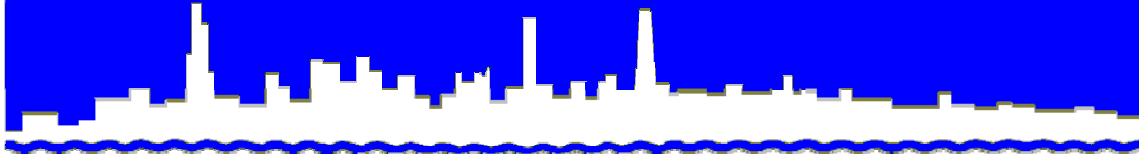


Protecting Our Water Environment



Metropolitan Water Reclamation District of Greater Chicago

***RESEARCH AND DEVELOPMENT
DEPARTMENT***

REPORT NO. 08-50

***TUNNEL AND RESERVOIR PLAN
CALUMET TUNNEL SYSTEM
2007 ANNUAL GROUNDWATER MONITORING REPORT***

SEPTEMBER 2008

Protecting Our Water Environment

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September 19, 2008

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, Calumet Tunnel System, 2007 Annual
Groundwater Monitoring Report

Enclosed are three copies of "Tunnel and Reservoir Plan, Calumet Tunnel System, 2007
Annual Groundwater Monitoring Report."

Very truly yours,

Louis Kollias
Director
Research and Development

LK:HZ:lmf

Enclosures

cc w/enc: Ms. Sally K. Swanson (USEPA Region V—WC15J) (2)

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INTRODUCTION

This report contains 2007 data for the Tunnel and Reservoir Plan Calumet Tunnel System compiled from the monitoring of the groundwater level elevations in the observation wells and monitoring of water quality in the water quality monitoring wells. The observation and monitoring wells are located along the Calumet Tunnel System. The tunnel between Crawford Avenue and the Calumet Water Reclamation Plant has four water quality monitoring wells (QC-1, QC-2, QC-2.1, and QC-2.2) and 11 observation wells (OC-1 through OC-11). The tunnel between 140th Street and Indiana Avenue has 17 water quality monitoring wells (QC-3 through QC-19). The tunnel on the Torrence Avenue leg has nine water quality monitoring wells (QC-20 through QC-28). The tunnel along the Little Calumet leg has nine water quality monitoring wells (QC-29 through QC-37).

Water quality monitoring wells QC-1, QC-2, and QC-29 through QC-37 are sampled six times per year (Illinois Environmental Protection Agency [IEPA] memorandum July 9, 2004). Water quality monitoring wells QC-2.1, QC-2.2, QC-3 through QC-7 (QC-8.1 is a dry well), and QC-9 through QC-28 are sampled three times per year (IEPA memoranda July 9, 2004, and February 23, 2006). Water level readings are taken at the same frequency. Groundwater observation wells OC-1 through OC-11 are sampled once every two weeks.

Monitoring Data

Appendix AI contains a location map of observation wells OC-1 through OC-11 located along the Calumet Tunnel System.

Table AII-1 in Appendix AII contains groundwater elevation data for 2007 for observation wells OC-1 through OC-11 shown in Appendix AI. Table AII-1 also contains the yearly minimum, mean, and maximum water level elevations of each observation well.

Appendix AIII contains a location map of the water quality monitoring wells QC-1, QC-2, QC-2.1, QC-2.2, QC-3 through QC-7, and QC-9 through QC-37 located along the Calumet Tunnel System.

Tables AIV-1 and AIV-2 in Appendix AIV contain the 2007 water quality monitoring data for wells QC-1, QC-2, QC-2.1, QC-2.2, and QC-3 through QC-37 (except for QC-8.1 which is a dry well) along the Calumet Tunnel System shown in Appendix AIII.

All of the wells in the Calumet system were visited for the required number of samples. However, in some instances the samples could not be collected. Water quality monitoring well QC-2.1 could not be sampled on August 16, 2007, because the pump was inoperable. Water quality monitoring well QC-17 could not be sampled on October 11, 2007, because access to the well was blocked. Water quality monitoring well QC-20 could not be sampled on April 3, 2007, July 30, 2007, or November 6, 2007, because the pump fell into the well and could not be retrieved. Water quality monitoring well QC-30 could not be sampled on January 11, 2007,

because the pump was inoperable. Water quality monitoring wells QC-32 and QC-33 were not sampled during 2007 because there was insufficient water in the wells to collect a sample. Water quality monitoring well QC-34 could not be sampled on January 11, 2007, March 22, 2007, May 24, 2007, September 25, 2007, or November 27, 2007, because there was insufficient water in the well to collect a sample. Water quality monitoring wells QC-35, QC-36, and QC-37 were not sampled during 2007 because there was insufficient water in the wells to collect a sample.

The elevation of groundwater observation wells OC-1 and OC-4 could not be measured on September 7, 2007, September 21, 2007, or October 5, 2007, because access to the well was blocked by fallen trees. The elevation of groundwater observation wells OC-8 and OC-9 could not be measured on August 24, 2007, because access to the area was blocked by flooding. The elevation of groundwater observation well OC-11 could not be measured on March 9, 2007, because access to the area was blocked by road construction.

Summary of Data

Observation Well Water Level Elevation Data. In [Figure 1](#), the 2007 groundwater level elevation data for the observation wells (OC-1 through OC-11) of the Calumet Tunnel System have been plotted. In this figure, yearly minimum, mean, and maximum water level elevations of all 11 wells are plotted to show fluctuations in the water level elevations during 2007. [Table AII-1](#) in [Appendix AII](#) contains the entire groundwater level elevation data for 2007 for all the observation wells in the Calumet Tunnel System.

Water Quality Monitoring Well Data. [Tables 1](#) through [7](#) contain summary statistics of the water quality parameters for 2007 for water quality monitoring wells QC-1, QC-2, QC-2.1, QC-2.2, and QC-3 through QC-37 (except for well QC-8.1 which is a dry well) in the Calumet Tunnel System. The summary statistics include minimum, mean, maximum, standard deviation (Std. Dev.), median and coefficient of variation (Coeff. Var.) for the nine water quality parameters analyzed during 2007. The nine water quality parameters are: chloride (Cl), conductivity (Cond.), fecal coliform (FC), hardness as CaCO₃ (Hard.), ammonia as NH₄⁺-N, pH, sulfate (SO₄), total dissolved solids (TDS), and total organic carbon (TOC).

TABLE 1: SUMMARY STATISTICS OF THE 2007 DATA FOR THE WATER QUALITY MONITORING WELLS IN THE CALUMET TUNNEL SYSTEM: WELLS QC-1, QC-2, QC-2.1, QC-2.2, AND QC-3

Parameter		Well Number				
		QC-1	QC-2	QC-2.1	QC-2.2	QC-3
Cl mg/L	Minimum	73	33	5	14	13
	Mean	100	36	21	16	13
	Maximum	223	41	36	17	13
	Std. Dev.	60	3	22	2	0
	Median	75	36	21	16	13
	Coeff. Var.	60	8	107	10	0
Cond. µmhos/cm	Minimum	502	332	403	295	381
	Mean	818	477	455	410	522
	Maximum	1,505	711	507	555	621
	Std. Dev.	371	148	74	133	126
	Median	735	442	455	379	565
	Coeff. Var.	45	31	16	32	24
FC ¹ cfu/100 mL	Minimum	1	1	1	1	1
	Geo. Mean	1	22	1	1	1
	Maximum	1	130	1	1	1
	Geo. Std. Dev.	0	7	0	0	0
	Median	1	41	1	1	1
	Coeff. Var.	0	31	0	0	0
Hard. mg/L	Minimum	540	82	56	35	64
	Mean	546	89	59	38	65
	Maximum	553	98	62	41	66
	Std. Dev.	6	5	4	3	1
	Median	546	88	59	38	66
	Coeff. Var.	1	6	7	8	2
NH ₄ ⁺ -N mg/L	Minimum	0.27	0.47	0.60	0.45	0.40
	Mean	0.34	0.60	0.62	0.50	0.42
	Maximum	0.40	0.74	0.63	0.53	0.44
	Std. Dev.	0.05	0.11	0.02	0.04	0.02
	Median	0.35	0.62	0.62	0.52	0.42
	Coeff. Var.	14.23	18.53	3.45	8.72	4.76

TABLE 1 (Continued): SUMMARY STATISTICS OF THE 2007 DATA FOR THE WATER QUALITY MONITORING WELLS IN THE CALUMET TUNNEL SYSTEM: WELLS QC-1, QC-2, QC-2.1, QC-2.2, AND QC-3

Parameter	Well Number					
	QC-1	QC-2	QC-2.1	QC-2.2	QC-3	
pH	Minimum	7.3	7.4	8.0	8.2	7.6
	Mean	7.7	7.7	8.0	8.3	7.8
	Maximum	7.8	8.0	8.0	8.6	8.2
	Std. Dev.	0.2	0.2	0.0	0.2	0.3
	Median	7.8	7.7	8.0	8.2	7.7
	Coeff. Var.	2.7	2.5	0.0	2.8	4.1
SO ₄ ²⁻ mg/L	Minimum	215	21	0.40	26	24
	Mean	234	25	0.40	27	27
	Maximum	248	31	0.40	27	29
	Std. Dev.	12	4	0.00	1	3
	Median	236	25	0.40	27	28
	Coeff. Var.	5	15	0.00	2	10
TDS mg/L	Minimum	840	336	510	360	396
	Mean	879	381	521	365	411
	Maximum	1,022	434	532	374	428
	Std. Dev.	71	36	16	8	16
	Median	849	381	521	362	408
	Coeff. Var.	8	10	3	2	4
TOC mg/L	Minimum	1.4	1.2	0.9	1.0	0.4
	Mean	1.5	1.4	0.9	1.1	0.5
	Maximum	1.6	1.9	0.9	1.2	0.5
	Std. Dev.	0.1	0.3	0.0	0.1	0.1
	Median	1.5	1.3	0.9	1.1	0.5
	Coeff. Var.	5.6	20.2	0.0	9.1	12.4

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

²For purposes of statistical evaluation, sulfate values less than 0.4 mg/L were set equal to 0.4 mg/L.

