MONITORING AND RESEARCH DEPARTMENT

REPORT NO. 09-43

TUNNEL AND RESERVOIR PLAN
DES PLAINES TUNNEL SYSTEM
2008 ANNUAL GROUNDWATER MONITORING REPORT

JUNE 2009

Protecting Our Water Environment

Metropolitan Water Reclamation District of Greater Chicago

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July 6, 2009

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

Dear Ms. Willhite:

Subject: Tunnel and Reservoir Plan, Des Plaines Tunnel System, 2008 Annual Groundwater Monitoring Report

Enclosed are three copies of the "Tunnel and Reservoir Plan, Des Plaines Tunnel System, 2008 Annual Groundwater Monitoring Report."

Very truly yours,

Louis Kollias
Director
Monitoring and Research

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TUNNEL AND RESERVOIR PLAN
DES PLAINES TUNNEL SYSTEM
2008 ANNUAL GROUNDWATER MONITORING REPORT

Monitoring and Research Department
Louis Kollias, Director

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2008 MONITORING RESULTS

Introduction

This report contains 2008 data for the Tunnel and Reservoir Plan Des Plaines Tunnel System compiled from the monitoring of the 40 groundwater quality monitoring wells QD–21 through QD–60 located along the Des Plaines Tunnel alignment. The groundwater quality monitoring wells are located along the 13A Extension, south leg, middle leg, and north leg of the Des Plaines Tunnel System. These groundwater quality monitoring wells were sampled either three times per year or six times per year. Water quality monitoring wells QD–21 through QD–26, QD–28 through QD–32, QD–35, QD–36, and QD–38 through QD–60 were sampled three times per year (Illinois Environmental Protection Agency [IEPA] memoranda July 9, 2004, and February 23, 2006). Water quality monitoring wells QD–27, QD–33, QD–34, and QD–37 were sampled six times per year (IEPA memorandum July 9, 2004, and February 23, 2006).

Monitoring Data

Appendix AI contains a schematic showing the relative locations of the 40 groundwater quality monitoring wells along the Des Plaines Tunnel System.

Tables AII–1 and AII–2 in Appendix AII contain groundwater quality data for 2008 pertaining to the 40 groundwater quality monitoring wells QD–21 through QD–60 in the Des Plaines Tunnel System.

All of the wells in the Des Plaines Tunnel System were visited for the required number of samples. However, in some instances the well could not be sampled. Water quality monitoring well QD–21 could not be sampled on November 25, 2008, because there was an electrical problem with the pump. Water quality monitoring well QD–32 could not be sampled on August 14, 2008, because there was insufficient water in the well to collect a sample. Water quality monitoring well QD–34 could not be sampled on February 14, 2008, because access to the well was blocked by a snow pile. Water quality monitoring well QD–43 could not be sampled on March 13, 2008, because the pump was inoperable. Water quality monitoring well QD–45 could not be sampled on August 28, 2008, or October 28, 2008, because the pump was inoperable. Water quality monitoring well QD–49 could not be sampled on June 19, 2008, or September 25, 2008, because there was insufficient water in the well to collect a sample. Water quality monitoring well QD–57 could not be sampled on March 13, 2008, because access to the well was blocked by snow, or July 31, 2008, because access to the well was blocked by fallen trees. Water quality monitoring well QD–58 could not be sampled on February 26, 2008, because access to the well was blocked by snow.

Summary of Data

Tables 1 through 8 contain summary statistics of the groundwater quality parameters for 2008 for all 40 groundwater quality monitoring wells QD–21 through QD–60 in the Des Plaines Tunnel System. These statistics are computed from the data collected from each well in 2008. The summary statistics include minimum, mean, maximum, standard deviation (Std. Dev.), median, and coefficient of variation (Coeff. Var.) for eight of the nine groundwater quality parameters analyzed during 2008. These groundwater quality parameters are: chloride (Cl), conductivity (Cond.), hardness as $CaCO_3$ (Hard.), ammonia nitrogen (NH_3–N), pH, sulfate (SO_4), total dissolved solids (TDS), and total organic carbon (TOC). For the ninth parameter, fecal coliform (FC), the geometric mean (Geo. Mean) has been calculated and presented in the tables, along with minimum, maximum, and median. Median values were calculated using the Microsoft® Excel function MEDIAN. In instances where an even number of samples were collected and analyzed, the reported median is the average of the two numbers in the middle of the series.

TABLE 1: SUMMARY STATISTICS OF THE 2008 DATA FOR THE WATER QUALITY MONITORING WELLS IN THE DES PLAINES TUNNEL SYSTEM: WELLS QD–21 THROUGH QD–25

Parameter[1]		Well Number				
		QD–21	QD–22	QD–23	QD–24	QD–25
Cl	Minimum	213	121	150	83	431
mg/L	Mean	292	134	161	110	434
	Maximum	372	147	173	148	436
	Std. Dev.	112	13	12	34	3
	Median	292	133	161	100	435
	Coeff. Var. (%)	38	10	7	31	1
FC	Minimum	1	1	1	1	1
cfu/100 mL	Geo. Mean	1	1	1	1	1
	Maximum	1	1	1	1	1
	Median	1	1	1	1	1
SO_4	Minimum	278.7	276.6	303.0	138.5	164.4
mg/L	Mean	341.5	293.5	321.1	173.1	202.9
	Maximum	404.2	316.3	340.3	235.6	248.8
	Std. Dev.	88.7	20.5	18.7	54.2	42.7
	Median	341.5	287.7	320.0	145.2	195.5
	Coeff. Var. (%)	26.0	7.0	5.8	31.3	21.0
NH_3–N	Minimum	0.24	0.38	0.45	0.02	0.02
mg/L	Mean	0.24	0.39	0.48	0.32	0.50
	Maximum	0.24	0.41	0.50	0.47	0.78
	Std. Dev.	0.00	0.02	0.03	0.26	0.42
	Median	0.24	0.38	0.48	0.46	0.71
	Coeff. Var. (%)	0.00	4.44	5.28	81.15	83.45
TOC	Minimum	1.0	1.0	1.1	1.3	1.0
mg/L	Mean	1.0	1.0	1.2	1.4	1.2
	Maximum	1.0	1.0	1.3	1.7	1.5
	Std. Dev.	0.0	0.0	0.1	0.2	0.3
	Median	1.0	1.0	1.1	1.3	1.1
	Coeff. Var. (%)	0.0	0.0	9.9	16.1	22.0

TABLE 1 (Continued): SUMMARY STATISTICS OF THE 2008 DATA FOR THE WATER QUALITY MONITORING WELLS IN THE DES PLAINES TUNNEL SYSTEM: WELLS QD–21 THROUGH QD–25

Parameter[1]		Well Number				
		QD–21	QD–22	QD–23	QD–24	QD–25
TDS	Minimum	1,474	1,030	1,138	702	1,318
mg/L	Mean	1,540	1,185	1,284	836	1,438
	Maximum	1,606	1,362	1,444	956	1,614
	Std. Dev.	93	167	153	128	156
	Median	1,540	1,164	1,270	850	1,382
	Coeff. Var. (%)	6	14	12	15	11
Hard.	Minimum	716	703	727	416	511
mg/L	Mean	823	747	761	506	559
	Maximum	930	795	784	650	645
	Std. Dev.	151	46	30	126	75
	Median	823	744	773	453	520
	Coeff. Var. (%)	18	6	4	25	13
Cond.	Minimum	582	664	738	628	906
µmhos/cm	Mean	717	737	832	710	1,135
	Maximum	852	834	933	766	1,272
	Std. Dev.	191	88	98	73	199
	Median	717	712	824	737	1,226
	Coeff. Var. (%)	27	12	12	10	18
pH	Minimum	7.4	7.5	7.6	7.3	7.4
unit	Mean	7.5	7.6	7.8	7.5	7.6
	Maximum	7.5	7.6	7.9	7.7	7.7
	Std. Dev.	0.1	0.1	0.2	0.2	0.2
	Median	7.5	7.6	7.8	7.5	7.6
	Coeff. Var. (%)	0.9	0.8	2.0	2.7	2.0

[1]For the purpose of statistical evaluation, any value less than the appropriate method detection limit (MDL) or limit of quantification (LOQ) was set equal to the value of the MDL or LOQ.

