Metropolitan Water Reclamation District of Greater Chicago

RESEARCH AND DEVELOPMENT DEPARTMENT

REPORT NO. 06-46

GROUNDWATER MONITORING REPORT

TUNNEL AND RESERVOIR PLAN
UPPER DES PLAINES TUNNEL SYSTEM
2005 ANNUAL REPORT

AUGUST 2006

Protecting Our Water Environment

Metropolitan Water Reclamation District of Greater Chicago

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Louis Kollias, P.E., BCEE
Director of Research and Development
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August 8, 2006

Ms. Marcia Willhite, Chief
Bureau of Water
Illinois Environmental Protection Agency
P. O. Box 19276
Springfield, IL 62794–9276

Subject: Upper Des Plaines TARP System Groundwater Monitoring Annual Report for the Year 2005

Dear Ms. Willhite:

Enclosed are three copies of "Groundwater Monitoring Report, Tunnel and Reservoir Plan Upper Des Plaines Tunnel System 2005 Annual Report."

Very truly yours,

Louis Kollias
Director
Research and Development

LK:JSJ:lmf
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cc w/enc: Ms. Sally K. Swanson (USEPA Region V—WC15J) (2)
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GROUNDWATER MONITORING REPORT

TUNNEL AND RESERVOIR PLAN
UPPER DES PLAINES TUNNEL SYSTEM
2005 ANNUAL REPORT

Research and Development Department
Louis Kollias, Director

August 2006

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UPPER DES PLAINES SYSTEM
2005 ANNUAL REPORT

Introduction

This report contains data for the year 2005 for the TARP Upper Des Plaines System. This system consists of two sub-systems, Upper Des Plaines 20 and 21. Upper Des Plaines 20 contains six water quality monitoring wells, MW–1 through MW–6, while Upper Des Plaines 21 contains three water quality wells, MW–7 through MW–9. These nine water quality monitoring wells are sampled six times per year with the exception of MW–1 which is sampled three times per year (IEPA memo July 9, 2004). Water levels were monitored once every two weeks as required.

Monitoring Data

Appendix AI contains a location map of nine water quality monitoring wells, MW–1 through MW–6 for the Upper Des Plaines 20 System, and MW–7 through MW–9 for the Upper Des Plaines 21 System.

Table AII–1 in Appendix AII contains groundwater elevation data for the year 2005 for monitoring wells MW–1 through MW–6 for the Upper Des Plaines 20 System, and Table AII–2 contains groundwater elevation data for the same period for monitoring wells MW–7 through MW–9 for the Upper Des Plaines 21 Tunnel System.

Tables AIII–1 and AIII–2 in Appendix AIII contain water quality data for Upper Des Plaines 20. Tables AIII–3 and AIII–4 in Appendix AIII contain water quality data for Upper Des Plaines 21 monitoring wells. These data are compiled from the data collected from the nine water quality wells. These wells were sampled six times per year except for MW–1 which was sampled three times per year (Illinois Environmental Protection Agency memorandum July 9, 2004) during 2005.

All of the wells in the Upper Des Plaines System were visited for the required number of samples. However, in some instances the wells could not be sampled. Water quality well MW–2 could not be sampled on February 3, 2005, because of a severed power line, April 27, 2005, because power to the pump had been restored improperly, or August 29, 2005, because the well was struck by a vehicle and damaged. Water quality well MW–3 could not be sampled on December 22, 2005, because the ground was frozen and access to the well was not safe. Water quality well MW–4 could not be sampled on April 20, 2005, because the pump was inoperable, or December 22, 2005, because ice covered the manhole and it could not be removed. Water quality well MW–5 could not be sampled on August 18, 2005, because a foreign lock on the well cover prevented access to the well, or December 22, 2005, because ice covered the manhole and it could not be removed.

Summary of Data

Monitoring Wells Water Level Elevation Data. In Figure 1, the 2005 groundwater level elevation data for monitoring wells MW–1 through MW–6 of the Upper Des Plaines 20 Tunnel System have been plotted. In this figure, mean, minimum, and maximum water level elevations of all six monitoring wells are plotted to show the fluctuations in the water level elevations during 2005.

Similarly, in Figure 2, the 2005 groundwater elevation data for monitoring wells MW–7 through MW–9 of the Upper Des Plaines 21 Tunnel System have been plotted. Also, mean, minimum, and maximum water level elevations of all three monitoring wells are plotted to show the fluctuations in the water level elevation during 2005.

Water Quality Monitoring Wells Data. Table 1 contains summary statistics of the water quality parameters for the year 2005 for the Upper Des Plaines 20 Tunnel System, and Table 2 contains summary statistics of the water quality parameters for the same period for the Upper Des Plaines 21 Tunnel System. The summary statistics are computed from the water quality data collected in 2005 from Upper Des Plaines water quality wells MW–1 through MW–6 (Upper Des Plaines 20), and MW–7 through MW–9 (Upper Des Plaines 21). The summary statistics include minimum, mean, maximum, standard deviation (Std. Dev.), median, and coefficient of variation (Coeff. Var.) of the values of all nine water quality parameters analyzed for 2005. The nine water quality parameters are: chloride (Cl), conductivity (Cond.), fecal coliform (FC), hardness as $CaCO_3$ (Hard.), ammonia as NH_4^+–N, pH, sulfate (SO_4), total dissolved solids (TDS), and total organic carbon (TOC).