TABLE 2: SUMMARY STATISTICS OF THE 2007 DATA FOR THE WATER QUALITY MONITORING WELLS IN THE CALUMET TUNNEL SYSTEM: WELLS QC-4, QC-5, QC-6, QC-7, AND QC-9

Parameter		Well Number				
		QC-4	QC-5	QC-6	QC-7	QC-9
Cl mg/L	Minimum	11	25	14	11	10
	Mean	11	26	15	13	10
	Maximum	11	27	16	16	10
	Std. Dev.	0	1	1	3	0
	Median	11	26	15	11	10
	Coeff. Var.	0	4	7	23	0
Cond. µmhos/cm	Minimum	410	520	428	384	292
	Mean	535	792	572	508	361
	Maximum	632	945	749	668	494
	Std. Dev.	114	236	163	145	115
	Median	564	912	540	472	296
	Coeff. Var.	21	30	28	29	32
FC ¹ cfu/100 mL	Minimum	1	1	1	1	1
	Geo. Mean	1	1	1	1	1
	Maximum	1	1	1	1	2
	Geo. Std. Dev.	0	0	0	0	1
	Median	1	1	1	1	1
	Coeff. Var.	0	0	0	0	118
Hard. mg/L	Minimum	10	9	17	11	60
	Mean	10	9	18	12	63
	Maximum	11	10	19	13	67
	Std. Dev.	1	1	1	1	4
	Median	10	9	18	11	62
	Coeff. Var.	6	6	6	10	6
NH ₄ ⁺ -N mg/L	Minimum	0.08	0.08	0.28	0.19	0.23
	Mean	0.14	0.14	0.31	0.23	0.37
	Maximum	0.20	0.17	0.34	0.29	0.50
	Std. Dev.	0.06	0.05	0.03	0.05	0.14
	Median	0.14	0.16	0.31	0.21	0.37
	Coeff. Var.	42.86	36.09	9.68	23.01	36.83

TABLE 2 (Continued): SUMMARY STATISTICS OF THE 2007 DATA FOR THE WATER QUALITY MONITORING WELLS IN THE CALUMET TUNNEL SYSTEM: WELLS QC-4, QC-5, QC-6, QC-7, AND QC-9

Parameter		Well Number				
		QC-4	QC-5	QC-6	QC-7	QC-9
pH	Minimum	7.7	7.6	8.1	7.9	7.6
	Mean	8.3	8.2	8.2	8.1	7.9
	Maximum	8.8	8.7	8.3	8.3	8.1
	Std. Dev.	0.6	0.6	0.1	0.2	0.3
	Median	8.4	8.2	8.2	8.0	8.0
	Coeff. Var.	6.7	6.7	1.2	2.6	3.3
SO ₄ mg/L	Minimum	12	5	7	1	28
	Mean	14	8	9	2	31
	Maximum	17	11	12	3	35
	Std. Dev.	3	3	3	1	4
	Median	14	7	7	2	29
	Coeff. Var.	18	40	33	50	12
TDS mg/L	Minimum	420	572	468	420	312
	Mean	451	618	491	454	339
	Maximum	510	702	520	502	374
	Std. Dev.	51	73	27	43	32
	Median	424	580	484	440	332
	Coeff. Var.	11	12	5	9	9
TOC mg/L	Minimum	0.5	0.8	1.1	1.1	0.8
	Mean	0.5	0.9	1.2	1.2	0.8
	Maximum	0.5	0.9	1.3	1.2	0.9
	Std. Dev.	0.0	0.1	0.1	0.1	0.1
	Median	0.5	0.9	1.2	1.2	0.8
	Coeff. Var.	0.0	6.7	8.3	4.9	6.9

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

TABLE 3: SUMMARY STATISTICS OF THE 2007 DATA FOR THE WATER QUALITY MONITORING WELLS IN THE CALUMET TUNNEL SYSTEM: WELLS QC-10 THROUGH QC-14

Parameter		Well Number				
		QC-10	QC-11	QC-12	QC-13	QC-14
Cl mg/L	Minimum	31	22	39	46	96
	Mean	32	23	39	48	99
	Maximum	32	23	40	49	103
	Std. Dev.	1	1	1	2	4
	Median	32	23	39	48	97
	Coeff. Var.	2	3	1	3	4
Cond. µmhos/cm	Minimum	447	325	812	431	488
	Mean	498	338	988	522	643
	Maximum	560	348	1,137	595	795
	Std. Dev.	57	12	164	83	154
	Median	486	342	1,016	540	646
	Coeff. Var.	12	4	17	16	24
FC ¹ cfu/100 mL	Minimum	1	1	1	1	1
	Geo. Mean	1	1	1	1	1
	Maximum	1	1	1	1	1
	Geo. Std. Dev.	0	0	0	0	0
	Median	1	1	1	1	1
	Coeff. Var.	0	0	0	0	0
Hard. mg/L	Minimum	10	12	155	33	106
	Mean	14	18	160	36	113
	Maximum	20	21	163	37	124
	Std. Dev.	6	5	4	2	10
	Median	11	20	162	37	109
	Coeff. Var.	40	28	3	6	9
NH ₄ ⁺ -N mg/L	Minimum	0.04	0.06	0.22	0.14	0.14
	Mean	0.06	0.07	0.23	0.15	0.19
	Maximum	0.10	0.08	0.24	0.16	0.22
	Std. Dev.	0.03	0.01	0.01	0.01	0.04
	Median	0.04	0.07	0.23	0.15	0.20
	Coeff. Var.	57.74	14.29	4.35	6.67	22.30

TABLE 3 (Continued): SUMMARY STATISTICS OF THE 2007 DATA FOR THE WATER QUALITY MONITORING WELLS IN THE CALUMET TUNNEL SYSTEM:
WELLS QC-10 THROUGH QC-14

Parameter		Well Number				
		QC-10	QC-11	QC-12	QC-13	QC-14
pH	Minimum	7.6	7.9	7.8	7.6	7.4
	Mean	8.2	8.5	7.9	8.0	7.7
	Maximum	8.9	9.0	8.0	8.6	8.1
	Std. Dev.	0.7	0.6	0.1	0.5	0.4
	Median	8.0	8.7	8.0	7.9	7.7
	Coeff. Var.	8.2	6.7	1.5	6.4	4.5
SO ₄ mg/L	Minimum	0.4	1	269	40	2
	Mean	1	1	469	43	3
	Maximum	1	2	844	47	4
	Std. Dev.	0.3	1	325	4	1
	Median	1	1	295	43	2
	Coeff. Var.	43	43	69	8	43
TDS mg/L	Minimum	422	300	856	424	694
	Mean	429	311	864	464	699
	Maximum	438	328	876	502	702
	Std. Dev.	8	15	11	39	5
	Median	426	306	860	466	702
	Coeff. Var.	2	5	1	8	1
TOC mg/L	Minimum	0.3	0.2	0.5	0.6	2.0
	Mean	0.4	0.3	0.6	0.7	2.1
	Maximum	0.5	0.4	0.7	0.7	2.2
	Std. Dev.	0.1	0.1	0.1	0.1	0.1
	Median	0.3	0.4	0.5	0.7	2.0
	Coeff. Var.	31.5	34.6	20.4	8.7	5.6

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

TABLE 4: SUMMARY STATISTICS OF THE 2007 DATA FOR THE WATER QUALITY MONITORING WELLS IN THE CALUMET TUNNEL SYSTEM: WELLS QC-15 THROUGH QC-19

Parameter		Well Number				
		QC-15	QC-16	QC-17	QC-18	QC-19
Cl mg/L	Minimum	13	23	14	8	6
	Mean	16	24	14	8	6
	Maximum	20	26	14	9	7
	Std. Dev.	4	2	0	1	1
	Median	15	24	14	8	6
	Coeff. Var.	23	6	0	7	9
Cond. µmhos/cm	Minimum	349	383	470	566	486
	Mean	377	622	613	613	562
	Maximum	406	932	755	701	613
	Std. Dev.	29	281	202	77	67
	Median	376	550	613	571	586
	Coeff. Var.	8	45	33	12	12
FC ¹ cfu/100 mL	Minimum	1	1	1	1	1
	Geo. Mean	1	1	1	1	1
	Maximum	1	1	1	1	1
	Geo. Std. Dev.	0	0	0	0	0
	Median	1	1	1	1	1
	Coeff. Var.	0	0	0	0	0
Hard. mg/L	Minimum	13	79	174	7	107
	Mean	14	82	179	8	109
	Maximum	15	85	184	9	110
	Std. Dev.	1	3	7	1	2
	Median	13	81	179	7	109
	Coeff. Var.	8	4	4	15	1
NH ₄ ⁺ -N ² mg/L	Minimum	0.12	0.02	0.19	0.02	0.20
	Mean	0.15	0.03	0.21	0.03	0.23
	Maximum	0.21	0.05	0.23	0.06	0.25
	Std. Dev.	0.05	0.00	0.03	0.00	0.03
	Median	0.13	0.02	0.21	0.02	0.24
	Coeff. Var.	32.17	0.00	13.47	0.00	11.50

