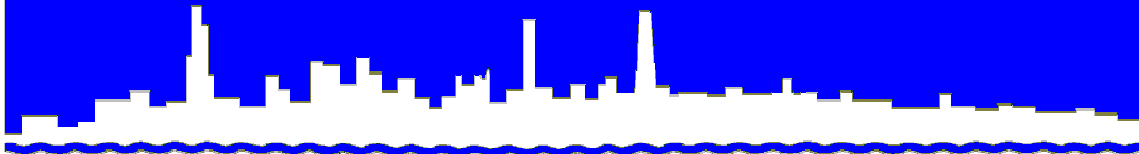


Protecting Our Water Environment



Metropolitan Water Reclamation District of Greater Chicago

***MONITORING AND RESEARCH
DEPARTMENT***

REPORT NO. 10-31

TUNNEL AND RESERVOIR PLAN

O'HARE CHICAGOLAND UNDERFLOW PLAN RESERVOIR

WATER QUALITY MONITORING WELLS

2009 ANNUAL GROUNDWATER MONITORING REPORT

June 2010

Protecting Our Water Environment

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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, O'Hare Chicago Underflow Plan Reservoir
Water Quality Monitoring Wells, 2009 Annual Groundwater Monitoring
Report

Enclosed are three copies of "Tunnel and Reservoir Plan, O'Hare Chicago Underflow
Plan Reservoir Water Quality Monitoring Wells, 2009 Annual Groundwater Monitoring Report."

Very truly yours,

Louis Kollias
Director
Monitoring and Research

LK:HZ:lf

Enclosure

cc w/enc: Ms. Sally K. Swanson (USEPA Region V - WC15J) (2)
Ms. Linda Sorn (COE) (2)
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TUNNEL AND RESERVOIR PLAN
O'HARE CHICAGOLAND UNDERFLOW PLAN RESERVOIR
WATER QUALITY MONITORING WELLS
2009 ANNUAL GROUNDWATER MONITORING REPORT

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INTRODUCTION

This report contains data for the year 2009 for the four water quality monitoring wells located on the perimeter of the O'Hare Chicagoland Underflow Plan (CUP) Reservoir (Figure 1). The four water quality monitoring wells are QK-1, QK-2, QK-3, and QK-4. Well QK-1 is located on the northwest side, QK-2 on the northeast side, QK-3 on the southeast side, and QK-4 on the southwest side of the reservoir. Also shown in Figure 1 are locations of the nine private water supply wells within 1,000 feet of the reservoir. Please note that originally there were ten private water supply wells, but one was abandoned as of January 25, 1996, leaving only nine private water supply wells.

The Water Pollution Control Permit No. 1996-AB-3401 dated July 9, 1996, issued by the Illinois Environmental Protection Agency (IEPA) to construct and/or operate the O'Hare CUP Reservoir is subject to the following three special conditions:

Special Condition 1: If this project is located within wetlands, the U. S. Army Corps of Engineers (COE) may require a permit for construction pursuant to Section 404 of the Clean Water Act.

Special Condition 2: The operational portion of this permit shall not become effective until the Permittee has received IEPA approval of a groundwater monitoring program for this site.

Special Condition 3: The operating reports associated with the groundwater monitoring program shall be submitted quarterly to the IEPA's Maywood Regional Office and Springfield Permit Section.

The groundwater monitoring plan for the O'Hare CUP Reservoir as summarized in the IEPA letter dated October 14, 1997, to Mr. Joseph D. Jacobazzi of the COE, Chicago District is as follows:

1. The establishment of existing background concentrations at the site by sampling the four (4) monitoring wells a minimum of six times over the period of 12 months. Parameters to be sampled will be all of the Class I Standards parameters, with the exception of radioactive compounds, and the Tunnel and Reservoir Plan (TARP) indicator parameters.
2. The establishment of existing background concentrations for the inorganic Class I Standards parameters and TARP indicator parameters for the ten private wells within 1,000 feet of the reservoir with a minimum of three sampling events.
3. After the establishment of existing background concentrations, the four monitoring wells at the site shall be sampled quarterly for the TARP indicator

parameters. The results will be submitted to the IEPA in accordance with Special Condition 3 of Permit No. 1996-AB-3401.

4. Groundwater sampling of the TARP indicator parameters for event-based monitoring shall be conducted on a weekly basis following an event in which the reservoir is used to store combined sewage overflow from the TARP system. The weekly sampling frequency will continue until all sampling results indicate concentrations below the 95 percent confidence level established for the background concentrations. Event-based monitoring requirements will continue weekly for at least six weeks after the event.

