

Protecting Our Water Environment



Metropolitan Water Reclamation District of Greater Chicago

*MONITORING AND RESEARCH
DEPARTMENT*

REPORT NO. 11-22

TUNNEL AND RESERVOIR PLAN

DES PLAINES TUNNEL SYSTEM

2010 ANNUAL GROUNDWATER MONITORING REPORT

April 2011

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April 21, 2011

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, 2010 Annual
Groundwater Monitoring Report

Enclosed are three copies of the "Tunnel and Reservoir Plan, Des Plaines Tunnel System,
2010 Annual Groundwater Monitoring Report."

Very truly yours,

Thomas C. Granato
Acting Director
Monitoring and Research

TCG:DGM:lf

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TUNNEL AND RESERVOIR PLAN
DES PLAINES TUNNEL SYSTEM
2010 ANNUAL GROUNDWATER MONITORING REPORT

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2010 MONITORING RESULTS

Introduction

This report contains 2010 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. 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 2010 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-34 could not be sampled on July 8, 2010, because muddy conditions blocked access to the well, and on September 1, 2010, because a fallen tree blocked access to the well. Groundwater quality monitoring well QD-37 could not be sampled on December 2, 2010, because of insufficient water in the well to collect a sample. Groundwater quality monitoring well QD-40 could not be sampled during 2010 because of an electrical problem with the pump. A work order has been written to fix the pump. Groundwater quality monitoring well QD-57 could not be sampled on March 16, 2010, due to unsafe conditions, and on September 2, 2010, because construction blocked access to the well. Groundwater quality monitoring well QD-58 could not be sampled on March 16, 2010, because unsafe conditions blocked access to the well, and on December 16, 2010, because snow blocked access to the well.

Summary of Data

Tables 1 through 8 contain summary statistics of the groundwater quality parameters for 2010 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 2010. The summary statistics include minimum, mean, maximum, standard deviation (Stdv.), median,

and coefficient of variation (COV) for eight of the nine groundwater quality parameters analyzed during 2010. These groundwater quality parameters are: chloride (Cl), conductivity (Cond.), hardness as CaCO₃ (Hard.), ammonia nitrogen (NH₃-N), pH, sulfate (SO₄), 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. The statistical analysis of the data was conducted using Microsoft[®] Excel functions.

TABLE 1: SUMMARY STATISTICS OF THE 2010 DATA FOR THE GROUNDWATER QUALITY MONITORING WELLS IN THE DES PLAINES TUNNEL SYSTEM: QD-21 THROUGH QD-25

Parameter ¹		Well Number				
		QD-21	QD-22	QD-23	QD-24	QD-25
Cl mg/L	Minimum	233	111	175	15	464
	Mean	249	132	189	69	484
	Maximum	269	149	199	99	506
	Stdv.	18	19	13	47	21
	Median	245	137	194	92	483
	COV	7	15	7	68	4
FC cfu/100 mL	Minimum	1	1	1	1	1
	Geo. Mean	1	1	1	1	1
	Maximum	1	1	1	1	1
	Median	1	1	1	1	1
SO ₄ mg/L	Minimum	308.0	272.6	363.9	91.1	198.5
	Mean	327.1	307.6	376.1	124.2	228.8
	Maximum	351.0	375.0	396.0	159.0	245.5
	Stdv.	21.9	58.4	17.4	34.0	26.3
	Median	322.2	275.0	368.5	122.6	242.3
	COV	6.7	19.0	4.6	27.4	11.5
NH ₃ -N mg/L	Minimum	0.20	0.36	0.38	0.22	0.63
	Mean	0.22	0.38	0.44	0.33	0.70
	Maximum	0.24	0.39	0.49	0.43	0.75
	Stdv.	0.02	0.02	0.06	0.11	0.06
	Median	0.21	0.38	0.45	0.33	0.71
	COV	9.61	4.06	12.65	32.16	8.77
TOC mg/L	Minimum	1.7	1.1	1.6	1.0	1.4
	Mean	2.8	1.3	1.7	1.6	1.6
	Maximum	4.6	1.4	1.9	2.0	1.7
	Stdv.	1.6	0.2	0.2	0.6	0.2
	Median	2.0	1.4	1.7	1.9	1.6
	COV	57.6	13.3	8.8	33.7	9.8

TABLE 1 (Continued): SUMMARY STATISTICS OF THE 2010 DATA FOR THE GROUNDWATER QUALITY MONITORING WELLS IN THE DES PLAINES TUNNEL SYSTEM: QD-21 THROUGH QD-25

Parameter ¹		Well Number				
		QD-21	QD-22	QD-23	QD-24	QD-25
TDS mg/L	Minimum	1,328	1,070	1,316	634	1,480
	Mean	1,450	1,208	1,470	690	1,651
	Maximum	1,656	1,278	1,646	754	1,870
	Stdv.	179	120	166	60	199
	Median	1,366	1,276	1,448	682	1,604
	COV	12	10	11	9	12
Hard. mg/L as CO ₃	Minimum	739	774	305	66	545
	Mean	759	791	672	319	656
	Maximum	788	802	857	468	734
	Stdv.	26	15	318	220	99
	Median	750	798	853	423	688
	COV	3	2	47	69	15
Cond. µmhos/cm	Minimum	803	792	730	737	1,145
	Mean	1,057	907	941	909	1,325
	Maximum	1,191	999	1,123	1,029	1,685
	Stdv.	220	105	198	153	312
	Median	1,177	930	971	962	1,145
	COV	21	12	21	17	24
pH unit	Minimum	7.0	6.9	6.9	6.9	7.0
	Mean	7.0	7.1	7.1	7.3	7.3
	Maximum	7.1	7.5	7.3	7.8	7.4
	Stdv.	0.1	0.3	0.2	0.4	0.2
	Median	7.0	7.0	7.1	7.3	7.4
	COV	1.2	4.5	2.7	6.0	3.3

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

TABLE 2: SUMMARY STATISTICS OF THE 2010 DATA FOR THE GROUNDWATER QUALITY MONITORING WELLS IN THE DES PLAINES TUNNEL SYSTEM: QD-26 THROUGH QD-30