TABLE 4 (Continued): SUMMARY STATISTICS OF THE 2007 DATA FOR THE WATER QUALITY MONITORING WELLS IN THE CALUMET TUNNEL SYSTEM:
WELLS QC-15 THROUGH QC-19

Parameter		Well Number				
		QC-15	QC-16	QC-17	QC-18	QC-19
pH	Minimum	7.5	7.5	7.6	7.3	7.5
	Mean	7.8	7.7	7.7	7.4	7.9
	Maximum	8.1	7.8	7.7	7.5	8.6
	Std. Dev.	0.3	0.2	0.1	0.1	0.6
	Median	7.8	7.7	7.7	7.5	7.7
	Coeff. Var.	3.8	2.0	0.9	1.6	7.4
SO ₄ ³ mg/L	Minimum	0.4	56	191	31	149
	Mean	0.7	60	194	33	166
	Maximum	1.0	65	196	34	193
	Std. Dev.	0.3	5	4	2	24
	Median	0.8	60	194	33	155
	Coeff. Var.	42	7	2	5	14
TDS mg/L	Minimum	306	508	536	364	432
	Mean	324	538	557	369	453
	Maximum	338	568	578	372	476
	Std. Dev.	16	30	30	4	22
	Median	328	538	557	370	450
	Coeff. Var.	5	6	5	1	5
TOC mg/L	Minimum	0.7	0.4	0.6	0.3	0.5
	Mean	0.8	0.4	0.7	0.3	0.5
	Maximum	0.8	0.4	0.7	0.4	0.5
	Std. Dev.	0.1	0.0	0.1	0.1	0.0
	Median	0.8	0.4	0.7	0.3	0.5
	Coeff. Var.	7.5	0.0	10.9	0.0	0.0

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

²For purposes of statistical evaluation, ammonium nitrogen values less than 0.02 mg/L were set equal to 0.02 mg/L.

³For purposes of statistical evaluation, sulfate values less than 0.4 mg/L were set equal to 0.4 mg/L.

TABLE 5: SUMMARY STATISTICS OF THE 2007 DATA FOR THE WATER QUALITY MONITORING WELLS IN THE CALUMET TUNNEL SYSTEM: WELLS QC-20 THROUGH QC-24

Parameter		Well Number				
		QC-20	QC-21	QC-22	QC-23	QC-24
Cl mg/L	Minimum		14	16	20	26
	Mean		17	17	21	27
	Maximum		19	18	21	29
	Std. Dev.		3	1	1	2
	Median		17	16	21	27
	Coeff. Var.		15	7	3	6
Cond. µmhos/cm	Minimum		360	360	402	301
	Mean		416	365	464	338
	Maximum	W	447	373	498	376
	Std. Dev.	E	49	7	54	38
	Median	L	442	361	492	337
	Coeff. Var.	L	12	2	12	11
FC ¹ cfu/100 mL	Minimum	N	1	1	1	1
	Geo. Mean	O	1	1	1	1
	Maximum	T	1	1	1	1
	Geo. Std. Dev.		0	0	0	0
	Median	S	1	1	1	1
	Coeff. Var.	A	0	0	0	0
Hard. mg/L	Minimum	M				
	Mean	P	11	24	6	12
	Maximum	L	12	25	6	12
	Std. Dev.	E	13	26	7	12
	Median	D	1	1	1	0
	Coeff. Var.		9	5	9	0
NH ₄ ⁺ -N mg/L	Minimum		0.02	0.08	0.05	0.09
	Mean		0.07	0.11	0.08	0.13
	Maximum		0.14	0.13	0.10	0.17
	Std. Dev.		0.06	0.03	0.03	0.04
	Median		0.06	0.12	0.09	0.12
	Coeff. Var.		83.32	24.05	33.07	31.91

TABLE 5 (Continued): SUMMARY STATISTICS OF THE 2007 DATA FOR THE WATER QUALITY MONITORING WELLS IN THE CALUMET TUNNEL SYSTEM:
WELLS QC-20 THROUGH QC-24

Parameter	Well Number					
	QC-20	QC-21	QC-22	QC-23	QC-24	
pH	Minimum		7.5	7.6	7.5	7.4
	Mean		8.3	7.9	8.7	8.4
	Maximum		8.7	8.3	9.5	9.0
	Std. Dev.		0.7	0.4	1.1	0.9
	Median		8.7	7.7	9.2	8.8
	Coeff. Var.	W	8.3	4.8	12.4	10.4
SO ₄ ²⁻ mg/L	Minimum	E	0.8	0.8	2	0.4
	Mean	L	2	1	5	1
	Maximum		3	2	7	2
	Std. Dev.	N	1	1	3	1
	Median	O	1	1	6	1
	Coeff. Var.	T	76	51	53	93
TDS mg/L	Minimum	S	242	262	324	240
	Mean	A	303	288	349	277
	Maximum	M	368	310	386	306
	Std. Dev.	P	63	24	33	34
	Median	L	300	292	336	284
	Coeff. Var.	E	21	8	9	12
TOC mg/L	Minimum	D	0.9	1.0	0.3	0.4
	Mean		1.1	1.1	0.4	0.4
	Maximum		1.5	1.3	0.5	0.5
	Std. Dev.		0.3	0.2	0.1	0.1
	Median		0.9	1.1	0.4	0.4
	Coeff. Var.		31.5	13.5	25.0	13.3

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

²For purposes of statistical evaluation, sulfate values less than 0.4 mg/L were set equal to 0.4 mg/L.

TABLE 6: SUMMARY STATISTICS OF THE 2007 DATA FOR THE WATER QUALITY MONITORING WELLS IN THE CALUMET TUNNEL SYSTEM: WELLS QC-25 THROUGH QC-29

Parameter		Well Number				
		QC-25	QC-26	QC-27	QC-28	QC-29
Cl mg/L	Minimum	15	12	29	14	130
	Mean	16	13	30	15	141
	Maximum	17	14	32	17	162
	Std. Dev.	1	1	2	2	11
	Median	16	12	30	15	139
	Coeff. Var.	6	9	5	10	8
Cond. µmhos/cm	Minimum	231	256	252	260	750
	Mean	243	317	305	311	927
	Maximum	258	414	392	392	1,162
	Std. Dev.	14	85	76	71	187
	Median	241	282	271	281	877
	Coeff. Var.	6	27	25	23	20
FC ¹ cfu/100 mL	Minimum	1	1	1	1	1
	Geo. Mean	1	1	1	1	1
	Maximum	1	1	1	1	1
	Geo. Std. Dev.	0	0	0	0	0
	Median	1	1	1	1	1
	Coeff. Var.	0	0	0	0	0
Hard. mg/L	Minimum	18	6	22	15	237
	Mean	18	7	24	15	260
	Maximum	18	7	25	16	285
	Std. Dev.	0	1	2	1	19
	Median	18	7	24	15	262
	Coeff. Var.	0	9	6	4	7
NH ₄ ⁺ -N mg/L	Minimum	0.10	0.06	0.11	0.03	0.53
	Mean	0.12	0.07	0.13	0.04	0.56
	Maximum	0.13	0.07	0.14	0.05	0.62
	Std. Dev.	0.02	0.01	0.02	0.01	0.04
	Median	0.12	0.07	0.13	0.05	0.54
	Coeff. Var.	13.09	8.66	12.06	26.65	7.42

TABLE 6 (Continued): SUMMARY STATISTICS OF THE 2007 DATA FOR THE WATER QUALITY MONITORING WELLS IN THE CALUMET TUNNEL SYSTEM:
WELLS QC-25 THROUGH QC-29

Parameter		Well Number				
		QC-25	QC-26	QC-27	QC-28	QC-29
pH	Minimum	7.5	7.5	7.6	7.5	7.2
	Mean	8.0	7.8	7.7	7.7	7.5
	Maximum	8.7	7.9	7.8	7.9	7.8
	Std. Dev.	0.6	0.2	0.1	0.2	0.2
	Median	7.7	7.9	7.7	7.7	7.6
	Coeff. Var.	8.1	3.0	1.3	2.6	3.1
SO ₄ mg/L	Minimum	2	1	0.4	1	112
	Mean	3	2	1	2	129
	Maximum	4	3	3	4	145
	Std. Dev.	1	1	1	2	13
	Median	4	2	1	1	128
	Coeff. Var.	35	50	93	87	10
TDS mg/L	Minimum	206	276	250	256	688
	Mean	231	291	266	267	733
	Maximum	262	302	294	274	780
	Std. Dev.	28	13	24	10	38
	Median	226	294	254	272	736
	Coeff. Var.	12	5	9	4	5
TOC ² mg/L	Minimum	0.2	0.2	0.2	0.8	0.8
	Mean	0.3	0.2	0.2	1.2	0.9
	Maximum	0.4	0.2	0.3	1.6	1.0
	Std. Dev.	0.1	0.0	0.1	0.4	0.1
	Median	0.3	0.2	0.2	1.1	0.9
	Coeff. Var.	47.1	0.0	24.7	34.6	9.9

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

²For purposes of statistical evaluation, total organic carbon values less than 0.2 mg/L were set equal to 0.2 mg/L.