Until existing background confidence limits are established at each monitoring well, the event-based monitoring requirements will continue on a weekly basis for at least six weeks after the event. All samples from the monitoring wells will be compared to the Class I Standards until the 95 percent confidence levels have been determined for each parameter at each well. If the sampling reveals that the water quality has been impacted, sampling should continue on a weekly basis until there is no indication of groundwater being impacted.

5. A preventive response will be required if any of the detected contaminants exceed the levels specified in the Standards, Subsection 620.310(a)(3). The COE and Metropolitan Water Reclamation District of Greater Chicago (District) have the option to demonstrate that the O'Hare CUP Reservoir is not the source of contamination.
6. In the event that a Class I Standard is exceeded due to the storage of combined sewage in the reservoir, a groundwater management zone may be required.

Unless the concentrations which exceed Class I Standards are due to natural causes, the COE and/or District will be responsible for the remediation of groundwater contamination on site.

7. In the event that any of the Class I Standards are exceeded in any potable water supply well as a result of leakage from the O'Hare CUP Reservoir, an alternate water supply shall be supplied with either the COE or District bearing all costs as associated with providing the alternate water supply.

Out of the seven above items summarizing the groundwater monitoring plan for the O'Hare CUP Reservoir, the requirements under items 3 and 4 are to be fulfilled by the District. The remainder of the requirements set forth under items 1, 2, 5, 6, and 7 are to be fulfilled by the COE.

According to item 3 referred to above, the four water quality monitoring wells located on the perimeter of the O'Hare CUP Reservoir are to be sampled quarterly for the TARP water quality indicator parameters. The ten TARP water quality parameters to be analyzed are:

chloride (Cl), fecal coliform (FC), sulfate (SO₄), ammonia nitrogen (NH₃-N), total organic carbon (TOC), total dissolved solids (TDS), hardness (Hard.), conductivity (Cond.), pH, and temperature (Temp.).

According to item 4, the sampling of the O'Hare CUP Reservoir water quality monitoring wells for the TARP indicator parameters for fill-event based monitoring shall be conducted on a weekly basis following a fill event in which the reservoir is used to store combined sewage overflow from the TARP system. The weekly sampling will continue for at least six weeks. The same ten TARP water quality parameters are to be analyzed for each weekly sample.

This report fulfills the requirements, as set forth under items 3 and 4 referred to above. In 2009, all four water quality monitoring wells were monitored quarterly as required under item 3 except when there was insufficient water in the well to collect a sample, and weekly after each fill event of the four fill events experienced in 2009 as required under item 4.

MONITORING DATA

Quarterly Monitoring

Table 1 contains the 2009 data for ten TARP water quality indicator parameters obtained from samples collected on a quarterly basis from the four water quality monitoring wells (QK-1, QK-2, QK-3, and QK-4) located on the perimeter of the O'Hare CUP Reservoir. Water quality monitoring well QK-1 could not be sampled on April 15, 2009, July 15, 2009, or October 13, 2009, because there was insufficient water in the well to collect a sample. Water quality monitoring well QK-2 could not be sampled on July 15, 2009, or October 13, 2009, because there was insufficient water in the well to collect a sample. Water quality monitoring well QK-3 could not be sampled on March 11, 2009, or October 13, 2009, because there was insufficient water in the well to collect a sample. Water quality monitoring well QK-4 was sampled as required.

Table 2 contains summary statistics of the water quality parameters for the year 2009 quarterly samples for all four water quality monitoring wells QK-1 through QK-4. The summary statistics include minimum, mean, maximum, standard deviation (Std. Dev.), median, and coefficient of variation (Coeff. Var.) for the values of the TARP water quality indicator parameters analyzed during 2009, except for FC. Geometric mean was calculated for FC, 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.

Fill Event Monitoring

The O'Hare CUP Reservoir experienced four fill events during 2009. They occurred on February 27, 2009, March 9, 2009, June 23, 2009, and December 25, 2009. Sampling of these events was conducted weekly according to item 4 requirements as described on page 2. According to this requirement, sampling of the TARP indicator parameters for fill event-based monitoring should be conducted on a weekly basis following a fill event for at least six weeks or until all sampling results indicate concentrations below the 95 percent confidence level for background concentration. If two fill events occurred within six weeks, the monitoring results were grouped together. Therefore, the monitoring data for the four fill events experienced in 2009 were compiled into three groups, which are presented in the following paragraphs.