Parameter ¹		Well Number				
		QD-26	QD-27	QD-28	QD-29	QD-30
Cl mg/L	Minimum	15	325	263	133	120
	Mean	15	349	279	140	125
	Maximum	15	429	291	144	133
	Stdv.	0	40	15	6	7
	Median	15	335	284	142	121
	COV	0	11	5	4	6
FC cfu/100 mL	Minimum	1	1	1	1	1
	Geo. Mean	1	1	1	1	1
	Maximum	1	1	1	1	1
	Median	1	1	1	1	1
SO ₄ mg/L	Minimum	94.7	36.3	227.8	257.3	2.0
	Mean	105.9	42.6	247.7	272.5	208.1
	Maximum	114.2	53.0	267.2	284.2	326.8
	Stdv.	10.1	5.9	19.7	13.8	179.2
	Median	108.9	42.7	248.0	276.0	295.5
	COV	9.6	13.9	8.0	5.1	86.1
NH ₃ -N mg/L	Minimum	0.34	29.01	0.55	0.40	0.21
	Mean	0.35	30.06	0.60	0.44	0.27
	Maximum	0.36	33.96	0.63	0.48	0.33
	Stdv.	0.01	1.92	0.04	0.04	0.06
	Median	0.35	29.37	0.61	0.43	0.26
	COV	2.86	6.40	6.98	9.26	22.60
TOC mg/L	Minimum	1.0	15.7	1.1	1.9	1.2
	Mean	1.0	16.6	1.3	2.4	1.3
	Maximum	1.0	17.4	1.7	3.4	1.3
	Stdv.	0.0	0.8	0.3	0.8	0.1
	Median	1.0	16.6	1.2	2.0	1.3
	COV	0.0	4.5	24.1	34.5	4.6

TABLE 2 (Continued): SUMMARY STATISTICS OF THE 2010 DATA FOR THE GROUNDWATER QUALITY MONITORING WELLS IN THE DES PLAINES TUNNEL SYSTEM: QD-26 THROUGH QD-30

Parameter ¹		Well Number				
		QD-26	QD-27	QD-28	QD-29	QD-30
TDS mg/L	Minimum	518	1,236	1,154	1,064	1,064
	Mean	541	1,297	1,272	1,095	1,157
	Maximum	554	1,392	1,370	1,156	1,276
	Stdv.	20	54	109	53	108
	Median	552	1,284	1,292	1,064	1,132
	COV	4	4	9	5	9
Hard. mg/L as CO ₃	Minimum	369	485	627	664	664
	Mean	403	522	666	694	690
	Maximum	426	562	721	712	718
	Stdv.	30	29	49	26	27
	Median	413	520	649	706	689
	COV	7	6	7	4	4
Cond. µmhos/cm	Minimum	395	353	1,120	847	591
	Mean	470	995	1,154	915	807
	Maximum	603	2,110	1,198	1,010	960
	Stdv.	115	637	40	85	193
	Median	413	1,024	1,143	889	871
	COV	25	64	3	9	24
pH unit	Minimum	7.2	7.2	6.9	6.9	6.9
	Mean	7.5	7.5	7.2	7.2	7.2
	Maximum	7.8	7.8	7.4	7.6	7.6
	Stdv.	0.3	0.2	0.3	0.4	0.3
	Median	7.3	7.5	7.3	7.0	7.1
	COV	4.2	2.7	4.0	5.4	4.8

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

TABLE 3: SUMMARY STATISTICS OF THE 2010 DATA FOR THE GROUNDWATER QUALITY MONITORING WELLS IN THE DES PLAINES TUNNEL SYSTEM: QD-31 THROUGH QD-35

Parameter ¹		Well Number				
		QD-31	QD-32	QD-33	QD-34	QD-35
Cl mg/L	Minimum	116	514	340	102	106
	Mean	124	516	348	121	110
	Maximum	135	519	358	131	114
	Stdv.	10	3	6	13	4
	Median	120	515	347	125	110
	COV	8	1	2	11	4
FC cfu/100 mL	Minimum	1	1	1	1	1
	Geo. Mean	1	1	1	1	1
	Maximum	1	1	1	1	1
	Median	1	1	1	1	1
SO ₄ mg/L	Minimum	182.1	213.7	189.4	287.6	260.8
	Mean	194.2	221.1	197.4	298.6	264.9
	Maximum	216.7	228.0	209.6	311.0	271.1
	Stdv.	19.5	7.2	8.3	10.5	5.5
	Median	183.9	221.5	195.3	297.9	262.7
	COV	10.0	3.2	4.2	3.5	2.1
NH ₃ -N mg/L	Minimum	0.23	0.23	0.24	0.24	0.28
	Mean	0.24	0.24	0.28	0.36	0.31
	Maximum	0.25	0.25	0.33	0.44	0.32
	Stdv.	0.01	0.01	0.04	0.09	0.02
	Median	0.25	0.23	0.27	0.39	0.32
	COV	4.75	4.88	13.94	23.66	7.53
TOC mg/L	Minimum	1.0	1.0	1.0	1.6	1.9
	Mean	1.0	1.0	1.0	1.8	2.1
	Maximum	1.0	1.0	1.0	1.9	2.2
	Stdv.	0.0	0.0	0.0	0.1	0.2
	Median	1.0	1.0	1.0	1.8	2.2
	COV	0.0	0.0	0.0	7.4	8.2

TABLE 3 (Continued): SUMMARY STATISTICS OF THE 2010 DATA FOR THE GROUNDWATER QUALITY MONITORING WELLS IN THE DES PLAINES TUNNEL SYSTEM: QD-31 THROUGH QD-35

Parameter ¹		Well Number				
		QD-31	QD-32	QD-33	QD-34	QD-35
TDS mg/L	Minimum	946	1,970	1,620	1,040	966
	Mean	963	2,001	1,698	1,098	1,057
	Maximum	992	2,018	2,004	1,178	1,144
	Stdv.	25	27	150	58	89
	Median	950	2,014	1,642	1,087	1,062
	COV	3	1	9	5	8
Hard. mg/L as CO ₃	Minimum	242	33	28	708	647
	Mean	254	36	38	730	659
	Maximum	277	39	82	741	677
	Stdv.	20	3	22	15	16
	Median	244	36	29	735	654
	COV	8	8	58	2	2
Cond. µmhos/cm	Minimum	666	1,856	481	708	810
	Mean	751	1,908	1,113	872	859
	Maximum	840	1,970	1,996	1,113	906
	Stdv.	87	58	633	171	48
	Median	747	1,899	939	833	862
	COV	12	3	57	20	6
pH unit	Minimum	7.4	8.0	7.2	6.9	6.8
	Mean	7.6	8.9	7.8	7.1	7.0
	Maximum	7.9	9.6	8.3	7.7	7.3
	Stdv.	0.3	0.8	0.4	0.4	0.2
	Median	7.4	9.2	7.7	7.0	7.0
	COV	3.7	9.3	5.1	5.3	3.5

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

TABLE 4: SUMMARY STATISTICS OF THE 2010 DATA FOR THE GROUNDWATER QUALITY MONITORING WELLS IN THE DES PLAINES TUNNEL SYSTEM: QD-36, QD-37, QD-38, QD-39, AND QD-41

