Metropolitan Water Reclamation District of Greater Chicago

MONITORING AND RESEARCH DEPARTMENT

REPORT NO. 10-28

TUNNEL AND RESERVOIR PLAN

DES PLAINES TUNNEL SYSTEM

2009 ANNUAL GROUNDWATER MONITORING REPORT

June 2010

Protecting Our Water Environment

Metropolitan Water Reclamation District of Greater Chicago
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June 18, 2010

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, 2009 Annual Groundwater Monitoring Report

Enclosed are three copies of the "Tunnel and Reservoir Plan, Des Plaines Tunnel System, 2009 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
2009 ANNUAL GROUNDWATER MONITORING REPORT

Monitoring and Research Department
Louis Kollias, Director

June 2010

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Introduction

This report contains 2009 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. Groundwater 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). Groundwater quality monitoring wells QD-27, QD-33, QD-34, and QD-37 were sampled six times per year (IEPA memoranda 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 2009 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. Groundwater quality monitoring well QD-21 could not be sampled during 2009 because there was an electrical problem with the pump, which has been repaired. Groundwater quality monitoring well QD-25 could not be sampled on February 18, 2010, because snow blocked access to the well. Groundwater quality monitoring wells QD-31 and QD-32 could not be sampled on February 5, 2009, because snow blocked access to these wells. Groundwater quality monitoring well QD-40 could not be sampled during 2009 because the pump was inoperable. A work order to repair this pump has been issued. Groundwater quality monitoring well QD-41 could not be sampled on April 24, 2009, because there was insufficient water in the well to collect a sample. Groundwater quality monitoring well QD-45 could not be sampled during 2009 because the pump was inoperable. The pump has been repaired. Groundwater quality monitoring well QD-49 could not be sampled on February 19, 2009, or April 30, 2009, because the pump was inoperable. The pump has been repaired.

Summary of Data

Tables 1 through 8 contain summary statistics of the groundwater quality parameters for 2009 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 2009.

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 2009. 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 2009 DATA FOR THE GROUNDWATER QUALITY MONITORING WELLS IN THE DES PLAINES TUNNEL SYSTEM: WELLS QD-22 THROUGH QD-26

Parameter[1]		Well Number				
		QD-22	QD-23	QD-24	QD-25	QD-26
Cl	Minimum	87	181	102	472	13
mg/L	Mean	112	196	119	490	19
	Maximum	133	211	144	507	26
	Std. Dev.	23	15	22	25	7
	Median	115	195	110	490	17
	Coeff. Var. (%)	21	8	19	5	36
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	164.3	333.3	166.8	246.6	69.6
mg/L	Mean	232.6	370.8	219.9	246.8	90.1
	Maximum	274.3	412.6	315.4	247.1	104.5
	Std. Dev.	59.6	39.8	82.9	0.4	18.2
	Median	259.1	366.3	177.5	246.8	96.2
	Coeff. Var. (%)	25.6	10.7	37.7	0.1	20.2
NH_3-N	Minimum	0.33	0.46	0.47	0.72	0.31
mg/L	Mean	0.41	0.47	0.49	0.73	0.33
	Maximum	0.49	0.48	0.53	0.73	0.35
	Std. Dev.	0.08	0.01	0.03	0.01	0.02
	Median	0.40	0.47	0.48	0.73	0.32
	Coeff. Var. (%)	19.72	2.13	6.52	0.98	6.37
TOC	Minimum	1.2	1.6	1.3	1.6	1.0
mg/L	Mean	1.4	1.7	1.7	2.0	1.0
	Maximum	1.7	1.8	2.1	2.3	1.0
	Std. Dev.	0.3	0.1	0.4	0.5	0.0
	Median	1.2	1.6	1.8	2.0	1.0
	Coeff. Var. (%)	21.1	6.9	23.3	25.4	0.0

TABLE 1 (Continued): SUMMARY STATISTICS OF THE 2009 DATA FOR THE GROUNDWATER QUALITY MONITORING WELLS IN THE DES PLAINES TUNNEL SYSTEM: WELLS QD-22 THROUGH QD-26

Parameter[1]		Well Number				
		QD-22	QD-23	QD-24	QD-25	QD-26
TDS	Minimum	772	1,502	824	1,698	436
mg/L	Mean	1,083	1,531	999	1,713	519
	Maximum	1,248	1,552	1,220	1,728	576
	Std. Dev.	269	26	202	21	74
	Median	1,228	1,540	954	1,713	546
	Coeff. Var. (%)	25	2	20	1	14
Hard.	Minimum	510	783	457	617	326
mg/L	Mean	643	806	586	654	360
	Maximum	758	848	810	691	387
	Std. Dev.	125	37	194	52	31
	Median	662	786	492	654	367
	Coeff. Var. (%)	19	5	33	8	9
Cond.	Minimum	1,210	635	622	1,395	450
µmhos/cm	Mean	1,221	1,116	807	1,571	581
	Maximum	1,236	1,625	949	1,747	813
	Std. Dev.	13	496	168	249	201
	Median	1,217	1,089	849	1,571	480
	Coeff. Var. (%)	1	44	21	16	35
pH	Minimum	6.8	6.8	7.2	6.8	7.2
unit	Mean	7.1	7.1	7.4	6.9	7.2
	Maximum	7.6	7.5	7.5	6.9	7.4
	Std. Dev.	0.4	0.4	0.1	0.1	0.1
	Median	6.9	7.0	7.4	6.9	7.2
	Coeff. Var. (%)	5.9	5.1	1.7	1.9	1.4

[1]For purpose of statistical evaluation, any value less than the appropriate MDL or LOQ was set equal to the value of the MDL or LOQ.

TABLE 2: SUMMARY STATISTICS OF THE 2009 DATA FOR THE GROUNDWATER QUALITY MONITORING WELLS IN THE DES PLAINES TUNNEL SYSTEM: WELLS QD-27 THROUGH QD-31

Parameter[1]		Well Number				
		QD-27	QD-28	QD-29	QD-30	QD-31
Cl	Minimum	240	300	121	118	118
mg/L	Mean	303	305	136	130	123
	Maximum	337	308	149	143	127
	Std. Dev.	43	5	14	13	6
	Median	322	308	138	130	123
	Coeff. Var. (%)	14	2	10	10	5
FC	Minimum	1	1	1	1	1
cfu/100 mL	Geo. Mean	1	1	1	1	2
	Maximum	4	1	1	1	3
	Median	1	1	1	1	2
SO_4	Minimum	12.0	255.5	240.5	306.2	176.9
mg/L	Mean	33.6	259.1	259.9	324.9	179.1
	Maximum	49.2	262.8	280.1	342.0	181.3
	Std. Dev.	12.9	5.1	19.9	18.0	3.1
	Median	33.6	259.1	259.2	326.5	179.1
	Coeff. Var. (%)	38.3	2.0	7.6	5.5	1.7
NH_3-N	Minimum	21.20	0.53	0.37	0.29	0.23
mg/L	Mean	27.07	0.54	0.39	0.32	0.25
	Maximum	29.13	0.55	0.40	0.36	0.26
	Std. Dev.	3.01	0.01	0.02	0.04	0.02
	Median	28.12	0.55	0.39	0.30	0.25
	Coeff. Var. (%)	11.13	2.13	3.95	11.96	8.66
TOC	Minimum	15.1	1.1	1.7	1.3	1.0
mg/L	Mean	16.9	1.2	1.8	1.4	1.0
	Maximum	18.6	1.3	2.0	1.5	1.0
	Std. Dev.	1.2	0.1	0.2	0.1	0.0
	Median	17.0	1.2	1.7	1.5	1.0
	Coeff. Var. (%)	6.9	8.3	9.6	8.1	0.0