February 27, 2009, and March 9, 2009, Fill Events. Table 3 contains water quality data for water quality monitoring wells QK-1 through QK-4 for the post fill events of February 27, 2009, and March 9, 2009. Sampling covered the period of February 27, 2009, through April 15, 2009.

All wells were sampled as required with the following exceptions. Water quality monitoring well QK-1 could not be sampled on February 27, 2009, March 6, 2009, March 17, 2009, March 25, 2009, March 30, 2009, April 8, 2009, or April 15, 2009, because there was

insufficient water in the well to collect a sample. Water quality monitoring well QK-2 could not be sampled on February 27, 2009, March 6, 2009, March 17, 2009, or March 30, 2009, because there was insufficient water in the well to collect a sample. Water quality monitoring well QK-3 could not be sampled on February 27, 2009, March 11, 2009, or March 30, 2009, because there was insufficient water in the well to collect a sample. Water quality monitoring well QK-4 could not be sampled on February 27, 2009, because there was insufficient water in the well to collect a sample.

June 23, 2009, Fill Event. Table 4 contains water quality data for water quality monitoring wells QK-1 through QK-4 for the post fill event of June 23, 2009. Sampling covered the period of June 23, 2009, through July 31, 2009.

All wells were sampled as required with the following exceptions. Water quality monitoring well QK-1 could not be sampled on June 30, 2009, July 8, 2009, July 15, 2009, July 24, 2009, or July 31, 2009, because there was insufficient water in the well to collect a sample. Water quality monitoring well QK-2 could not be sampled on June 23, 2009, June 30, 2009, July 15, 2009, July 24, 2009, or July 31, 2009, because there was insufficient water in the well to collect a sample. Water quality monitoring well QK-3 could not be sampled on June 30, 2009, July 8, 2009, July 24, 2009, or July 31, 2009, because there was insufficient water in the well to collect a sample. Water quality monitoring well QK-4 could not be sampled on July 31, 2009, because there was insufficient water in the well to collect a sample.

December 25, 2009, Fill Event. Table 5 contains water quality data for water quality monitoring wells QK-1 through QK-4 for the post fill events of December 25, 2009. Sampling covered the period of December 30, 2009, through February 3, 2010.

All wells were sampled as required with the following exceptions. On December 30, 2009, no samples could be collected because access to each well was blocked by snow. On January 5, 2010, water quality monitoring wells QK-1, QK-2, and, QK-4, could not be sampled because there was insufficient water in these wells. On January 13, 2010, water quality monitoring wells QK-1 and QK-2 could not be sampled because there was insufficient water in these wells. On January 20, 2010, no samples could be collected because access to water quality monitoring wells QK-1, QK-2, and QK-4 was blocked by snow, and there was insufficient water in water quality monitoring well QK-3 to collect a sample. On January 27, 2010, water quality monitoring wells QK-1 and QK-2 could not be sampled because there was insufficient water in these wells. On February 3, 2010 water quality monitoring wells QK-1, QK-2, and QK-4 could not be sampled because there was insufficient water in these wells.