TABLE 7: SUMMARY STATISTICS OF THE 2007 DATA FOR THE WATER QUALITY MONITORING WELLS IN THE CALUMET TUNNEL SYSTEM: WELLS QC-30 THROUGH QC-34

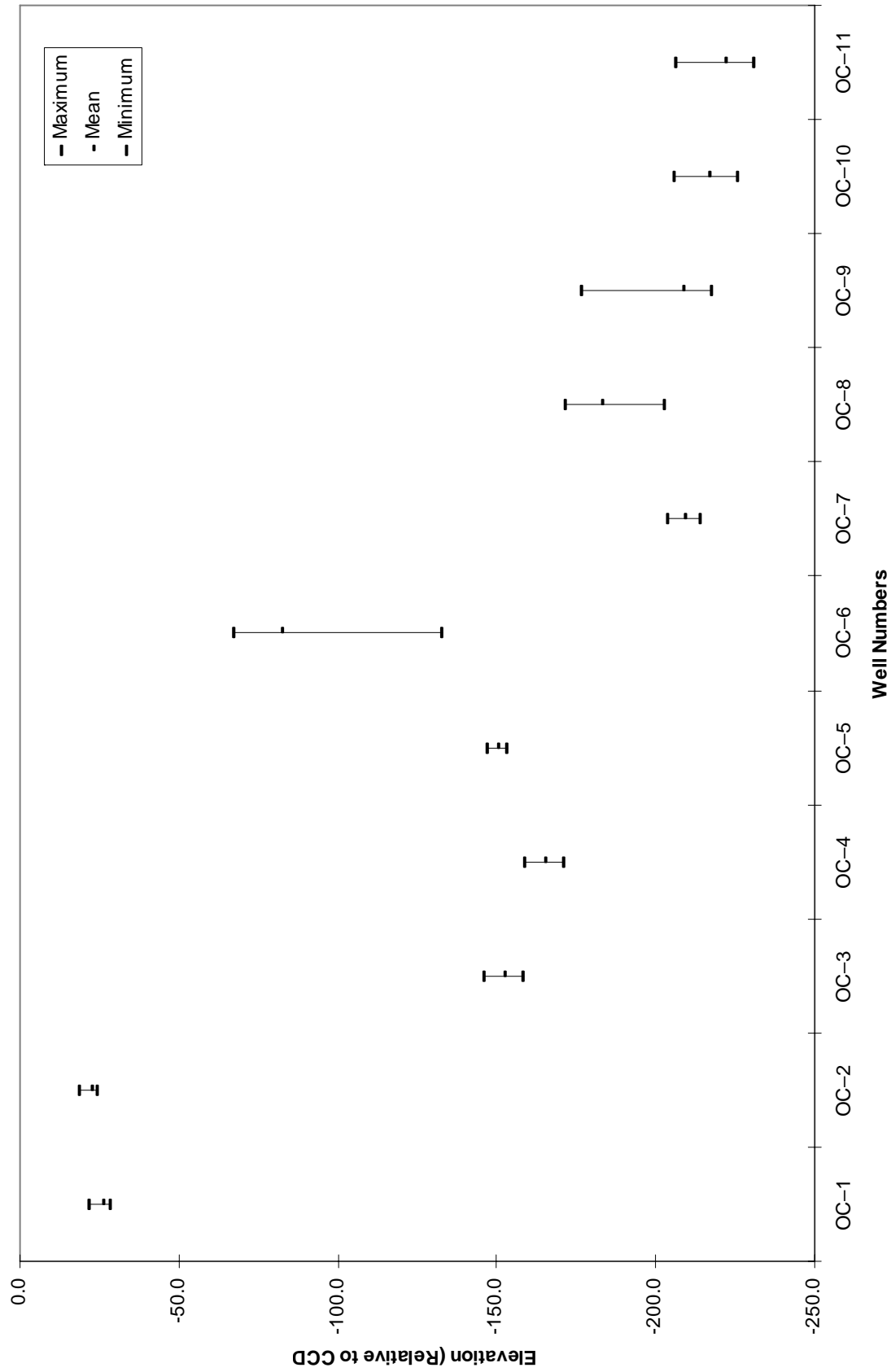
Parameter		Well Number				
		QC-30	QC-31	QC-32	QC-33	QC-34
Cl mg/L	Minimum	7	16			24
	Mean	13	17			24
	Maximum	22	18			24
	Std. Dev.	6	0.8			0
	Median	12	17			24
	Coeff. Var.	44	4			0
Cond. µmhos/cm	Minimum	350	476			860
	Mean	512	672			860
	Maximum	601	860	W	W	860
	Std. Dev.	107	131	E	E	0
	Median	574	643	L	L	860
	Coeff. Var.	21	20	L	L	NA
FC ¹ cfu/100 mL	Minimum	1	1	N	N	1
	Geo. Mean	1	1	O	O	1
	Maximum	1	6	T	T	1
	Geo. Std. Dev.	0	2			0
	Median	1	1	S	S	1
	Coeff. Var.	0	154	A	A	0
Hard. mg/L	Minimum	49	197	M	M	30
	Mean	53	219	P	P	30
	Maximum	57	229	L	L	30
	Std. Dev.	3	12	E	E	0
	Median	54	224	D	D	30
	Coeff. Var.	6	6			0
NH ₄ ⁺ -N mg/L	Minimum	0.10	0.67			0.29
	Mean	0.18	0.91			0.29
	Maximum	0.31	1.09			0.29
	Std. Dev.	0.08	0.14			0.00
	Median	0.18	0.92			0.29
	Coeff. Var.	43.92	14.94			0.00

TABLE 7 (Continued): SUMMARY STATISTICS OF THE 2007 DATA FOR THE WATER QUALITY MONITORING WELLS IN THE CALUMET TUNNEL SYSTEM:
WELLS QC-30 THROUGH QC-34

Parameter		Well Number				
		QC-30	QC-31	QC-32	QC-33	QC-34
pH	Minimum	7.4	7.5			8.6
	Mean	7.8	7.7			8.6
	Maximum	8.3	7.8			8.6
	Std. Dev.	0.3	0.1			0.0
	Median	7.7	7.7			8.6
	Coeff. Var.	4.4	1.4	W	W	0.0
				E	E	
SO ₄ mg/L	Minimum	54	167	L	L	161
	Mean	58	191	L	L	161
	Maximum	65	211			161
	Std. Dev.	5	18	N	N	0
	Median	56	195	O	O	161
	Coeff. Var.	8	10	T	T	0
TDS mg/L	Minimum	384	524	S	S	1,054
	Mean	410	552	A	A	1,054
	Maximum	430	564	M	M	1,054
	Std. Dev.	17	17	P	P	0
	Median	414	561	L	L	1,054
	Coeff. Var.	4	3	E	E	0
				D	D	
TOC mg/L	Minimum	0.9	0.8			3.8
	Mean	1.2	1.0			3.8
	Maximum	1.8	1.2			3.8
	Std. Dev.	0.3	0.2			0.0
	Median	1.2	0.9			3.8
	Coeff. Var.	28.6	17.3			0.0

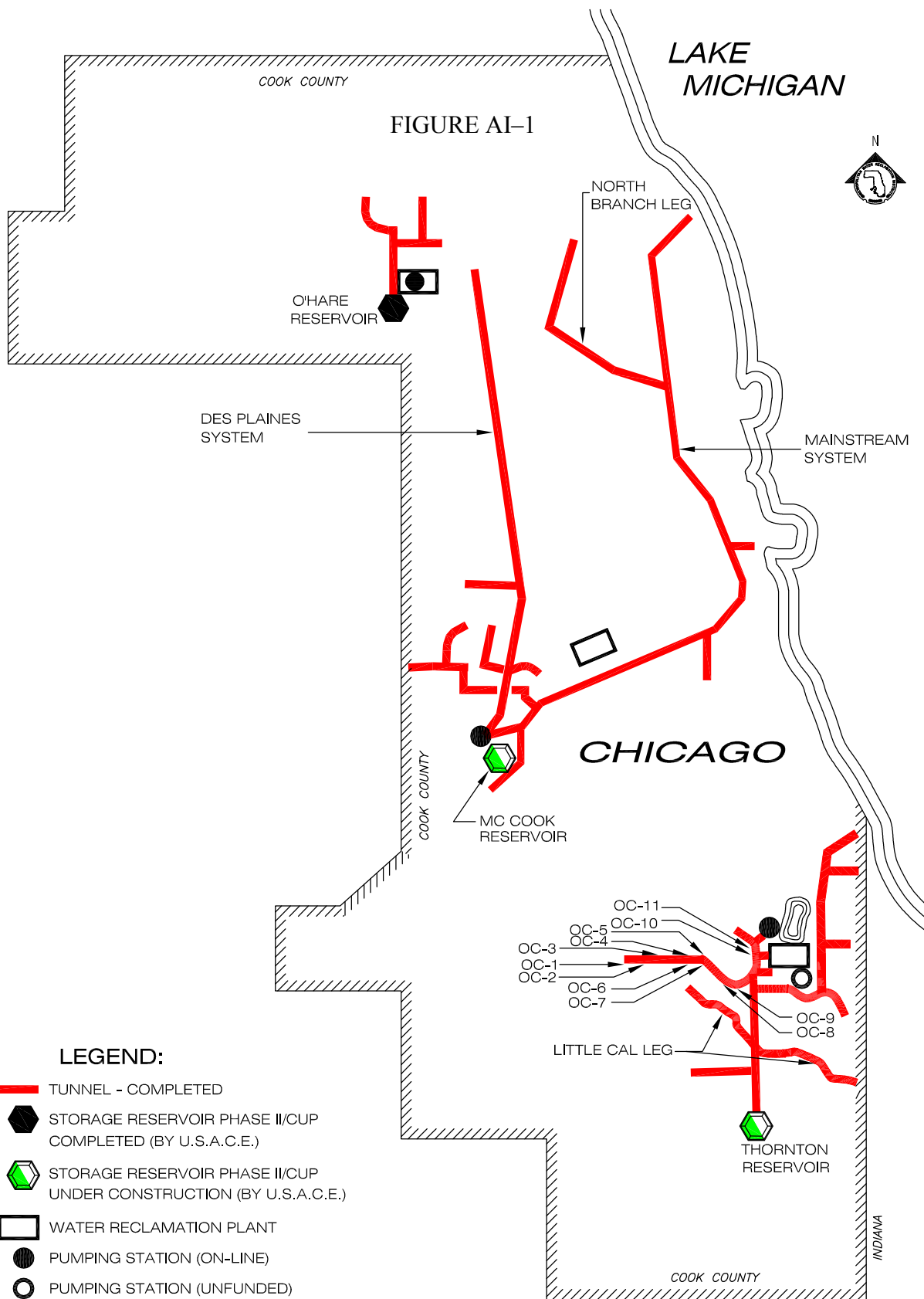
¹For purposes of statistical evaluation, fecal coliform values less than 1 were set equal to 1.

