Metropolitan Water Reclamation District of Greater Chicago

RESEARCH AND DEVELOPMENT DEPARTMENT

REPORT NO. 07-44

TUNNEL AND RESERVOIR PLAN

O'HARE CUP RESERVOIR WATER QUALITY MONITORING WELLS

2006 ANNUAL GROUNDWATER MONITORING REPORT

July 2007

Protecting Our Water Environment

Metropolitan Water Reclamation District of Greater Chicago

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July 27, 2007

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 Cup Reservoir Water Quality Monitoring Wells, 2006 Annual Groundwater Monitoring Report

Enclosed are three copies of "Tunnel and Reservoir Plan, O'Hare Cup Reservoir Water Quality Monitoring Wells, 2006 Annual Groundwater Monitoring 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)
Mr. Sobanski
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TUNNEL AND RESERVOIR PLAN
O'HARE CUP RESERVOIR WATER QUALITY MONITORING WELLS
2006 ANNUAL GROUNDWATER MONITORING REPORT

Research and Development Department
Louis Kollias, Director

July 2007

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INTRODUCTION

This report contains data for the year 2006 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 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), 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 2006 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, and QK–2 could not be sampled on February 16, 2006, May 3, 2006, or August 3, 2006, because there was insufficient water in the well to collect a sample. Water quality monitoring well QK–3 could not be sampled on February 16, 2006, 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 2006 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 2006.

Fill Event Monitoring. The O'Hare CUP Reservoir experienced two fill events during 2006, which occurred on October 1 and December 21, 2006. Sampling of these events was conducted 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. 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.

October 1, 2006, Fill Event. Table 3 contains water quality data for water quality monitoring wells QK–1 through QK–4 for the October 1, 2006, fill event. Sampling covered the period of October 1, 2006, through November 8, 2006. All wells were sampled as required with one exception. On October 10, 2006, water quality well QK–2 could not be sampled because there was insufficient water in the well to collect a sample.

December 21, 2006, Fill Event. Table 4 contains water quality data for water quality monitoring wells QK–1 through QK–4 for the December 21, 2006, fill event. Sampling covered the period of December 26, 2006, through January 29, 2007.

All wells were sampled as required with the following exceptions. On January 10, 2007, water quality monitoring wells QK–1 and QK–2 could not be sampled because there was insufficient water in the well to collect a sample. On January 18, 2007, water quality monitoring well QK–1 could not be sampled because there was insufficient water in the well to collect a sample. On January 25, 2007, water quality well QK–2 could not be sampled because there was insufficient water in the well to collect a sample.

TABLE 1: 2006 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	2/16/2006				Well could not be sampled						
QK–1	5/3/2006				Well could not be sampled						
QK–1	8/3/2006				Well could not be sampled						
QK–1	11/8/2006	25	595	<1	597	<0.02	7.7	505	1098	0.8	12
QK-2	2/16/2006				Well could not be sampled						
QK-2	5/3/2006				Well could not be sampled						
QK-2	8/3/2006				Well could not be sampled						
QK-2	11/8/2006	1	568	<1	484	0.08	7.8	177	1016	0.7	13
QK-3	2/16/2006				Well could not be sampled						
QK-3	5/3/2006	35	960	<1	463	0.09	7.3	369	880	0.7	14
QK-3	8/3/2006	15	344	2	382	0.27	7.6	53	750	0.9	14
QK-3	11/8/2006	32	516	<1	403	0.31	7.5	92	760	1.7	13
QK-4	2/16/2006	54	877	<1	513	0.59	7.0	296	976	0.8	11
QK-4	5/3/2006	60	826	<1	493	0.42	7.4	310	934	0.7	12
QK-4	8/3/2006	59	432	<1	489	0.43	7.5	7	852	0.9	13
QK-4	11/8/2006	58	602	<1	494	0.40	7.5	95	844	0.8	12