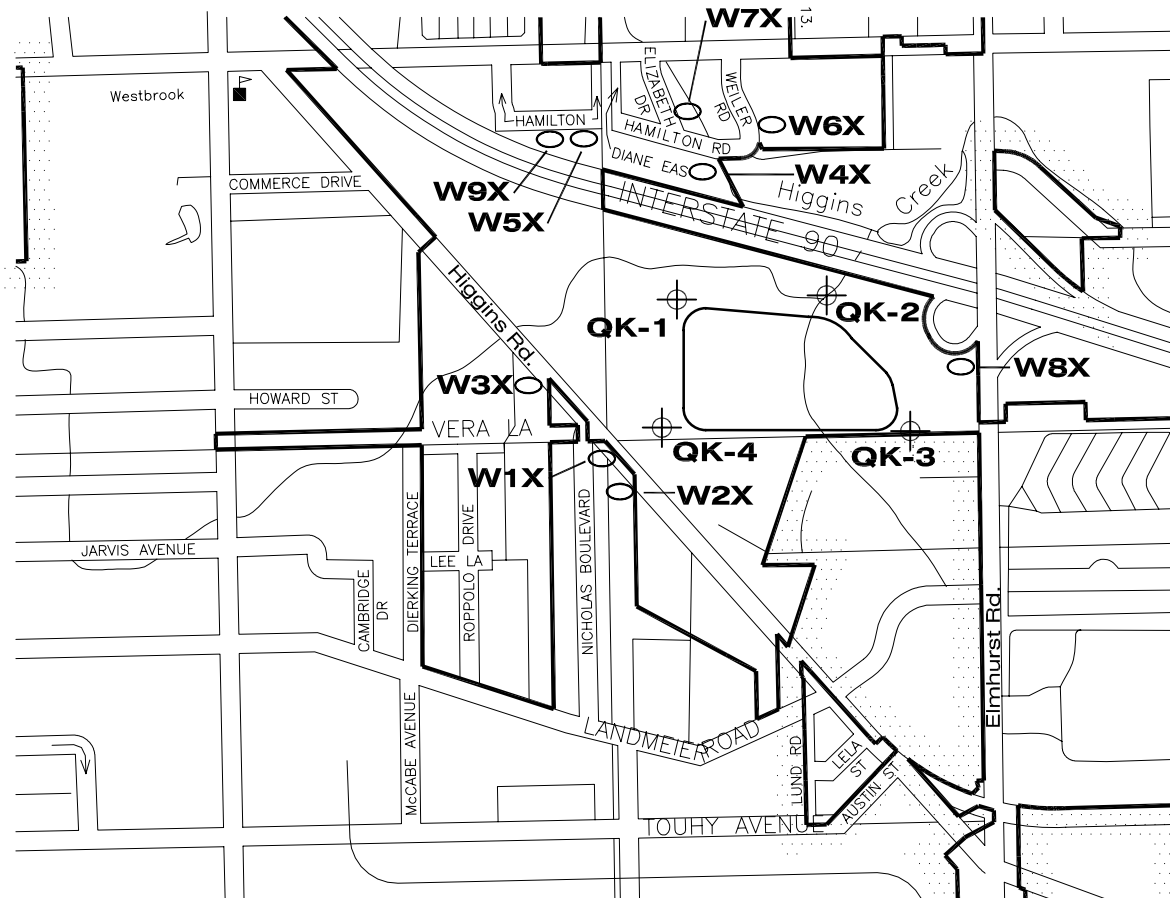


FIGURE 1

**LOCATION OF FOUR WATER QUALITY MONITORING WELLS
AND NINE PRIVATE WELLS**

METROPOLITAN WATER RECLAMATION
DISTRICT OF GREATER CHICAGO

TABLE 1: 2009 GROUNDWATER QUALITY DATA FOR O'HARE CHICAGOLAND UNDERFLOW PLAN RESERVOIR
WATER QUALITY MONITORING WELLS QK-1 THROUGH QK-4

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 ¹ mg/L	Hard. mg/L	Cond. ² µmhos/cm	pH ² unit	Temp. °C
QK-1	3/11/09	115	5,600	353	0.16	1.1	1,276	546	530	7.40	10.8
QK-1	4/15/09				Well could not be sampled						
QK-1	7/15/09				Well could not be sampled						
QK-1	10/13/09				Well could not be sampled						
QK-2	3/11/09	<10	<1	533	<0.10	<1.0	1,046	575	536	7.70	10.9
QK-2	4/15/09	<10	<1	511	<0.10	1.2	876	462	779	7.80	11.5
QK-2	7/15/09				Well could not be sampled						
QK-2	10/13/09				Well could not be sampled						
QK-3	3/11/09				Well could not be sampled						
QK-3	4/15/09	36	210	803	<0.10	<1.0	1,594	931	822	7.00	12.2
QK-3	7/15/09	33	800	901	0.13	2.6	1,718	909	890	6.99	14.1
QK-3	10/13/09				Well could not be sampled						
QK-4	3/11/09	49	10	345	0.63	2.2	968	531	572	7.60	10.9
QK-4	4/15/09	48	<1	363	0.53	1.2	994	521	756	7.30	11.0
QK-4	7/15/09	45	390	227	0.58	1.1	972	547	794	7.40	12.9
QK-4	10/13/09	48	1	349	0.60	1.1	896	504	945	7.60	11.6

¹The method detection limit (MDL) or limit of quantification (LOQ) is 10 mg/L for Cl (LOQ), 2.0 mg/L for SO₄ (LOQ), 0.10 mg/L for NH₃-N (LOQ), 1.0 mg/L for TOC (LOQ), and 40 mg/L for TDS (LOQ). The detection limit for the FC analysis using the membrane filter method varies based on the actual sample volume analyzed.