FIGURE 1: 2007 MINIMUM, MEAN, AND MAXIMUM WATER LEVEL ELEVATIONS FOR THE CALUMET TUNNEL SYSTEM OBSERVATION WELLS



APPENDIX AI

LOCATION MAP OF GROUNDWATER OBSERVATION WELLS
OC-1 THROUGH OC-11
IN THE CALUMET TUNNEL SYSTEM



**CALUMET TUNNEL SYSTEM
LOCATION MAP OF
GROUNDWATER OBSERVATION WELLS**

METROPOLITAN WATER RECLAMATION
DISTRICT OF GREATER CHICAGO

APPENDIX AII

2007 GROUNDWATER LEVEL ELEVATION DATA
FOR OBSERVATION WELLS OC-1 THROUGH OC-11
IN THE CALUMET TUNNEL SYSTEM

TABLE AII-1: 2007 GROUNDWATER LEVEL ELEVATION* DATA FOR OBSERVATION WELLS OC-1 THROUGH OC-11 IN THE CALUMET TUNNEL SYSTEM

Date	Observation Well					
	OC-1	OC-2	OC-3	OC-4	OC-5	OC-6
	feet					
1/12/07	-21.8	-19.6	-149.3	-166.2	-147.3	-67.7
1/16/07	-26.8	-21.6	-151.3	-164.2	-147.3	-80.7
2/9/07	-26.8	-23.6	-152.3	-166.2	-150.3	-80.7
2/23/07	-27.8	-24.6	-152.3	-165.2	-149.3	-82.7
3/9/07	-26.8	-22.6	-154.3	-166.7	-150.8	-83.7
3/23/07	-25.8	-23.6	-155.3	-159.2	-147.3	-85.7
4/6/07	-27.8	-22.6	-153.3	-163.2	-151.3	-83.7
4/20/07	-26.8	-22.6	-151.3	-165.2	-153.3	-80.7
5/4/07	-25.8	-22.6	-149.3	-163.2	-151.3	-77.7
5/18/07	-26.8	-23.6	-152.3	-167.2	-149.3	-80.7
6/1/07	-26.8	-22.6	-158.3	-163.2	-153.3	-79.7
6/15/07	-27.8	-23.6	-153.3	-167.2	-150.3	-82.7
6/29/07	-26.8	-23.6	-154.3	-166.2	-151.3	-79.7
7/11/07	-28.8	-23.6	-157.3	-165.2	-151.3	-132.7
7/27/07	-23.8	-19.1	-146.3	-166.2	-151.3	-77.7
8/17/07	-27.8	-23.6	-149.3	-161.2	-152.3	-78.7
8/24/07	-27.8	-23.6	-151.3	-165.2	-153.3	-79.7
9/7/07	**	-24.6	-153.3	**	-149.3	-78.7
9/21/07	**	-23.6	-152.3	**	-150.3	-82.7
10/5/07	**	-23.6	-154.3	**	-151.3	-82.7
10/19/07	-21.8	-24.6	-155.3	-167.2	-151.3	-81.7
10/26/07	-27.8	-23.6	-155.3	-168.2	-151.3	-85.7
11/2/07	-22.8	-23.6	-150.3	-167.2	-151.3	-80.7
11/16/07	-27.8	-23.6	-155.3	-168.2	-152.3	-82.7
11/30/07	-28.8	-23.6	-155.3	-168.2	-152.3	-82.7
12/7/07	-27.8	-23.6	-155.3	-168.2	-152.3	-82.7
12/21/07	-27.8	-23.6	-152.3	-171.2	-153.3	-80.7
Minimum	-28.8	-24.6	-158.3	-171.2	-153.3	-132.7
Mean	-26.6	-23.1	-153.0	-165.8	-150.9	-82.8
Maximum	-21.8	-19.1	-146.3	-159.2	-147.3	-67.7

TABLE AII-1 (Continued): 2007 GROUNDWATER LEVEL ELEVATION* DATA FOR OBSERVATION WELLS OC-1 THROUGH OC-11 IN THE CALUMET TUNNEL SYSTEM

Date	Observation Well				
	OC-7	OC-8	OC-9	OC-10	OC-11
	feet				
1/12/07	-204.0	-171.9	-212.7	-206.0	-224.3
1/16/07	-206.0	-176.9	-209.7	-212.0	-225.3
2/9/07	-208.0	-182.9	-209.7	-216.0	-219.3
2/23/07	-209.0	-181.9	-209.7	-217.0	-220.3
3/9/07	-211.0	-183.9	-176.7	-221.0	***
3/23/07	-208.0	-175.9	-212.7	-226.0	-225.3
4/6/07	-212.0	-176.9	-210.7	-216.0	-223.3
4/20/07	-207.0	-189.9	-209.7	-221.0	-231.3
5/4/07	-211.0	-181.9	-204.7	-213.0	-221.3
5/18/07	-208.0	-183.9	-210.7	-217.0	-219.3
6/1/07	-210.0	-184.9	-212.7	-213.0	-222.3
6/15/07	-211.0	-183.9	-212.7	-219.0	-221.3
6/29/07	-212.0	-183.9	-213.7	-220.0	-223.3
7/11/07	-209.0	-202.9	-217.7	-214.0	-216.3
7/27/07	-212.0	-172.9	-213.7	-218.0	-224.3
8/17/07	-210.0	-187.9	-213.7	-209.0	-221.3
8/24/07	-211.0	****	****	-221.0	-222.3
9/7/07	-204.0	-178.9	-199.7	-223.0	-226.3
9/21/07	-209.0	-185.9	-197.7	-216.0	-222.3
10/5/07	-211.0	-185.9	-210.7	-218.0	-222.3
10/19/07	-212.0	-182.9	-210.7	-217.0	-221.3
10/26/07	-212.0	-185.9	-213.7	-219.0	-222.3
11/2/07	-209.0	-179.9	-194.7	-213.0	-206.3
11/16/07	-213.0	-184.9	-214.7	-220.0	-224.3
11/30/07	-214.0	-185.9	-214.7	-220.0	-224.3
12/7/07	-214.0	-185.9	-214.7	-219.0	-224.3
12/21/07	-209.0	-187.9	-208.7	-221.0	-227.3
Minimum	-214.0	-202.9	-217.7	-226.0	-231.3
Mean	-209.9	-183.3	-208.9	-217.2	-222.4
Maximum	-204.0	-171.9	-176.7	-206.0	-206.3

*Relative to Chicago City Datum.

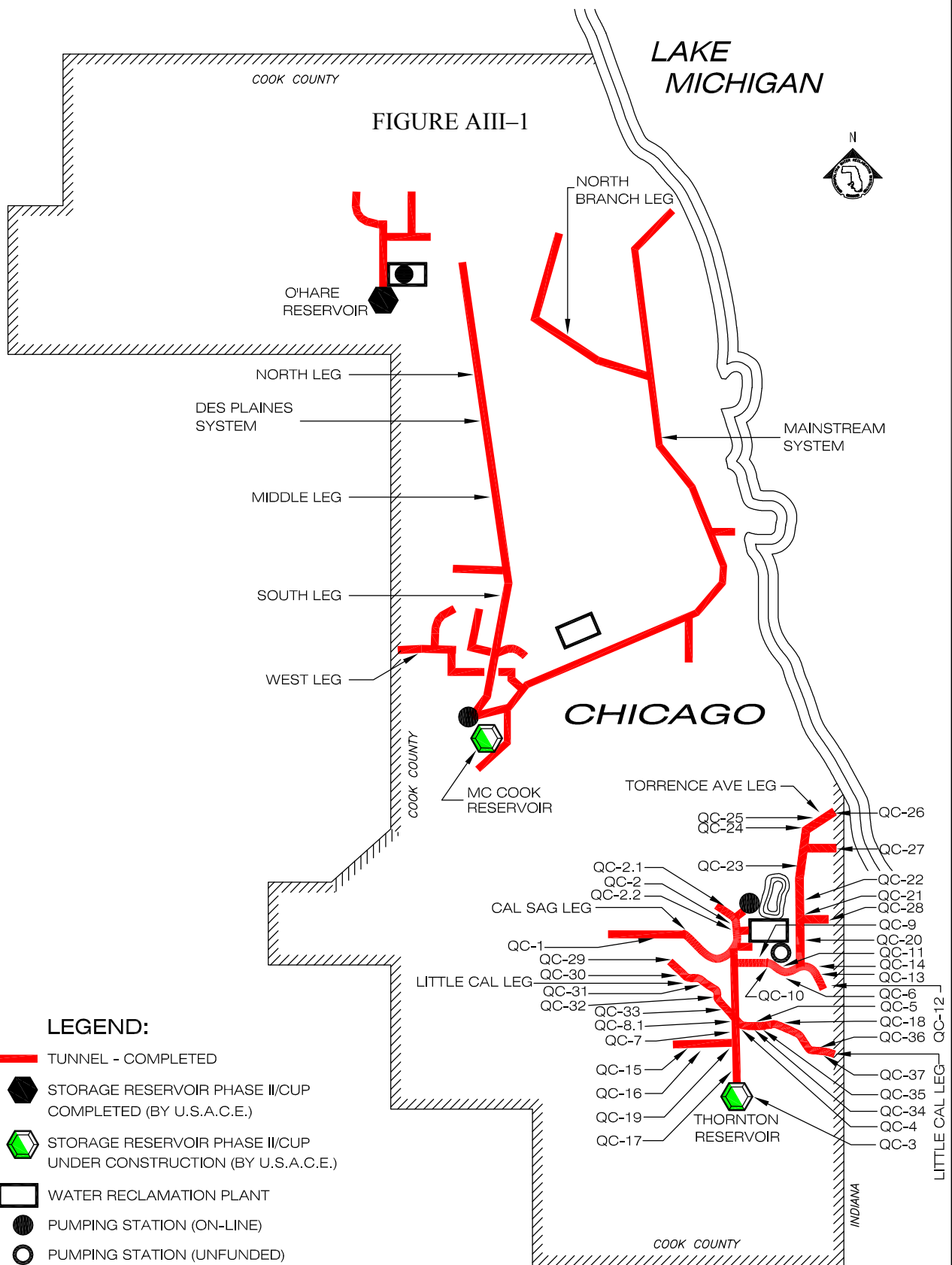
**Unable to take reading because fallen trees were blocking access.