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

TABLE 2: SUMMARY STATISTICS OF THE 2006 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	25	1	15	54
	Mean	25	1	27	58
	Maximum	25	1	35	60
	Std. Dev.	0	0	11	3
	Median	25	1	32	59
	Coeff. Var.	0	0	39	5
Cond., µmhos/cm	Minimum	595	568	344	432
	Mean	595	568	607	684
	Maximum	595	568	960	877
	Std. Dev.	0	0	318	206
	Median	595	568	516	714
	Coeff. Var.	0	0	52	30
FC,[1] cfu/100 mL	Minimum	1	1	1	1
	Geo. Mean	1	1	1	1
	Maximum	1	1	2	1
	Geo. Std. Dev.	0	0	1	0
	Median	1	1	1	1
	Coeff. Var.	0	0	42	0

TABLE 2 (Continued): SUMMARY STATISTICS OF THE 2006 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	597	484	382	489
as $CaCO_3$,	Mean	597	484	416	497
mg/L	Maximum	597	484	463	513
	Std. Dev.	0	0	42	11
	Median	597	484	403	494
	Coeff. Var.	0	0	10	2
NH_4^+–N,[2]	Minimum	0.02	0.08	0.09	0.40
mg/L	Mean	0.02	0.08	0.22	0.46
	Maximum	0.02	0.08	0.31	0.59
	Std. Dev.	0.00	0.00	0.12	0.09
	Median	0.02	0.08	0.27	0.43
	Coeff. Var.	0.00	0.00	52.47	19.03
pH	Minimum	7.7	7.8	7.3	7.0
	Mean	7.7	7.8	7.5	7.4
	Maximum	7.7	7.8	7.6	7.5
	Std. Dev.	0.0	0.0	0.2	0.2
	Median	7.7	7.8	7.5	7.5
	Coeff. Var.	0.0	0.0	2.0	3.2

TABLE 2 (Continued): SUMMARY STATISTICS OF THE 2006 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	505	177	53	7
	Mean	505	177	171	177
	Maximum	505	177	369	310
	Std. Dev.	0	0	172	150
	Median	505	177	92	196
	Coeff. Var.	0	0	101	85
TDS, mg/L	Minimum	1098	1016	750	844
	Mean	1098	1016	797	902
	Maximum	1098	1016	880	976
	Std. Dev.	0	0	72	64
	Median	1098	1016	760	893
	Coeff. Var.	0	0	9	7
TOC, mg/L	Minimum	0.8	0.7	0.7	0.7
	Mean	0.8	0.7	1.1	0.8
	Maximum	0.8	0.7	1.7	0.9
	Std. Dev.	0.0	0.0	0.5	0.1
	Median	0.8	0.7	0.9	0.8
	Coeff. Var.	0.0	0.0	48.1	10.2

[1]For purposes of statistical evaluation, fecal coliform values less than 1 were set equal to 1.
[2]For purposes of statistical evaluation, NH_4^+–N values less than 0.02 (the detection limit) were set equal to 0.02.

TABLE 3: 2006 GROUNDWATER QUALITY DATA FOR O'HARE CUP RESERVOIR
WATER QUALITY MONITORING WELLS QK–1 THROUGH QK–4
FILL EVENT OCTOBER 1, 2006

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	10/3/06	27	652	<1	593	<0.02	7.5	601	1068	0.9	13
QK–1	10/10/06	12	1454	<1	647	<0.02	8.8	501	1272	0.7	13
QK–1	10/17/06	25	486	<1	600	<0.02	7.5	532	1070	0.8	13
QK–1	10/25/06	27	685	<1	583	<0.02	7.6	486	1060	0.6	13
QK–1	10/30/06	30	615	<1	588	<0.02	7.6	532	1062	0.6	13
QK–1	11/8/06	1	595	<1	597	<0.02	7.7	505	1098	0.8	12
QK–2	10/3/06	9	542	<1	426	0.11	7.5	503	910	0.7	13
QK–2	10/10/06	Well could not be sampled									
QK–2	10/17/06	6	492	<1	485	0.05	7.6	579	958	0.7	12
QK–2	10/25/06	33	687	<1	398	0.09	7.7	265	744	0.5	12
QK–2	10/30/06	1	556	<1	480	<0.02	7.5	581	966	0.5	13
QK–2	11/8/06	1	568	<1	484	<0.02	7.7	177	1016	0.7	12
QK–3	10/3/06	26	822	<1	534	<0.02	7.5	485	972	0.7	13
QK–3	10/10/06	35	1042	25	406	0.08	8.9	283	766	0.7	13
QK–3	10/17/06	33	330	3	392	0.10	7.5	277	740	0.7	12
QK–3	10/25/06	33	682	<1	398	0.09	7.5	265	744	0.5	11
QK–3	10/30/06	36	602	<1	391	0.26	7.7	282	714	0.5	12
QK–3	11/8/06	58	516	<1	494	0.40	7.5	95	844	1.7	13
QK–4	10/3/06	57	602	<1	487	0.22	7.5	276	872	0.8	13
QK–4	10/10/06	60	1194	<1	479	0.42	8.9	278	868	0.9	12