TABLE 2: SUMMARY STATISTICS OF THE 2008 DATA FOR THE WATER QUALITY MONITORING WELLS IN THE DES PLAINES TUNNEL SYSTEM: WELLS QD–26 THROUGH QD–30

Parameter[1]		Well Number				
		QD–26	QD–27	QD–28	QD–29	QD–30
Cl	Minimum	13	304	277	111	120
mg/L	Mean	14	333	304	115	124
	Maximum	15	367	339	120	127
	Std. Dev.	1	24	32	5	4
	Median	13	326	297	114	125
	Coeff. Var. (%)	8	7	10	4	3
FC	Minimum	1	1	1	1	1
cfu/100 mL	Geo. Mean	3	3	1	1	1
	Maximum	25	260	1	1	1
	Median	1	1	1	1	1
SO_4	Minimum	96.6	31.1	256.2	251.2	281.7
mg/L	Mean	100.8	46.5	271.8	255.1	295.6
	Maximum	103.7	57.4	281.5	259.5	312.0
	Std. Dev.	3.7	9.1	13.7	4.1	15.3
	Median	102.0	47.3	277.8	254.7	293.1
	Coeff. Var. (%)	3.7	19.6	5.0	1.6	5.2
NH_3–N	Minimum	0.34	26.53	0.53	0.32	0.23
mg/L	Mean	0.35	28.15	0.55	0.35	0.31
	Maximum	0.36	28.92	0.56	0.37	0.44
	Std. Dev.	0.01	0.90	0.02	0.03	0.11
	Median	0.34	28.42	0.55	0.36	0.27
	Coeff. Var. (%)	3.33	3.22	2.79	7.56	35.59
TOC	Minimum	1.0	15.5	1.0	1.1	1.0
mg/L	Mean	1.0	16.6	1.0	1.3	1.0
	Maximum	1.0	19.1	1.0	1.6	1.0
	Std. Dev.	0.0	1.3	0.0	0.3	0.0
	Median	1.0	16.2	1.0	1.2	1.0
	Coeff. Var. (%)	0.0	7.9	0.0	20.4	0.0

TABLE 2 (Continued): SUMMARY STATISTICS OF THE 2008 DATA FOR THE WATER QUALITY MONITORING WELLS IN THE DES PLAINES TUNNEL SYSTEM: WELLS QD–26 THROUGH QD–30

Parameter[1]		Well Number				
		QD–26	QD–27	QD–28	QD–29	QD–30
TDS	Minimum	532	1,224	1,330	960	1,018
mg/L	Mean	547	1,270	1,463	1,127	1,133
	Maximum	560	1,316	1,532	1,218	1,310
	Std. Dev.	14	34	115	145	155
	Median	548	1,277	1,526	1,204	1,072
	Coeff. Var. (%)	3	3	8	13	14
Hard.	Minimum	387	466	673	627	574
mg/L	Mean	402	501	693	649	654
	Maximum	418	517	724	665	696
	Std. Dev.	16	21	27	20	69
	Median	402	513	682	656	692
	Coeff. Var. (%)	4	4	4	3	11
Cond.	Minimum	723	1,180	954	682	862
µmhos/cm	Mean	788	1,673	1,384	842	1,071
	Maximum	908	2,110	1,885	1,004	1,201
	Std. Dev.	104	403	470	161	183
	Median	732	1,708	1,312	840	1,150
	Coeff. Var. (%)	13	24	34	19	17
pH	Minimum	7.3	7.1	7.5	7.4	7.5
unit	Mean	7.4	7.7	7.6	7.6	7.5
	Maximum	7.5	8.1	7.8	7.9	7.6
	Std. Dev.	0.1	0.4	0.2	0.3	0.1
	Median	7.4	7.8	7.6	7.6	7.5
	Coeff. Var. (%)	1.4	4.9	2.0	3.3	0.8

[1]For the purpose of statistical evaluation, any value less than the appropriate method detection limit (MDL) or limit of quantification (LOQ) was set equal to the value of the MDL or LOQ.

TABLE 3: SUMMARY STATISTICS OF THE 2008 DATA FOR THE WATER QUALITY MONITORING WELLS IN THE DES PLAINES TUNNEL SYSTEM: WELLS QD–31 THROUGH QD–35

Parameter[1]		Well Number				
		QD–31	QD–32	QD–33	QD–34	QD–35
Cl	Minimum	107	528	327	101	120
mg/L	Mean	111	531	345	109	124
	Maximum	117	534	364	118	129
	Std. Dev.	5	4	15	7	5
	Median	109	531	349	111	124
	Coeff. Var. (%)	5	1	4	6	4
FC	Minimum	1	1	1	1	1
cfu/100 mL	Geo. Mean	6	1	1	1	1
	Maximum	120	1	4	1	1
	Median	2	1	1	1	1
SO_4	Minimum	146.4	214.8	171.0	311.3	278.8
mg/L	Mean	165.8	217.9	194.7	340.0	294.8
	Maximum	185.1	221.0	209.0	354.0	322.3
	Std. Dev.	19.4	4.4	14.0	16.7	23.9
	Median	165.8	217.9	198.6	343.9	283.2
	Coeff. Var. (%)	11.7	2.0	7.2	4.9	8.1
NH_3–N	Minimum	0.16	0.12	0.16	0.33	0.21
mg/L	Mean	0.20	0.19	0.20	0.34	0.30
	Maximum	0.23	0.25	0.23	0.38	0.38
	Std. Dev.	0.04	0.09	0.03	0.02	0.09
	Median	0.22	0.19	0.21	0.34	0.32
	Coeff. Var. (%)	18.62	49.69	14.14	6.03	28.42
TOC	Minimum	1.0	1.0	1.0	1.0	1.1
mg/L	Mean	1.0	1.0	1.0	1.0	1.4
	Maximum	1.0	1.0	1.0	1.0	1.6
	Std. Dev.	0.0	0.0	0.0	0.0	0.3
	Median	1.0	1.0	1.0	1.0	1.5
	Coeff. Var. (%)	0.0	0.0	0.0	0.0	18.9

TABLE 3 (Continued): SUMMARY STATISTICS OF THE 2008 DATA FOR THE WATER QUALITY MONITORING WELLS IN THE DES PLAINES TUNNEL SYSTEM: WELLS QD–31 THROUGH QD–35

Parameter[1]		Well Number				
		QD–31	QD–32	QD–33	QD–34	QD–35
TDS	Minimum	882	2,010	1,610	1,298	1,024
mg/L	Mean	904	2,012	1,641	1,362	1,262
	Maximum	940	2,014	1,660	1,440	1,416
	Std. Dev.	31	3	21	53	209
	Median	890	2,012	1,648	1,368	1,346
	Coeff. Var. (%)	3	0	1	4	17
Hard.	Minimum	235	25	21	737	683
mg/L	Mean	240	31	29	759	714
	Maximum	248	37	42	793	771
	Std. Dev.	7	8	7	23	50
	Median	238	31	28	748	687
	Coeff. Var. (%)	3	27	24	3	7
Cond.	Minimum	834	1,961	700	855	646
µmhos/cm	Mean	1,046	2,341	1,862	1,081	862
	Maximum	1,233	2,720	2,375	1,249	1,130
	Std. Dev.	201	537	647	204	246
	Median	1,071	2,341	2,041	1,195	811
	Coeff. Var. (%)	19	23	35	19	29
pH	Minimum	7.7	7.4	7.4	7.2	7.5
unit	Mean	7.8	7.8	8.2	7.4	7.6
	Maximum	7.8	8.2	9.0	7.6	7.7
	Std. Dev.	0.1	0.6	0.7	0.1	0.1
	Median	7.8	7.8	8.4	7.4	7.6
	Coeff. Var. (%)	0.7	7.3	8.0	1.9	1.3

[1]For the purpose of statistical evaluation, any value less than the appropriate method detection limit (MDL) or limit of quantification (LOQ) was set equal to the value of the MDL or LOQ.

