Metropolitan Water Reclamation District of Greater Chicago

MONITORING AND RESEARCH DEPARTMENT

REPORT NO. 23-21

TUNNEL AND RESERVOIR PLAN

DES PLAINES TUNNEL SYSTEM

ANNUAL GROUNDWATER MONITORING REPORT

FOR 2022

July 2023

Protecting Our Water Environment

Metropolitan Water Reclamation District of Greater Chicago

CECIL LUE-HING RESEARCH AND DEVELOPMENT COMPLEX
6001 West Pershing Road Cicero, Illinois 60804-4112

July 17, 2023

Mr. Sanjay Sofat
Bureau of Water
Illinois Environmental Protection Agency
P. O. Box 19276
Springfield, IL 62794-9276

Dear Mr. Sofat:

Subject: Tunnel and Reservoir Plan Des Plaines Tunnel System Annual Groundwater Monitoring Report for 2022

The report entitled "Tunnel and Reservoir Plan Des Plaines Tunnel System Annual Groundwater Monitoring Report for 2022" is attached.

Very truly yours,

Albert Cox

Albert E. Cox, Ph.D.
Environmental Monitoring and Research Manager
Monitoring and Research Department

AC:EE:lf
Attachment
cc: Mr. Ryan Bahr (USEPA Region 5 - WC15J)
Mr. E. Podczerwinski
Dr. H. Zhang
cc w/o att: Mr. J. Murray
Mr. A. Gronski

Metropolitan Water Reclamation District of Greater Chicago
100 East Erie Street Chicago, Illinois 60611-2803 (312) 751-5600

TUNNEL AND RESERVOIR PLAN
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ANNUAL GROUNDWATER MONITORING REPORT
FOR 2022

By

Essam El-Naggar
Environmental Soil Scientist

Guanglong Tian
Principal Environmental Scientist

Albert Cox
Environmental Monitoring and Research Manager

Heng Zhang
Assistant Director of Monitoring and Research
Environmental Monitoring and Research Division

Monitoring and Research Department
Edward W. Podczerwinski, Director **July 2023**

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LIST OF ABBREVIATIONS

Abbreviation	Definition
°C	degrees Celsius
CCD	Chicago City Datum
CFU	colony forming units
Cl^-	chloride
District	Metropolitan Water Reclamation District of Greater Chicago
EC	electrical conductivity
FC	fecal coliform
IEPA	Illinois Environmental Protection Agency
L	liter
m	meter
mg	milligram
mS	millisiemens
NH_3-N	ammonia nitrogen
SO_4^{2-}	sulfate
TARP	Tunnel and Reservoir Plan
TDS	total dissolved solids
Temp.	temperature
TOC	total organic carbon

ANNUAL DATA FOR MONITORING WELLS

Introduction

All monitoring wells are located along the 13A extension, south leg, middle leg, and north leg of the Des Plaines Tunnel System (Figure 1). The monitoring wells were sampled based on the modified groundwater monitoring program for the Metropolitan Water Reclamation District of Greater Chicago's (District's) Tunnel and Reservoir Plan (TARP) as briefly described below.

Modified Groundwater Monitoring Program

In a letter dated May 14, 2021, the Illinois Environmental Protection Agency (IEPA) approved a modified TARP groundwater monitoring program for the District's Calumet, Mainstream, Des Plaines, and Upper Des Plaines tunnel systems effective January 2021. The modification of the TARP groundwater monitoring program was based on the key findings from a three-year fill event-based groundwater monitoring study conducted by the District from 2017 to 2019 and was submitted to the IEPA in a report dated July 30, 2020.

Under the modified monitoring program, nine fill event-based monitoring wells in the Des Plaines Tunnel System (QD-27, QD-29, QD-30, QD-31, QD-33, QD-34, QD-36, QD-46, and QD-54) are sampled for two tunnel fill events per year, usually following storm events. Fecal coliforms (FC) in these wells were detected in 10 percent or more of samples collected during the period 1995–2013. In addition, well QD-57, previously sampled annually, is monitored according to this schedule. Fecal coliforms were detected in this well in all samples collected during 2017–2019. The criterion that triggers fill event sampling is that the level of water in the TARP Mainstream tunnels reaches -150 feet Chicago City Datum (CCD). The fill event-based monitoring wells are sampled in two groups. At each fill event, the first group of wells (QD-29, QD-30, QD-54, and QD-57) is sampled during the first week of the fill event, and the second group of wells (QD-27, QD-31, QD-33, QD-34, QD-36, and QD-46) is sampled during the second week of the fill event. For the first fill event, samples are analyzed for all parameters including pH, temperature (Temp.), electrical conductivity (EC), total dissolved solids (TDS), hardness, ammonia nitrogen (NH_3-N), total organic carbon (TOC), chloride (Cl^-), sulfate (SO_4^{2-}), and FC. For the second fill event, samples are analyzed for FC only. Groundwater elevations in the monitoring wells are measured during each sampling event.

The other 30 wells associated with the Des Plaines Tunnel System, referred to as annual monitoring wells, are sampled once per year. These wells had FC detected in less than 10 percent of samples during the period 1995–2013.