TABLE 3 (Continued): 2006 GROUNDWATER QUALITY DATA FOR O'HARE CUP RESERVOIR
WATER QUALITY MONITORING WELLS QK–1 THROUGH QK–4
FILL EVENT OCTOBER 1, 2006

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	10/17/06	52	533	<1	506	0.32	7.6	306	860	0.8	12
QK–4	10/25/06	52	673	<1	505	0.27	7.6	285	864	0.6	11
QK–4	10/30/06	58	550	<1	496	0.36	7.5	303	854	0.6	12
QK–4	11/8/06	58	602	<1	494	0.40	7.7	96	844	0.8	12

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

TABLE 4: 2006 GROUNDWATER QUALITY DATA FOR O'HARE CUP RESERVOIR
WATER QUALITY MONITORING WELLS QK–1 THROUGH QK–4
FILL EVENT DECEMBER 21, 2006

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	12/26/06	13	536	1100	684	<0.02	7.7	635	1202	0.9	11
QK–1	1/4/07	6	1122	<1	534	0.14	7.9	593	1062	0.7	12
QK–1	1/10/07	Well could not be sampled									
QK–1	1/18/07	Well could not be sampled									
QK–1	1/25/07	12	1090	<1	500	0.11	7.1	413	1020	0.7	11
QK–1	1/29/07	20	1004	20	646	0.03	6.9	538	1148	0.7	9
QK–2	12/26/06	6	538	<1	536	0.14	7.7	616	1042	0.7	11
QK–2	1/4/07	8	1239	1000	680	<0.02	7.8	615	1226	0.6	11
QK–2	1/10/07	Well could not be sampled									
QK–2	1/18/07	6	472	<1	523	0.12	7.9	1361	1044	0.7	10
QK–2	1/25/07	Well could not be sampled									
QK–2	1/29/07	5	846	<1	482	0.13	7.6	549	970	0.6	10
QK–3	12/26/06	51	520	<1	641	<0.02	7.6	528	1106	0.9	11
QK–3	1/4/07	91	1001	1	928	<0.02	7.2	709	1608	1.2	11
QK–3	1/10/07	43	836	<1	471	0.29	7.5	332	858	0.9	10
QK–3	1/18/07	36	423	<1	395	0.32	7.8	789	722	0.7	10
QK–3	1/25/07	36	911	<1	401	0.28	7.1	278	734	0.7	10
QK–3	1/29/07	35	705	<1	384	0.28	7.3	287	710	0.7	10
QK–4	12/1/06	59	514	<1	509	0.47	7.8	313	896	0.9	11
QK–4	1/4/07	49	1066	<1	534	0.36	7.1	314	926	0.8	12

TABLE 4 (Continued): 2006 GROUNDWATER QUALITY DATA FOR O'HARE CUP RESERVOIR
WATER QUALITY MONITORING WELLS QK–1 THROUGH QK–4
FILL EVENT DECEMBER 21, 2006

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	1/10/07	66	852	<1	472	0.41	7.6	270	832	0.7	11
QK–4	1/18/07	60	466	<1	491	0.39	8.0	272	850	0.7	10
QK–4	1/25/07	64	1070	<1	481	0.38	7.1	288	878	0.7	10
QK–4	1/29/07	63	836	<1	475	0.40	7.3	296	850	0.8	9

