Metropolitan Water Reclamation District of Greater Chicago

RESEARCH AND DEVELOPMENT DEPARTMENT

REPORT NO. 06-44

GROUNDWATER MONITORING REPORT

TUNNEL AND RESERVOIR PLAN
O'HARE CUP RESERVOIR
WATER QUALITY MONITORING WELLS
2005 ANNUAL REPORT

AUGUST 2006

Protecting Our Water Environment

Metropolitan Water Reclamation District of Greater Chicago

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Louis Kollias, P.E., BCEE
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August 8, 2006

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

Subject: O'Hare CUP Reservoir Water Quality Monitoring Wells Annual Report for the Year 2005

Dear Ms. Willhite:

Enclosed are three copies of "Groundwater Monitoring Report, Tunnel and Reservoir Plan O'Hare CUP Reservoir Water Quality Monitoring Wells 2005 Annual Report."

Very truly yours,

Louis Kollias
Director
Research and Development

LK:JSJ:lmf
Enclosure
cc w/enc: Ms. Sally K. Swanson (USEPA Region V—WC15J) (2)
Ms. Linda Sorn (COE) (2)
Mr. Jay Patel (IEPA Region 2—Des Plaines) (2)
cc via MWRDGC website:
Mr. Sobanski
Mr. Jamjun
Dr. Granato
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Research and Development Department
Louis Kollias, Director

August 2006

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Introduction

This report contains data for the year 2005 for the four water quality monitoring wells located on the perimeter of the O'Hare 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 eight private water supply wells within 1000 feet of the reservoir. Please note that originally there were ten private water supply wells, but one was abandoned as of January 25, 1996, and another was locked and left vacant in 2000, leaving only eight 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 a 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.

Given below is 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:

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 1000 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