Figure 1: 2005 MINIMUM, MEAN, AND MAXIMUM WATER LEVEL ELEVATIONS FOR THE UPPER DES PLAINES 20 TUNNEL SYSTEM MONITORING WELLS

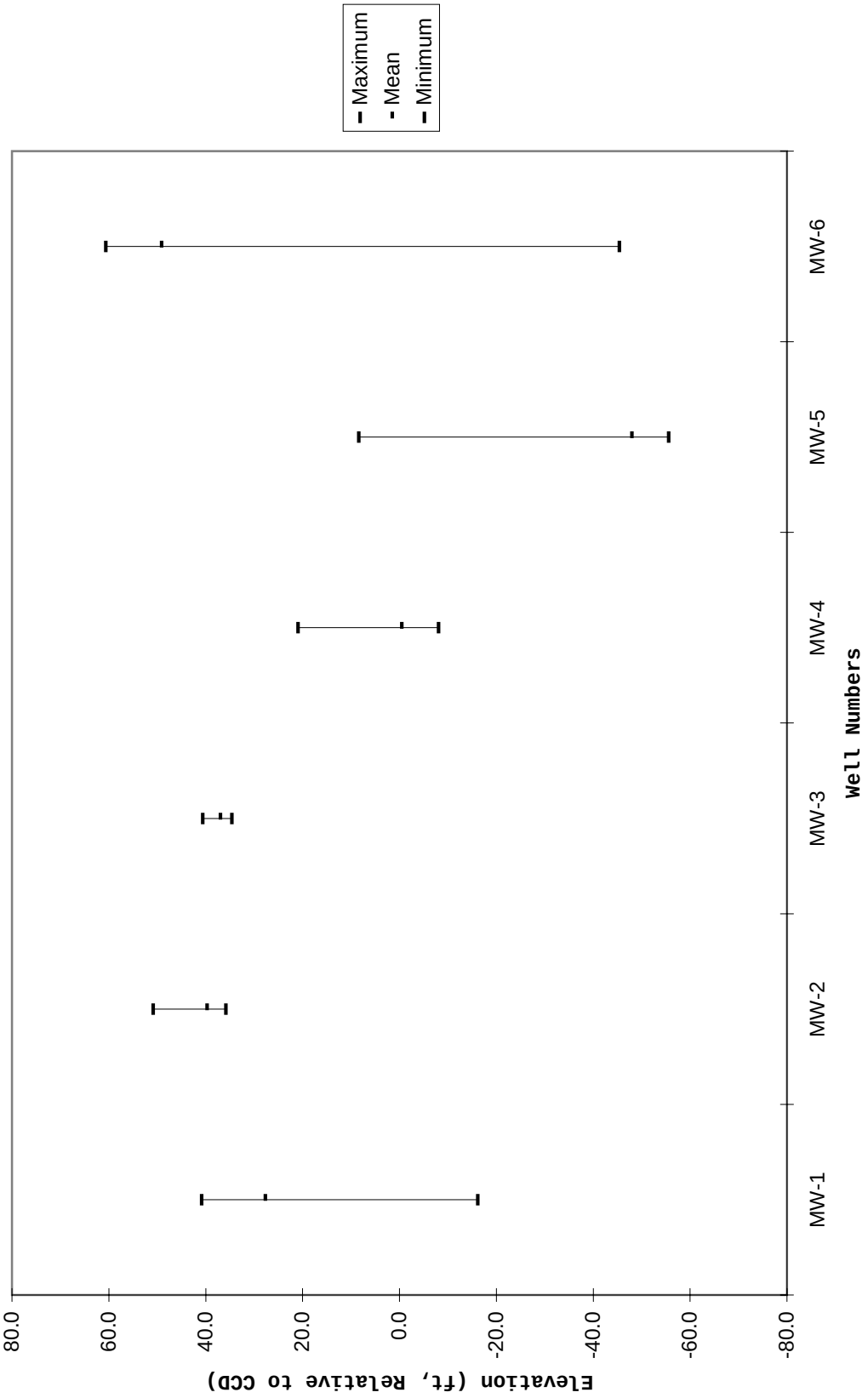


Figure 2: 2005 MINIMUM, MEAN, AND MAXIMUM WATER LEVEL ELEVATIONS FOR THE UPPER DES PLAINES 21 TUNNEL SYSTEM MONITORING WELLS