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

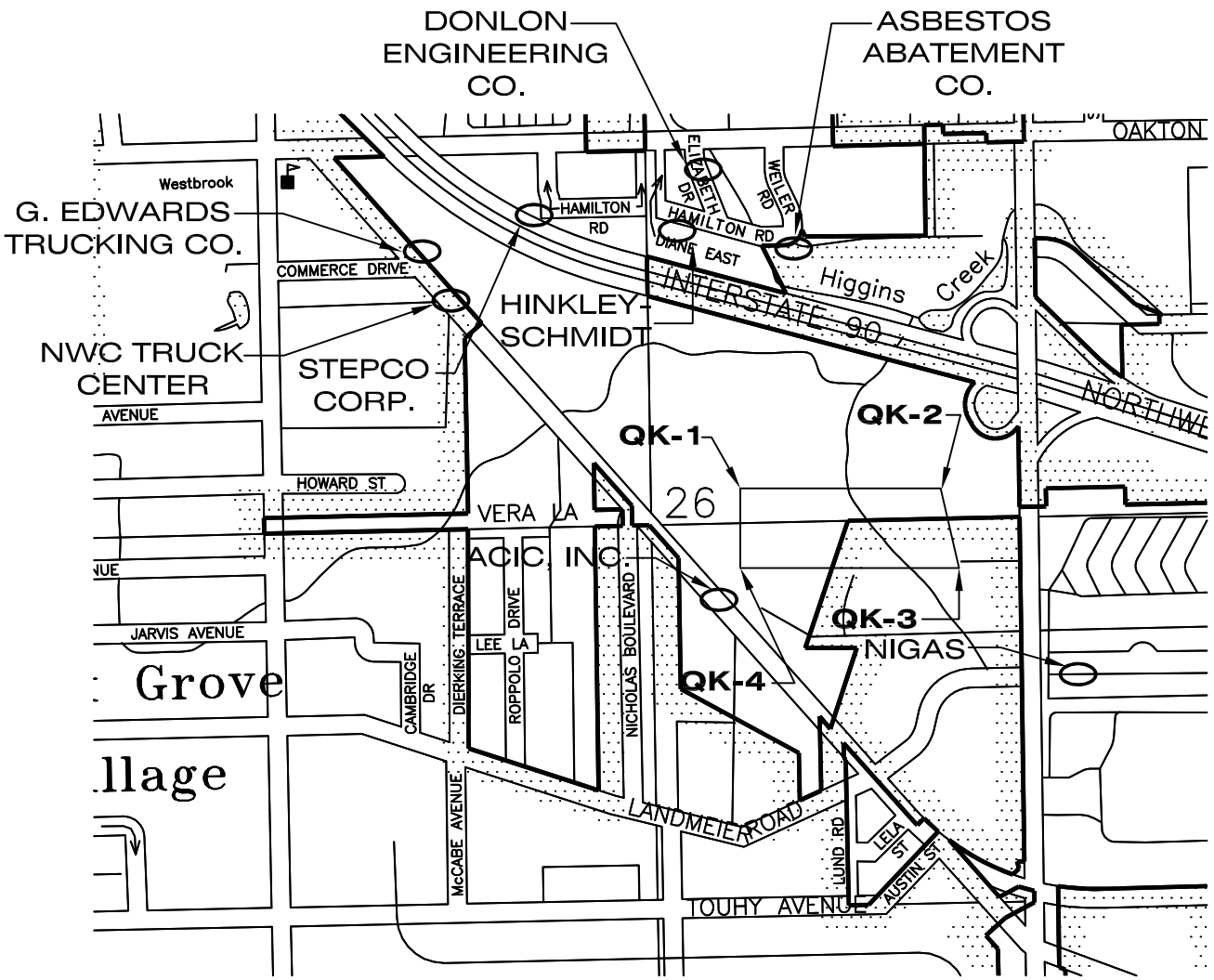

FIGURE 1

LOCATION OF FOUR WATER QUALITY MONITORING WELLS AND EIGHT PRIVATE WELLS

METROPOLITAN WATER RECLAMATION DISTRICT OF GREATER CHICAGO

H:\DMAC\OHAREWATERQUALITYMONITORS.dwg, 06/14/04 at 13.56