TABLE 2 (Continued): SUMMARY STATISTICS OF THE 2009 DATA FOR THE GROUNDWATER QUALITY MONITORING WELLS IN THE DES PLAINES TUNNEL SYSTEM: WELLS QD-27 THROUGH QD-31

Parameter[1]		Well Number				
		QD-27	QD-28	QD-29	QD-30	QD-31
TDS	Minimum	1,042	1,382	990	1,036	936
mg/L	Mean	1,186	1,393	1,082	1,196	941
	Maximum	1,292	1,414	1,212	1,388	946
	Std. Dev.	97	18	116	178	7
	Median	1,214	1,382	1,044	1,164	941
	Coeff. Var. (%)	8	1	11	15	1
Hard.	Minimum	449	618	615	616	241
mg/L	Mean	465	643	655	680	242
	Maximum	491	655	678	715	243
	Std. Dev.	19	21	35	55	1
	Median	458	655	671	708	242
	Coeff. Var. (%)	4	3	5	8	1
Cond.	Minimum	1,187	668	850	665	774
µmhos/cm	Mean	1,415	784	1,007	935	968
	Maximum	1,907	1,015	1,256	1,325	1,162
	Std. Dev.	295	200	218	346	274
	Median	1,275	668	916	815	968
	Coeff. Var. (%)	21	26	22	37	28
pH	Minimum	6.8	7.0	7.1	7.0	7.4
unit	Mean	7.1	7.1	7.4	7.1	7.5
	Maximum	7.5	7.2	7.7	7.4	7.5
	Std. Dev.	0.3	0.1	0.3	0.2	0.1
	Median	7.1	7.0	7.5	7.0	7.5
	Coeff. Var. (%)	3.5	1.6	4.2	3.2	0.9

[1]For purpose of statistical evaluation, any value less than the appropriate MDL or LOQ was set equal to the value of the MDL or LOQ.

TABLE 3: SUMMARY STATISTICS OF THE 2009 DATA FOR THE GROUNDWATER QUALITY MONITORING WELLS IN THE DES PLAINES TUNNEL SYSTEM: WELLS QD-32 THROUGH QD-36

Parameter[1]		Well Number				
		QD-32	QD-33	QD-34	QD-35	QD-36
Cl	Minimum	515	357	128	125	13
mg/L	Mean	528	369	140	126	89
	Maximum	540	380	150	128	130
	Std. Dev.	18	8	8	2	66
	Median	528	369	141	125	123
	Coeff. Var. (%)	3	2	6	1	74
FC	Minimum	1	1	1	1	1
cfu/100 mL	Geo. Mean	2	1	1	1	1
	Maximum	5	1	1	1	1
	Median	3	1	1	1	1
SO_4	Minimum	221.7	189.3	258.7	233.4	302.8
mg/L	Mean	225.3	194.2	280.2	245.9	316.4
	Maximum	228.9	203.3	303.3	256.0	328.7
	Std. Dev.	5.1	5.5	19.5	11.5	13.0
	Median	225.3	192.9	279.5	248.2	317.8
	Coeff. Var. (%)	2.3	2.8	7.0	4.7	4.1
NH_3-N	Minimum	0.24	0.19	0.38	0.27	0.29
mg/L	Mean	0.25	0.24	0.39	0.30	0.30
	Maximum	0.25	0.32	0.39	0.32	0.31
	Std. Dev.	0.01	0.05	0.01	0.03	0.01
	Median	0.25	0.25	0.39	0.32	0.29
	Coeff. Var. (%)	2.89	20.41	1.42	9.52	3.89
TOC	Minimum	1.0	1.0	1.6	1.8	1.4
mg/L	Mean	1.0	1.0	1.8	2.1	1.7
	Maximum	1.0	1.0	2.0	2.2	2.1
	Std. Dev.	0.0	0.0	0.1	0.2	0.4
	Median	1.0	1.0	1.8	2.2	1.7
	Coeff. Var. (%)	0.0	0.0	8.3	11.2	20.3

TABLE 3 (Continued): SUMMARY STATISTICS OF THE 2009 DATA FOR THE GROUNDWATER QUALITY MONITORING WELLS IN THE DES PLAINES TUNNEL SYSTEM: WELLS QD-32 THROUGH QD-36

Parameter[1]		Well Number				
		QD-32	QD-33	QD-34	QD-35	QD-36
TDS	Minimum	1,932	1,624	1,084	1,014	1,232
mg/L	Mean	1,942	1,682	1,237	1,093	1,321
	Maximum	1,952	1,864	1,316	1,236	1,452
	Std. Dev.	14	91	95	124	116
	Median	1,942	1,652	1,274	1,030	1,278
	Coeff. Var. (%)	1	5	8	11	9
Hard.	Minimum	28	26	651	561	707
mg/L	Mean	32	27	675	592	718
	Maximum	35	28	695	614	728
	Std. Dev.	5	1	20	28	11
	Median	32	27	673	602	719
	Coeff. Var. (%)	16	3	3	5	1
Cond.	Minimum	2,135	1,466	642	739	787
µmhos/cm	Mean	2,487	1,797	921	922	986
	Maximum	2,839	2,348	1,145	1,154	1,285
	Std. Dev.	498	319	195	212	264
	Median	2,487	1,730	953	872	886
	Coeff. Var. (%)	20	18	21	23	27
pH	Minimum	8.7	7.9	6.9	7.1	7.1
unit	Mean	9.1	8.2	7.2	7.2	7.3
	Maximum	9.4	8.6	7.6	7.4	7.7
	Std. Dev.	0.5	0.2	0.3	0.2	0.3
	Median	9.1	8.2	7.1	7.2	7.2
	Coeff. Var. (%)	5.6	2.9	3.7	2.3	4.7

[1]For purpose of statistical evaluation, any value less than the appropriate MDL or LOQ was set equal to the value of the MDL or LOQ.

TABLE 4: SUMMARY STATISTICS OF THE 2009 DATA FOR THE GROUNDWATER QUALITY MONITORING WELLS IN THE DES PLAINES TUNNEL SYSTEM: WELLS QD-37, QD-38, QD-39, QD-41, AND QD-42

Parameter[1]		Well Number				
		QD-37	QD-38	QD-39	QD-41	QD-42
Cl	Minimum	255	179	20	19	19
mg/L	Mean	266	188	32	23	20
	Maximum	285	199	41	27	20
	Std. Dev.	11	10	11	6	1
	Median	265	187	35	23	20
	Coeff. Var. (%)	4	5	34	25	3
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	349.3	96.6	80.6	96.7	269.2
mg/L	Mean	378.4	98.8	173.0	221.5	279.2
	Maximum	405.1	101.5	348.9	346.2	285.9
	Std. Dev.	19.8	2.5	152.4	176.4	8.8
	Median	377.6	98.4	89.5	221.5	282.6
	Coeff. Var. (%)	5.2	2.5	88.1	79.7	3.2
NH_3-N	Minimum	0.12	0.30	0.10	0.10	0.29
mg/L	Mean	0.28	0.34	0.17	0.21	0.29
	Maximum	0.33	0.37	0.32	0.31	0.30
	Std. Dev.	0.08	0.04	0.13	0.15	0.01
	Median	0.30	0.35	0.10	0.21	0.29
	Coeff. Var. (%)	28.34	10.60	73.28	72.44	1.97
TOC	Minimum	1.0	1.0	1.0	1.0	1.2
mg/L	Mean	1.0	1.0	1.1	1.5	1.3
	Maximum	1.0	1.0	1.4	1.9	1.3
	Std. Dev.	0.0	0.0	0.2	0.6	0.1
	Median	1.0	1.0	1.0	1.5	1.3
	Coeff. Var. (%)	0.0	0.0	20.4	43.9	4.6