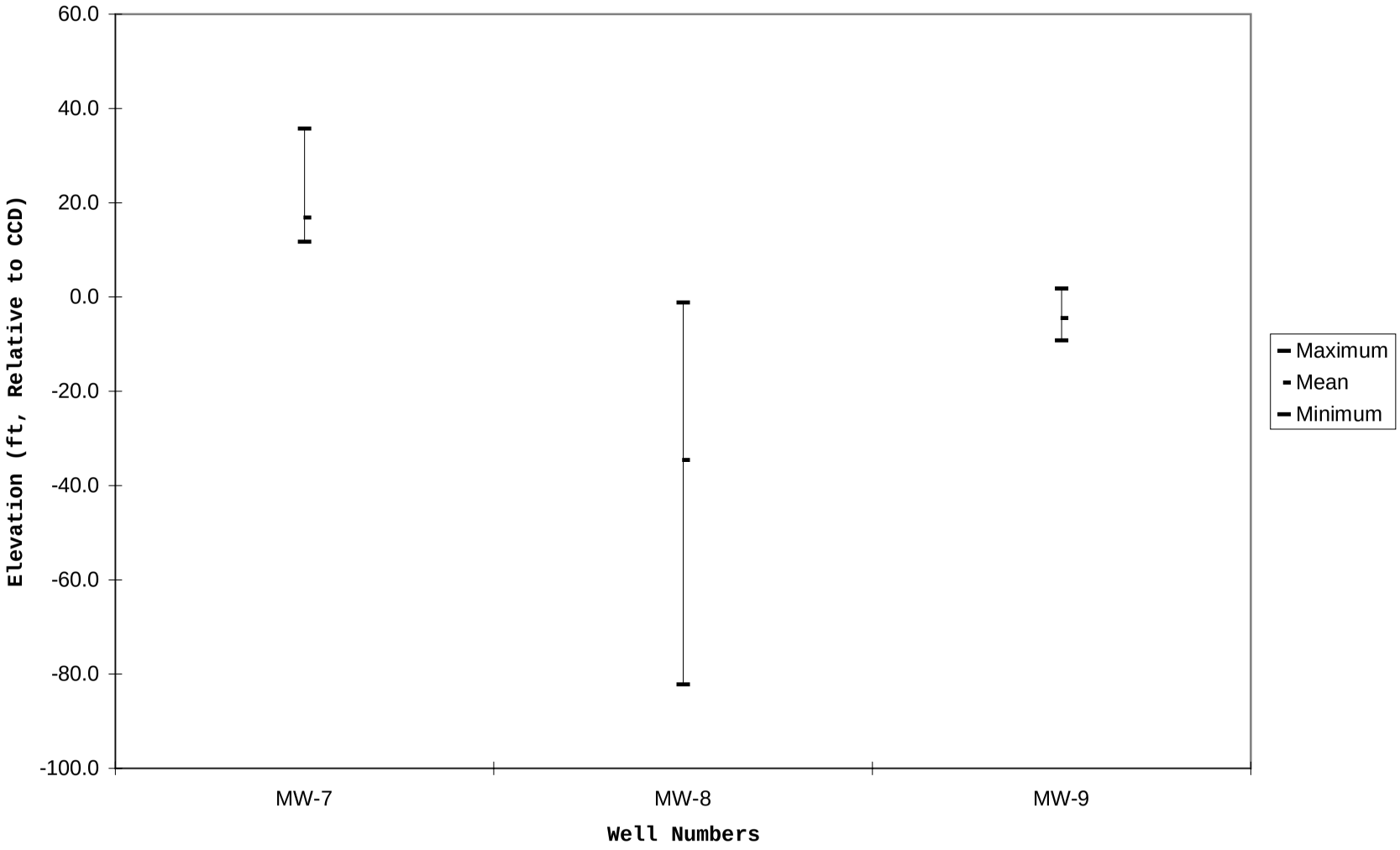


TABLE 1: SUMMARY STATISTICS FOR 2005 WATER QUALITY DATA FOR THE MONITORING WELLS IN UPPER DES PLAINES 20 TUNNEL SYSTEM: WELLS MW–1 THROUGH MW–6*

Parameter		Well Number					
		MW–1	MW–2	MW–3	MW–4	MW–5	MW–6
Cl, mg/L	Minimum	29	30	11	46	110	37
	Mean	37	41	14	48	157	39
	Maximum	51	63	19	50	218	42
	Std. Dev.	12	19	3	2	45	3
	Median	32	31	13	48	150	39
	Coeff. Var.	32	45	23	4	29	7
Cond., µmhos/cm	Minimum	683	328	316	458	488	399
	Mean	861	708	629	688	784	669
	Maximum	1008	915	903	1021	1168	863
	Std. Dev.	165	329	252	238	283	203
	Median	891	880	560	636	739	684
	Coeff. Var.	19	47	40	35	36	30
FC, cfu/100 mL	Minimum	1	1	1	1	1	1
	Geo. Mean	1	1	1	1	1	1
	Maximum	1	1	1	1	1	1
	Geo. Std. Dev.	0	0	0	0	0	0
	Median	1	1	1	1	1	1
	Coeff. Var.	0	0	0	0	0	0
Hard., as $CaCO_3$, mg/L	Minimum	422	451	417	491	229	368
	Mean	442	452	428	516	264	382
	Maximum	477	453	437	543	296	399
	Std. Dev.	30	1	8	22	29	10
	Median	428	452	430	516	265	381
	Coeff. Var.	7	0	2	4	11	3
NH_4^+–N, mg/L	Minimum	0.27	0.49	0.26	0.08	0.11	0.44
	Mean	0.31	0.50	0.34	0.64	0.17	0.48
	Maximum	0.34	0.52	0.46	2.24	0.22	0.54
	Std. Dev.	0.04	0.00	0.08	1.07	0.05	0.04
	Median	0.32	0.50	0.32	0.13	0.18	0.49
	Coeff. Var.	11.63	0.00	23.59	165.79	31.49	7.48