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

TABLE 2: SUMMARY STATISTICS OF THE 2009 QUARTERLY SAMPLING DATA FOR O'HARE CHICAGOLAND UNDERFLOW PLAN RESERVOIR WATER QUALITY MONITORING WELLS QK-1 THROUGH QK-4

Parameter ¹		Well Number			
		QK-1	QK-2	QK-3	QK-4
Cl mg/L	Minimum	115	10	33	45
	Mean	115	10	35	48
	Maximum	115	10	36	49
	Std. Dev.	N/C ²	0	2	2
	Median	115	10	35	48
	Coeff. Var. (%)	N/C	0	6	4
FC cfu/100 mL	Minimum	5,600	1	210	1
	Geo. Mean	5,600	1	410	8
	Maximum	5,600	1	800	390
	Median	5,600	1	505	6
SO ₄ mg/L	Minimum	353	511	803	227
	Mean	353	522	852	321
	Maximum	353	533	901	363
	Std. Dev.	N/C	16	69	63
	Median	353	522	852	347
	Coeff. Var. (%)	N/C	3	8	20
NH ₃ -N mg/L	Minimum	0.16	0.10	0.10	0.53
	Mean	0.16	0.10	0.12	0.59
	Maximum	0.16	0.10	0.13	0.63
	Std. Dev.	N/C	0.00	0.02	0.04
	Median	0.16	0.10	0.12	0.59
	Coeff. Var. (%)	N/C	0.00	18.45	7.18
TOC mg/L	Minimum	1.1	1.0	1.0	1.1
	Mean	1.1	1.1	1.8	1.4
	Maximum	1.1	1.2	2.6	2.2
	Std. Dev.	N/C	0.1	1.1	0.5
	Median	1.1	0.1	1.8	1.2
	Coeff. Var. (%)	N/C	12.9	62.9	38.2
TDS mg/L	Minimum	1,276	876	1,594	896
	Mean	1,276	961	1,656	958
	Maximum	1,276	1,046	1,718	994
	Std. Dev.	N/C	120	88	43

TABLE 2 (Continued): SUMMARY STATISTICS OF THE 2009 QUARTERLY SAMPLING DATA FOR O'HARE CHICAGOLAND UNDERFLOW PLAN RESERVOIR WATER QUALITY MONITORING WELLS QK-1 THROUGH QK-4

Parameter ¹	Well Number				
	QK-1	QK-2	QK-3	QK-4	
	Median	1,276	961	1,656	970
	Coeff. Var. (%)	N/C	13	5	4
Hard. mg/L as CO ₃	Minimum	546	462	909	504
	Mean	546	519	920	526
	Maximum	546	575	931	547
	Std. Dev.	N/C	80	16	18
	Median	546	519	920	526
	Coeff. Var. (%)	N/C	15	2	3
Cond. µmhos/cm	Minimum	530	536	822	572
	Mean	530	658	856	767
	Maximum	530	779	890	945
	Std. Dev.	N/C	172	48	153
	Median	530	658	856	775
	Coeff. Var. (%)	N/C	26	6	20
pH unit	Minimum	7.40	7.70	6.99	7.30
	Mean	7.40	7.75	7.00	7.48
	Maximum	7.40	7.80	7.00	7.60
	Std. Dev.	N/C	0.07	0.01	0.15
	Median	7.40	7.75	7.00	7.50
	Coeff. Var. (%)	N/C	0.91	0.10	2.01

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

²N/C stands for no calculation due to single value.

TABLE 4: 2009 GROUNDWATER QUALITY DATA FOR O'HARE CHICAGOLAND UNDERFLOW PLAN RESERVOIR
WATER QUALITY MONITORING WELLS QK-1 THROUGH QK-4
JUNE 23, 2009, FILL EVENT