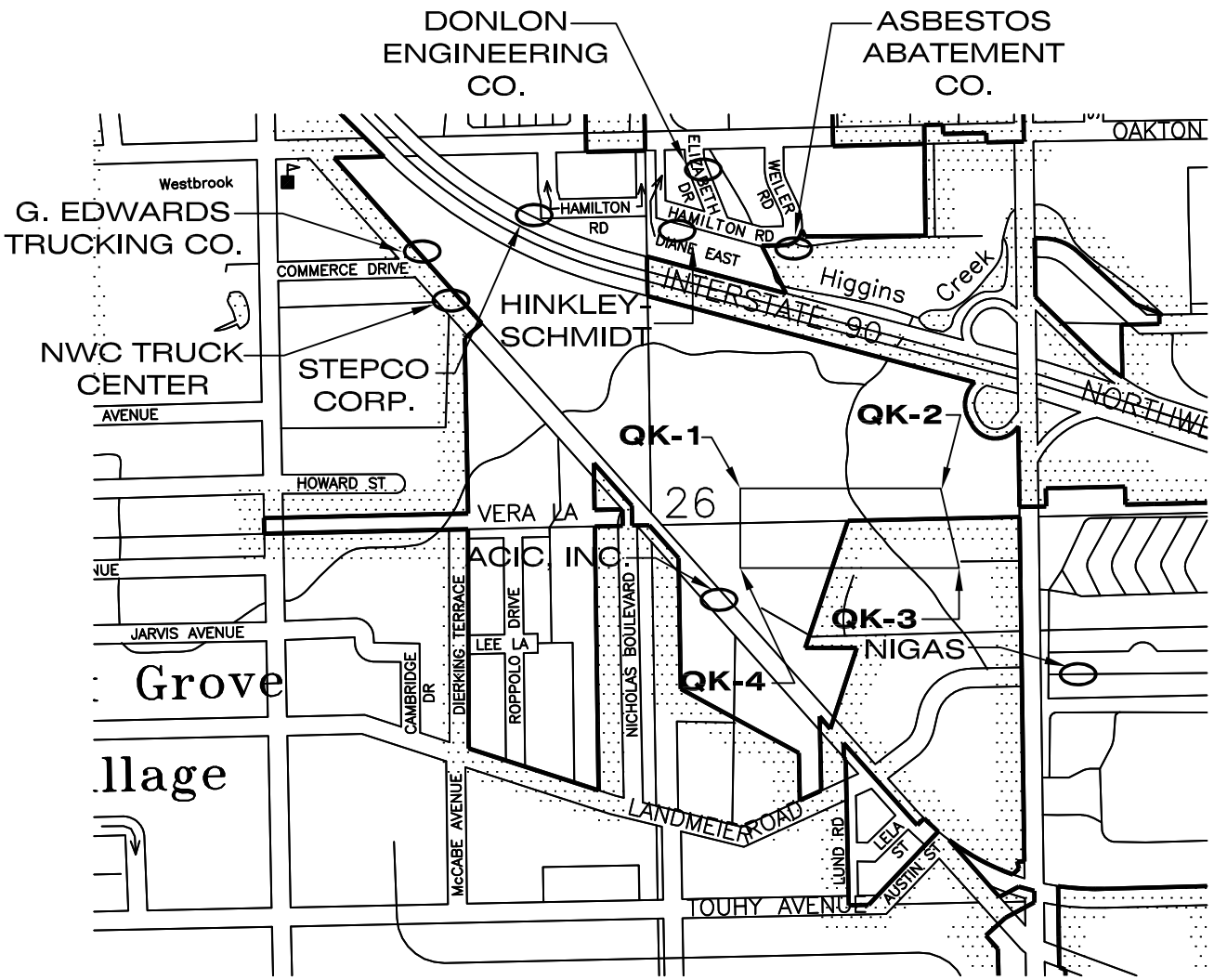

FIGURE 1

LOCATION OF FOUR WATER QUALITY MONITORING WELLS AND EIGHT PRIVATE WELLS

METROPOLITAN WATER RECLAMATION DISTRICT OF GREATER CHICAGO

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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 eventbased 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), conductivity (Cond.), fecal coliform (FC), hardness (Hard.), ammonia (NH_4^+–N), pH, sulfate (SO_4), total dissolved solids (TDS), total organic carbon (TOC), temperature (Temp.).

This report fulfills the requirements, as set forth under items 3 and 4 referred to above, which are to be completed by the District.

Monitoring Data

Quarterly Monitoring. Table 1 contains the 2005 data for ten TARP water quality indicator parameters obtained from samples collected on a quarterly basis from the four (QK–1, QK–2, QK–3, and QK–4) water quality monitoring wells located on the perimeter

of the O'Hare CUP Reservoir. Water quality monitoring wells QK–1, QK–2 and QK–3 could not be sampled on August 10, 2005, because there was insufficient water in the well to collect a sample. Also on May 24, 2005, water well QK–2 could not be sampled because there was insufficient water in the well to collect a sample.

Table 2 contains summary statistics of the water quality parameters for the year 2005 quarterly samples for all four wells QK–1 through QK–4. The summary statistics include minimum, mean, maximum, standard deviation (Std. Dev.), median, and coefficient of variation (Coeff. Var.) of the values of the TARP water quality indicator parameters analyzed during 2005.

Fill Event Monitoring. The O'Hare CUP Reservoir experienced one fill event during 2005, which occurred on January 5, 2005. Sampling of the event was conducted according to item 4 requirements as described on page 3 of this report. 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. The weekly sampling is to be continued for at least six weeks or until all sampling results indicate concentrations below the 95 percent confidence level for background concentration.

January 5, 2005, Fill Event. Table 3 contains water quality data for water quality monitoring wells QK–1 through QK–4 for the January 5, 2005, fill event. Sampling covered the period of January 14 through February 16, 2005. All of the wells were sampled as required.