TABLE 4 (Continued): SUMMARY STATISTICS OF THE 2009 DATA FOR THE GROUNDWATER QUALITY MONITORING WELLS IN THE DES PLAINES TUNNEL SYSTEM: WELLS QD-37, QD-38, QD-39, QD-41, AND QD-42

Parameter[1]		Well Number				
		QD-37	QD-38	QD-39	QD-41	QD-42
TDS	Minimum	1,426	838	860	840	760
mg/L	Mean	1,457	847	896	912	772
	Maximum	1,484	860	926	984	784
	Std. Dev.	21	11	33	102	12
	Median	1,458	844	902	912	772
	Coeff. Var. (%)	1	1	4	11	2
Hard.	Minimum	439	238	18	18	372
mg/L	Mean	522	245	142	219	381
	Maximum	558	249	391	419	392
	Std. Dev.	44	6	215	284	10
	Median	530	247	18	219	380
	Coeff. Var. (%)	8	2	151	130	3
Cond.	Minimum	1,172	622	756	656	550
µmhos/cm	Mean	1,487	783	883	696	779
	Maximum	1,803	930	1,075	736	970
	Std. Dev.	263	155	169	57	213
	Median	1,549	798	818	696	818
	Coeff. Var. (%)	18	20	19	8	27
pH	Minimum	6.8	7.1	8.0	7.6	7.3
unit	Mean	7.2	7.4	8.2	7.6	7.4
	Maximum	7.4	7.7	8.4	7.6	7.5
	Std. Dev.	0.2	0.3	0.2	0.0	0.1
	Median	7.2	7.3	8.4	7.6	7.3
	Coeff. Var. (%)	2.7	3.8	2.4	0.4	1.2

[1]For purpose of statistical evaluation, any value less than the appropriate MDL or LOQ was set equal to the value of the MDL or LOQ.

TABLE 5: SUMMARY STATISTICS OF THE 2009 DATA FOR THE GROUNDWATER QUALITY MONITORING WELLS IN THE DES PLAINES TUNNEL SYSTEM: WELLS QD-43, QD-44, QD-46, QD-47, AND QD-48

Parameter[1]		Well Number				
		QD-43	QD-44	QD-46	QD-47	QD-48
Cl	Minimum	51	18	13	15	10
mg/L	Mean	52	19	17	16	11
	Maximum	52	20	24	18	13
	Std. Dev.	1	1	6	2	2
	Median	52	18	14	16	11
	Coeff. Var. (%)	1	6	36	9	13
FC	Minimum	1	1	1	1	1
cfu/100 mL	Geo. Mean	1	1	1	1	1
	Maximum	1	1	3	1	1
	Median	1	1	1	1	1
SO_4	Minimum	157.0	191.0	105.8	140.3	241.5
mg/L	Mean	176.5	205.7	111.2	146.6	267.4
	Maximum	196.1	213.6	121.2	153.1	282.6
	Std. Dev.	27.6	12.7	8.6	6.4	22.5
	Median	176.5	212.4	106.7	146.5	278.1
	Coeff. Var. (%)	15.6	6.2	7.8	4.3	8.4
NH_3-N	Minimum	0.30	0.31	0.20	0.25	0.18
mg/L	Mean	0.32	0.34	0.22	0.26	0.23
	Maximum	0.34	0.36	0.26	0.28	0.30
	Std. Dev.	0.03	0.03	0.03	0.02	0.06
	Median	0.32	0.35	0.21	0.25	0.22
	Coeff. Var. (%)	8.84	7.78	14.39	6.66	26.19
TOC	Minimum	1.1	1.0	1.0	1.0	1.2
mg/L	Mean	1.1	1.1	1.3	1.0	1.2
	Maximum	1.1	1.1	1.5	1.1	1.2
	Std. Dev.	0.0	0.1	0.3	0.1	0.0
	Median	1.1	1.1	1.3	1.0	1.2
	Coeff. Var. (%)	0.0	5.4	19.9	5.6	0.0

TABLE 5 (Continued): SUMMARY STATISTICS OF THE 2009 DATA FOR THE GROUNDWATER QUALITY MONITORING WELLS IN THE DES PLAINES TUNNEL SYSTEM: WELLS QD-43, QD-44, QD-46, QD-47, AND QD-48

Parameter[1]		Well Number				
		QD-43	QD-44	QD-46	QD-47	QD-48
TDS	Minimum	706	618	602	528	550
mg/L	Mean	730	633	633	557	643
	Maximum	754	648	650	584	736
	Std. Dev.	34	15	27	28	93
	Median	730	632	648	560	644
	Coeff. Var. (%)	5	2	4	5	14
Hard.	Minimum	400	292	59	223	230
mg/L	Mean	413	300	65	227	250
	Maximum	426	312	73	231	271
	Std. Dev.	18	11	7	4	21
	Median	413	296	63	228	249
	Coeff. Var. (%)	4	4	11	2	8
Cond.	Minimum	617	572	499	500	516
µmhos/cm	Mean	758	692	617	597	598
	Maximum	899	781	700	778	757
	Std. Dev.	199	108	105	157	138
	Median	758	723	652	512	520
	Coeff. Var. (%)	26	16	17	26	23
pH	Minimum	7.2	7.5	7.8	7.6	7.8
unit	Mean	7.4	7.6	7.9	7.7	8.2
	Maximum	7.6	7.8	8.0	7.7	8.4
	Std. Dev.	0.3	0.1	0.1	0.1	0.3
	Median	7.4	7.6	7.9	7.7	8.3
	Coeff. Var. (%)	3.8	1.7	1.4	0.7	3.8

[1]For purpose of statistical evaluation, any value less than the appropriate MDL or LOQ was set equal to the value of the MDL or LOQ.