Parameter ¹		Well Number				
		QD-36	QD-37	QD-38	QD-39	QD-41
Cl mg/L	Minimum	116	249	167	26	15
	Mean	119	264	170	27	15
	Maximum	125	304	172	27	15
	Stdv.	5	24	3	1	0
	Median	117	250	171	27	15
	COV	4	9	2	2	0
FC cfu/100 mL	Minimum	1	1	1	1	1
	Geo. Mean	4	1	1	1	1
	Maximum	68	1	1	1	1
	Median	1	1	1	1	1
SO ₄ mg/L	Minimum	298.8	339.4	88.9	86.5	314.2
	Mean	313.2	363.1	100.2	89.9	328.3
	Maximum	338.8	386.8	108.3	93.7	335.8
	Stdv.	22.3	20.2	10.1	3.6	12.2
	Median	301.9	358.9	103.3	89.4	334.9
	COV	7.1	5.6	10.0	4.0	3.7
NH ₃ -N mg/L	Minimum	0.30	0.17	0.30	0.02	0.27
	Mean	0.31	0.28	0.35	0.07	0.29
	Maximum	0.32	0.36	0.39	0.13	0.30
	Stdv.	0.01	0.07	0.05	0.06	0.02
	Median	0.30	0.31	0.36	0.06	0.29
	COV	3.77	25.50	13.09	79.54	5.33
TOC mg/L	Minimum	1.5	1.0	1.0	1.0	1.5
	Mean	1.6	1.0	1.0	1.0	1.6
	Maximum	1.8	1.0	1.0	1.0	1.7
	Stdv.	0.2	0.0	0.0	0.0	0.1
	Median	1.6	1.0	1.0	1.0	1.7
	COV	9.4	0.0	0.0	0.0	7.1

TABLE 4 (Continued): SUMMARY STATISTICS OF THE 2010 DATA FOR THE GROUNDWATER QUALITY MONITORING WELLS IN THE DES PLAINES TUNNEL SYSTEM: QD-36, QD-37, QD-38, QD-39, AND QD-41

Parameter ¹		Well Number				
		QD-36	QD-37	QD-38	QD-39	QD-41
TDS mg/L	Minimum	1,240	1,382	806	788	770
	Mean	1,299	1,457	823	940	857
	Maximum	1,386	1,510	832	1,242	1,024
	Stdv.	77	46	14	262	145
	Median	1,270	1,466	830	790	776
	COV	6	3	2	28	17
Hard. mg/L as CO ₃	Minimum	764	235	246	18	401
	Mean	778	487	254	28	415
	Maximum	786	633	268	47	438
	Stdv.	12	169	12	16	20
	Median	784	575	247	19	406
	COV	2	35	5	59	5
Cond. µmhos/cm	Minimum	706	836	747	811	685
	Mean	819	1,008	773	878	754
	Maximum	908	1,115	807	955	820
	Stdv.	103	106	31	73	68
	Median	843	1,040	766	867	756
	COV	13	11	4	8	9
pH unit	Minimum	6.7	7.3	7.4	8.2	6.9
	Mean	7.0	7.5	7.4	8.3	7.2
	Maximum	7.2	7.7	7.5	8.4	7.5
	Stdv.	0.3	0.2	0.0	0.1	0.3
	Median	7.0	7.5	7.4	8.4	7.4
	COV	3.7	2.2	0.7	1.2	4.7

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

TABLE 5: SUMMARY STATISTICS OF THE 2010 DATA FOR THE GROUNDWATER QUALITY MONITORING WELLS IN THE DES PLAINES TUNNEL SYSTEM: QD-42 THROUGH QD-46

Parameter ¹		Well Number				
		QD-42	QD-43	QD-44	QD-45	QD-46
Cl mg/L	Minimum	18	19	17	17	15
	Mean	21	33	17	18	63
	Maximum	27	41	17	19	151
	Stdv.	5	12	0	1	77
	Median	19	39	17	17	22
	COV	23	37	0	7	122
FC cfu/100 mL	Minimum	1	1	1	1	1
	Geo. Mean	1	1	1	1	1
	Maximum	1	1	1	1	1
	Median	1	1	1	1	1
SO ₄ mg/L	Minimum	266.3	195.6	204.2	199.7	120.3
	Mean	272.6	232.8	215.3	208.3	176.2
	Maximum	277.5	277.5	226.1	219.1	255.3
	Stdv.	5.8	41.5	10.9	9.9	70.4
	Median	274.1	225.3	215.6	206.1	153.0
	COV	2.1	17.8	5.1	4.7	40.0
NH ₃ -N mg/L	Minimum	0.29	0.29	0.33	0.32	0.21
	Mean	0.32	0.31	0.34	0.33	0.40
	Maximum	0.33	0.33	0.35	0.34	0.74
	Stdv.	0.02	0.02	0.01	0.01	0.29
	Median	0.33	0.32	0.35	0.33	0.26
	COV	7.29	6.64	3.36	3.03	72.55
TOC mg/L	Minimum	1.1	1.1	1.0	1.1	1.0
	Mean	1.2	1.1	1.1	1.3	1.0
	Maximum	1.2	1.2	1.2	1.7	1.0
	Stdv.	0.1	0.1	0.1	0.3	0.0
	Median	1.2	1.1	1.1	1.2	1.0
	COV	4.9	5.1	9.1	24.1	0.0

TABLE 5 (Continued): SUMMARY STATISTICS OF THE 2010 DATA FOR THE GROUNDWATER QUALITY MONITORING WELLS IN THE DES PLAINES TUNNEL SYSTEM: QD-42 THROUGH QD-46

Parameter ¹		Well Number				
		QD-42	QD-43	QD-44	QD-45	QD-46
TDS mg/L	Minimum	744	696	528	554	602
	Mean	847	761	560	595	838
	Maximum	1,018	872	598	640	1,296
	Stdv.	149	96	35	43	397
	Median	778	716	554	590	616
	COV	18	13	6	7	47
Hard. mg/L as CO ₃	Minimum	375	436	79	87	74
	Mean	390	531	225	198	272
	Maximum	398	701	307	417	663
	Stdv.	13	148	127	189	338
	Median	396	456	288	91	80
	COV	3	28	56	95	124
Cond. µmhos/cm	Minimum	654	551	371	449	516
	Mean	702	630	427	541	562
	Maximum	745	672	510	658	652
	Stdv.	46	68	73	107	78
	Median	706	666	399	517	519
	COV	7	11	17	20	14
pH unit	Minimum	7.4	7.3	7.5	7.3	7.5
	Mean	7.5	7.4	7.6	7.8	7.6
	Maximum	7.5	7.5	7.8	8.5	7.7
	Stdv.	0.0	0.1	0.2	0.6	0.1
	Median	7.5	7.3	7.6	7.6	7.6
	COV	0.6	1.6	2.1	8.3	0.7

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

TABLE 6: SUMMARY STATISTICS OF THE 2010 DATA FOR THE GROUNDWATER QUALITY MONITORING WELLS IN THE DES PLAINES TUNNEL SYSTEM: QD-47 THROUGH QD-51