12

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 ¹ mg/L	Hard. mg/L	Cond. ² µmhos/cm	pH ² unit	Temp. °C
QK-1	6/23/09	57	>6,000	303	0.66	1.5	748	430	600	7.36	12.5
QK-1	6/30/09				Well could not be sampled						
QK-1	7/8/09				Well could not be sampled						
QK-1	7/15/09				Well could not be sampled						
QK-1	7/24/09				Well could not be sampled						
QK-1	7/31/09				Well could not be sampled						
QK-2	6/23/09				Well could not be sampled						
QK-2	6/30/09				Well could not be sampled						
QK-2	7/8/09	16	<1	579	0.15	<1.0	1,076	519	1,102	7.30	13.1
QK-2	7/15/09				Well could not be sampled						
QK-2	7/24/09				Well could not be sampled						
QK-2	7/31/09				Well could not be sampled						
QK-3	6/23/09	138	6,800	437	<0.10	1.4	1,420	678	745	7.00	13.0
QK-3	6/30/09				Well could not be sampled						
QK-3	7/8/09				Well could not be sampled						
QK-3	7/15/09	33	800	901	0.13	2.6	1,718	909	890	6.97	14.1
QK-3	7/24/09				Well could not be sampled						
QK-3	7/31/09				Well could not be sampled						
QK-4	6/23/09	73	5,900	270	0.56	1.3	860	432	640	7.40	12.8
QK-4	6/30/09	45	6,600	72	0.56	1.2	908	470	1,090	7.70	12.0
QK-4	7/8/09	46	2,800	365	0.57	1.0	964	503	1,060	7.50	12.3

TABLE 4 (Continued): 2009 GROUNDWATER QUALITY DATA FOR O'HARE CHICAGOLAND UNDERFLOW PLAN
 RESERVOIR WATER QUALITY MONITORING WELLS QK-1 THROUGH QK-4
 June 23, 2009, Fill Event

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 ¹ mg/L	Hard. mg/L	Cond. ² µmhos/cm	pH ² unit	Temp. °C
QK-4	7/15/09	45	390	227	0.58	1.1	972	547	794	7.40	12.9
QK-4	7/24/09	44	430	337	0.50	1.4	988	481	650	7.12	12.9
QK-4	7/31/09				Well could not be sampled						

¹The method detection limit (MDL) or limit of quantification (LOQ) is 10 mg/L for Cl (LOQ), 2.0 mg/L for SO₄ (LOQ), 0.10 mg/L for NH₃-N (LOQ), 1.0 mg/L for TOC (LOQ), and 40 mg/L for TDS (LOQ). The detection limit for the FC analysis using the membrane filter method varies based on the actual sample volume analyzed.

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

TABLE 5: 2009 GROUNDWATER QUALITY DATA FOR O'HARE CHICAGOLAND UNDERFLOW PLAN RESERVOIR
WATER QUALITY MONITORING WELLS QK-1 THROUGH QK-4
DECEMBER 25, 2009, FILL EVENT

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 ¹ mg/L	Hard. mg/L	Cond. ² µmhos/cm	pH ² unit	Temp. °C
QK-1	12/30/09										
QK-1	1/5/10										
QK-1	1/13/10										
QK-1	1/20/10										
QK-1	1/27/10										
QK-1	2/3/10										
QK-2	12/30/09										
QK-2	1/5/10										
QK-2	1/13/10										
QK-2	1/20/10										
QK-2	1/27/10										
QK-2	2/3/10										
QK-3	12/30/09										
QK-3	1/5/10	40	520	722	<0.10	1.2	1,444	898	928	7.0	8.8
QK-3	1/13/10	29	68	603	<0.10	1.4	1,344	921	703	6.4	10.0
QK-3	1/20/10										
QK-3	1/27/10	29	50	601	<0.10	<1.0	1,234	729	1,065	7.3	11.2
QK-3	2/3/10	26	27	614	<0.10	<1.0	1,308	764	1,310	7.7	4.1
QK-4	12/30/09										
QK-4	1/5/10										
QK-4	1/13/10	43	<1	362	0.48	1.7	1,050	573	666	7.3	9.8

TABLE 5 (Continued): 2009 GROUNDWATER QUALITY DATA FOR O'HARE CHICAGOLAND UNDERFLOW PLAN
RESERVOIR WATER QUALITY MONITORING WELLS QK-1 THROUGH QK-4
DECEMBER 25, 2009, FILL EVENT

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 ¹ mg/L	Hard. mg/L	Cond. ² µmhos/cm	pH ² unit	Temp. °C
QK-4	1/20/10										
QK-4	1/27/10	38	<1	356	0.49	1.1	928	579	912	7.6	10.5
QK-4	2/3/10										

¹The method detection limit (MDL) or limit of quantification (LOQ) is 10 mg/L for Cl (LOQ), 2.0 mg/L for SO₄ (LOQ), 0.10 mg/L for NH₃-N (MDL), 1.0 mg/L for TOC (LOQ), and 40 mg/L for TDS (LOQ). The detection limit for the FC analysis using the membrane filter method varies based on the actual sample volume analyzed.

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