TABLE 1 (Continued): SUMMARY STATISTICS FOR 2005 WATER QUALITY DATA FOR THE MONITORING WELLS IN UPPER DES PLAINES 20 TUNNEL SYSTEM: WELLS MW–1 THROUGH MW–6

Parameter		Well Number					
		MW–1	MW–2	MW–3	MW–4	MW–5	MW–6
pH	Minimum	6.9	7.6	7.2	7.3	7.5	6.6
	Mean	7.3	7.7	7.4	7.5	7.7	7.3
	Maximum	7.6	7.8	7.6	7.6	7.9	7.7
	Std. Dev.	0.4	0.0	0.1	0.1	0.2	0.4
	Median	7.4	7.6	7.4	7.5	7.6	7.5
	Coeff. Var.	4.9	0.0	2.0	1.7	2.3	6.1
SO_4, mg/L	Minimum	316	374	402	341	211	206
	Mean	339	411	427	367	244	301
	Maximum	351	437	442	381	262	329
	Std. Dev.	20	33	16	18	23	47
	Median	351	422	435	374	252	317
	Coeff. Var.	6	8	4	5	9	16
TDS, mg/L	Minimum	794	872	788	912	846	704
	Mean	822	891	839	955	873	770
	Maximum	854	926	873	1012	906	816
	Std. Dev.	30	31	34	42	28	42
	Median	818	874	832	948	869	773
	Coeff. Var.	4	3	4	4	3	5
TOC, mg/L	Minimum	1	1	1	1	1	1
	Mean	1	1	1	1	2	2
	Maximum	1	1	2	2	5	2
	Std. Dev.	0	0	0	1	2	1
	Median	1	1	1	1	2	2
	Coeff. Var.	0	0	37	40	84	37

*For purposes of statistical evaluation, fecal coliform values less than 1 were set equal to 1.

TABLE 2: SUMMARY STATISTICS FOR 2005 WATER QUALITY DATA FOR THE MONITORING WELLS IN UPPER DES PLAINES 21 TUNNEL SYSTEM: MW–7 THROUGH MW–9

Parameter		Well Number		
		MW–7	MW–8	MW–9
Cl, mg/L	Minimum	32	37	2
	Mean	34	43	30
	Maximum	35	58	49
	Std. Dev.	1	8	15
	Median	34	40	32
	Coeff. Var.	3	18	51
Cond., µmhos/cm	Minimum	482	543	432
	Mean	829	717	686
	Maximum	1056	924	900
	Std. Dev.	267	183	215
	Median	966	696	697
	Coeff. Var.	32	25	31
FC,* cfu/100 mL	Minimum	1	1	1
	Geo. Mean	1	1	1
	Maximum	1	4	1
	Geo. Std. Dev.	0	1	0
	Median	1	1	1
	Coeff. Var.	0	97	0
Hard., as CaCO3, mg/L	Minimum	509	346	371
	Mean	519	393	385
	Maximum	525	429	398
	Std. Dev.	6	29	11
	Median	521	391	382
	Coeff. Var.	1	7	3
NH_4^+–N, mg/L	Minimum	0.44	0.00**	0.28
	Mean	0.47	0.04	0.34
	Maximum	0.50	0.12	0.39
	Std. Dev.	0.03	0.05	0.04
	Median	0.48	0.02	0.34
	Coeff. Var.	5.29	130.98	12.74

TABLE 2 (Continued): SUMMARY STATISTICS FOR 2005 WATER QUALITY DATA FOR THE MONITORING WELLS IN UPPER DES PLAINES 21 TUNNEL SYSTEM: MW–7 THROUGH MW–9