Parameter ¹		Well Number				
		QD-47	QD-48	QD-49	QD-50	QD-51
Cl mg/L	Minimum	15	15	15	15	15
	Mean	17	15	15	15	15
	Maximum	22	15	15	15	15
	Stdv.	4	0	0	0	0
	Median	15	15	15	15	15
	COV	23	0	0	0	0
FC cfu/100 mL	Minimum	1	1	1	1	1
	Geo. Mean	1	1	1	1	2
	Maximum	1	1	1	1	6
	Median	1	1	1	1	1
SO ₄ mg/L	Minimum	152.7	248.3	198.9	276.9	115.9
	Mean	153.9	270.5	220.4	280.0	120.2
	Maximum	156.0	283.9	241.8	284.2	128.2
	Stdv.	1.8	19.4	21.4	3.8	6.9
	Median	153.0	279.2	220.5	278.8	116.5
	COV	1.2	7.2	9.7	1.4	5.8
NH ₃ -N mg/L	Minimum	0.24	0.11	0.11	0.12	0.03
	Mean	0.25	0.18	0.19	0.14	0.05
	Maximum	0.26	0.27	0.35	0.16	0.07
	Stdv.	0.01	0.08	0.14	0.02	0.02
	Median	0.25	0.17	0.12	0.13	0.06
	COV	4.00	44.09	70.23	15.23	39.03
TOC mg/L	Minimum	1.0	1.0	1.0	1.0	1.0
	Mean	1.0	1.0	1.0	1.0	1.1
	Maximum	1.0	1.0	1.0	1.0	1.2
	Stdv.	0.0	0.0	0.0	0.0	0.1
	Median	1.0	1.0	1.0	1.0	1.1
	COV	0.0	0.0	0.0	0.0	9.1

TABLE 6 (Continued): SUMMARY STATISTICS OF THE 2010 DATA FOR THE GROUNDWATER QUALITY MONITORING WELLS IN THE DES PLAINES TUNNEL SYSTEM: QD-47 THROUGH QD-51

Parameter ¹		Well Number				
		QD-47	QD-48	QD-49	QD-50	QD-51
TDS mg/L	Minimum	528	526	552	680	514
	Mean	532	575	607	695	534
	Maximum	540	612	660	708	560
	Stdv.	7	44	54	14	24
	Median	528	586	610	698	528
	COV	1	8	9	2	4
Hard. mg/L as CO ₃	Minimum	234	231	274	7	4
	Mean	241	273	311	9	5
	Maximum	248	316	345	10	6
	Stdv.	7	43	36	2	1
	Median	242	273	313	9	5
	COV	3	16	11	18	20
Cond. µmhos/cm	Minimum	487	468	449	671	524
	Mean	508	502	498	727	624
	Maximum	540	536	585	774	682
	Stdv.	29	34	76	52	87
	Median	496	501	460	735	667
	COV	6	7	15	7	14
pH unit	Minimum	7.4	7.6	7.0	7.8	8.1
	Mean	7.6	8.0	7.6	8.5	8.8
	Maximum	7.8	8.4	8.2	9.5	9.3
	Stdv.	0.2	0.4	0.6	0.9	0.6
	Median	7.7	8.1	7.6	8.2	9.2
	COV	2.6	4.9	8.2	10.5	7.3

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

TABLE 7: SUMMARY STATISTICS OF THE 2010 DATA FOR THE GROUNDWATER QUALITY MONITORING WELLS IN THE DES PLAINES TUNNEL SYSTEM: QD-52 THROUGH QD-56

Parameter ¹		Well Number				
		QD-52	QD-53	QD-54	QD-55	QD-56
Cl mg/L	Minimum	15	18	16	17	15
	Mean	15	18	17	17	15
	Maximum	15	19	17	17	15
	Stdv.	0	1	1	0	0
	Median	15	18	17	17	15
	COV	0	3	3	0	0
FC cfu/100 mL	Minimum	1	1	1	1	1
	Geo. Mean	1	1	1	1	1
	Maximum	1	1	1	1	1
	Median	1	1	1	1	1
SO ₄ mg/L	Minimum	128.2	160.1	137.1	178.1	8.2
	Mean	137.9	165.7	145.7	193.3	9.5
	Maximum	148.1	172.7	155.5	214.7	11.9
	Stdv.	9.9	6.4	9.3	19.1	2.1
	Median	137.6	164.2	144.5	186.9	8.5
	COV	7.2	3.9	6.4	9.9	21.7
NH ₃ -N mg/L	Minimum	0.11	0.02	0.21	0.36	0.22
	Mean	0.12	0.02	0.22	0.37	0.23
	Maximum	0.13	0.02	0.23	0.38	0.24
	Stdv.	0.01	0.00	0.01	0.01	0.01
	Median	0.13	0.02	0.23	0.37	0.24
	COV	9.36	0.00	5.17	2.70	4.95
TOC mg/L	Minimum	1.0	1.2	1.0	1.2	1.0
	Mean	1.1	1.3	1.0	1.3	1.0
	Maximum	1.2	1.4	1.0	1.3	1.0
	Stdv.	0.1	0.1	0.0	0.1	0.0
	Median	1.1	1.3	1.0	1.3	1.0
	COV	9.1	7.7	0.0	4.6	0.0

TABLE 7 (Continued): SUMMARY STATISTICS OF THE 2010 DATA FOR THE GROUNDWATER QUALITY MONITORING WELLS IN THE DES PLAINES TUNNEL SYSTEM: QD-52 THROUGH QD-56

Parameter ¹		Well Number				
		QD-52	QD-53	QD-54	QD-55	QD-56
TDS mg/L	Minimum	472	444	406	486	290
	Mean	481	509	435	493	299
	Maximum	492	592	454	502	314
	Stdv.	10	76	25	8	13
	Median	480	492	444	492	292
	COV	2	15	6	2	4
Hard. mg/L as CO ₃	Minimum	15	9	36	145	41
	Mean	18	64	37	163	48
	Maximum	21	148	38	197	53
	Stdv.	3	74	1	29	6
	Median	19	36	36	148	49
	COV	17	115	3	18	13
Cond. µmhos/cm	Minimum	523	443	443	432	333
	Mean	566	764	723	486	355
	Maximum	607	1,216	1,216	515	378
	Stdv.	42	403	428	47	22
	Median	569	634	510	511	353
	COV	7	53	59	10	6
pH unit	Minimum	8.0	7.8	7.5	4.6	7.4
	Mean	8.6	8.4	8.1	7.4	7.9
	Maximum	9.1	9.0	8.8	10.5	8.1
	Stdv.	0.6	0.6	0.6	3.0	0.4
	Median	8.9	8.4	8.2	7.2	8.1
	COV	6.5	7.0	7.8	39.8	5.3