TABLE 6: SUMMARY STATISTICS OF THE 2009 DATA FOR THE GROUNDWATER QUALITY MONITORING WELLS IN THE DES PLAINES TUNNEL SYSTEM: WELLS QD-49 THROUGH QD-53

Parameter[1]		Well Number				
		QD-49	QD-50	QD-51	QD-52	QD-53
Cl	Minimum	14	12	10	15	19
mg/L	Mean	14	13	12	16	19
	Maximum	14	14	14	16	20
	Std. Dev.	N/C[2]	1	2	1	1
	Median	14	13	12	16	19
	Coeff. Var. (%)	N/C	8	17	4	3
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	172.3	275.1	117.4	125.2	155.2
mg/L	Mean	172.3	281.1	119.1	131.1	161.0
	Maximum	172.3	293.2	120.8	134.9	166.6
	Std. Dev.	N/C	10.5	1.7	5.2	5.7
	Median	172.3	275.1	119.2	133.2	161.4
	Coeff. Var. (%)	N/C	3.7	1.4	3.9	3.5
NH_3-N	Minimum	0.29	0.10	0.10	0.10	0.10
mg/L	Mean	0.29	0.11	0.10	0.12	0.10
	Maximum	0.29	0.13	0.10	0.14	0.10
	Std. Dev.	N/C	0.02	0.00	0.02	0.00
	Median	0.29	0.10	0.10	0.11	0.10
	Coeff. Var. (%)	N/C	15.75	0.00	17.84	0.00
TOC	Minimum	1.1	1.1	1.0	1.1	1.3
mg/L	Mean	1.1	1.2	1.1	1.1	1.3
	Maximum	1.1	1.3	1.1	1.1	1.4
	Std. Dev.	N/C	0.1	0.1	0.0	0.1
	Median	1.1	1.3	1.1	1.1	1.3
	Coeff. Var. (%)	N/C	9.4	5.4	0.0	4.3

TABLE 6 (Continued): SUMMARY STATISTICS OF THE 2009 DATA FOR THE GROUNDWATER QUALITY MONITORING WELLS IN THE DES PLAINES TUNNEL SYSTEM: WELLS QD-49 THROUGH QD-53

Parameter[1]		Well Number				
		QD-49	QD-50	QD-51	QD-52	QD-53
TDS	Minimum	774	664	510	450	592
mg/L	Mean	774	693	527	467	603
	Maximum	774	724	538	486	614
	Std. Dev.	N/C	30	15	18	11
	Median	774	690	532	466	604
	Coeff. Var. (%)	N/C	4	3	4	2
Hard.	Minimum	317	6	4	19	9
mg/L	Mean	317	7	4	20	10
	Maximum	317	7	5	21	12
	Std. Dev.	N/C	1	1	1	2
	Median	317	7	4	20	10
	Coeff. Var. (%)	N/C	9	13	5	15
Cond.	Minimum	810	478	518	466	544
µmhos/cm	Mean	810	703	662	582	626
	Maximum	810	965	792	701	715
	Std. Dev.	N/C	246	138	117	86
	Median	810	665	677	578	620
	Coeff. Var. (%)	N/C	35	21	20	14
pH	Minimum	7.9	9.0	9.3	8.2	8.6
unit	Mean	7.9	9.4	9.4	8.9	9.1
	Maximum	7.9	9.9	9.5	9.3	9.4
	Std. Dev.	N/C	0.5	0.1	0.6	0.5
	Median	7.9	9.2	9.4	9.3	9.3
	Coeff. Var. (%)	N/C	5.0	1.1	7.0	5.0

[1]For purpose of statistical evaluation, any value less than the appropriate MDL or LOQ was set equal to the value of the MDL or LOQ.
[2]N/C stands for no calculation due to single value.

TABLE 7: SUMMARY STATISTICS OF THE 2009 DATA FOR THE GROUNDWATER QUALITY MONITORING WELLS IN THE DES PLAINES TUNNEL SYSTEM: WELLS QD-54 THROUGH QD-58

Parameter[1]		Well Number				
		QD-54	QD-55	QD-56	QD-57	QD-58
Cl	Minimum	17	18	12	13	11
mg/L	Mean	18	20	13	13	13
	Maximum	20	22	14	14	14
	Std. Dev.	2	2	1	1	2
	Median	17	19	12	13	13
	Coeff. Var. (%)	10	11	9	4	12
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	131.8	179.0	8.6	50.2	2.0
mg/L	Mean	139.4	202.0	9.3	54.5	2.6
	Maximum	143.8	219.8	10.2	56.8	3.4
	Std. Dev.	6.7	20.9	0.8	3.8	0.7
	Median	142.7	207.3	9.1	56.7	2.3
	Coeff. Var. (%)	4.8	10.4	8.5	6.9	27.9
NH_3-N	Minimum	0.20	0.13	0.21	0.22	0.27
mg/L	Mean	0.23	0.25	0.22	0.24	0.29
	Maximum	0.27	0.36	0.23	0.26	0.32
	Std. Dev.	0.04	0.12	0.01	0.02	0.03
	Median	0.21	0.27	0.21	0.24	0.28
	Coeff. Var. (%)	16.70	45.75	5.33	8.33	9.12
TOC	Minimum	1.0	1.1	1.0	1.0	1.0
mg/L	Mean	1.0	1.2	1.0	1.0	1.0
	Maximum	1.1	1.4	1.0	1.0	1.0
	Std. Dev.	0.1	0.2	0.0	0.0	0.0
	Median	1.0	1.1	1.0	1.0	1.0
	Coeff. Var. (%)	5.6	14.4	0.0	0.0	0.0

TABLE 7 (Continued): SUMMARY STATISTICS OF THE 2009 DATA FOR THE GROUNDWATER QUALITY MONITORING WELLS IN THE DES PLAINES TUNNEL SYSTEM: WELLS QD-54 THROUGH QD-58

Parameter[1]		Well Number				
		QD-54	QD-55	QD-56	QD-57	QD-58
TDS	Minimum	414	302	306	380	252
mg/L	Mean	429	446	383	387	267
	Maximum	442	546	534	396	274
	Std. Dev.	14	128	131	8	13
	Median	432	490	308	384	274
	Coeff. Var. (%)	3	29	34	2	5
Hard.	Minimum	31	157	47	17	110
mg/L	Mean	34	187	48	18	114
	Maximum	37	212	48	19	119
	Std. Dev.	3	28	1	1	5
	Median	35	192	48	18	114
	Coeff. Var. (%)	9	15	1	6	4
Cond.	Minimum	412	481	381	434	321
µmhos/cm	Mean	511	552	416	438	341
	Maximum	670	633	466	445	383
	Std. Dev.	139	76	44	6	36
	Median	450	543	402	436	321
	Coeff. Var. (%)	27	14	11	1	10
pH	Minimum	8.9	7.1	7.9	8.3	7.9
unit	Mean	9.1	7.9	8.4	8.5	8.0
	Maximum	9.2	8.7	8.6	8.7	8.0
	Std. Dev.	0.2	0.8	0.4	0.2	0.0
	Median	9.1	8.0	8.6	8.6	8.0
	Coeff. Var. (%)	1.7	10.0	4.7	2.4	0.6

[1]For purpose of statistical evaluation, any value less than the appropriate MDL or LOQ was set equal to the value of the MDL or LOQ.