***No access, road under construction.

****No access, area flooded.

APPENDIX AIII

LOCATION MAP OF GROUNDWATER QUALITY MONITORING WELLS
QC-1, QC-2, QC-2.1, QC-2.2, QC-3 THROUGH QC-7, AND QC-9 THROUGH QC-37
IN THE CALUMET TUNNEL SYSTEM



**CALUMET TUNNEL SYSTEM
LOCATION MAP OF GROUNDWATER
QUALITY MONITORING WELLS**

METROPOLITAN WATER RECLAMATION
DISTRICT OF GREATER CHICAGO

APPENDIX AIV

2007 GROUNDWATER QUALITY DATA FOR MONITORING WELLS
QC-1, QC-2, QC-2.1, QC-2.2, QC-3 THROUGH QC-7, AND QC-9 THROUGH QC-37
IN THE CALUMET TUNNEL SYSTEM

TABLE AIV-1: 2007 pH, CONDUCTIVITY, TEMPERATURE, HARDNESS, AMMONIA NITROGEN, AND CHLORIDE DATA FOR WATER QUALITY MONITORING WELLS QC-1, QC-2, QC-2.1, QC-2.2, QC-3 THROUGH QC-7, AND QC-9 THROUGH QC-37 IN THE CALUMET TUNNEL SYSTEM

Well	Date of Sampling	pH ¹	Cond. ¹ µmhos/cm	Temp. °C	Hard. mg/L	NH ₄ ⁺ -N mg/L	Cl mg/L	
QC-1	2/8/07	7.8	502	11	553	0.31	79	
QC-1	3/15/07	7.8	525	12	553	0.27	223	
QC-1	5/17/07	7.7	668	12	540	0.35	74	
QC-1	6/14/07	7.8	1,505	14	548	0.34	73	
QC-1	8/16/07	7.5	801	21	540	0.39	75	
QC-1	11/8/07	7.3	906	12	544	0.40	75	
QC-2	2/8/07	7.7	332	10	98	0.74	37	
QC-2	3/15/07	7.7	355	12	87	0.57	38	
QC-2	5/17/07	7.8	392	13	90	0.48	41	
QC-2	6/14/07	7.7	491	14	88	0.68	35	
QC-2	8/16/07	7.4	711	22	87	0.47	34	
QC-2	10/4/07	8.0	581	14	82	0.66	33	
QC-2.1	2/8/07	8.0	403	10	62	0.63	5	
QC-2.1	5/17/07	8.0	507	12	56	0.60	36	
QC-2.1	8/16/07			Well could not be sampled				
QC-2.2	2/8/07	8.2	295	10	38	0.45	14	
QC-2.2	5/17/07	8.2	379	12	41	0.53	17	
QC-2.2	10/4/07	8.6	555	15	35	0.52	16	
QC-3	4/12/07	7.7	381	12	64	0.44	13	
QC-3	6/21/07	7.6	621	15	66	0.40	13	
QC-3	11/8/07	8.2	565	13	66	0.42	13	
QC-4	4/12/07	8.4	410	11	10	0.20	11	
QC-4	6/21/07	7.7	632	13	10	0.08	11	
QC-4	11/8/07	8.8	564	12	11	0.14	11	
QC-5	4/12/07	8.2	520	11	9	0.16	25	
QC-5	6/21/07	7.6	912	14	10	0.08	27	
QC-5	10/4/07	8.7	945	13	9	0.17	26	

TABLE AIV-1 (Continued): 2007 pH, CONDUCTIVITY, TEMPERATURE, HARDNESS, AMMONIA NITROGEN, AND CHLORIDE DATA FOR WATER QUALITY MONITORING WELLS QC-1, QC-2, QC-2.1, QC-2.2, QC-3 THROUGH QC-7, AND QC-9 THROUGH QC-37 IN THE CALUMET TUNNEL SYSTEM

Well	Date of Sampling	pH ¹	Cond. ¹ µmhos/cm	Temp. °C	Hard. mg/L	NH ₄ ⁺ -N mg/L	Cl mg/L
QC-6	4/12/07	8.2	428	12	18	0.34	16
QC-6	6/21/07	8.1	540	14	17	0.28	15
QC-6	8/22/07	8.3	749	15	19	0.31	14
QC-7	4/12/07	7.9	384	11	11	0.29	11
QC-7	6/21/07	8.0	472	13	11	0.21	11
QC-7	8/22/07	8.3	668	14	13	0.19	16
QC-9	2/8/07	8.0	296	12	67	0.23	10
QC-9	4/12/07	7.6	292	12	60	0.50	10
QC-9	8/22/07	8.1	494	15	62	0.37	10
QC-10	3/28/07	8.9	486	12	20	0.04	32
QC-10	6/20/07	8.0	447	13	11	0.04	31
QC-10	10/29/07	7.6	560	12	10	0.10	32
QC-11	1/17/07	9.0	342	11	20	0.06	23
QC-11	3/28/07	8.7	348	13	12	0.07	22
QC-11	6/20/07	7.9	325	13	21	0.08	23
QC-12	1/17/07	8.0	1,137	8	155	0.24	39
QC-12	3/28/07	8.0	1,016	12	163	0.22	40
QC-12	6/20/07	7.8	812	13	162	0.23	39
QC-13	1/17/07	8.6	540	12	33	0.14	46
QC-13	6/20/07	7.9	431	14	37	0.15	48
QC-13	10/29/07	7.6	595	12	37	0.16	49
QC-14	2/8/07	8.1	488	11	124	0.20	103
QC-14	7/5/07	7.7	646	14	109	0.14	96
QC-14	10/11/07	7.4	795	13	106	0.22	97
QC-15	2/8/07	8.1	406	12	15	0.12	15
QC-15	7/5/07	7.8	349	13	13	0.13	13
QC-15	10/11/07	7.5	376	13	13	0.21	20

TABLE AIV-1 (Continued): 2007 pH, CONDUCTIVITY, TEMPERATURE, HARDNESS, AMMONIA NITROGEN, AND CHLORIDE DATA FOR WATER QUALITY MONITORING WELLS QC-1, QC-2, QC-2.1, QC-2.2, QC-3 THROUGH QC-7, AND QC-9 THROUGH QC-37 IN THE CALUMET TUNNEL SYSTEM

Well	Date of Sampling	pH ¹	Cond. ¹ µmhos/cm	Temp. °C	Hard. mg/L	NH ₄ ⁺ -N mg/L	Cl mg/L
QC-16	3/15/07	7.8	383	10	79	0.05	26
QC-16	6/21/07	7.7	550	14	81	<0.02	23
QC-16	7/12/07	7.5	932	14	85	<0.02	24
QC-17	3/1/07	7.7	755	12	174	0.19	14
QC-17	7/5/07	7.6	470	13	184	0.23	14
QC-17	10/11/07			Well could not be sampled			
QC-18	3/1/07	7.5	571	12	7	<0.02	8
QC-18	6/14/07	7.5	566	15	9	<0.02	8
QC-18	7/12/07	7.3	701	14	7	0.06	9
QC-19	4/5/07	8.6	486	10	107	0.20	7
QC-19	7/12/07	7.7	613	13	110	0.24	6
QC-19	10/11/07	7.5	586	12	109	0.25	6
QC-20	4/3/4			Well could not be sampled			
QC-20	7/30/07			Well could not be sampled			
QC-20	11/6/07			Well could not be sampled			
QC-21	4/5/07	8.7	360	11	13	0.02	17
QC-21	8/1/07	7.5	442	14	13	0.06	19
QC-21	11/8/07	8.7	447	13	11	0.14	14
QC-22	4/5/07	7.6	373	12	24	0.13	16
QC-22	8/1/07	7.7	361	14	26	0.12	16
QC-22	11/8/07	8.3	360	12	24	0.08	18
QC-23	4/5/07	9.5	402	11	6	0.05	20
QC-23	8/1/07	7.5	492	13	7	0.10	21
QC-23	11/8/07	9.2	498	12	6	0.09	21
QC-24	4/5/07	9.0	301	11	12	0.09	27
QC-24	8/1/07	7.4	337	14	12	0.12	29
QC-24	11/8/07	8.8	376	12	12	0.17	26