TABLE 1: 2005 GROUNDWATER QUALITY DATA FOR O'HARE CUP RESERVOIR
WATER QUALITY MONITORING WELLS QK–1 THROUGH QK–4

Well	Date of Sampling	Cl mg/L	Cond.[1] µmhos/cm	FC[1] cfu/100 mL	Hard. as $CaCO_3$ mg/L	NH_4^+–N mg/L	pH[1]	SO_4 mg/L	TDS mg/L	TOC mg/L	Temp. °C
QK–1	2/9/05	23	650	68	628	0.03	7.3	519	1164	1	6
QK–1	5/24/05	10	1136	<1	658	0.00[2]	6.9	574	1196	2	13
QK–1	8/10/05				Well could not be sampled						
QK–1	11/15/05	5	910	<1	467	0.20	7.2	521	900	1	12
QK–2	2/9/05	1	605	<1	436	0.17	7.5	475	922	2	10
QK–2	5/24/05				Well could not be sampled						
QK–2	8/10/05				Well could not be sampled						
QK–2	11/15/05	10	1090	<1	617	0.00[2]	7.3	570	1080	1	12
QK–3	2/9/05	26	835	<1	489	0.10	7.6	379	898	2	10
QK–3	5/24/05	32	788	<1	423	0.19	7.3	287	746	1	12
QK–3	8/10/05				Well could not be sampled						
QK–3	11/15/05	27	804	<1	514	0.00[2]	7.5	409	914	1	12
QK–4	2/9/05	45	767	<1	538	0.53	7.5	302	940	1	11
QK–4	5/24/05	35	989	<1	553	0.32	6.9	353	920	2	12
QK–4	8/10/05	46	1003	<1	510	0.47	7.3	303	926	1	13
QK–4	11/15/05	62	906	<1	447	0.49	7.4	262	844	1	12

[1]Unfiltered samples, all others were filtered through 0.45 µm membrane.
[2]A zero value indicates that the test result was below the detection limit (DL). The DL for ammonia nitrogen is 0.2 mg/L.

TABLE 2: SUMMARY STATISTICS OF THE 2005 QUARTERLY SAMPLING DATA FOR
O'HARE CUP RESERVOIR WATER QUALITY MONITORING WELLS QK–1 THROUGH QK–4

Parameters		Well Number			
		QK–1	QK–2	QK–3	QK–4
Cl, mg/L	Minimum	5	1	26	35
	Mean	13	6	28	47
	Maximum	23	10	32	62
	Std. Dev.	9	6	3	11
	Median	10	6	27	46
	Coeff. Var.	73	116	11	24
Cond., µmhos/cm	Minimum	650	605	788	767
	Mean	899	848	809	916
	Maximum	1136	1090	835	1003
	Std. Dev.	243	343	24	108
	Median	910	848	804	948
	Coeff. Var.	27	40	3	12
FC,* cfu/100 mL	Minimum	1	1	1	1
	Geo. Mean	4	1	1	1
	Maximum	68	1	1	1
	Geo. Std. Dev.	39	1	1	1
	Median	1	1	1	1
	Coeff. Var.	948	0	0	0

TABLE 2 (Continued): SUMMARY STATISTICS OF THE 2005 QUARTERLY SAMPLING DATA FOR O'HARE CUP RESERVOIR WATER QUALITY MONITORING WELLS QK–1 THROUGH QK–4

Parameters		Well Number			
		QK–1	QK–2	QK–3	QK–4
Hard.	Minimum	467	436	423	447
as $CaCO_3$,	Mean	584	527	475	512
mg/L	Maximum	658	617	514	553
	Std. Dev.	103	128	47	47
	Median	628	527	489	524
	Coeff. Var.	18	24	10	9
NH_4^+–N,	Minimum	0.00**	0.00**	0.00**	0.32
mg/L	Mean	0.08	0.09	0.10	0.45
	Maximum	0.20	0.17	0.19	0.53
	Std. Dev.	0.11	0.12	0.10	0.09
	Median	0.03	0.09	0.10	0.48
	Coeff. Var.	140.68	141.42	98.32	20.28
pH	Minimum	6.9	7.3	7.3	6.9
	Mean	7.1	7.4	7.5	7.3
	Maximum	7.3	7.5	7.6	7.5
	Std. Dev.	0.2	0.1	0.2	0.3
	Median	7.2	7.4	7.5	7.4
	Coeff. Var.	2.9	1.9	2.0	3.6

TABLE 2 (Continued): SUMMARY STATISTICS OF THE 2005 QUARTERLY SAMPLING DATA FOR O'HARE CUP RESERVOIR WATER QUALITY MONITORING WELLS QK–1 THROUGH QK–4