TABLE 4: SUMMARY STATISTICS OF THE 2008 DATA FOR THE WATER QUALITY MONITORING WELLS IN THE DES PLAINES TUNNEL SYSTEM: WELLS QD–36 THROUGH QD–40

Parameter[1]		Well Number				
		QD–36	QD–37	QD–38	QD–39	QD–40
Cl	Minimum	133	235	165	25	13
mg/L	Mean	140	268	178	30	18
	Maximum	146	328	185	35	26
	Std. Dev.	7	34	11	5	7
	Median	141	264	184	30	14
	Coeff. Var. (%)	5	13	6	17	41
FC	Minimum	1	1	1	1	1
cfu/100 mL	Geo. Mean	1	1	1	1	1
	Maximum	1	1	1	1	1
	Median	1	1	1	1	1
SO_4	Minimum	300.0	318.6	93.5	82.8	301.3
mg/L	Mean	318.5	372.7	99.3	89.4	338.2
	Maximum	342.5	393.6	104.0	96.9	371.4
	Std. Dev.	21.8	28.6	5.3	7.1	35.2
	Median	313.0	384.8	100.3	88.5	342.0
	Coeff. Var. (%)	6.8	7.7	5.4	8.0	10.4
NH_3–N	Minimum	0.26	0.07	0.29	0.06	0.02
mg/L	Mean	0.29	0.26	0.33	0.07	0.06
	Maximum	0.32	0.31	0.36	0.09	0.08
	Std. Dev.	0.03	0.09	0.04	0.02	0.03
	Median	0.28	0.30	0.35	0.06	0.07
	Coeff. Var. (%)	10.66	36.60	11.36	24.74	56.73
TOC	Minimum	1.0	1.0	1.0	1.0	1.0
mg/L	Mean	1.1	1.0	1.0	1.0	1.0
	Maximum	1.2	1.0	1.0	1.0	1.0
	Std. Dev.	0.1	0.0	0.0	0.0	0.0
	Median	1.2	1.0	1.0	1.0	1.0
	Coeff. Var. (%)	10.2	0.0	0.0	0.0	0.0

TABLE 4 (Continued): SUMMARY STATISTICS OF THE 2008 DATA FOR THE WATER QUALITY MONITORING WELLS IN THE DES PLAINES TUNNEL SYSTEM: WELLS QD–36 THROUGH QD–40

Parameter[1]		Well Number				
		QD–36	QD–37	QD–38	QD–39	QD–40
TDS	Minimum	1,186	1,396	832	794	630
mg/L	Mean	1,279	1,470	843	893	703
	Maximum	1,392	1,506	858	1,066	740
	Std. Dev.	105	38	13	150	63
	Median	1,258	1,480	840	820	738
	Coeff. Var. (%)	8	3	2	17	9
Hard.	Minimum	730	318	225	19	16
mg/L	Mean	761	523	242	19	19
	Maximum	789	607	259	20	26
	Std. Dev.	30	104	17	1	6
	Median	765	560	241	19	16
	Coeff. Var. (%)	4	20	7	3	30
Cond.	Minimum	699	1,090	786	982	620
µmhos/cm	Mean	945	1,406	1,031	1,038	872
	Maximum	1,120	1,835	1,221	1,140	1,030
	Std. Dev.	219	336	223	88	220
	Median	1,015	1,254	1,087	993	965
	Coeff. Var. (%)	23	24	22	8	25
pH	Minimum	7.5	7.3	7.8	8.3	9.4
unit	Mean	7.6	7.6	8.0	8.6	9.5
	Maximum	7.6	8.0	8.2	9.1	9.6
	Std. Dev.	0.1	0.2	0.2	0.4	0.1
	Median	7.6	7.6	8.0	8.4	9.4
	Coeff. Var. (%)	0.8	3.2	2.5	5.1	1.2

[1]For the purpose of statistical evaluation, any value less than the appropriate method detection limit (MDL) or limit of quantification (LOQ) was set equal to the value of the MDL or LOQ.

TABLE 5: SUMMARY STATISTICS OF THE 2008 DATA FOR THE WATER QUALITY MONITORING WELLS IN THE DES PLAINES TUNNEL SYSTEM: WELLS QD–41 THROUGH QD–45

Parameter[1]		Well Number				
		QD–41	QD–42	QD–43	QD–44	QD–45
Cl	Minimum	16	17	43	13	16
mg/L	Mean	17	19	44	15	16
	Maximum	18	20	45	16	16
	Std. Dev.	1	2	1	2	NC
	Median	17	19	44	15	16
	Coeff. Var. (%)	6	8	3	10	NC
FC	Minimum	1	1	1	1	1
cfu/100 mL	Geo. Mean	1	1	1	1	1
	Maximum	1	1	1	1	1
	Median	1	1	1	1	1
SO_4	Minimum	298.2	261.3	184.8	206.7	203.0
mg/L	Mean	330.9	278.9	192.4	210.9	203.0
	Maximum	351.7	290.5	199.9	213.0	203.0
	Std. Dev.	28.7	15.5	10.7	3.7	NC
	Median	342.9	285.0	192.4	213.0	203.0
	Coeff. Var. (%)	8.7	5.6	5.6	1.7	NC
NH_3–N	Minimum	0.26	0.24	0.28	0.34	0.28
mg/L	Mean	0.28	0.29	0.30	0.35	0.28
	Maximum	0.30	0.33	0.31	0.37	0.28
	Std. Dev.	0.02	0.05	0.02	0.02	NC
	Median	0.27	0.31	0.30	0.34	0.28
	Coeff. Var. (%)	7.52	16.11	7.19	4.95	NC
TOC	Minimum	1.0	1.0	1.0	1.0	1.0
mg/L	Mean	1.1	1.0	1.0	1.0	1.0
	Maximum	1.3	1.0	1.0	1.0	1.0
	Std. Dev.	0.2	0.0	0.0	0.0	NC
	Median	1.0	1.0	1.0	1.0	1.0
	Coeff. Var. (%)	15.7	0.0	0.0	0.0	NC

TABLE 5 (Continued): SUMMARY STATISTICS OF THE 2008 DATA FOR THE WATER QUALITY MONITORING WELLS IN THE DES PLAINES TUNNEL SYSTEM: WELLS QD–41 THROUGH QD–45

Parameter[1]		Well Number				
		QD–41	QD–42	QD–43	QD–44	QD–45
TDS	Minimum	788	764	658	598	566
mg/L	Mean	797	775	669	615	566
	Maximum	812	784	680	632	566
	Std. Dev.	13	10	16	17	NC
	Median	790	778	669	616	566
	Coeff. Var. (%)	2	1	2	3	NC
Hard.	Minimum	393	352	394	285	85
mg/L	Mean	397	370	404	301	85
	Maximum	400	383	413	317	85
	Std. Dev.	4	16	13	16	NC
	Median	399	375	404	301	85
	Coeff. Var. (%)	1	4	3	5	NC
Cond.	Minimum	683	666	543	483	699
µmhos/cm	Mean	861	809	587	663	699
	Maximum	996	885	630	860	699
	Std. Dev.	161	124	62	189	NC
	Median	905	875	587	647	699
	Coeff. Var. (%)	19	15	10	28	NC
pH	Minimum	7.6	7.5	7.4	7.5	8.0
unit	Mean	7.7	7.6	7.4	7.7	8.0
	Maximum	7.8	7.7	7.4	8.0	8.0
	Std. Dev.	0.1	0.1	0.0	0.3	NC
	Median	7.8	7.5	7.4	7.7	8.0
	Coeff. Var. (%)	1.5	1.5	0.0	3.3	NC

NC = No calculation was performed because there was only one data point.
[1]For the purpose of statistical evaluation, any value less than the appropriate method detection limit (MDL) or limit of quantification (LOQ) was set equal to the value of the MDL or LOQ.