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

TABLE 8: SUMMARY STATISTICS OF THE 2010 DATA FOR THE GROUNDWATER QUALITY MONITORING WELLS IN THE DES PLAINES TUNNEL SYSTEM: QD-57 THROUGH QD-60

Parameter ¹		Well Number			
		QD-57	QD-58	QD-59	QD-60
Cl mg/L	Minimum	15	15	114	42
	Mean	15	15	115	43
	Maximum	15	15	116	44
	Stdv.	N/C ²	N/C	1	1
	Median	15	15	116	43
	COV	N/C	N/C	1	2
FC cfu/100 mL	Minimum	1	1	1	1
	Geo. Mean	1	1	1	1
	Maximum	1	1	1	1
	Median	1	1	1	1
SO ₄ mg/L	Minimum	54.1	2.0	45.2	94.1
	Mean	54.1	2.0	47.0	99.5
	Maximum	54.1	2.0	50.0	110.2
	Stdv.	N/C	N/C	2.6	9.2
	Median	54.1	2.0	45.7	94.3
	COV	N/C	N/C	5.6	9.3
NH ₃ -N mg/L	Minimum	0.25	0.32	0.35	0.34
	Mean	0.25	0.32	0.36	0.36
	Maximum	0.25	0.32	0.36	0.39
	Stdv.	N/C	N/C	0.01	0.03
	Median	0.25	0.32	0.36	0.36
	COV	N/C	N/C	1.62	6.93
TOC mg/L	Minimum	1.0	1.0	1.0	1.0
	Mean	1.0	1.0	1.0	1.0
	Maximum	1.0	1.0	1.0	1.0
	Stdv.	N/C	N/C	0.0	0.0
	Median	1.0	1.0	1.0	1.0
	COV	N/C	N/C	0.0	0.0

TABLE 8 (Continued): SUMMARY STATISTICS OF THE 2010 DATA FOR THE GROUNDWATER QUALITY MONITORING WELLS IN THE DES PLAINES TUNNEL SYSTEM: QD-57 THROUGH QD-60

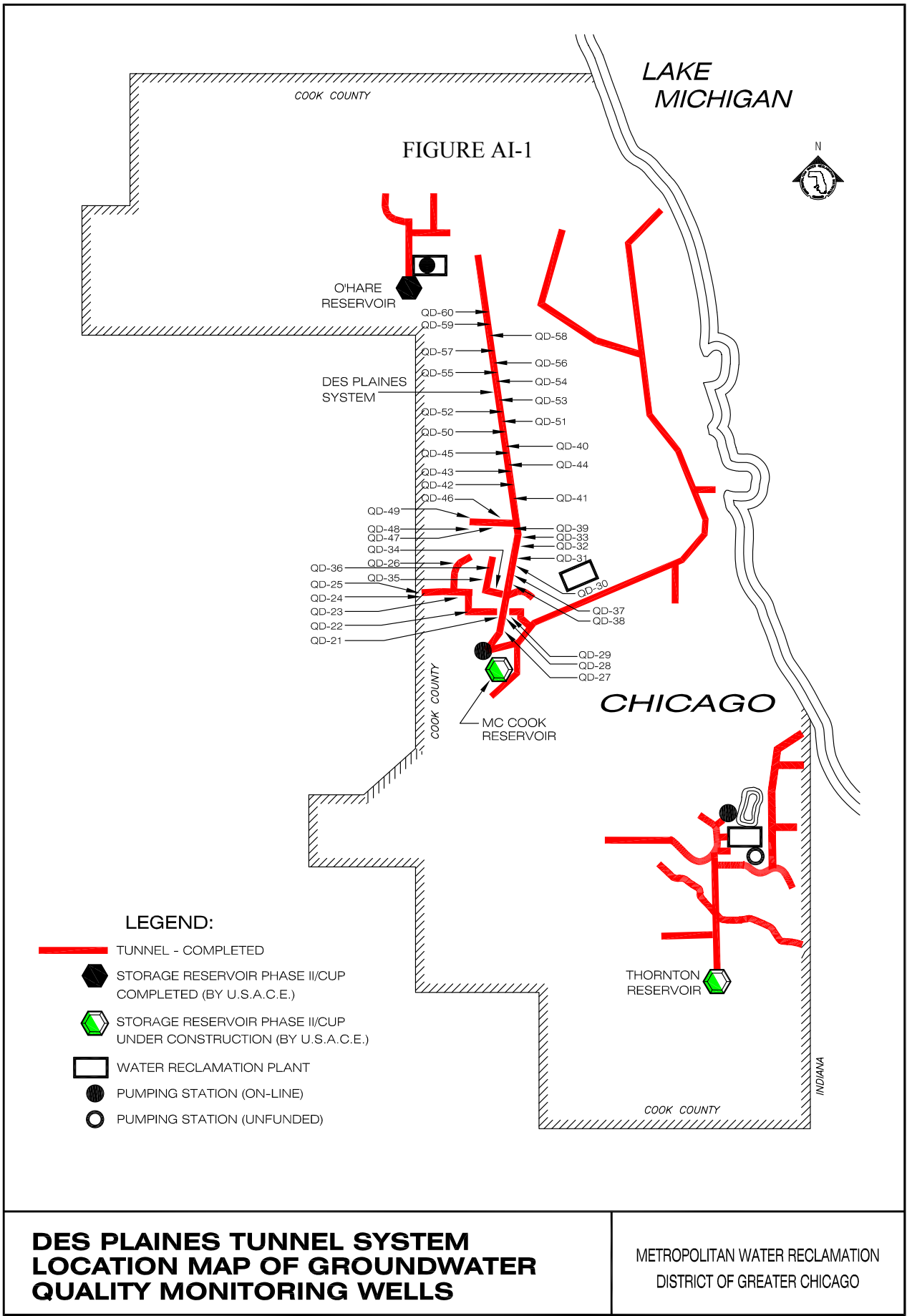
Parameter ¹		Well Number			
		QD-57	QD-58	QD-59	QD-60
TDS mg/L	Minimum	392	278	460	400
	Mean	392	278	495	419
	Maximum	392	278	524	428
	Stdv.	N/C	N/C	32	16
	Median	392	278	500	428
	COV	N/C	N/C	7	4
	Hard. mg/L as CO ₃	Minimum	19	110	262
Mean		19	110	274	248
Maximum		19	110	289	263
Stdv.		N/C	N/C	14	14
Median		19	110	270	247
COV		N/C	N/C	5	6
Cond. µmhos/cm		Minimum	405	286	430
	Mean	405	286	503	405
	Maximum	405	286	601	451
	Stdv.	N/C	N/C	88	43
	Median	405	286	479	401
	COV	N/C	N/C	17	11
	pH unit	Minimum	7.7	7.3	7.2
Mean		7.7	7.3	7.4	7.6
Maximum		7.7	7.3	7.6	7.7
Stdv.		N/C	N/C	0.2	0.1
Median		7.7	7.3	7.5	7.5
COV		N/C	N/C	2.6	1.2

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

²N/C = No calculation due to single value.