TABLE 8: SUMMARY STATISTICS OF THE 2009 DATA FOR THE GROUNDWATER QUALITY MONITORING WELLS IN THE DES PLAINES TUNNEL SYSTEM: WELLS QD-59 AND QD-60

Parameter[1]		Well Number QD-59	Well Number QD-60
Cl	Minimum	127	46
mg/L	Mean	129	48
	Maximum	132	50
	Std. Dev.	3	2
	Median	129	48
	Coeff. Var. (%)	2	4
FC	Minimum	1	1
cfu/100 mL	Geo. Mean	1	1
	Maximum	1	1
	Median	1	1
SO_4	Minimum	51.6	95.1
mg/L	Mean	53.0	98.6
	Maximum	53.8	101.3
	Std. Dev.	1.2	3.1
	Median	53.6	99.3
	Coeff. Var. (%)	2.3	3.2
NH_3-N	Minimum	0.33	0.18
mg/L	Mean	0.33	0.29
	Maximum	0.34	0.38
	Std. Dev.	0.01	0.10
	Median	0.33	0.31
	Coeff. Var. (%)	1.73	35.00
TOC	Minimum	1.0	1.0
mg/L	Mean	1.0	1.0
	Maximum	1.0	1.0
	Std. Dev.	0.0	0.0
	Median	1.0	1.0
	Coeff. Var. (%)	0.0	0.0

TABLE 8 (Continued): SUMMARY STATISTICS OF THE 2009 DATA FOR THE GROUNDWATER QUALITY MONITORING WELLS IN THE DES PLAINES TUNNEL SYSTEM: WELLS QD-59 AND QD-60

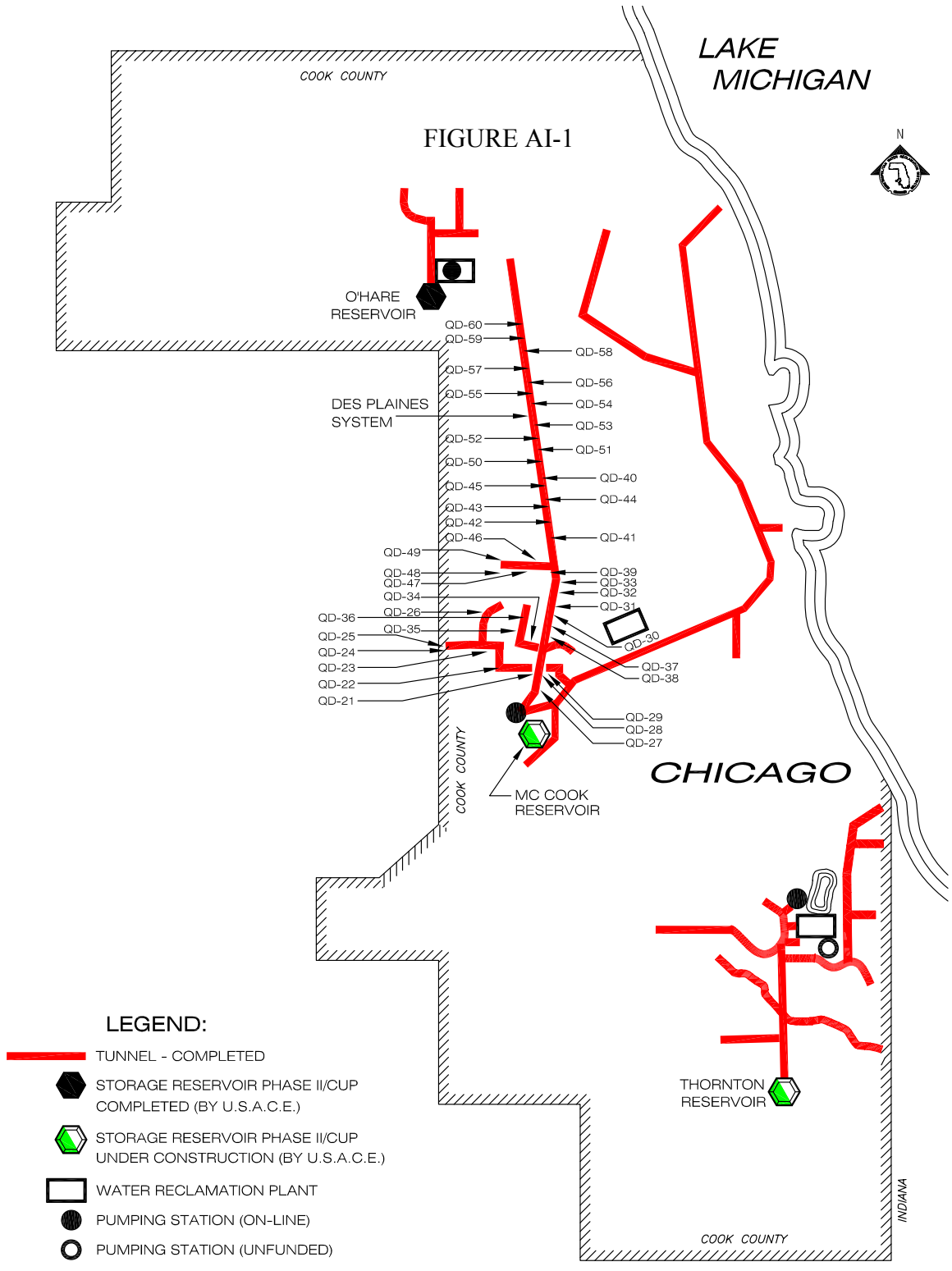
Parameter[1]		Well Number QD-59	Well Number QD-60
TDS	Minimum	504	396
mg/L	Mean	533	420
	Maximum	550	436
	Std. Dev.	25	21
	Median	546	428
	Coeff. Var. (%)	5	5
Hard.	Minimum	250	223
mg/L	Mean	259	233
	Maximum	266	242
	Std. Dev.	8	10
	Median	261	235
	Coeff. Var. (%)	3	4
Cond.	Minimum	480	380
µmhos/cm	Mean	575	467
	Maximum	710	578
	Std. Dev.	120	101
	Median	535	443
	Coeff. Var. (%)	21	22
pH	Minimum	7.8	7.7
unit	Mean	7.8	7.8
	Maximum	7.8	7.8
	Std. Dev.	0.0	0.0
	Median	7.8	7.8
	Coeff. Var. (%)	0.4	0.5

[1]For purpose of statistical evaluation, any value less than the appropriate MDL or 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

2009 GROUNDWATER QUALITY DATA FOR MONITORING WELLS QD-21 THROUGH QD-60 IN THE DES PLAINES TUNNEL SYSTEM

TABLE AII-1: 2009 CHLORIDE, FECAL COLIFORM, SULFATE, AMMONIA NITROGEN, TOTAL ORGANIC CARBON, AND TOTAL DISSOLVED SOLIDS DATA FOR GROUNDWATER QUALITY MONITORING WELLS QD-21 THROUGH QD-60 IN THE DES PLAINES TUNNEL SYSTEM

Well	Date of Sampling	Cl^{11} 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	2/18/09			Well could not be sampled			
QD-21	5/27/09			Well could not be sampled			
QD-21	10/6/09			Well could not be sampled			
QD-22	2/18/09	87	<1	164.3	0.49	1.7	772
QD-22	5/27/09	115	<1	259.1	0.33	1.2	1,228
QD-22	10/6/09	133	<1	274.3	0.40	1.2	1,248
QD-23	2/18/09	181	<1	333.3	0.48	1.6	1,502
QD-23	5/27/09	211	<1	366.3	0.46	1.8	1,552
QD-23	8/31/09	195	<1	412.6	0.47	1.6	1,540
QD-24	2/18/09	144	<1	315.4	0.48	1.3	1,220
QD-24	5/27/09	102	<1	166.8	0.47	1.8	824
QD-24	8/31/09	110	<1	177.5	0.53	2.1	954
QD-25	2/18/09			Well could not be sampled			
QD-25	8/31/09	507	<1	246.6	0.73	1.6	1,698
QD-25	10/14/09	472	<1	247.1	0.72	2.3	1,728
QD-26	2/5/09	26	<1	69.6	0.31	<1.0	436
QD-26	4/30/09	17	<1	104.5	0.32	<1.0	576
QD-26	8/27/09	13	<1	96.2	0.35	<1.0	546
QD-27	1/22/09	331	<1	29.6	28.68	18.6	1,260
QD-27	3/19/09	337	4	43.8	29.03	17.3	1,292
QD-27	4/22/09	257	1	33.6	26.84	16.6	1,094
QD-27	7/9/09	313	<1	49.2	27.56	16.4	1,214
QD-27	10/8/09	240	<1	12.0	21.20	15.1	1,042
QD-27	12/17/09	337	<1	33.5	29.13	17.4	1,230
QD-28	4/29/09	332	<1	---[3]	0.53	1.3	1,382
QD-28	9/9/09	300	<1	262.8	0.55	1.1	1,414
QD-28	11/24/09	308	<1	255.5	0.55	1.2	1,182