TABLE 6: SUMMARY STATISTICS OF THE 2008 DATA FOR THE WATER QUALITY MONITORING WELLS IN THE DES PLAINES TUNNEL SYSTEM: WELLS QD–46 THROUGH QD–50

Parameter[1]		Well Number				
		QD–46	QD–47	QD–48	QD–49	QD–50
Cl	Minimum	10	14	10	16	11
mg/L	Mean	12	15	11	16	12
	Maximum	13	16	12	16	12
	Std. Dev.	2	1	1	NC	1
	Median	12	14	11	16	12
	Coeff. Var. (%)	13	8	9	NC	6
FC	Minimum	1	1	1	1	1
cfu/100 mL	Geo. Mean	1	1	2	1	1
	Maximum	1	1	6	1	1
	Median	1	1	1	1	1
SO_4	Minimum	102.1	137.2	257.4	206.5	255.8
mg/L	Mean	119.4	142.4	266.8	206.5	265.8
	Maximum	134.0	148.0	274.3	206.5	277.5
	Std. Dev.	16.1	5.4	8.6	NC	11.0
	Median	122.0	142.0	268.8	206.5	264.0
	Coeff. Var. (%)	13.5	3.8	3.2	NC	4.1
NH_3–N	Minimum	0.20	0.19	0.18	0.23	0.07
mg/L	Mean	0.21	0.23	0.24	0.23	0.08
	Maximum	0.22	0.25	0.32	0.23	0.09
	Std. Dev.	0.01	0.03	0.07	NC	0.01
	Median	0.22	0.24	0.21	0.23	0.09
	Coeff. Var. (%)	5.41	14.18	31.15	NC	13.86
TOC	Minimum	1.0	1.0	1.0	1.0	1.0
mg/L	Mean	1.0	1.0	1.0	1.0	1.0
	Maximum	1.0	1.0	1.1	1.0	1.0
	Std. Dev.	0.0	0.0	0.1	NC	0.0
	Median	1.0	1.0	1.0	1.0	1.0
	Coeff. Var. (%)	0.0	0.0	5.6	NC	0.0

TABLE 6 (Continued): SUMMARY STATISTICS OF THE 2008 DATA FOR THE WATER QUALITY MONITORING WELLS IN THE DES PLAINES TUNNEL SYSTEM: WELLS QD–46 THROUGH QD–50

Parameter[1]		Well Number				
		QD–46	QD–47	QD–48	QD–49	QD–50
TDS	Minimum	552	516	578	580	670
mg/L	Mean	590	520	617	580	678
	Maximum	610	526	688	580	684
	Std. Dev.	33	5	62	NC	7
	Median	608	518	584	580	680
	Coeff. Var. (%)	6	1	10	NC	1
Hard.	Minimum	63	222	251	293	5
mg/L	Mean	72	232	305	293	7
	Maximum	77	241	372	293	8
	Std. Dev.	8	10	62	NC	2
	Median	75	234	291	293	7
	Coeff. Var. (%)	11	4	20	NC	23
Cond.	Minimum	566	452	388	799	643
µmhos/cm	Mean	747	1,900	571	799	884
	Maximum	1,008	4,680	773	799	1,007
	Std. Dev.	232	2,408	193	NC	208
	Median	666	569	551	799	1,001
	Coeff. Var. (%)	31	127	34	NC	24
pH	Minimum	7.5	7.6	7.4	7.7	7.4
unit	Mean	7.8	7.7	8.0	7.7	8.1
	Maximum	8.1	7.7	8.5	7.7	9.3
	Std. Dev.	0.3	0.1	0.6	NC	1.1
	Median	7.9	7.7	8.0	7.7	7.5
	Coeff. Var. (%)	3.9	0.8	6.9	NC	13.3

NC = No calculation was performed because there was only one data point.
[1]For the purpose of statistical evaluation, any value less than the appropriate method detection limit (MDL) or limit of quantification (LOQ) was set equal to the value of the MDL or LOQ.

TABLE 7: SUMMARY STATISTICS OF THE 2008 DATA FOR THE WATER QUALITY MONITORING WELLS IN THE DES PLAINES TUNNEL SYSTEM: WELLS QD–51 THROUGH QD–55

Parameter[1]		Well Number				
		QD–51	QD–52	QD–53	QD–54	QD–55
Cl	Minimum	11	14	17	14	16
mg/L	Mean	11	15	19	23	20
	Maximum	11	16	21	35	28
	Std. Dev.	0	1	2	11	7
	Median	11	14	18	21	16
	Coeff. Var. (%)	2	7	10	46	35
FC	Minimum	1	1	1	1	1
cfu/100 mL	Geo. Mean	1	1	1	15	1
	Maximum	1	1	1	3,700	1
	Median	1	1	1	1	1
SO_4	Minimum	107.0	133.0	152.5	125.2	189.7
mg/L	Mean	112.6	133.9	156.9	134.8	203.9
	Maximum	115.9	135.5	160.0	142.3	218.0
	Std. Dev.	4.9	1.4	4.0	8.7	14.2
	Median	115.0	133.3	158.3	137.0	203.9
	Coeff. Var. (%)	4.3	1.0	2.5	6.5	6.9
NH_3–N	Minimum	0.02	0.09	0.02	0.21	0.38
mg/L	Mean	0.03	0.11	0.03	0.23	0.38
	Maximum	0.03	0.13	0.04	0.26	0.39
	Std. Dev.	0.01	0.02	0.01	0.03	0.01
	Median	0.03	0.10	0.02	0.21	0.38
	Coeff. Var. (%)	21.65	19.52	43.30	12.74	1.51
TOC	Minimum	1.0	1.0	1.0	1.0	1.0
mg/L	Mean	1.0	1.0	1.0	1.0	1.0
	Maximum	1.0	1.0	1.0	1.0	1.0
	Std. Dev.	0.0	0.0	0.0	0.0	0.0
	Median	1.0	1.0	1.0	1.0	1.0
	Coeff. Var. (%)	0.0	0.0	0.0	0.0	0.0

TABLE 7 (Continued): SUMMARY STATISTICS OF THE 2008 DATA FOR THE WATER QUALITY MONITORING WELLS IN THE DES PLAINES TUNNEL SYSTEM: WELLS QD–51 THROUGH QD–55

Parameter[1]		Well Number				
		QD–51	QD–52	QD–53	QD–54	QD–55
TDS	Minimum	466	388	576	426	454
mg/L	Mean	503	450	582	472	492
	Maximum	530	488	592	510	522
	Std. Dev.	33	54	9	43	35
	Median	514	474	578	480	500
	Coeff. Var. (%)	7	12	1	9	7
Hard.	Minimum	5	18	9	33	151
mg/L	Mean	5	20	10	36	174
	Maximum	5	21	11	39	194
	Std. Dev.	0	2	1	3	22
	Median	5	20	10	36	176
	Coeff. Var. (%)	0	8	10	8	12
Cond.	Minimum	634	565	577	452	452
µmhos/cm	Mean	693	648	677	531	587
	Maximum	755	689	801	606	677
	Std. Dev.	61	72	114	77	119
	Median	690	689	653	535	633
	Coeff. Var. (%)	9	11	17	15	20
pH	Minimum	7.6	7.3	7.6	7.6	7.5
unit	Mean	8.3	8.2	8.8	8.2	8.0
	Maximum	9.6	9.5	9.4	9.2	8.9
	Std. Dev.	1.1	1.2	1.0	0.9	0.8
	Median	7.7	7.7	9.3	7.7	7.6
	Coeff. Var. (%)	13.6	14.3	11.5	11.0	9.8

[1]For the purpose of statistical evaluation, any value less than the appropriate method detection limit (MDL) or limit of quantification (LOQ) was set equal to the value of the MDL or LOQ.