TABLE AIV-1 (Continued): 2007 pH, CONDUCTIVITY, TEMPERATURE, HARDNESS, AMMONIA NITROGEN, AND CHLORIDE DATA FOR WATER QUALITY MONITORING WELLS QC-1, QC-2, QC-2.1, QC-2.2, QC-3 THROUGH QC-7, AND QC-9 THROUGH QC-37 IN THE CALUMET TUNNEL SYSTEM

Well	Date of Sampling	pH ¹	Cond. ¹ µmhos/cm	Temp. °C	Hard. mg/L	NH ₄ ⁺ -N mg/L	Cl mg/L
QC-25	4/5/07	8.7	258	12	18	0.10	16
QC-25	8/1/07	7.7	241	13	18	0.13	17
QC-25	10/18/07	7.5	231	13	18	0.12	15
QC-26	4/5/07	7.5	414	11	7	0.07	12
QC-26	8/1/07	7.9	256	13	7	0.07	14
QC-26	10/18/07	7.9	282	13	6	0.06	12
QC-27	4/5/07	7.7	392	12	24	0.11	29
QC-27	8/1/07	7.8	271	13	25	0.13	30
QC-27	10/18/07	7.6	252	13	22	0.14	32
QC-28	4/5/07	7.5	392	12	15	0.03	15
QC-28	8/1/07	7.9	281	14	16	0.05	17
QC-28	10/18/07	7.7	260	14	15	0.05	14
QC-29	1/11/07	7.7	835	11	237	0.53	130
QC-29	3/22/07	7.5	1,145	12	238	0.53	136
QC-29	5/24/07	7.3	918	12	260	0.54	142
QC-29	7/19/07	7.8	1,162	13	275	0.62	162
QC-29	9/27/07	7.6	750	12	263	0.54	142
QC-29	11/29/07	7.2	750	11	285	0.61	136
QC-30	1/11/07			Well could not be sampled			
QC-30	3/22/07	7.7	574	12	49	0.13	22
QC-30	5/24/07	8.0	457	12	55	0.10	13
QC-30	7/19/07	7.7	580	14	57	0.18	10
QC-30	9/27/07	7.4	601	12	51	0.20	12
QC-30	11/29/07	8.3	350	5	54	0.31	7
QC-31	1/11/07	7.7	647	12	225	0.95	18
QC-31	3/22/07	7.6	860	12	222	0.91	18
QC-31	5/24/07	7.8	638	14	229	0.92	17
QC-31	7/19/07	7.5	770	14	197	0.67	17
QC-31	9/27/07	7.7	639	12	212	0.90	17
QC-31	11/29/07	7.6	476	11	229	1.09	16

TABLE AIV-1 (Continued): 2007 pH, CONDUCTIVITY, TEMPERATURE, HARDNESS, AMMONIA NITROGEN, AND CHLORIDE DATA FOR WATER QUALITY MONITORING WELLS QC-1, QC-2, QC-2.1, QC-2.2, QC-3 THROUGH QC-7, AND QC-9 THROUGH QC-37 IN THE CALUMET TUNNEL SYSTEM

Well	Date of Sampling	pH ¹	Cond. ¹ µmhos/cm	Temp. °C	Hard. mg/L	NH ₄ ⁺ -N mg/L	Cl mg/L
QC-32	1/11/07			Well could not be sampled			
QC-32	3/22/07			Well could not be sampled			
QC-32	5/24/07			Well could not be sampled			
QC-32	7/19/07			Well could not be sampled			
QC-32	9/25/07			Well could not be sampled			
QC-32	11/27/07			Well could not be sampled			
QC-33	1/11/07			Well could not be sampled			
QC-33	3/22/07			Well could not be sampled			
QC-33	5/24/07			Well could not be sampled			
QC-33	7/19/07			Well could not be sampled			
QC-33	9/25/07			Well could not be sampled			
QC-33	11/27/07			Well could not be sampled			
QC-34	1/11/07			Well could not be sampled			
QC-34	3/22/07			Well could not be sampled			
QC-34	5/24/07			Well could not be sampled			
QC-34	7/19/07	8.6	860	15	30	0.29	24
QC-34	9/25/07			Well could not be sampled			
QC-34	11/27/07			Well could not be sampled			
QC-35	1/11/07			Well could not be sampled			
QC-35	3/15/07			Well could not be sampled			
QC-35	5/24/07			Well could not be sampled			
QC-35	7/19/07			Well could not be sampled			
QC-35	9/25/07			Well could not be sampled			
QC-35	11/27/07			Well could not be sampled			
QC-36	1/11/07			Well could not be sampled			
QC-36	3/15/07			Well could not be sampled			
QC-36	5/24/07			Well could not be sampled			
QC-36	7/19/07			Well could not be sampled			
QC-36	9/27/07			Well could not be sampled			
QC-36	11/27/07			Well could not be sampled			

TABLE AIV-1 (Continued): 2007 pH, CONDUCTIVITY, TEMPERATURE, HARDNESS, AMMONIA NITROGEN, AND CHLORIDE DATA FOR WATER QUALITY MONITORING WELLS QC-1, QC-2, QC-2.1, QC-2.2, QC-3 THROUGH QC-7, AND QC-9 THROUGH QC-37 IN THE CALUMET TUNNEL SYSTEM

Well	Date of Sampling	pH ¹	Cond. ¹ µmhos/cm	Temp. °C	Hard. mg/L	NH ₄ ⁺ -N mg/L	Cl mg/L
QC-37	1/11/07						
QC-37	3/15/07						
QC-37	5/24/07						
QC-37	7/19/07						
QC-37	9/27/07						
QC-37	11/27/07						

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

TABLE AIV-2: 2007 SULFATE, TOTAL ORGANIC CARBON,
TOTAL DISSOLVED SOLIDS, FECAL COLIFORM, WATER ELEVATION, AND
RECHARGE DATA FOR WATER QUALITY MONITORING WELLS
QC-1, QC-2, QC-2.1, QC-2.2, QC-3 THROUGH QC-7, AND QC-9 THROUGH QC-37
IN THE CALUMET TUNNEL SYSTEM

Well	Date of Sampling	SO ₄ mg/L	TOC mg/L	TDS mg/L	FC ¹ cfu/100 mL	Water Elevation ² Feet	Recharge ³ Hours
QC-1	2/8/07	215	1.6	854	<1	-167	<48
QC-1	3/15/07	233	1.5	1,022	<1	-169	<48
QC-1	5/17/07	238	1.4	840	<1	-157	<48
QC-1	6/14/07	248	1.4	868	<1	-168	<48
QC-1	8/16/07	224	1.5	844	<1	-165	<48
QC-1	11/8/07	243	1.4	844	<1	-163	<48
QC-2	2/8/07	21	1.6	390	33	-270	<48
QC-2	3/15/07	31	1.9	434	1	-271	<48
QC-2	5/17/07	25	1.2	406	49	-283	<48
QC-2	6/14/07	25	1.2	350	5	-281	<48
QC-2	8/16/07	25	1.4	336	130	-287	<48
QC-2	10/4/07	21	1.2	372	110	-286	<48
QC-2.1	2/8/07	0.4	0.9	532	<1	-295	<48
QC-2.1	5/17/07	<0.4	0.9	510	<1	-294	<48
QC-2.1	8/16/07			Well could not be sampled			
QC-2.2	2/8/07	26	1.2	362	<1	-221	<48
QC-2.2	5/17/07	27	1.1	374	<1	-282	<48
QC-2.2	10/4/07	27	1.0	360	<1	-270	<48
QC-3	4/12/07	28	0.5	396	<1	-218	<48
QC-3	6/21/07	24	0.5	428	<1	-226	<48
QC-3	11/8/07	29	0.4	408	<1	-224	<48
QC-4	4/12/07	12	0.5	424	<1	-225	<48
QC-4	6/21/07	14	0.5	510	<1	-238	<48
QC-4	11/8/07	17	0.5	420	<1	-245	<48
QC-5	4/12/07	11	0.8	580	<1	-206	<48
QC-5	6/21/07	7	0.9	702	<1	-237	<48
QC-5	10/4/07	5	0.9	572	<1	-205	<48

TABLE AIV-2 (Continued): 2007 SULFATE, TOTAL ORGANIC CARBON,
TOTAL DISSOLVED SOLIDS, FECAL COLIFORM, WATER ELEVATION, AND
RECHARGE DATA FOR WATER QUALITY MONITORING WELLS
QC-1, QC-2, QC-2.1, QC-2.2, QC-3 THROUGH QC-7, AND QC-9 THROUGH QC-37
IN THE CALUMET TUNNEL SYSTEM