APPENDIX AI

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



APPENDIX AII

2010 GROUNDWATER QUALITY DATA FOR MONITORING WELLS QD-21 THROUGH
QD-60 IN THE DES PLAINES TUNNEL SYSTEM

TABLE AII-1: 2010 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 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	2/9/10	269	<1	308.0	0.20	4.6	1,328
QD-21	6/24/10	245	<1	322.2	0.21	2.0	1,656
QD-21	11/9/10	233	<1	351.0	0.24	1.7	1,366
QD-22	2/9/10	137	<1	272.6	0.39	1.4	1,070
QD-22	6/24/10	111	<1	275.0	0.38	1.1	1,276
QD-22	11/9/10	149	<1	375.0	0.36	1.4	1,278
QD-23	2/10/10	175	<1	368.5	0.38	1.9	1,316
QD-23	6/24/10	194	<1	363.9	0.49	1.6	1,646
QD-23	11/9/10	199	<1	396.0	0.45	1.7	1,448
QD-24	2/10/10	92	<1	91.1	0.33	2.0	634
QD-24	7/8/10	<15	<1	122.6	0.22	1.0	682
QD-24	11/9/10	99	<1	159.0	0.43	1.9	754
QD-25	2/17/10	464	<1	242.3	0.71	1.4	1,604
QD-25	7/8/10	506	<1	245.5	0.75	1.6	1,870
QD-25	11/9/10	483	<1	198.5	0.63	1.7	1,480
QD-26	4/1/10	<15	<1	94.7	0.35	<1.0	518
QD-26	9/30/10	<15	<1	108.9	0.34	<1.0	554
QD-26	12/16/10	<15	<1	114.2	0.36	<1.0	552
QD-27	1/28/10	325	<1	36.3	29.53	17.3	1,236
QD-27	3/11/10	341	<1	42.9	29.07	15.9	1,280
QD-27	4/1/10	328	<1	42.4	29.01	15.7	1,266
QD-27	6/10/10	327	<1	37.4	29.60	17.4	1,318
QD-27	9/30/10	341	1	43.4	29.21	17.0	1,288
QD-27	12/16/10	429	<1	53.0	33.96	16.1	1,392
QD-28	2/2/10	291	<1	267.2	0.55	1.2	1,370
QD-28	8/30/10	263	<1	227.8	0.61	1.7	1,292
QD-28	12/15/10	284	<1	248.0	0.63	1.1	1,154

TABLE AII-1 (Continued): 2010 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 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	2/2/10	133	<1	257.3	0.40	1.9	1,064
QD-29	8/30/10	144	<1	276.0	0.43	3.4	1,156
QD-29	12/15/10	142	<1	284.2	0.48	2.0	1,068
QD-30	2/18/10	121	<1	295.5	0.33	1.2	1,064
QD-30	4/1/10	120	<1	326.8	0.21	1.3	1,132
QD-30	10/21/10	133	<1	<2.0	0.26	1.3	1,276
QD-31	2/18/10	116	<1	216.7	0.25	1.0	946
QD-31	4/1/10	120	<1	183.9	0.25	<1.0	950
QD-31	10/21/10	135	1	182.1	0.23	<1.0	992
QD-32	2/18/10	515	<1	221.5	0.25	<1.0	2,014
QD-32	4/1/10	519	<1	228.0	0.23	<1.0	1,970
QD-32	10/21/10	514	<1	213.7	0.23	<1.0	2,018
QD-33	1/28/10	340	<1	192.1	0.24	<1.0	1,620
QD-33	3/11/10	345	<1	190.3	0.24	<1.0	1,626
QD-33	4/1/10	352	<1	198.6	0.33	<1.0	1,646
QD-33	6/10/10	345	<1	189.4	0.25	<1.0	2,004
QD-33	9/30/10	349	<1	204.7	0.28	1.0	1,638
QD-33	12/16/10	358	<1	209.6	0.31	<1.0	1,654
QD-34	2/2/10	125	<1	292.5	0.24	1.6	1,098
QD-34	3/29/10	125	<1	303.2	0.38	1.7	1,178
QD-34	5/12/10	102	<1	311.0	0.39	1.9	1,076
QD-34	7/8/10			Well could not be sampled			
QD-34	9/1/10			Well could not be sampled			
QD-34	12/15/10	131	<1	287.6	0.44	1.8	1,040
QD-35	2/17/10	110	<1	260.8	0.28	2.2	966
QD-35	3/29/10	114	<1	262.7	0.32	1.9	1,062
QD-35	8/30/10	106	<1	271.1	0.32	2.2	1,144

TABLE AII-1 (Continued): 2010 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 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	3/29/10	125	<1	298.8	0.30	1.5	1,240
QD-36	6/12/10	117	<1	301.9	0.30	1.8	1,270
QD-36	8/30/10	116	68	338.8	0.32	1.6	1,386
QD-37	1/28/10	250	<1	380.8	0.31	<1.0	1,458
QD-37	3/11/10	249	<1	358.9	0.31	<1.0	1,466
QD-37	4/1/10	250	<1	386.8	0.36	<1.0	1,468
QD-37	6/10/10	265	<1	349.9	0.26	<1.0	1,510
QD-37	9/30/10	304	<1	339.4	0.17	<1.0	1,382
QD-37	12/2/10	Well could not be sampled					
QD-38	1/28/10	172	<1	88.9	0.39	<1.0	832
QD-38	3/11/10	167	<1	103.3	0.36	<1.0	806
QD-38	4/1/10	171	<1	108.3	0.30	<1.0	830
QD-39	3/11/10	27	<1	89.4	<0.02	<1.0	790
QD-39	6/10/10	27	<1	86.5	0.13	<1.0	1,242
QD-39	10/21/10	26	<1	93.7	0.06	<1.0	788
QD-40	3/11/10	Well could not be sampled					
QD-40	6/10/10	Well could not be sampled					
QD-40	10/21/10	Well could not be sampled					
QD-41	3/11/10	15	<1	314.2	0.29	1.7	770
QD-41	6/10/10	15	<1	334.9	0.30	1.5	1,024
QD-41	10/21/10	<15	<1	335.8	0.27	1.7	776
QD-42	3/11/10	18	<1	266.3	0.33	1.2	744
QD-42	6/10/10	27	<1	274.1	0.33	1.1	1,018
QD-42	10/21/10	19	<1	277.5	0.29	1.2	778
QD-43	3/11/10	41	<1	195.6	0.33	1.1	696
QD-43	10/21/10	39	<1	225.3	0.32	1.1	872
QD-43	10/21/10	19	<1	277.5	0.29	1.2	778