Parameters		Well Number			
		QK–1	QK–2	QK–3	QK–4
SO_4, mg/L	Minimum	519	475	287	262
	Mean	538	523	358	305
	Maximum	574	570	409	353
	Std. Dev.	31	67	64	37
	Median	521	523	379	303
	Coeff. Var.	6	13	18	12
TDS, mg/L	Minimum	900	922	746	844
	Mean	1087	1001	853	908
	Maximum	1196	1080	914	940
	Std. Dev.	162	112	93	43
	Median	1164	1001	898	923
	Coeff. Var.	15	11	11	5
TOC, mg/L	Minimum	1	1	1	1
	Mean	1	2	1	1
	Maximum	2	2	2	2
	Std. Dev.	1	1	1	1
	Median	1	2	1	1
	Coeff. Var.	43	47	43	40

*For purposes of statistical evaluation, fecal coliform values less than 1 were set equal to 1.
**A zero value indicates that the test result was below the detection limit (DL). The DL for ammonia nitrogen is 0.2 mg/L.

TABLE 3: 2005 GROUNDWATER QUALITY DATA FOR O'HARE CUP RESERVOIR
WATER QUALITY MONITORING WELLS QK–1 THROUGH QK–4
FILL EVENT JANUARY 5, 2005

Well	Date of Sampling	Cl mg/L	Cond.[1] µmhos/cm	FC[1] cfu/100 mL	Hard. as $CaCO_3$ mg/L	NH_4^+–N mg/L	pH[1]	SO_4 mg/L	TDS mg/L	TOC mg/L	Temp. °C
QK–1	1/14/05	35	624	2000	579	0.11	7.6	441	907	2	10
QK–1	1/19/05	12	395	680	648	0.00[2]	7.0	541	1154	1	12
QK–1	1/24/05	Well could not be sampled[3]									
QK–1	1/31/05	15	672	66	634	0.05	7.5	554	1128	2	12
QK–1	2/9/05	23	650	68	628	0.17	7.3	519	922	1	11
QK–1	2/16/05	20	587	12	672	0.08	6.9	499	1140	2	12
QK–2	1/14/05	8	530	<1	448	0.28	7.5	473	824	2	12
QK–2	1/19/05	Well could not be sampled[3]									
QK–2	1/26/05	Well could not be sampled[3]									
QK–2	1/31/05	26	538	4	474	0.09	7.3	360	890	2	11
QK–2	2/9/05	1	605	<1	436	0.17	7.5	475	922	2	10
QK–2	2/16/05	Well could not be sampled[3]									
QK–3	1/14/05	34	457	110	509	0.22	7.1	350	880	1	12
QK–3	1/19/05	Well could not be sampled[3]									
QK–3	1/26/05	39	439	4	467	0.07	6.9	321	768	2	12
QK–3	1/31/05	26	457	4	474	0.09	7.6	360	890	2	11
QK–3	2/9/05	26	835	<1	489	0.10	7.6	379	898	2	12
QK–3	2/16/05	Well could not be sampled[3]									

TABLE 3 (Continued): 2005 GROUNDWATER QUALITY DATA FOR O'HARE CUP RESERVOIR
WATER QUALITY MONITORING WELLS QK–1 THROUGH QK–4
FILL EVENT JANUARY 5, 2005

Well	Date of Sampling	Cl mg/L	Cond.[1] µmhos/cm	FC[1] cfu/100 mL	Hard. as $CaCO_3$ mg/L	NH_4^+–N mg/L	pH[1]	SO_4 mg/L	TDS mg/L	TOC mg/L	Temp. °C
QK–4	1/14/05	59	585	<1	474	0.51	7.5	262	868	2	12
QK–4	1/19/05	35	450	<10	572	0.15	7.8	317	960	1	12
QK–4	1/26/05	55	439	<1	502	0.44	7.0	279	850	3	10
QK–4	1/31/05	54	584	<1	488	0.46	7.7	277	924	2	12
QK–4	2/9/05	45	767	<1	538	0.53	7.5	302	940	1	12
QK–4	2/16/05	50	897	<1	513	0.46	6.9	278	865	2	12

[1]Unfiltered samples, all others were filtered through a 0.45 µm membrane.
[2]A zero value indicates that the test result was below the detection limit (DL). The DL for ammonia nitrogen is 0.2 mg/L.
[3]Well could not be sampled because a large enough sample could not be collected from the well.