TABLE 8: SUMMARY STATISTICS OF THE 2008 DATA FOR THE WATER QUALITY MONITORING WELLS IN THE DES PLAINES TUNNEL SYSTEM: WELLS QD–56 THROUGH QD–60

Parameter[1]		Well Number				
		QD–56	QD–57	QD–58	QD–59	QD–60
Cl	Minimum	10	12	10	111	40
mg/L	Mean	11	12	10	116	41
	Maximum	12	12	10	123	43
	Std. Dev.	1	NC	0	6	2
	Median	11	12	10	114	40
	Coeff. Var. (%)	9	NC	0	5	4
FC	Minimum	1	2	1	1	1
cfu/100 mL	Geo. Mean	1	2	1	1	1
	Maximum	1	2	1	1	1
	Median	1	2	1	1	1
SO_4	Minimum	8.6	54.6	2.0	49.2	94.3
mg/L	Mean	10.4	54.6	2.0	50.8	96.5
	Maximum	12.4	54.6	2.0	52.7	99.8
	Std. Dev.	1.9	NC	0.0	1.8	2.9
	Median	10.1	54.6	2.0	50.4	95.5
	Coeff. Var. (%)	18.3	NC	0.0	3.5	3.0
NH_3–N	Minimum	0.14	0.21	0.25	0.32	0.31
mg/L	Mean	0.19	0.21	0.27	0.37	0.36
	Maximum	0.23	0.21	0.29	0.42	0.41
	Std. Dev.	0.05	NC	0.03	0.05	0.05
	Median	0.21	0.21	0.27	0.37	0.37
	Coeff. Var. (%)	24.44	NC	10.48	13.51	13.85
TOC	Minimum	1.0	1.0	1.0	1.0	1.0
mg/L	Mean	1.0	1.0	1.0	1.0	1.0
	Maximum	1.0	1.0	1.0	1.0	1.0
	Std. Dev.	0.0	NC	0.0	0.0	0.0
	Median	1.0	1.0	1.0	1.0	1.0
	Coeff. Var. (%)	0.0	NC	0.0	0.0	0.0

TABLE 8 (Continued): SUMMARY STATISTICS OF THE 2008 DATA FOR THE WATER QUALITY MONITORING WELLS IN THE DES PLAINES TUNNEL SYSTEM: WELLS QD–56 THROUGH QD–60

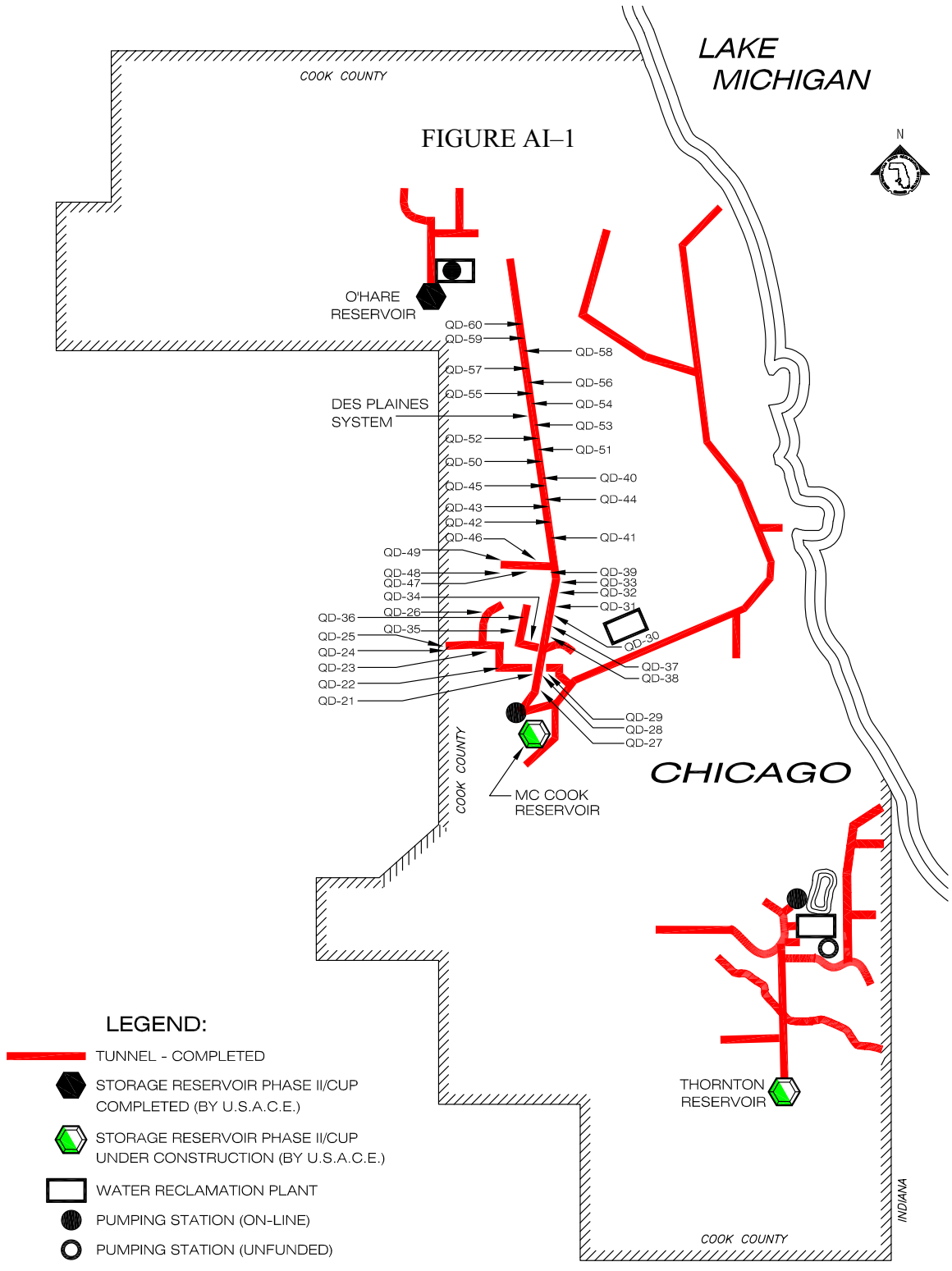
Parameter[1]		Well Number				
		QD–56	QD–57	QD–58	QD–59	QD–60
TDS	Minimum	308	378	262	546	438
mg/L	Mean	330	378	268	585	446
	Maximum	360	378	274	624	462
	Std. Dev.	27	NC	8	39	14
	Median	322	378	268	586	438
	Coeff. Var. (%)	8	NC	3	7	3
Hard.	Minimum	33	18	117	234	224
mg/L	Mean	41	18	119	259	233
	Maximum	48	18	120	285	250
	Std. Dev.	8	NC	2	26	14
	Median	43	18	119	258	226
	Coeff. Var. (%)	18	NC	2	10	6
Cond.	Minimum	332	393	312	280	300
µmhos/cm	Mean	414	393	351	740	619
	Maximum	493	393	390	997	818
	Std. Dev.	81	NC	55	400	279
	Median	416	393	351	944	740
	Coeff. Var. (%)	19	NC	16	54	45
pH	Minimum	7.5	8.9	7.9	7.4	7.3
unit	Mean	8.0	8.9	8.1	7.6	7.8
	Maximum	8.7	8.9	8.2	7.9	8.1
	Std. Dev.	0.6	NC	0.2	0.3	0.4
	Median	7.8	8.9	8.1	7.4	8.0
	Coeff. Var. (%)	7.8	NC	2.6	3.8	5.6

NC = No calculation was performed because there was only one data point.
[1]For the purpose of statistical evaluation, any value less than the appropriate method detection limit (MDL) or limit of quantification (LOQ) was set equal to the value of the MDL or LOQ.