TABLE AII-1 (Continued): 2010 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 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	4/8/10	17	<1	204.2	0.35	1.0	598
QD-44	6/24/10	17	<1	226.1	0.35	1.2	862
QD-44	10/21/10	17	<1	215.6	0.33	1.1	602
QD-45	2/25/10	17	<1	199.7	0.34	1.7	590
QD-45	4/8/10	17	<1	206.1	0.32	1.1	554
QD-45	6/24/10	19	<1	219.1	0.33	1.2	640
QD-46	2/23/10	<15	<1	120.3	0.21	<1.0	602
QD-46	7/8/10	151	<1	255.3	0.74	<1.0	1,296
QD-46	7/15/10	22	<1	153.0	0.26	<1.0	540
QD-47	2/25/10	15	<1	152.7	0.24	<1.0	528
QD-47	4/8/10	15	<1	156.0	0.25	<1.0	528
QD-47	7/15/10	22	<1	153.0	0.26	<1.0	540
QD-48	2/25/10	<15	<1	248.3	0.27	<1.0	526
QD-48	4/8/10	<15	<1	283.9	0.11	<1.0	612
QD-48	7/15/10	<15	<1	279.2	0.17	<1.0	586
QD-49	2/25/10	<15	<1	198.9	0.35	<1.0	552
QD-49	7/15/10	<15	<1	220.5	0.11	<1.0	610
QD-49	9/30/10	<15	<1	241.8	0.12	<1.0	660
QD-50	4/8/10	<15	<1	276.9	0.13	<1.0	680
QD-50	7/15/10	<15	<1	278.8	0.12	<1.0	698
QD-50	12/16/10	<15	<1	284.2	0.16	<1.0	708
QD-51	4/8/10	<15	<1	115.9	0.07	1.0	528
QD-51	7/15/10	<15	6	116.5	0.06	1.2	560
QD-51	9/2/10	<15	<1	128.2	0.03	1.1	514
QD-52	4/8/10	15	<1	128.2	0.13	1.0	480
QD-52	7/15/10	15	<1	137.6	0.13	1.1	492
QD-52	9/2/10	15	1	148.1	0.11	1.2	472

TABLE AII-1 (Continued): 2010 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 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	5/15/10	19	<1	160.1	0.02	1.2	592
QD-53	7/15/10	18	<1	164.2	0.02	1.4	606
QD-53	9/2/10	18	<1	172.7	<0.02	1.3	580
QD-54	5/15/10	17	<1	137.1	0.23	<1.0	444
QD-54	7/15/10	16	<1	144.5	0.23	1.0	454
QD-54	9/2/10	17	<1	155.5	0.21	<1.0	406
QD-55	5/15/10	17	<1	178.1	0.36	1.3	492
QD-55	7/15/10	17	<1	186.9	0.38	1.3	502
QD-55	9/2/10	17	<1	214.7	0.37	1.2	486
QD-56	3/18/10	<15	<1	8.2	0.24	<1.0	290
QD-56	5/15/10	<15	<1	8.5	0.24	<1.0	314
QD-56	9/2/10	<15	<1	11.9	0.22	<1.0	292
QD-57	3/16/10			Well could not be sampled			
QD-57	4/15/10	<15	<1	54.1	0.25	<1.0	392
QD-57	9/2/10			Well could not be sampled			
QD-58	3/16/10			Well could not be sampled			
QD-58	4/15/10	<15	<1	<2.0	0.32	<1.0	278
QD-58	12/16/10			Well could not be sampled			
QD-59	3/18/10	114	<1	45.7	0.36	<1.0	460
QD-59	5/15/10	116	<1	45.2	0.36	<1.0	500
QD-59	9/2/10	116	<1	50.0	0.35	<1.0	524
QD-60	3/18/10	42	<1	94.3	0.39	<1.0	428
QD-60	5/15/10	44	<1	94.1	0.36	<1.0	428
QD-60	9/2/10	43	<1	110.2	0.34	<1.0	400

¹The limit of quantification is 15 mg/L for Cl, 2.0 mg/L for SO₄, 0.02 mg/L for NH₃-N, 1.0 mg/L for TOC, and 40 mg/L for TDS. The detection limit for the FC analysis using the membrane filter method varies based on the actual sample analyzed.

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

TABLE AII-2: 2010 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	2/9/10	788	1,177	7.0	12	-65	<4
QD-21	6/24/10	750	803	7.1	14	-76	<4
QD-21	11/9/10	739	1,191	7.0	13	-68	<4
QD-22	2/9/10	774	999	7.5	10	-26	<4
QD-22	6/24/10	802	792	7.0	14	-24	<4
QD-22	11/9/10	798	930	6.9	13	-27	<4
QD-23	2/10/10	853	730	7.3	13	-32	<4
QD-23	6/24/10	305	971	6.9	13	-27	<4
QD-23	11/9/10	857	1,123	7.1	13	-32	<4
QD-24	2/10/10	423	737	7.3	11	19	<4
QD-24	7/8/10	66	1,029	7.8	12	12	<4
QD-24	11/9/10	468	962	6.9	12	18	<4
QD-25	2/17/10	734	1,685	7.0	10	30	<4
QD-25	7/8/10	688	1,145	7.4	13	14	<4
QD-25	11/9/10	545	1,145	7.4	12	32	<4
QD-26	4/1/10	369	395	7.2	13	-26	<48
QD-26	9/30/10	413	413	7.8	14	-26	<48
QD-26	12/16/10	426	603	7.3	11	-34	<48
QD-27	1/28/10	525	1,007	7.5	7	-209	<48
QD-27	3/11/10	545	1,041	7.4	13	-214	<48
QD-27	4/1/10	485	1,071	7.3	13	-217	<48
QD-27	6/10/10	497	390	7.2	15	-222	<48
QD-27	9/30/10	515	2,110	7.8	14	-194	<48
QD-27	12/16/10	562	353	7.5	11	-229	<48
QD-28	2/2/10	721	1,198	7.4	4	-143	<4
QD-28	8/30/10	627	1,143	7.3	14	-119	<4
QD-28	12/15/10	649	1,120	6.9	12	-126	<4