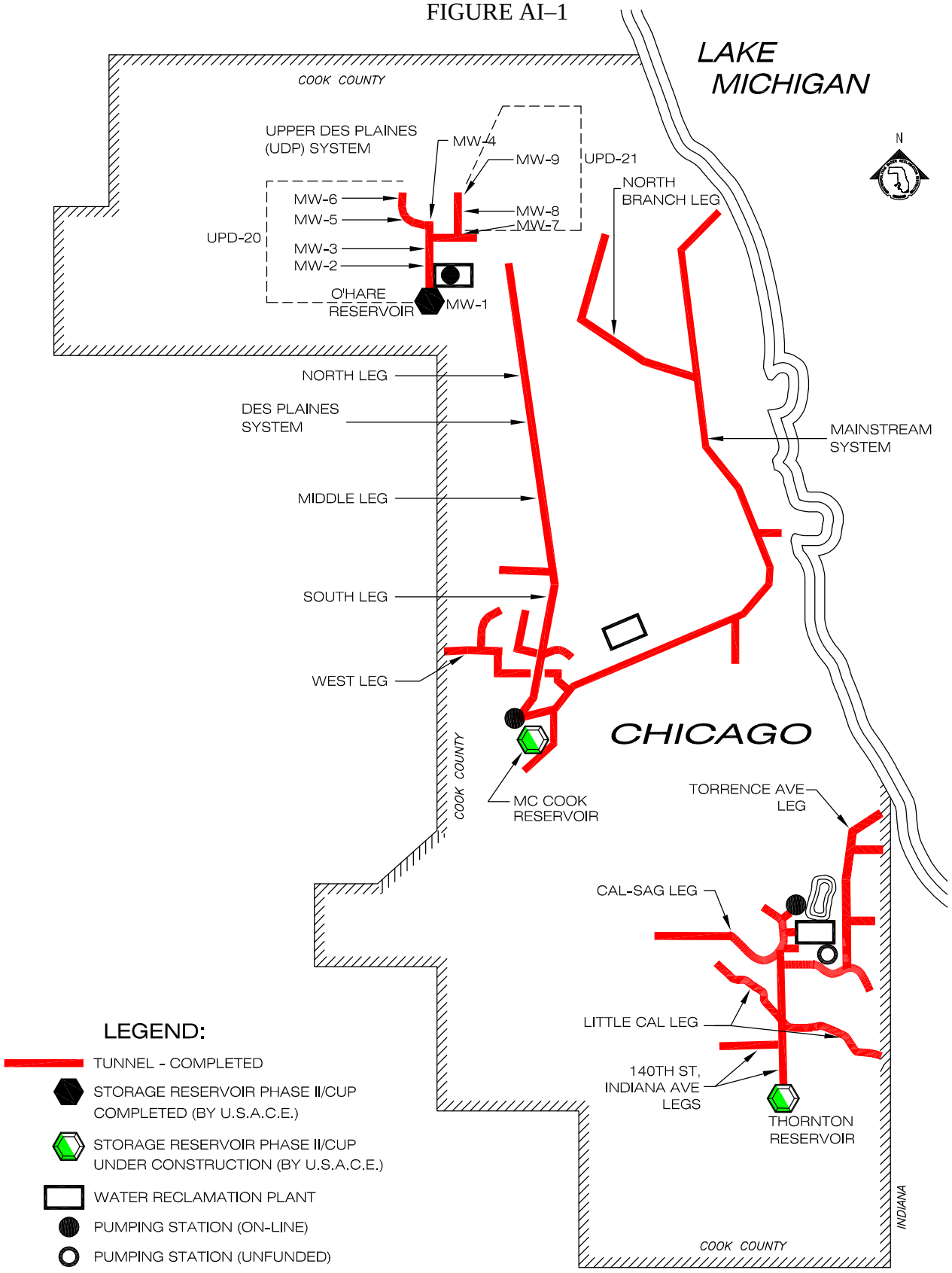
Parameter		Well Number MW–7	MW–8	MW–9
pH	Minimum	7.1	6.9	6.8
	Mean	7.4	7.4	7.3
	Maximum	7.6	7.6	7.7
	Std. Dev.	0.2	0.3	0.3
	Median	7.5	7.5	7.3
	Coeff. Var.	2.4	3.5	4.6
SO_4, mg/L	Minimum	312	294	311
	Mean	404	399	413
	Maximum	471	680	737
	Std. Dev.	55	140	162
	Median	409	354	347
	Coeff. Var.	14	35	39
TDS, mg/L	Minimum	890	762	772
	Mean	943	796	789
	Maximum	984	830	808
	Std. Dev.	34	27	14
	Median	950	800	790
	Coeff. Var.	4	3	2
TOC, mg/L	Minimum	1	1	1
	Mean	1	1	1
	Maximum	2	2	2
	Std. Dev.	0	0	0.41
	Median	1	1	1
	Coeff. Var.	35	35	35

*For purposes of statistical evaluation, fecal coliform values less than 1 were set equal to 1.

**A zero value indicates that the test result was below the detection limit (DL). The DL for ammonia nitrogen is 0.02 mg/L.

APPENDIX AI

LOCATION MAP OF GROUNDWATER QUALITY MONITORING WELLS MW–1 THROUGH MW–6 (UPPER DES PLAINES 20), AND MW–7 THROUGH MW–9 (UPPER DES PLAINES 21) IN THE UPPER DES PLAINES TUNNEL SYSTEM



UPPER DES PLAINES TUNNEL SYSTEM LOCATION MAP OF GROUNDWATER QUALITY MONITORING WELLS

METROPOLITAN WATER RECLAMATION DISTRICT OF GREATER CHICAGO

I:\DMAC\UpperDesPlainesMonitor Updated.dwg, 08/18/06 at 11.39

APPENDIX AII

2005 GROUNDWATER LEVEL ELEVATION DATA
FOR MONITORING WELLS MW–1 THROUGH MW–6 (UPPER DES PLAINES 20),
AND MW–7 THROUGH MW–9 (UPPER DES PLAINES 21)
IN THE UPPER DES PLAINES TUNNEL SYSTEM

TABLE AII–1: 2005 GROUNDWATER LEVEL ELEVATION* DATA FOR MONITORING WELLS MW–1 THROUGH MW–6 IN THE UPPER DES PLAINES 20 TUNNEL SYSTEM