TABLE AII-1 (Continued): 2009 CHLORIDE, FECAL COLIFORM, SULFATE, AMMONIA NITROGEN, TOTAL ORGANIC CARBON, AND TOTAL DISSOLVED SOLIDS DATA FOR GROUNDWATER QUALITY MONITORING WELLS QD-21 THROUGH QD-60 IN THE DES PLAINES TUNNEL SYSTEM

Well	Date of Sampling	Cl^{11} 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	2/19/09	138	<1	259.2	0.37	1.7	1,044
QD-29	9/9/09	149	<1	280.1	0.40	2.0	1,212
QD-29	11/24/09	121	<1	240.5	0.39	1.7	990
QD-30	2/5/09	130	<1	326.5	0.30	1.3	1,164
QD-30	4/22/09	143	<1	342.0	0.36	1.5	1,388
QD-30	8/27/09	118	<1	306.2	0.29	1.5	1,036
QD-31	2/5/09	Well could not be sampled					
QD-31	4/22/09	127	<1	176.9	0.26	<1.0	936
QD-31	8/27/09	118	3	181.3	0.23	<1.0	946
QD-32	2/5/09	Well could not be sampled					
QD-32	4/22/09	540	<1	221.7	0.24	<1.0	1,952
QD-32	8/27/09	515	5	228.9	0.25	<1.0	1,932
QD-33	1/22/09	357	<1	195.5	0.19	<1.0	1,670
QD-33	3/19/09	367	1	190.3	0.25	<1.0	1,864
QD-33	4/22/09	374	<1	196.9	0.32	<1.0	1,658
QD-33	7/9/09	380	<1	203.3	0.27	<1.0	1,646
QD-33	8/27/09	363	<1	189.7	0.24	<1.0	1,624
QD-33	9/17/09	371	1	189.3	0.19	<1.0	1,632
QD-34	4/29/09	139	<1	---[3]	0.38	1.8	1,274
QD-34	6/3/09	142	1	258.7	0.38	2.0	1,208
QD-34	8/26/09	128	<1	288.1	0.39	1.8	1,316
QD-34	9/9/09	141	<1	303.3	0.39	1.7	1,304
QD-34	10/14/09	150	<1	270.9	0.39	1.6	1,084
QD-34	11/24/09	128	<1	291.8	0.39	1.6	1,072
QD-35	2/10/09	125	<1	256.0	0.32	2.2	1,030
QD-35	6/3/09	128	<1	233.4	0.32	2.2	1,014
QD-35	8/26/09	125	<1	248.2	0.27	1.8	1,236
QD-36	2/10/09	13	<1	317.8	0.29	2.1	1,278
QD-36	6/3/09	130	<1	302.8	0.29	1.7	1,232
QD-36	8/26/09	123	<1	328.7	0.31	1.4	1,452

TABLE AII-1 (Continued): 2009 CHLORIDE, FECAL COLIFORM, SULFATE, AMMONIA NITROGEN, TOTAL ORGANIC CARBON, AND TOTAL DISSOLVED SOLIDS DATA FOR GROUNDWATER QUALITY MONITORING WELLS QD-21 THROUGH QD-60 IN THE DES PLAINES TUNNEL SYSTEM

Well	Date of Sampling	Cl^{11} 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-37	1/22/09	285	<1	371.5	0.12	<1.0	1,426
QD-37	3/19/09	258	<1	367.7	0.32	<1.0	1,474
QD-37	7/9/09	264	<1	393.0	0.33	<1.0	1,462
QD-37	8/27/09	255	<1	405.1	0.31	<1.0	1,444
QD-37	9/17/09	265	<1	349.3	0.29	<1.0	1,454
QD-37	12/17/09	271	<1	383.7	0.29	1.0	1,484
QD-38	1/22/09	187	<1	98.4	0.30	<1.0	838
QD-38	3/19/09	179	<1	101.5	0.35	<1.0	844
QD-38	7/9/09	199	<1	96.6	0.37	<1.0	860
QD-39	8/13/09	20	<1	348.9	0.32	1.4	926
QD-39	9/17/09	35	<1	80.6	<0.10	<1.0	860
QD-39	12/17/09	41	<1	89.5	<0.10	<1.0	902
QD-40	5/20/09	Well could not be sampled					
QD-40	6/18/09	Well could not be sampled					
QD-40	9/17/09	Well could not be sampled					
QD-41	2/5/09	19	<1	346.2	0.31	1.9	840
QD-41	4/24/09	Well could not be sampled					
QD-41	8/13/09	27	<1	96.7	<0.10	<1.0	984
QD-42	2/5/09	20	<1	282.6	0.29	1.3	784
QD-42	7/9/09	19	<1	285.9	0.30	1.3	760
QD-42	9/17/09	20	<1	269.2	0.29	1.2	772
QD-43	2/5/09	47	<1	205.6	0.30	1.1	702
QD-43	7/9/09	52	<1	196.1	0.34	1.1	706
QD-43	9/17/09	51	<1	157.0	0.30	1.1	754
QD-44	7/9/09	18	<1	213.6	0.36	1.0	648
QD-44	8/27/09	18	<1	212.4	0.35	1.1	632
QD-44	9/17/09	20	<1	191.0	0.31	1.1	618

TABLE AII-1 (Continued): 2009 CHLORIDE, FECAL COLIFORM, SULFATE, AMMONIA NITROGEN, TOTAL ORGANIC CARBON, AND TOTAL DISSOLVED SOLIDS DATA FOR GROUNDWATER QUALITY MONITORING WELLS QD-21 THROUGH QD-60 IN THE DES PLAINES TUNNEL SYSTEM

Well	Date of Sampling	Cl^{11} 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-45	2/5/09			Well could not be sampled			
QD-45	6/18/09			Well could not be sampled			
QD-45	9/17/09			Well could not be sampled			
QD-46	2/10/09	24	3	105.8	0.21	1.5	650
QD-46	8/26/09	14	<1	106.7	0.20	1.3	648
QD-46	10/14/09	13	<1	121.2	0.26	<1.0	602
QD-47	2/19/09	16	<1	146.5	0.25	1.0	528
QD-47	4/30/09	18	<1	153.1	0.25	1.1	560
QD-47	8/13/09	15	<1	140.3	0.28	1.0	584
QD-48	2/19/09	11	<1	278.1	0.30	1.2	550
QD-48	4/30/09	13	<1	282.6	0.18	1.2	644
QD-48	8/13/09	10	<1	241.5	0.22	1.2	736
QD-49	2/19/09			Well could not be sampled			
QD-49	4/30/09			Well could not be sampled			
QD-49	8/13/09	14	<1	172.3	0.29	1.1	774
QD-50	2/26/09	13	<1	275.1	<0.10	1.3	690
QD-50	7/9/09	14	<1	275.1	0.13	1.3	664
QD-50	10/15/09	12	<1	293.2	0.10	1.1	724
QD-51	2/26/09	10	<1	120.8	<0.10	1.1	538
QD-51	7/9/09	12	<1	117.4	<0.10	1.1	510
QD-51	10/15/09	14	<1	119.2	<0.10	1.0	532
QD-52	2/26/09	15	<1	134.9	0.11	1.1	486
QD-52	7/9/09	16	<1	133.2	0.14	1.1	450
QD-52	10/15/09	16	<1	125.2	0.10	1.1	466
QD-53	2/26/09	19	<1	155.2	<0.10	1.3	592
QD-53	7/9/09	20	<1	161.4	<0.10	1.4	614
QD-53	10/29/09	19	<1	166.6	<0.10	1.3	604