APPENDIX AI

LOCATION MAP OF GROUNDWATER QUALITY MONITORING WELLS QD–21 THROUGH QD–60 IN THE DES PLAINES TUNNEL SYSTEM

FIGURE AI–1



DES PLAINES TUNNEL SYSTEM
LOCATION MAP OF GROUNDWATER QUALITY MONITORING WELLS

METROPOLITAN WATER RECLAMATION DISTRICT OF GREATER CHICAGO

APPENDIX AII

2008 GROUNDWATER QUALITY DATA
FOR MONITORING WELLS QD–21 THROUGH QD–60
IN THE DES PLAINES TUNNEL SYSTEM

TABLE AII–1: 2008 CHLORIDE, FECAL COLIFORM, SULFATE, AMMONIA NITROGEN, TOTAL ORGANIC CARBON, AND TOTAL DISSOLVED SOLIDS DATA FOR WATER QUALITY MONITORING WELLS QD–21 THROUGH QD–60 IN THE DES PLAINES TUNNEL SYSTEM

Well	Date of Sampling	Cl^{1} mg/L	$FC^{1,2}$ cfu/100 mL	$SO_4{}^{1}$ mg/L	$NH_3–N^{1}$ mg/L	TOC^{1} mg/L	TDS mg/L
QD–21	2/13/08	372	<1	404.2	0.24	<1.0	1,606
QD–21	6/11/08	213	<1	278.7	0.24	<1.0	1,474
QD–21	11/25/08	Well could not be sampled					
QD–22	2/13/08	147	<1	316.3	0.38	<1.0	1,030
QD–22	6/11/08	121	<1	276.6	0.41	<1.0	1,362
QD–22	11/25/08	133	<1	287.7	0.38	<1.0	1,164
QD–23	2/13/08	161	<1	340.3	0.45	1.3	1,138
QD–23	6/11/08	150	<1	303.0	0.50	1.1	1,444
QD–23	11/25/08	173	<1	320.0	0.48	1.1	1,270
QD–24	2/13/08	148	<1	235.6	<0.02	1.7	956
QD–24	6/11/08	83	<1	145.2	0.47	1.3	850
QD–24	11/25/08	100	<1	138.5	0.46	1.3	702
QD–25	2/13/08	431	<1	248.8	<0.02	1.5	1,318
QD–25	6/11/08	435	<1	164.4	0.78	1.0	1,614
QD–25	11/25/08	436	<1	195.5	0.71	1.1	1,382
QD–26	4/24/08	15	<1	103.7	0.34	<1.0	548
QD–26	7/17/08	13	<1	102.0	0.34	<1.0	532
QD–26	8/14/08	13	25	96.6	0.36	<1.0	560
QD–27	4/24/08	355	<1	47.6	27.78	15.5	1,288
QD–27	5/22/08	329	<1	57.4	26.53	15.9	1,224
QD–27	7/17/08	321	<1	53.0	28.69	16.5	1,280
QD–27	8/14/08	304	<1	42.7	28.14	15.8	1,274
QD–27	10/2/08	322	260	31.1	28.92	19.1	1,238
QD–27	11/20/08	367	3	47.1	28.82	16.5	1,316
QD–28	2/14/08	339	<1	281.5	0.53	<1.0	1,330
QD–28	5/29/08	297	<1	256.2	0.56	<1.0	1,532
QD–28	7/16/08	277	<1	277.8	0.55	<1.0	1,526

TABLE AII–1 (Continued): 2008 CHLORIDE, FECAL COLIFORM, SULFATE, AMMONIA NITROGEN, TOTAL ORGANIC CARBON, AND TOTAL DISSOLVED SOLIDS DATA FOR WATER QUALITY MONITORING WELLS QD–21 THROUGH QD–60 IN THE DES PLAINES TUNNEL SYSTEM

Well	Date of Sampling	Cl^{1} mg/L	$FC^{1,2}$ cfu/100 mL	$SO_4{}^{1}$ mg/L	$NH_3–N^{1}$ mg/L	TOC^{1} mg/L	TDS mg/L
QD–29	2/14/08	111	<1	251.2	0.32	1.2	960
QD–29	5/29/08	120	<1	254.7	0.37	1.6	1,218
QD–29	7/16/08	114	<1	259.5	0.36	1.1	1,204
QD–30	5/22/08	125	<1	312.0	0.27	1.0	1,072
QD–30	8/14/08	120	<1	281.7	0.44	<1.0	1,310
QD–30	11/20/08	127	<1	293.1	0.23	<1.0	1,018
QD–31	5/22/08	117	<1	185.1	0.22	<1.0	882
QD–31	8/14/08	109	120	146.4	0.23	<1.0	940
QD–31	11/20/08	107	2	165.8	0.16	<1.0	890
QD–32	5/22/08	528	<1	214.8	0.25	<1.0	2,010
QD–32	8/14/08	Well could not be sampled					
QD–32	11/20/08	534	<1	221.0	0.12	<1.0	2,014
QD–33	4/24/08	356	<1	204.4	0.21	<1.0	1,658
QD–33	5/22/08	350	<1	209.0	0.21	<1.0	1,620
QD–33	7/17/08	327	1	201.9	0.23	<1.0	1,640
QD–33	8/14/08	327	<1	171.0	0.22	<1.0	1,660
QD–33	10/2/08	364	4	186.4	0.17	<1.0	1,610
QD–33	11/20/08	348	<1	195.4	0.16	<1.0	1,656
QD–34	2/14/08	Well could not be sampled					
QD–34	4/30/08	118	<1	343.9	0.34	<1.0	1,370
QD–34	5/29/08	113	<1	342.0	0.33	1	1,368
QD–34	6/17/08	111	<1	354.0	0.38	<1.0	1,298
QD–34	7/16/08	103	<1	349.0	0.33	<1.0	1,332
QD–34	9/4/08	101	<1	311.3	0.34	<1.0	1,440
QD–35	2/14/08	124	<1	278.8	0.21	1.5	1,024
QD–35	4/30/08	129	<1	322.3	0.38	1.1	1,416
QD–35	5/29/08	120	<1	283.2	0.32	1.6	1,346

TABLE AII–1 (Continued): 2008 CHLORIDE, FECAL COLIFORM, SULFATE, AMMONIA NITROGEN, TOTAL ORGANIC CARBON, AND TOTAL DISSOLVED SOLIDS DATA FOR WATER QUALITY MONITORING WELLS QD–21 THROUGH QD–60 IN THE DES PLAINES TUNNEL SYSTEM

Well	Date of Sampling	Cl^{1} mg/L	$FC^{1,2}$ cfu/100 mL	$SO_4{}^{1}$ mg/L	$NH_3–N^{1}$ mg/L	TOC^{1} mg/L	TDS mg/L
QD–36	2/14/08	141	<1	342.5	0.26	1.2	1,186
QD–36	4/30/08	146	<1	313.0	0.28	1.2	1,392
QD–36	6/17/08	133	<1	300.0	0.32	<1.0	1,258
QD–37	4/24/08	276	<1	393.6	0.29	<1.0	1,506
QD–37	5/22/08	259	<1	391.5	0.30	<1.0	1,470
QD–37	7/17/08	239	<1	384.0	0.31	<1.0	1,488
QD–37	8/14/08	235	<1	363.0	0.31	<1.0	1,482
QD–37	10/2/08	328	<1	318.6	0.07	<1.0	1,396
QD–37	11/20/08	269	<1	385.5	0.25	<1.0	1,478
QD–38	4/24/08	185	<1	104.0	0.36	<1.0	840
QD–38	8/14/08	165	<1	93.5	0.35	<1.0	832
QD–38	10/2/08	184	<1	100.3	0.29	<1.0	858
QD–39	4/24/08	30	<1	96.9	0.09	<1.0	820
QD–39	8/14/08	25	<1	82.8	0.06	<1.0	1,066
QD–39	10/2/08	35	<1	88.5	0.06	<1.0	794
QD–40	4/24/08	14	<1	371.4	0.08	<1.0	740
QD–40	8/14/08	13	<1	342.0	0.07	<1.0	738
QD–40	11/20/08	26	<1	301.3	<0.02	<1.0	630
QD–41	4/24/08	18	<1	342.9	0.27	1.3	788
QD–41	8/14/08	16	<1	298.2	0.30	<1.0	812
QD–41	11/20/08	17	<1	351.7	0.26	<1.0	790
QD–42	4/24/08	20	<1	285.0	0.31	<1.0	778
QD–42	8/14/08	17	<1	261.3	0.33	<1.0	784
QD–42	11/20/08	19	<1	290.5	0.24	<1.0	764
QD–43	3/13/08	Well could not be sampled					
QD–43	8/28/08	45	<1	184.8	0.31	<1.0	658
QD–43	11/20/08	43	<1	199.9	0.28	<1.0	680

TABLE AII–1 (Continued): 2008 CHLORIDE, FECAL COLIFORM, SULFATE, AMMONIA NITROGEN, TOTAL ORGANIC CARBON, AND TOTAL DISSOLVED SOLIDS DATA FOR WATER QUALITY MONITORING WELLS QD–21 THROUGH QD–60 IN THE DES PLAINES TUNNEL SYSTEM