Date	Monitoring Well					
	MW–1	MW–2	MW–3	MW–4	MW–5	MW–6
	feet					
1/14/05	**	39.8	37.6	**	**	58.6
1/28/05	***	***	***	***	***	***
2/9/05	28.8	39.8	36.6	-3.1	-55.6	56.6
2/18/05	30.8	40.8	34.6	-4.1	-53.6	57.6
3/4/05	30.8	50.8	37.6	-1.1	-50.6	60.6
3/25/05	28.8	39.8	35.6	-3.1	-51.6	57.6
4/8/05	29.8	40.8	37.1	-3.1	-50.6	58.6
4/28/05	40.8	41.8	40.6	-0.1	-52.6	43.6
5/13/05	29.9	39.8	37.6	-2.6	-51.6	31.6
5/27/05	29.8	38.8	36.6	-2.1	-50.6	32.6
6/10/05	29.8	39.8	35.6	-8.1	-55.6	57.1
6/24/05	-16.2	40.8	36.6	-2.1	-51.6	49.6
7/8/05	29.8	38.8	37.6	-0.1	-49.6	50.6
7/22/05	32.8	38.8	37.6	7.9	-49.6	57.6
8/5/05	29.3	38.7	37.6	-2.6	-46.6	53.1
8/19/05	26.8	38.8	36.6	-2.1	-45.6	51.6
8/29/05	26.8	38.8	36.6	-5.1	-51.6	52.1
9/2/05	22.8	40.8	37.6	-0.1	-46.6	50.6
9/16/05	29.8	38.8	37.6	-0.6	-48.1	54.6
9/23/05	28.3	36.8	35.6	-2.1	-50.1	52.6
10/14/05	27.8	35.8	38.6	2.9	-48.6	54.6
10/28/05	28.8	38.8	37.6	20.9	8.4	-45.4
11/10/05	29.8	36.8	35.6	-3.1	-51.6	54.6
11/23/05	29.8	37.8	34.6	1.9	-52.6	56.6
12/13/05	27.8	39.8	37.6	***	***	59.6
12/20/05	29.8	39.8	***	***	***	59.6
Minimum	-16.2	35.8	34.6	-8.1	-55.6	-45.4
Mean	27.6	39.7	37.0	-0.5	-48.0	49.1
Maximum	40.8	50.8	40.6	20.9	8.4	60.6

*Relative to Chicago City Datum.
**Unable to take reading because the area around the well was flooded.
***Well was covered in snow and ice.

TABLE AII–2: 2005 GROUNDWATER LEVEL ELEVATION* DATA FOR MONITORING WELLS MW–7 THROUGH MW–9 IN THE UPPER DES PLAINES 21 TUNNEL SYSTEM

Date	Monitoring Well		
	MW–7	MW–8	MW–9
	feet		
1/14/05	13.7	**	**
1/28/05	12.7	***	***
2/9/05	14.7	-55.2	-5.2
2/18/05	11.7	-50.2	-6.2
3/4/05	23.7	-40.2	-3.2
3/25/05	11.7	-32.2	-4.2
4/8/05	12.7	-26.2	-4.2
4/28/05	15.7	-36.2	1.8
5/13/05	13.7	-31.7	-3.2
5/27/05	13.7	-24.2	-3.2
6/10/05	14.7	-16.7	-4.7
6/24/05	13.7	-5.2	-7.2
7/8/05	13.7	-1.2	-3.2
7/22/05	15.7	-4.2	-6.2
8/5/05	23.7	-31.2	-3.2
8/19/05	14.7	-30.2	-6.2
8/29/05	13.7	-26.2	-5.2
9/2/05	20.7	-57.2	-9.2
9/16/05	23.7	-47.2	-3.2
9/23/05	13.7	-47.2	-5.7
10/14/05	18.7	-38.2	1.8
10/28/05	35.7	-35.2	-6.2
11/10/05	12.7	-33.2	-7.2
11/23/05	20.7	-45.2	-4.2
12/13/05	13.7	-33.2	-7.2
12/20/05	23.7	-82.2	-3.2
Minimum	11.7	-82.2	-9.2
Mean	16.8	-34.6	-4.5
Maximum	35.7	-1.2	1.8

*Relative to Chicago City Datum.
**Unable to take reading because the area around the well was flooded.
***Well was covered in snow and ice.