TABLE AII-1 (Continued): 2009 CHLORIDE, FECAL COLIFORM, SULFATE, AMMONIA NITROGEN, TOTAL ORGANIC CARBON, AND TOTAL DISSOLVED SOLIDS DATA FOR GROUNDWATER QUALITY MONITORING WELLS QD-21 THROUGH QD-60 IN THE DES PLAINES TUNNEL SYSTEM

Well	Date of Sampling	Cl^{11} 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-54	2/26/09	17	<1	143.8	0.20	<1.0	432
QD-54	4/23/09	20	<1	142.7	0.27	1.1	442
QD-54	7/30/09	17	<1	131.8	0.21	<1.0	414
QD-55	2/26/09	18	<1	207.3	0.27	1.4	302
QD-55	4/23/09	22	<1	219.8	0.13	1.1	546
QD-55	7/30/09	19	<1	179.0	0.36	1.1	490
QD-56	2/26/09	12	<1	8.6	0.21	<1.0	534
QD-56	4/23/09	14	<1	10.2	0.21	<1.0	308
QD-56	7/30/09	12	<1	9.1	0.23	<1.0	306
QD-57	2/26/09	13	<1	56.7	0.22	<1.0	384
QD-57	7/30/09	13	<1	50.2	0.24	<1.0	380
QD-57	10/29/09	14	<1	56.8	0.26	<1.0	396
QD-58	2/26/09	11	<1	<2.0	0.28	<1.0	252
QD-58	4/23/09	14	<1	3.4	0.27	<1.0	274
QD-58	10/29/09	13	<1	2.3	0.32	<1.0	274
QD-59	2/5/09	129	<1	53.6	0.33	<1.0	504
QD-59	4/23/09	132	<1	53.8	0.33	<1.0	550
QD-59	7/30/09	127	<1	51.6	0.34	<1.0	546
QD-60	2/5/09	50	<1	99.3	0.18	<1.0	396
QD-60	4/23/09	48	<1	101.3	0.31	<1.0	436
QD-60	7/30/09	46	<1	95.1	0.38	<1.0	428

[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), 0.10 mg/L 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 with actual sampling volume analyzed.

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

[3]Sample not received by laboratory, analysis not performed.

TABLE AII-2: 2009 HARDNESS, CONDUCTIVITY, PH, TEMPERATURE, ELEVATION, AND RECHARGE DATA FOR GROUNDWATER QUALITY MONITORING WELLS QD-21 THROUGH QD-60 IN THE DES PLAINES TUNNEL SYSTEM

Well	Date of Sampling	Hard. mg/L	Cond.[1] µmhos/cm	pH[1] Unit	Temp. °C	Elevation[2] Feet	Recharge[3] Hours
QD-21	2/18/09			Well could not be sampled			
QD-21	5/27/09			Well could not be sampled			
QD-21	10/6/09			Well could not be sampled			
QD-22	2/18/09	510	1,210	7.6	12.4	-39	<4
QD-22	5/27/09	662	1,236	6.8	13.5	-23	<4
QD-22	10/6/09	758	1,217	6.9	13.9	-42	<4
QD-23	2/18/09	786	1,089	7.5	12.5	-52	<4
QD-23	5/27/09	783	1,625	6.8	14.2	-25	<4
QD-23	8/31/09	848	635	7.0	14.3	-30	<4
QD-24	2/18/09	810	849	7.4	10.7	7	<4
QD-24	5/27/09	457	949	7.2	12.5	22	<4
QD-24	8/31/09	492	622	7.5	12.6	19	<4
QD-25	2/18/09			Well could not be sampled			
QD-25	8/31/09	617	1,747	6.9	12.4	30	<4
QD-25	10/14/09	691	1,747	6.9	12.9	30	<4
QD-26	2/5/09	326	450	7.2	11.2	-18	<48
QD-26	4/30/09	387	480	7.2	12.7	-12	<48
QD-26	8/27/09	367	813	7.4	12.5	-14	<48
QD-27	1/22/09	491	1,196	7.5	11.4	-199	<48
QD-27	3/19/09	455	1,650	7.4	11.8	-199	<48
QD-27	4/22/09	486	1,907	7.1	13.0	-194	<48
QD-27	7/9/09	449	1,275	7.0	12.9	-196	<48
QD-27	10/8/09	460	1,187	6.8	13.2	-200	<48
QD-27	12/17/09	484	2,107	6.8	12.7	-207	<48
QD-28	4/29/09	655	668	7.0	13.2	-127	<4
QD-28	9/9/09	618	1,015	7.2	13.5	-128	<4
QD-28	11/24/09	647	1,530	7.1	13.0	-137	<4
QD-29	2/19/09	678	850	7.7	12.0	-191	<4
QD-29	9/9/09	671	916	7.1	13.4	-200	<4
QD-29	11/24/09	615	1,256	7.5	12.4	-177	<4

TABLE AII-2 (Continued): 2009 HARDNESS, CONDUCTIVITY, PH, TEMPERATURE, ELEVATION, AND RECHARGE DATA FOR GROUNDWATER QUALITY MONITORING WELLS QD-21 THROUGH QD-60 IN THE DES PLAINES TUNNEL SYSTEM

Well	Date of Sampling	Hard. mg/L	Cond.[1] µmhos/cm	pH[1] Unit	Temp. °C	Elevation[2] Feet	Recharge[3] Hours
QD-30	2/5/09	708	815	7.4	11.2	-151	<48
QD-30	4/22/09	715	1,325	7.0	12.6	-132	<48
QD-30	8/27/09	616	665	7.0	12.7	-121	<48
QD-31	2/5/09						
QD-31	4/22/09	241	1,162	7.5	12.0	-192	<48
QD-31	8/27/09	243	774	7.4	12.7	-190	<48
QD-32	2/5/09			Well could not be sampled			
QD-32	4/22/09	28	2,839	8.7	10.5	-218	<48
QD-32	8/27/09	35	2,135	9.4	12.5	-214	<48
QD-33	1/22/09	27	1,466	7.9	11.0	-159	<48
QD-33	3/19/09	27	1,625	8.3	11.6	-160	<48
QD-33	4/22/09	26	2,348	8.2	12.1	-179	<48
QD-33	7/9/09	28	1,835	8.2	12.5	-183	<48
QD-33	8/27/09	26	1,930	8.6	12.8	-179	<48
QD-33	9/17/09	27	1,580	8.1	12.9	-177	<48
QD-34	4/29/09	662	642	7.1	12.2	-104	<4
QD-34	6/3/09	651	1,145	7.6	12.4	-109	<4
QD-34	8/26/09	673	825	7.1	13.8	-103	<4
QD-34	9/9/09	695	953	7.1	13.5	-106	<4
QD-34	10/14/09	695	1,040	6.9	12.0	-107	<4
QD-34	11/24/09	704	1,285	7.3	12.5	-119	<4
QD-35	2/10/09	614	739	7.1	12.5	-103	<4
QD-35	6/3/09	561	1,154	7.4	12.9	-113	<4
QD-35	8/26/09	602	872	7.2	13.5	-98	<4
QD-36	2/10/09	728	787	7.1	11.5	-117	<4
QD-36	6/3/09	707	1,285	7.7	11.9	-129	<4
QD-36	8/26/09	719	886	7.2	13.0	-112	<4
QD-37	1/22/09	439	1,180	7.2	11.2	-207	<48
QD-37	3/19/09	519	1,172	7.4	12.0	-206	<48
QD-37	7/9/09	541	1,468	7.2	13.4	-209	<48
QD-37	8/27/09	518	1,803	6.8	13.4	-201	<48