Well	Date of Sampling	Cl^{1} mg/L	$FC^{1,2}$ cfu/100 mL	$SO_4{}^{1}$ mg/L	$NH_3–N^{1}$ mg/L	TOC^{1} mg/L	TDS mg/L
QD–44	6/19/08	16	<1	213.0	0.34	<1.0	616
QD–44	8/28/08	13	<1	213.0	0.34	<1.0	598
QD–44	10/30/08	15	<1	206.7	0.37	<1.0	632
QD–45	6/19/08	16	<1	203.0	0.28	<1.0	566
QD–45	8/28/08	Well could not be sampled					
QD–45	10/28/08	Well could not be sampled					
QD–46	2/5/08	13	1	102.1	0.20	<1.0	552
QD–46	5/29/08	12	<1	122.0	0.22	<1.0	610
QD–46	7/16/08	10	<1	134.0	0.22	<1.0	608
QD–47	6/19/08	16	<1	142.0	0.24	<1.0	526
QD–47	8/28/08	14	<1	148.0	0.25	<1.0	518
QD–47	9/25/08	14	<1	137.2	0.19	<1.0	516
QD–48	6/19/08	12	<1	257.4	0.32	1.1	578
QD–48	8/28/08	10	<1	268.8	0.21	<1.0	584
QD–48	9/25/08	11	6	274.3	0.18	<1.0	688
QD–49	6/19/08	Well could not be sampled					
QD–49	9/25/08	Well could not be sampled					
QD–49	11/20/08	16	<1	206.5	0.23	<1.0	580
QD–50	2/28/08	12	<1	277.5	0.09	<1.0	684
QD–50	8/28/08	12	<1	264.0	0.09	<1.0	670
QD–50	9/25/08	11	1	255.8	0.07	<1.0	680
QD–51	2/28/08	11	<1	115.9	0.03	<1.0	466
QD–51	8/28/08	11	<1	115.0	0.03	<1.0	514
QD–51	9/25/08	11	<1	107.0	0.02	<1.0	530
QD–52	2/28/08	16	<1	135.5	0.10	<1.0	388
QD–52	8/28/08	14	<1	133.0	0.13	<1.0	488
QD–52	9/25/08	14	<1	133.3	0.09	<1.0	474

TABLE AII–1 (Continued): 2008 CHLORIDE, FECAL COLIFORM, SULFATE, AMMONIA NITROGEN, TOTAL ORGANIC CARBON, AND TOTAL DISSOLVED SOLIDS DATA FOR WATER QUALITY MONITORING WELLS QD–21 THROUGH QD–60 IN THE DES PLAINES TUNNEL SYSTEM

Well	Date of Sampling	Cl^{1} mg/L	$FC^{1,2}$ cfu/100 mL	$SO_4{}^{1}$ mg/L	$NH_3–N^{1}$ mg/L	TOC^{1} mg/L	TDS mg/L
QD–53	2/28/08	21	<1	152.5	<0.02	1.0	578
QD–53	8/28/08	17	<1	160.0	0.04	<1.0	592
QD–53	9/25/08	18	1	158.3	<0.02	<1.0	576
QD–54	3/13/08	35	<1	142.3	0.21	<1.0	510
QD–54	7/31/08	14	<1	137.0	0.21	<1.0	480
QD–54	9/25/08	21	3,700	125.2	0.26	<1.0	426
QD–55	3/13/08	28	<1	203.9	0.39	1.0	522
QD–55	7/31/08	16	<1	218.0	0.38	<1.0	500
QD–55	9/25/08	16	<1	189.7	0.38	<1.0	454
QD–56	3/13/08	12	<1	8.6	0.21	<1.0	308
QD–56	7/31/08	10	<1	10.1	0.23	<1.0	360
QD–56	9/25/08	11	<1	12.4	0.14	<1.0	322
QD–57	3/13/08	Well could not be sampled					
QD–57	7/31/08	Well could not be sampled					
QD–57	9/25/08	12	2	54.6	0.21	<1.0	378
QD–58	2/26/08	Well could not be sampled					
QD–58	7/31/08	10	<1	<2.0	0.29	<1.0	262
QD–58	9/25/08	10	<1	<2.0	0.25	<1.0	274
QD–59	7/31/08	111	<1	49.2	0.37	<1.0	624
QD–59	10/30/08	123	<1	52.7	0.42	<1.0	586
QD–59	12/18/08	114	<1	50.4	0.32	<1.0	546
QD–60	7/31/08	40	<1	94.3	0.37	<1.0	462
QD–60	10/30/08	43	<1	99.8	0.41	<1.0	438
QD–60	12/18/08	40	<1	95.5	0.31	<1.0	438

[1]The method detection limit (MDL) or limit of quantification (LOQ) is 10 mg/L for Cl (LOQ), 2.0 mg/L for SO_4 (LOQ), 0.02 mg/L for NH_3–N (MDL), 1.0 mg/L for TOC (LOQ), and 40 mg/L for TDS (LOQ). The detection limit for the FC analysis using the membrane filter method varies based on the actual sample volume analyzed.

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

TABLE AII–2: 2008 HARDNESS, CONDUCTIVITY, pH, TEMPERATURE, ELEVATION, AND RECHARGE DATA FOR WATER QUALITY MONITORING WELLS QD–21 THROUGH QD–60 IN THE DES PLAINES TUNNEL SYSTEM

Well	Date of Sampling	Hard.[1] mg/L	Cond.[1] µmhos/cm	pH[1]	Temp. °C	Elevation[2] Feet	Recharge[3] Hours
QD–21	2/13/08	930	582	7.4	12	-72	<4
QD–21	6/11/08	716	852	7.5	13	-68	<4
QD–21	11/25/08	Well could not be sampled					
QD–22	2/13/08	795	664	7.6	12	-33	<4
QD–22	6/11/08	744	834	7.6	14	-28	<4
QD–22	11/25/08	703	712	7.5	12	-30	<4
QD–23	2/13/08	784	738	7.6	12	-40	<4
QD–23	6/11/08	773	933	7.8	14	-34	<4
QD–23	11/25/08	727	824	7.9	13	-36	<4
QD–24	2/13/08	650	628	7.5	10	14	<4
QD–24	6/11/08	453	737	7.7	12	18	<4
QD–24	11/25/08	416	766	7.3	11	16	<4
QD–25	2/13/08	645	906	7.7	9	25	<4
QD–25	6/11/08	520	1,226	7.6	12	29	<4
QD–25	11/25/08	511	1,272	7.4	10	29	<4
QD–26	4/24/08	387	732	7.3	12	-27	<48
QD–26	7/17/08	402	723	7.5	13	-31	<48
QD–26	8/14/08	418	908	7.4	13	-16	<48
QD–27	4/24/08	512	1,940	7.1	14	-192	<48
QD–27	5/22/08	517	1,476	8.1	12	-190	<48
QD–27	7/17/08	513	2,032	7.5	13	-198	<48
QD–27	8/14/08	514	1,180	7.7	12	-188	<48
QD–27	10/2/08	482	1,302	8.1	12	-199	<48
QD–27	11/20/08	466	2,110	7.8	10	-194	<48
QD–28	2/14/08	724	954	7.6	11	-127	<4
QD–28	5/29/08	673	1,312	7.8	13	-129	<4
QD–28	7/16/08	682	1,885	7.5	14	-123	<4

TABLE AII–2 (Continued): 2008 HARDNESS, CONDUCTIVITY, pH, TEMPERATURE, ELEVATION, AND RECHARGE DATA FOR WATER QUALITY MONITORING WELLS QD–21 THROUGH QD–60 IN THE DES PLAINES TUNNEL SYSTEM