TABLE AII-2 (Continued): 2010 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-29	2/2/10	706	1,010	7.6	6	-181	<4
QD-29	8/30/10	712	847	7.0	14	-171	<4
QD-29	12/15/10	717	889	6.9	10	-154	<4
QD-30	2/18/10	664	960	7.1	11	-121	<48
QD-30	4/1/10	689	871	7.6	12	-130	<48
QD-30	10/21/10	718	591	6.9	12	-133	<48
QD-31	2/18/10	244	666	7.4	10	-196	<48
QD-31	4/1/10	244	840	7.9	12	-194	<48
QD-31	10/21/10	242	747	7.4	11	-198	<48
QD-32	2/18/10	39	1,970	9.6	10	-213	<48
QD-32	4/1/10	36	1,899	8.0	12	-207	<48
QD-32	10/21/10	33	1,856	9.2	11	-208	<48
QD-33	1/28/10	29	1,211	7.2	6	-177	<48
QD-33	3/11/10	29	667	7.5	12	-182	<48
QD-33	4/1/10	28	1,715	8.3	12	-171	<48
QD-33	6/10/10	82	610	8.1	14	-185	<48
QD-33	9/30/10	29	1,996	7.8	13	-183	<48
QD-33	12/16/10	28	481	7.7	11	-191	<48
QD-34	2/2/10	730	1,113	7.7	4	-129	<4
QD-34	3/29/10	741	836	7.0	12	-106	<4
QD-34	5/12/10	740	708	7.0	12	-101	<4
QD-34	7/8/10			Well could not be sampled			
QD-34	9/1/10			Well could not be sampled			
QD-34	12/15/10	708	829	6.9	11	-103	<4
QD-35	2/17/10	647	862	6.8	12	-99	<4
QD-35	3/29/10	677	810	7.3	11	-99	<4
QD-35	8/30/10	654	906	7.0	14	-106	<4
QD-36	3/29/10	784	908	7.2	11	-113	<4
QD-36	6/12/10	764	706	6.7	11	-106	<4
QD-36	8/30/10	786	843	7.0	13	-129	<4

TABLE AII-2 (Continued): 2010 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	1/28/10	601	988	7.7	5	-213	<48
QD-37	3/11/10	633	1,040	7.5	12	-221	<48
QD-37	4/1/10	575	1,115	7.3	13	-219	<48
QD-37	6/10/10	392	1,061	7.5	15	-221	<48
QD-37	9/30/10	235	836	7.3	13	-208	<48
QD-37	12/2/10	Well could not be sampled					
QD-38	1/28/10	246	747	7.4	4	-203	<48
QD-38	3/11/10	268	766	7.4	13	-206	<48
QD-38	4/1/10	247	807	7.5	12	-208	<48
QD-39	3/11/10	19	867	8.4	12	-138	<48
QD-39	6/10/10	47	811	8.2	13	-107	<48
QD-39	10/21/10	18	955	8.4	11	-109	<48
QD-40	3/11/10	Well could not be sampled					
QD-40	6/10/10	Well could not be sampled					
QD-40	10/21/10	Well could not be sampled					
QD-41	3/11/10	438	756	7.5	13	-133	<48
QD-41	6/10/10	406	685	6.9	13	-132	<48
QD-41	10/21/10	401	820	7.4	13	-141	<48
QD-42	3/11/10	398	745	7.5	12	-119	<48
QD-42	6/10/10	396	654	7.5	13	-118	<48
QD-42	10/21/10	375	706	7.4	12	-121	<48
QD-43	3/11/10	456	672	7.5	11	-137	<48
QD-43	10/21/10	701	551	7.3	13	-119	<48
QD-43	10/21/10	436	666	7.3	12	-118	<48
QD-44	4/8/10	288	399	7.5	11	-17	<4
QD-44	6/24/10	79	371	7.6	12	-10	<4
QD-44	10/21/10	307	510	7.8	11	-6	<4

TABLE AII-2 (Continued): 2010 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-45	2/25/10	87	658	8.5	10	5	<48
QD-45	4/8/10	91	449	7.6	11	-16	<48
QD-45	6/24/10	417	517	7.3	12	-3	<48
QD-46	2/23/10	74	519	7.6	12	-172	<4
QD-46	7/8/10	663	516	7.5	13	-165	<4
QD-46	7/15/10	234	652	7.7	13	-184	<4
QD-47	2/25/10	248	540	7.8	12	4	<48
QD-47	4/8/10	242	496	7.4	12	-8	<48
QD-47	7/15/10	234	487	7.7	15	6	<48
QD-48	2/25/10	231	536	8.4	12	-173	<48
QD-48	4/8/10	316	468	7.6	13	-178	<48
QD-48	7/15/10	273	501	8.1	16	-176	<48
QD-49	2/25/10	274	585	8.2	11	-181	<48
QD-49	7/15/10	313	460	7.0	19	-181	<48
QD-49	9/30/10	345	449	7.6	20	-183	<48
QD-50	4/8/10	10	671	8.2	13	-133	<48
QD-50	7/15/10	7	735	9.5	15	-136	<48
QD-50	12/16/10	9	774	7.8	11	-138	<48
QD-51	4/8/10	4	682	8.1	13	-109	<48
QD-51	7/15/10	5	667	9.3	14	-108	<48
QD-51	9/2/10	6	524	9.2	13	-110	<48
QD-52	4/8/10	15	569	8.0	14	-67	<48
QD-52	7/15/10	19	607	9.1	16	-71	<48
QD-52	9/2/10	21	523	8.9	14	-68	<48
QD-53	5/15/10	9	634	7.8	14	-165	<48
QD-53	7/15/10	11	734	9.0	17	-166	<48
QD-53	9/2/10	10	645	8.4	14	-168	<48

TABLE AII-2 (Continued): 2010 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-54	5/15/10	36	443	7.5	13	-26	<48
QD-54	7/15/10	36	1,216	8.8	14	-24	<48
QD-54	9/2/10	38	510	8.2	13	-29	<48
QD-55	5/15/10	148	432	4.6	13	-139	<48
QD-55	7/15/10	145	511	10.5	15	-145	<48
QD-55	9/2/10	197	515	7.2	13	-147	<48
QD-56	3/18/10	53	333	8.1	11	-68	<48
QD-56	5/15/10	41	353	7.4	12	-70	<48
QD-56	9/2/10	49	378	8.1	12	-67	<48
QD-57	3/16/10			Well could not be sampled			
QD-57	4/15/10	19	405	7.7	12	-98	<48
QD-57	9/2/10			Well could not be sampled			
QD-58	3/16/10			Well could not be sampled			
QD-58	4/15/10	110	286	7.3	12	-96	<48
QD-58	12/16/10			Well could not be sampled			
QD-59	3/18/10	289	430	7.6	12	-38	<48
QD-59	5/15/10	262	479	7.2	13	-33	<48
QD-59	9/2/10	270	601	7.5	13	-47	<48
QD-60	3/18/10	263	365	7.7	12	-105	<48
QD-60	5/15/10	235	401	7.5	14	-108	<48
QD-60	9/2/10	247	451	7.5	13	-120	<48

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

²Water level elevations are relative to Chicago City Datum.

³Refers to elapsed time after initial drawdown before the well recovered sufficiently for sampling.