APPENDIX AIII

2005 GROUNDWATER QUALITY DATA
FOR MONITORING WELLS MW–1 THROUGH MW–6 (UPPER DES PLAINES 20),
AND MW–7 THROUGH MW–9 (UPPER DES PLAINES 21)
IN THE UPPER DES PLAINES TUNNEL SYSTEM

TABLE AIII–1: 2005 pH, CONDUCTIVITY, TEMPERATURE, HARDNESS, AMMONIA NITROGEN, AND CHLORIDE DATA FOR WATER QUALITY MONITORING WELLS MW–1 THROUGH MW–6 IN THE UPPER DES PLAINES 20 TUNNEL SYSTEM

Well	Date of Sampling	pH[1]	Cond.[1] µmhos/cm	Temp. °C	Hard. as $CaCO_3$ mg/L	NH_4^+–N mg/L	Cl mg/L
MW–1	2/3/05	6.9	1008	13	428	0.34	51
MW–1	4/21/05	7.6	683	14	422	0.32	32
MW–1	6/23/05	7.4	891	14	477	0.27	29
MW–2	2/3/05			Well could not be sampled			
MW–2	4/12/05			Well could not be sampled			
MW–2	6/8/05	7.8	915	14	453	0.52	63
MW–2	8/23/05			Well could not be sampled			
MW–2	11/2/05	7.6	328	14	452	0.49	30
MW–2	12/14/05	7.6	880	13	451	0.50	31
MW–3	2/3/05	7.4	494	13	437	0.36	19
MW–3	4/20/05	7.2	903	15	430	0.32	14
MW–3	6/9/05	7.6	560	14	434	0.28	11
MW–3	8/18/05	7.4	871	15	422	0.26	12
MW–3	10/20/05	7.3	316	14	417	0.46	13
MW–3	12/22/05			Well could not be sampled			
MW–4	2/3/05	7.6	612	13	543	0.13	48
MW–4	4/20/05			Well could not be sampled			
MW–4	6/9/05	7.5	660	14	491	0.12	46
MW–4	8/18/05	7.3	1021	14	522	2.24	47
MW–4	10/20/05	7.5	458	13	509	0.08	50
MW–4	12/22/05			Well could not be sampled			
MW–5	2/3/05	7.6	761	12	229	0.11	218
MW–5	4/20/05	7.5	1168	14	277	0.14	150
MW–5	6/9/05	7.9	717	15	296	0.22	110
MW–5	8/18/05			Well could not be sampled			
MW–5	10/20/05	7.6	488	14	252	0.21	149
MW–5	12/22/05			Well could not be sampled			
MW–6	1/31/05	6.6	542	13	377	0.48	41
MW–6	3/23/05	7.6	525	13	399	0.50	37
MW–6	5/25/05	7.7	826	12	380	0.44	37

TABLE AIII–1 (Continued): 2005 pH, CONDUCTIVITY, TEMPERATURE, HARDNESS, AMMONIA NITROGEN, AND CHLORIDE DATA FOR WATER QUALITY MONITORING WELLS MW–1 THROUGH MW–6 IN THE UPPER DES PLAINES 20 TUNNEL SYSTEM

Well	Date of Sampling	pH[1]	Cond.[1] µmhos/cm	Temp. °C	Hard. as $CaCO_3$ mg/L	NH_4^+–N mg/L	Cl mg/L
MW–6	7/7/05	7.6	856	15	368	0.54	42
MW–6	9/14/05	7.4	399	14	388	0.49	37
MW–6	11/22/05	6.9	863	12	381	0.45	42

[1]Unfiltered samples, all others were filtered through 0.45 µm membrane.

TABLE AIII–2: 2005 SULFATE, TOTAL ORGANIC CARBON,
TOTAL DISSOLVED SOLIDS, FECAL COLIFORM, WATER ELEVATION, AND
RECHARGE DATA FOR WATER QUALITY MONITORING WELLS
MW–1 THROUGH MW–6 IN THE UPPER DES PLAINES 20 TUNNEL SYSTEM

Well	Date of Sampling	SO_4 mg/L	TOC mg/L	TDS mg/L	FC[1] cfu/100 mL	Water Elevation[2] Feet	Recharge[3] Hours
MW–1	2/3/05	351	1	854	<1	28	<48
MW–1	4/21/05	351	1	794	<1	28	<48
MW–1	6/23/05	316	1	818	<1	6	<48
MW–2	2/3/05			Well could not be sampled			
MW–2	4/27/05			Well could not be sampled			
MW–2	6/8/05	374	1	926	<1	40	<48
MW–2	8/29/05			Well could not be sampled			
MW–2	11/2/05	437	1	874	<1	36	<48
MW–2	12/14/05	422	1	872	<1	40	<48
MW–3	2/3/05	437	2	873	<1	37	<48
MW–3	4/20/05	435	1	868	<1	38	<48
MW–3	6/9/05	402	1	832	<1	37	<48
MW–3	8/18/05	420	1	788	<1	37	<48
MW–3	10/20/05	442	1	832	<1	35	<48
MW–3	12/22/05			Well could not be sampled			
MW–4	2/3/05	374	1	950	<1	-2	<48
MW–4	4/20/05			Well could not be sampled			
MW–4	6/9/05	341	2	1012	<1	-2	<48
MW–4	8/18/05	373	1	946	<1	-5	<48
MW–4	10/20/05	381	1	912	<1	-2	<48
MW–4	12/22/05			Well could not be sampled			
MW–5	2/3/05	211	1	884	<1	-45	<48
MW–5	4/20/05	262	5	906	<1	-50	<48
MW–5	6/9/05	251	2	854	<1	-51	<48
MW–5	8/18/05			Well could not be sampled			
MW–5	10/20/05	252	1	846	<1	-50	<48
MW–5	12/22/05			Well could not be sampled			
MW–6	1/31/05	328	2	816	<1	57	<4
MW–6	3/23/05	308	2	744	<1	59	<4
MW–6	5/25/05	206	2	704	<1	59	<4