Well	Date of Sampling	SO ₄ mg/L	TOC mg/L	TDS mg/L	FC ¹ cfu/100 mL	Water Elevation ² Feet	Recharge ³ Hours
QC-6	4/12/07	12	1.1	484	<1	-202	<48
QC-6	6/21/07	7	1.2	468	<1	-195	<48
QC-6	8/22/07	7	1.3	520	<1	-201	<48
QC-7	4/12/07	3	1.1	420	<1	-177	<48
QC-7	6/21/07	2	1.2	440	<1	-174	<48
QC-7	8/22/07	1	1.2	502	<1	-176	<48
QC-9	2/8/07	28	0.8	332	<1	-246	<48
QC-9	4/12/07	35	0.8	312	<1	-247	<48
QC-9	8/22/07	29	0.9	374	2	-245	<48
QC-10	3/28/07	0.4	0.3	422	<1	-190	<4
QC-10	6/20/07	1	0.5	438	<1	-205	<4
QC-10	10/29/07	1	0.3	426	<1	-220	<4
QC-11	1/17/07	1	0.4	306	<1	-201	<4
QC-11	3/28/07	1	0.2	300	<1	-209	<4
QC-11	6/20/07	2	0.4	328	<1	-215	<4
QC-12	1/17/07	844	0.5	876	<1	-227	<4
QC-12	3/28/07	295	0.7	856	<1	-229	<4
QC-12	6/20/07	269	0.5	860	<1	-228	<4
QC-13	1/17/07	43	0.7	424	<1	-223	<48
QC-13	6/20/07	47	0.7	502	<1	-232	<48
QC-13	10/29/07	40	0.6	466	<1	-255	<48
QC-14	2/8/07	2	2.2	694	<1	-209	<48
QC-14	7/5/07	4	2.0	702	<1	-213	<48
QC-14	10/11/07	2	2.0	702	<1	-197	<48

TABLE AIV-2 (Continued): 2007 SULFATE, TOTAL ORGANIC CARBON, TOTAL DISSOLVED SOLIDS, FECAL COLIFORM, WATER ELEVATION, AND RECHARGE DATA FOR WATER QUALITY MONITORING WELLS QC-1, QC-2, QC-2.1, QC-2.2, QC-3 THROUGH QC-7, AND QC-9 THROUGH QC-37 IN THE CALUMET TUNNEL SYSTEM

Well	Date of Sampling	SO ₄ mg/L	TOC mg/L	TDS mg/L	FC ¹ cfu/100 mL	Water Elevation ² Feet	Recharge ³ Hours
QC-15	2/8/07	1	0.8	306	<1	-218	<48
QC-15	7/5/07	0.8	0.8	338	<1	-222	<48
QC-15	10/11/07	<0.4	0.7	328	<1	-225	<48
QC-16	3/15/07	60	0.4	508	<1	-233	<48
QC-16	6/21/07	56	0.4	568	1	-244	<48
QC-16	7/12/07	65	0.4	538	<1	-261	<48
QC-17	3/1/07	191	0.7	536	<1	-159	<48
QC-17	7/5/07	196	0.6	578	<1	-165	<48
QC-17	10/11/07			Well could not be sampled			
QC-18	3/1/07	34	0.3	370	<1	-210	<48
QC-18	6/14/07	33	0.4	364	<1	-212	<48
QC-18	7/12/07	31	0.3	372	<1	-210	<48
QC-19	4/5/07	149	0.5	432	<1	-114	<48
QC-19	7/12/07	155	0.5	476	<1	-102	<48
QC-19	10/11/07	193	0.5	450	<1	-94	<48
QC-20	4/3/4			Well could not be sampled			
QC-20	7/30/07			Well could not be sampled			
QC-20	11/6/07			Well could not be sampled			
QC-21	4/5/07	3	0.9	300	<1	-265	<48
QC-21	8/1/07	1	0.9	368	<1	-266	<48
QC-21	11/8/07	0.8	1.5	242	<1	-266	<48
QC-22	4/5/07	2	1.1	262	<1	-235	<48
QC-22	8/1/07	0.8	1.3	292	<1	-267	<48
QC-22	11/8/07	1	1.0	310	<1	-265	<48

TABLE AIV-2 (Continued): 2007 SULFATE, TOTAL ORGANIC CARBON, TOTAL DISSOLVED SOLIDS, FECAL COLIFORM, WATER ELEVATION, AND RECHARGE DATA FOR WATER QUALITY MONITORING WELLS QC-1, QC-2, QC-2.1, QC-2.2, QC-3 THROUGH QC-7, AND QC-9 THROUGH QC-37 IN THE CALUMET TUNNEL SYSTEM

Well	Date of Sampling	SO ₄ mg/L	TOC mg/L	TDS mg/L	FC ¹ cfu/100 mL	Water Elevation ² Feet	Recharge ³ Hours
QC-23	4/5/07	6	0.3	336	<1	-242	<48
QC-23	8/1/07	2	0.5	386	<1	-241	<48
QC-23	11/8/07	7	0.4	324	<1	-242	<48
QC-24	4/5/07	2	0.5	240	<1	-236	<48
QC-24	8/1/07	0.5	0.4	306	<1	-236	<48
QC-24	11/8/07	<0.4	0.4	284	<1	-230	<48
QC-25	4/5/07	4	<0.2	206	<1	-236	<48
QC-25	8/1/07	2	0.2	262	<1	-235	<48
QC-25	10/18/07	4	0.4	226	<1	-235	<48
QC-26	4/5/07	3	<0.2	276	<1	-227	<48
QC-26	8/1/07	1	0.2	302	<1	-229	<48
QC-26	10/18/07	2	<0.2	294	<1	-231	<48
QC-27	4/5/07	3	0.2	254	<1	-208	<48
QC-27	8/1/07	0.4	0.3	294	<1	-206	<48
QC-27	10/18/07	1	0.2	250	<1	-207	<48
QC-28	4/5/07	1	1.1	256	<1	-248	<48
QC-28	8/1/07	1	1.6	274	<1	-245	<48
QC-28	10/18/07	4	0.8	272	<1	-246	<48
QC-29	1/11/07	119	0.9	694	<1	-64	<48
QC-29	3/22/07	133	0.8	688	<1	-64	<48
QC-29	5/24/07	112	1.0	718	<1	-66	<48
QC-29	7/19/07	122	0.8	780	<1	-78	<48
QC-29	9/27/07	140	1.0	762	<1	-70	<48
QC-29	11/29/07	145	0.9	754	<1	-67	<48
QC-30	1/11/07			Well could not be sampled			
QC-30	3/22/07	54	1.8	404	<1	-143	<48
QC-30	5/24/07	56	1.0	414	<1	-145	<48

TABLE AIV-2 (Continued): 2007 SULFATE, TOTAL ORGANIC CARBON, TOTAL DISSOLVED SOLIDS, FECAL COLIFORM, WATER ELEVATION, AND RECHARGE DATA FOR WATER QUALITY MONITORING WELLS QC-1, QC-2, QC-2.1, QC-2.2, QC-3 THROUGH QC-7, AND QC-9 THROUGH QC-37 IN THE CALUMET TUNNEL SYSTEM

Well	Date of Sampling	SO ₄ mg/L	TOC mg/L	TDS mg/L	FC ¹ cfu/100 mL	Water Elevation ² Feet	Recharge ³ Hours
QC-30	7/19/07	55	1.2	416	<1	-141	<48
QC-30	9/27/07	60	0.9	430	<1	-146	<48
QC-30	11/29/07	65	1.2	384	<1	-145	<48
QC-31	1/11/07	177	1.1	562	6	-88	<48
QC-31	3/22/07	188	0.8	538	<1	-93	<48
QC-31	5/24/07	195	0.8	564	1	-98	<48
QC-31	7/19/07	167	0.9	524	<1	-110	<48
QC-31	9/27/07	204	0.9	564	<1	-101	<48
QC-31	11/29/07	211	1.2	560	<1	-93	<48
QC-32	1/11/07			Well could not be sampled			
QC-32	3/22/07			Well could not be sampled			
QC-32	5/24/07			Well could not be sampled			
QC-32	7/19/07			Well could not be sampled			
QC-32	9/25/07			Well could not be sampled			
QC-32	11/27/07			Well could not be sampled			
QC-33	1/11/07			Well could not be sampled			
QC-33	3/22/07			Well could not be sampled			
QC-33	5/24/07			Well could not be sampled			
QC-33	7/19/07			Well could not be sampled			
QC-33	9/25/07			Well could not be sampled			
QC-33	11/27/07			Well could not be sampled			
QC-34	1/11/07			Well could not be sampled			
QC-34	3/22/07			Well could not be sampled			
QC-34	5/24/07			Well could not be sampled			
QC-34	7/19/07	161	3.8	1,054	<1	-163	<48
QC-34	9/25/07			Well could not be sampled			
QC-34	11/27/07			Well could not be sampled			
QC-35	1/11/07			Well could not be sampled			
QC-35	3/15/07			Well could not be sampled			

TABLE AIV-2 (Continued): 2007 SULFATE, TOTAL ORGANIC CARBON, TOTAL DISSOLVED SOLIDS, FECAL COLIFORM, WATER ELEVATION, AND RECHARGE DATA FOR WATER QUALITY MONITORING WELLS QC-1, QC-2, QC-2.1, QC-2.2, QC-3 THROUGH QC-7, AND QC-9 THROUGH QC-37 IN THE CALUMET TUNNEL SYSTEM

Well	Date of Sampling	SO ₄ mg/L	TOC mg/L	TDS mg/L	FC ¹ cfu/100 mL	Water Elevation ² Feet	Recharge ³ Hours
QC-35	5/24/07						
QC-35	7/19/07						
QC-35	9/25/07						
QC-35	11/27/07						
QC-36	1/11/07						
QC-36	3/15/07						
QC-36	5/24/07						
QC-36	7/19/07						
QC-36	9/27/07						
QC-36	11/27/07						
QC-37	1/11/07						
QC-37	3/15/07						
QC-37	5/24/07						
QC-37	7/19/07						
QC-37	9/27/07						
QC-37	11/27/07						

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.