TABLE AII-2 (Continued): 2009 HARDNESS, CONDUCTIVITY, PH, TEMPERATURE, ELEVATION, AND RECHARGE DATA FOR GROUNDWATER QUALITY MONITORING WELLS QD-21 THROUGH QD-60 IN THE DES PLAINES TUNNEL SYSTEM

Well	Date of Sampling	Hard. mg/L	Cond.[1] µmhos/cm	pH[1] Unit	Temp. °C	Elevation[2] Feet	Recharge[3] Hours
QD-37	9/17/09	557	1,630	7.2	13.3	-207	<48
QD-37	12/17/09	558	1,667	7.3	12.1	-210	<48
QD-38	1/22/09	247	798	7.1	10.8	-202	<48
QD-38	3/19/09	249	622	7.3	12.1	-203	<48
QD-38	7/9/09	238	930	7.7	12.7	-208	<48
QD-39	8/13/09	391	756	8.4	12.4	-58	<48
QD-39	9/17/09	18	1,075	8.4	12.0	-141	<48
QD-39	12/17/09	18	818	8.0	10.9	-140	<48
QD-40	5/20/09			Well could not be sampled			
QD-40	6/18/09			Well could not be sampled			
QD-40	9/17/09			Well could not be sampled			
QD-41	2/5/09	419	656	7.6	11.5	-133	<48
QD-41	4/24/09			Well could not be sampled			
QD-41	8/13/09	18	736	7.6	13.2	-136	<48
QD-42	2/5/09	380	818	7.3	11.0	-130	<48
QD-42	7/9/09	372	970	7.3	13.0	-130	<48
QD-42	9/17/09	392	550	7.5	13.1	-123	<48
QD-43	2/5/09	416	1,001	7.5	10.9		
QD-43	7/9/09	400	899	7.2	12.7	-147	<48
QD-43	9/17/09	426	617	7.6	11.9	-137	<48
QD-44	7/9/09	296	723	7.5	11.9	-16	<4
QD-44	8/27/09	292	781	7.6	11.6	-19	<4
QD-44	9/17/09	312	572	7.8	11.9	-10	<4
QD-45	2/5/09			Well could not be sampled			
QD-45	6/18/09			Well could not be sampled			
QD-45	9/17/09			Well could not be sampled			
QD-46	2/10/09	63	499	7.8	12.0	-189	<4
QD-46	8/26/09	59	652	8.0	14.5	-181	<4
QD-46	10/14/09	73	700	7.9	9.9	-179	<4

TABLE AII-2 (Continued): 2009 HARDNESS, CONDUCTIVITY, PH, TEMPERATURE, ELEVATION, AND RECHARGE DATA FOR GROUNDWATER QUALITY MONITORING WELLS QD-21 THROUGH QD-60 IN THE DES PLAINES TUNNEL SYSTEM

Well	Date of Sampling	Hard. mg/L	Cond.[1] µmhos/cm	pH[1] Unit	Temp. °C	Elevation[2] Feet	Recharge[3] Hours
QD-47	2/19/09	231	500	7.6	12.2	5	<48
QD-47	4/30/09	228	512	7.7	13.4	3	<48
QD-47	8/13/09	223	778	7.7	15.2	5	<48
QD-48	2/19/09	230	520	7.8	11.7	-172	<48
QD-48	4/30/09	271	516	8.3	13.0	-187	<48
QD-48	8/13/09	249	757	8.4	15.0	-173	<48
QD-49	2/19/09			Well could not be sampled			
QD-49	4/30/09			Well could not be sampled			
QD-49	8/13/09	317	810	7.9	14.1	-176	<48
QD-50	2/26/09	7	478	9.0	11.5	-134	<48
QD-50	7/9/09	6	665	9.9	13.0	-132	<48
QD-50	10/15/09	7	965	9.2	11.6	-132	<48
QD-51	2/26/09	5	518	9.3	11.3	-105	<48
QD-51	7/9/09	4	677	9.5	12.7	-109	<48
QD-51	10/15/09	4	792	9.4	11.5	-104	<48
QD-52	2/26/09	19	466	9.3	12.9	-52	<48
QD-52	7/9/09	20	578	9.3	13.9	-67	<48
QD-52	10/15/09	21	701	8.2	12.8	-52	<48
QD-53	2/26/09	9	544	9.4	12.4	-164	<48
QD-53	7/9/09	10	715	9.3	13.5	-167	<48
QD-53	10/29/09	12	620	8.6	13.2	-169	<48
QD-54	2/26/09	37	412	9.2	11.7	-23	<48
QD-54	4/23/09	35	670	9.1	12.0	-26	<48
QD-54	7/30/09	31	450	8.9	12.2	-27	<48
QD-55	2/26/09	212	543	7.1	11.4	-135	<48
QD-55	4/23/09	192	633	8.0	11.8	-143	<48
QD-55	7/30/09	157	481	8.7	12.8	-144	<48

TABLE AII-2 (Continued): 2009 HARDNESS, CONDUCTIVITY, PH, TEMPERATURE, ELEVATION, AND RECHARGE DATA FOR GROUNDWATER QUALITY MONITORING WELLS QD-21 THROUGH QD-60 IN THE DES PLAINES TUNNEL SYSTEM

Well	Date of Sampling	Hard. mg/L	Cond.[1] µmhos/cm	pH[1] Unit	Temp. °C	Elevation[2] Feet	Recharge[3] Hours
QD-56	2/26/09	48	402	7.9	12.1	-69	<48
QD-56	4/23/09	48	466	8.6	11.1	-70	<48
QD-56	7/30/09	47	381	8.6	11.5	-70	<48
QD-57	2/26/09	19	436	8.3	10.8	-105	<48
QD-57	7/30/09	17	434	8.6	11.6	-115	<48
QD-57	10/29/09	18	445	8.7	11.4	-115	<48
QD-58	2/26/09	119	321	7.9	10.9	-112	<48
QD-58	4/23/09	110	383	8.0	11.2	-110	<48
QD-58	10/29/09	114	321	8.0	11.5	-106	<48
QD-59	2/5/09	266	480	7.8	10.5	-44	<48
QD-59	4/23/09	250	710	7.8	11.6	-39	<48
QD-59	7/30/09	261	535	7.8	11.5	-38	<48
QD-60	2/5/09	242	380	7.8	10.8	-114	<48
QD-60	4/23/09	223	578	7.8	12.1	-113	<48
QD-60	7/30/09	235	443	7.7	12.6	-115	<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.