TABLE AIII–2 (Continued): 2005 SULFATE, TOTAL ORGANIC CARBON, TOTAL DISSOLVED SOLIDS, FECAL COLIFORM, WATER ELEVATION, AND RECHARGE DATA FOR WATER QUALITY MONITORING WELLS MW–1 THROUGH MW–6 IN THE UPPER DES PLAINES 20 TUNNEL SYSTEM

Well	Date of Sampling	SO_4 mg/L	TOC mg/L	TDS mg/L	FC[1] cfu/100 mL	Water Elevation[2] Feet	Recharge[3] Hours
MW–6	7/7/05	310	1	770	<1	58	<4
MW–6	9/14/05	329	1	812	<1	51	<4
MW–6	11/22/05	323	1	776	<1	57	<48

[1]Unfiltered samples, all others were filtered through 0.45 µm membrane.
[2]Water level elevations are relative to Chicago City Datum.
[3]Refers to elapsed time after initial drawdown before the well recovered sufficiently for sampling.

TABLE AIII–3: 2005 pH, CONDUCTIVITY, TEMPERATURE, HARDNESS, AMMONIA NITROGEN, AND CHLORIDE DATA FOR WATER QUALITY MONITORING WELLS MW–7 THROUGH MW–9 IN THE UPPER DES PLAINES 21 TUNNEL SYSTEM

Well	Date of Sampling	pH[1]	Cond.[1] µmhos/cm	Temp. °C	Hard. as $CaCO_3$ mg/L	NH_4^+–N mg/L	Cl mg/L
MW-7	2/3/05	7.1	482	14	522	0.50	35
MW-7	4/27/05	7.4	1012	14	525	0.50	35
MW-7	6/8/05	7.6	1056	16	520	0.45	34
MW-7	8/29/05	7.5	939	16	523	0.44	32
MW-7	11/2/05	7.5	495	16	509	0.48	34
MW-7	12/14/05	7.5	992	14	517	0.47	34
MW-8	2/3/05	6.9	821	13	346	0.04	58
MW-8	4/21/05	7.6	543	15	418	0.06	44
MW-8	6/23/05	7.5	924	15	389	0.12	41
MW-8	8/31/05	7.5	571	14	429	0.00[2]	38
MW-8	11/17/05	7.5	897	14	385	0.00[2]	37
MW-8	12/15/05	7.5	547	14	393	0.00[2]	39
MW-9	2/3/05	6.8	859	14	371	0.28	49
MW-9	4/21/05	7.7	512	14	396	0.38	34
MW-9	6/23/05	7.3	880	14	398	0.39	32
MW-9	8/31/05	7.3	432	14	380	0.34	31
MW-9	11/17/05	7.2	900	14	384	0.34	2
MW-9	12/15/05	7.7	535	14	378	0.30	32

[1]Unfiltered samples, all others were filtered through 0.45 µm membrane.
[2]A zero value indicates that the test result was below the detection limit (DL). The DL for ammonia nitrogen is 0.02 mg/L.

TABLE AIII–4: 2005 SULFATE, TOTAL ORGANIC CARBON, TOTAL DISSOLVED SOLIDS, FECAL COLIFORM, WATER ELEVATION, AND RECHARGE DATA FOR WATER QUALITY MONITORING WELLS MW–7 THROUGH MW–9 IN THE UPPER DES PLAINES 21 TUNNEL SYSTEM

Well	Date of Sampling	SO_4 mg/L	TOC mg/L	TDS mg/L	FC[1] cfu/100 mL	Water Elevation[2] Feet	Recharge[3] Hours
MW-7	2/3/05	312	1	946	<1	22	<4
MW-7	4/27/05	419	2	984	<1	16	<4
MW-7	6/8/05	381	1	968	<1	13	<4
MW-7	8/29/05	398	1	890	<1	14	<4
MW-7	11/2/05	441	1	918	<1	13	<4
MW-7	12/14/05	471	1	954	<1	14	<4
MW-8	2/3/05	374	2	762	<1	-35	<48
MW-8	4/21/05	359	1	830	<1	-35	<48
MW-8	6/23/05	294	1	796	<1	-47	<48
MW-8	8/31/05	340	1	804	4	-26	<48
MW-8	11/17/05	348	1	768	<1	-31	<48
MW-8	12/15/05	680	1	818	<1	-55	<48
MW-9	2/3/05	405	1	774	<1	-6	<48
MW-9	4/21/05	347	2	788	<1	-6	<48
MW-9	6/23/05	311	1	808	<1	-2	<48
MW-9	8/31/05	331	1	772	<1	-7	<48
MW-9	11/17/05	346	1	792	<1	-5	<48
MW-9	12/15/05	737	1	798	<1	-6	<48

[1]Unfiltered samples, all others were filtered through 0.45 µm membrane.
[2]Water level elevations are relative to Chicago City Datum.
[3]Refers to elapsed time after initial drawdown before the well recovered sufficiently for sampling.