Well	Date of Sampling	Hard.[1] mg/L	Cond.[1] µmhos/cm	pH[1]	Temp. °C	Elevation[2] Feet	Recharge[3] Hours
QD–29	2/14/08	627	682	7.6	10	-197	<4
QD–29	5/29/08	665	840	7.9	13	-195	<4
QD–29	7/16/08	656	1,004	7.4	14	-198	<4
QD–30	5/22/08	696	862	7.6	12	-130	<48
QD–30	8/14/08	692	1,150	7.5	13	-141	<48
QD–30	11/20/08	574	1,201	7.5	11	-147	<48
QD–31	5/22/08	238	834	7.8	12	-194	<48
QD–31	8/14/08	248	1,233	7.8	12	-195	<48
QD–31	11/20/08	235	1,071	7.7	11	-195	<48
QD–32	5/22/08	37	1,961	8.2	12	-206	<48
QD–32	8/14/08	Well could not be sampled					
QD–32	11/20/08	25	2,720	7.4	11	-214	<48
QD–33	4/24/08	21	2,353	8.4	13	-175	<48
QD–33	5/22/08	28	1,782	8.4	12	-171	<48
QD–33	7/17/08	29	2,375	7.4	14	-180	<48
QD–33	8/14/08	42	2,299	7.4	13	-168	<48
QD–33	10/2/08	28	1,665	9.0	12	-160	<48
QD–33	11/20/08	26	700	8.6	10	-178	<48
QD–34	2/14/08	Well could not be sampled					
QD–34	4/30/08	748	1,195	7.4	12	-108	<4
QD–34	5/29/08	770	862	7.4	12	-113	<4
QD–34	6/17/08	746	855	7.4	13	-117	<4
QD–34	7/16/08	737	1,249	7.6	13	-119	<4
QD–34	9/4/08	793	1,245	7.2	13	-108	<4
QD–35	2/14/08	683	646	7.7	11	-109	<4
QD–35	4/30/08	771	1,130	7.6	12	-103	<4
QD–35	5/29/08	687	811	7.5	13	-109	<4
QD–36	2/14/08	789	699	7.6	10	-110	<4
QD–36	4/30/08	765	1,120	7.6	12	-117	<4
QD–36	6/17/08	730	1,015	7.5	13	-115	<4

TABLE AII–2 (Continued): 2008 HARDNESS, CONDUCTIVITY, pH, TEMPERATURE, ELEVATION, AND RECHARGE DATA FOR WATER QUALITY MONITORING WELLS QD–21 THROUGH QD–60 IN THE DES PLAINES TUNNEL SYSTEM

Well	Date of Sampling	Hard.[1] mg/L	Cond.[1] µmhos/cm	pH[1]	Temp. °C	Elevation[2] Feet	Recharge[3] Hours
QD–37	4/24/08	555	1,830	7.3	14	-212	<48
QD–37	5/22/08	607	1,173	8.0	12	-207	<48
QD–37	7/17/08	565	1,252	7.6	14	-216	<48
QD–37	8/14/08	565	1,835	7.6	14	-206	<48
QD–37	10/2/08	318	1,256	7.8	13	-206	<48
QD–37	11/20/08	525	1,090	7.5	12	-207	<48
QD–38	4/24/08	241	1,221	7.8	13	-201	<48
QD–38	8/14/08	259	1,087	8.0	13	-204	<48
QD–38	10/2/08	225	786	8.2	12	-204	<48
QD–39	4/24/08	19	1,140	8.4	12	-146	<48
QD–39	8/14/08	19	993	8.3	12	-138	<48
QD–39	10/2/08	20	982	9.1	12	-141	<48
QD–40	4/24/08	16	1,030	9.4	13	-83	<48
QD–40	8/14/08	16	965	9.6	13	-89	<48
QD–40	11/20/08	26	620	9.4	12	-112	<48
QD–41	4/24/08	399	996	7.8	14	-130	<48
QD–41	8/14/08	400	905	7.6	13	-137	<48
QD–41	11/20/08	393	683	7.8	12	-137	<48
QD–42	4/24/08	375	885	7.5	13	-126	<48
QD–42	8/14/08	383	875	7.7	12	-128	<48
QD–42	11/20/08	352	666	7.5	11	-97	<48
QD–43	3/13/08	Well could not be sampled					
QD–43	8/28/08	413	543	7.4	13	-135	<48
QD–43	11/20/08	394	630	7.4	11	-126	<48
QD–44	6/19/08	301	647	8.0	11	-10	<4
QD–44	8/28/08	317	483	7.7	11	-10	<4
QD–44	10/30/08	285	860	7.5	11	-10	<4

TABLE AII–2 (Continued): 2008 HARDNESS, CONDUCTIVITY, pH, TEMPERATURE, ELEVATION, AND RECHARGE DATA FOR WATER QUALITY MONITORING WELLS QD–21 THROUGH QD–60 IN THE DES PLAINES TUNNEL SYSTEM

Well	Date of Sampling	Hard.[1] mg/L	Cond.[1] µmhos/cm	pH[1]	Temp. °C	Elevation[2] Feet	Recharge[3] Hours
QD–45	6/19/08	85	699	8.0	13	-6	<48
QD–45	8/28/08	Well could not be sampled					
QD–45	10/28/08	Well could not be sampled					
QD–46	2/5/08	63	666	8.1	12	-177	<4
QD–46	5/29/08	75	566	7.9	12	-181	<4
QD–46	7/16/08	77	1,008	7.5	13	-171	<4
QD–47	6/19/08	222	4,680	7.7	14	4	<48
QD–47	8/28/08	241	452	7.7	14	3	<48
QD–47	9/25/08	234	569	7.6	13	-1	<48
QD–48	6/19/08	251	551	8.5	18	-172	<48
QD–48	8/28/08	291	388	8.0	14	-174	<48
QD–48	9/25/08	372	773	7.4	13	-183	<48
QD–49	6/19/08	Well could not be sampled					
QD–49	9/25/08	Well could not be sampled					
QD–49	11/20/08	293	799	7.7	12	-181	<48
QD–50	2/28/08	8	1,001	7.4	10	-140	<48
QD–50	8/28/08	7	643	9.3	12	-134	<48
QD–50	9/25/08	5	1,007	7.5	12	-132	<48
QD–51	2/28/08	5	755	7.6	10	-107	<48
QD–51	8/28/08	5	634	9.6	12	-104	<48
QD–51	9/25/08	5	690	7.7	12	-101	<48
QD–52	2/28/08	21	689	7.7	11	-68	<48
QD–52	8/28/08	18	565	9.5	14	-51	<48
QD–52	9/25/08	20	689	7.3	14	-61	<48
QD–53	2/28/08	11	801	7.6	9	-166	<48
QD–53	8/28/08	9	653	9.4	14	-164	<48
QD–53	9/25/08	10	577	9.3	14	-167	<48

TABLE AII–2 (Continued): 2008 HARDNESS, CONDUCTIVITY, pH, TEMPERATURE, ELEVATION, AND RECHARGE DATA FOR WATER QUALITY MONITORING WELLS QD–21 THROUGH QD–60 IN THE DES PLAINES TUNNEL SYSTEM

Well	Date of Sampling	Hard.[1] mg/L	Cond.[1] µmhos/cm	pH[1]	Temp. °C	Elevation[2] Feet	Recharge[3] Hours
QD–54	3/13/08	39	606	7.6	5	-25	<48
QD–54	7/31/08	36	535	7.7	14	-24	<48
QD–54	9/25/08	33	452	9.2	13	-22	<48
QD–55	3/13/08	194	633	7.6	5	-128	<48
QD–55	7/31/08	176	677	7.5	12	-136	<48
QD–55	9/25/08	151	452	8.9	13	-139	<48
QD–56	3/13/08	43	493	7.5	6	-69	<48
QD–56	7/31/08	48	416	7.8	14	-74	<48
QD–56	9/25/08	33	332	8.7	13	-68	<48
QD–57	3/13/08	Well could not be sampled					
QD–57	7/31/08	Well could not be sampled					
QD–57	9/25/08	18	393	8.9	12	-111	<48
QD–58	2/26/08						
QD–58	7/31/08	117	390	7.9	13	-95	<48
QD–58	9/25/08	120	312	8.2	12	-111	<48
QD–59	7/31/08	285	944	7.9	13	-33	<48
QD–59	10/30/08	234	997	7.4	12	-43	<48
QD–59	12/18/08	258	280	7.4	10	-42	<48
QD–60	7/31/08	250	740	8.1	14	-106	<48
QD–60	10/30/08	224	818	7.3	12	-120	<48
QD–60	12/18/08	226	300	8.0	10	-113	<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.