2.34	-4.86	-7.53	-3.08	-6.49	-8.27	-1.89	-1.26	-1.86
8/17/07	-4.58	-3.56	-3.43	-2.87	-3.67	-4.20	-4.18	-3.86	-5.15	-3.84	-0.60	-2.25	-3.14	-3.47	-1.03	-1.14	-4.96	-4.59	-3.33	-1.40	-4.23	-6.24	-2.20	-5.23	-7.25	-2.94	-1.09	-1.71
9/21/07	-3.94	-3.40	-3.07	-1.47	-3.31	-3.77	-3.76	-2.43	-4.70	-3.33	-0.12	-2.69	-1.90	-3.24	-0.79	-0.88	-3.85	-2.87	-3.68	-1.03	-3.87	-5.19	-1.76	-4.27	-6.17	-2.99	-0.91	-1.67
10/11/07	-3.73	-3.31	-3.04	-1.44	-3.29	-3.77	-3.75	-2.42	-4.71	-3.39	-0.11	-2.66	-1.87	-3.30	-0.70	-0.78	-3.78	-3.54	-2.86	-1.09	-3.86	-5.04	-1.64	-4.17	-6.07	-3.02	-0.91	-1.68
11/13/07	-3.62	-3.17	-2.83	-1.16	-3.11	-3.40	-3.39	-2.15	-4.73	-3.49	-0.48	-2.67	-1.65	-2.31	-0.71	-0.79	-4.16	-3.96	-2.98	-1.09	-3.98	-5.51	-1.84	-4.50	-6.56	-2.77	-0.96	-1.67
12/7/07			-2.82		-3.08	-3.43	-3.43		-4.92			-2.62					-4.11	-4.11	-3.05		-4.06	-5.66	-1.85	-4.68	-6.68	-2.77		-1.63