Summary of Monitoring Well Data

During 2022, fill event-based sampling was conducted at two fill events occurring on March 31 and September 1, 2022. The groundwater analytical data and physical parameters for the fill event-based monitoring wells QD-27, QD-29, QD-30, QD-31, QD-33, QD-34, QD-36, QD-46, QD-54, and QD-57 is presented in Table 1.

FIGURE 1: MAP OF MONITORING WELLS IN THE DES PLAINES TUNNEL SYSTEM

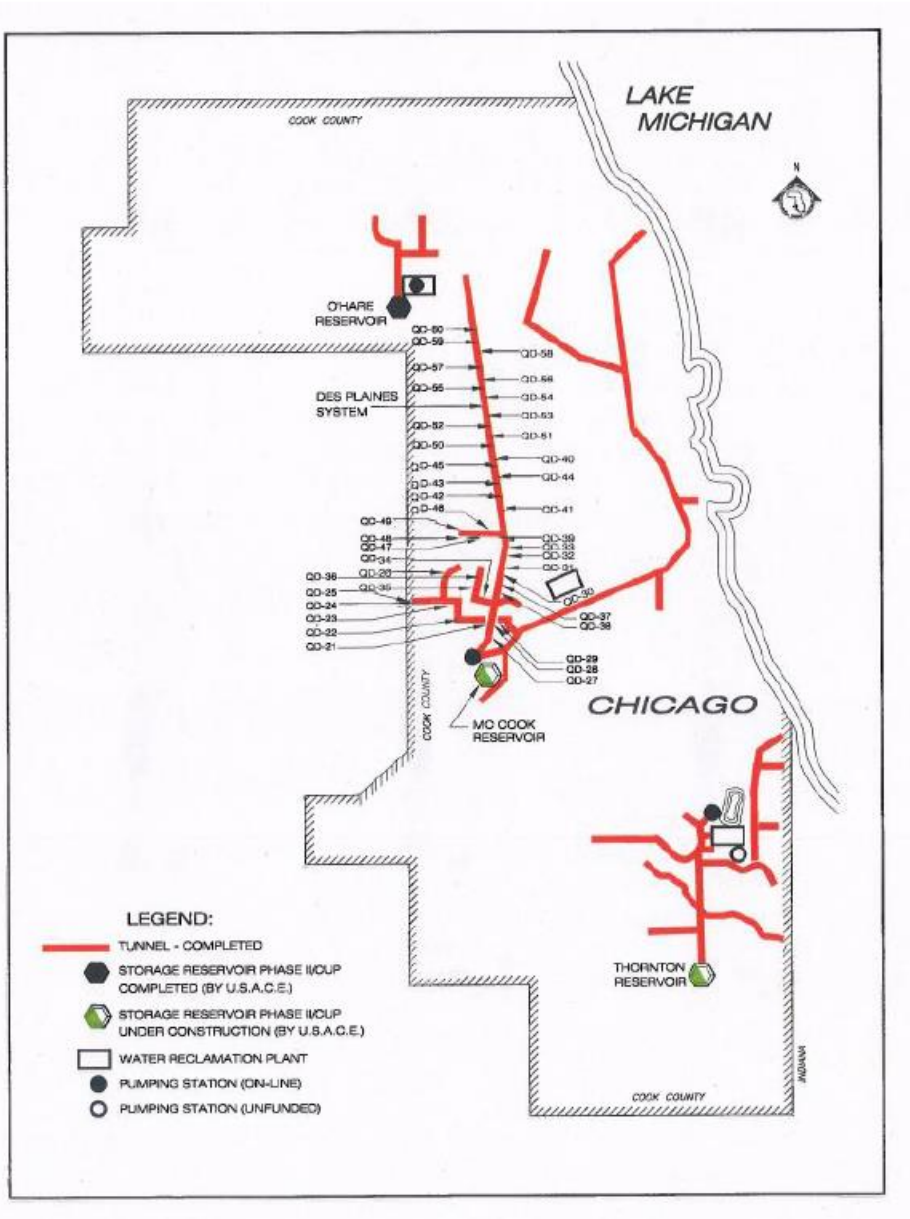

TABLE 1: ANALYSIS OF CHEMICAL AND PHYSICAL PARAMETERS AND FECAL COLIFORM IN GROUNDWATER SAMPLED FROM FILL EVENT MONITORING WELLS IN THE DES PLAINES TUNNEL SYSTEM OF THE TUNNEL AND RESERVOIR PLAN DURING 2022[1]

Well	Sampled Date	pH	EC mS/m	TDS	TOC	Cl^-	SO_4^{2-}	NH_3-N	Hardness	Temp. °C	Water Elevation[2] feet	Fecal Coliform CFU/100 mL	Recharge Time hours
				mg/L									
QD-27	04/13/22	7.34	198	1,272	17.1	473	54	25.1	521	13.3	-164	<1	<48
	09/22/22	7.31	190	—	—	—	—	—	—	13.5	-156	<1	<48
QD-29	04/06/22	7.41	172	1,378	7.4	401	354	0.8	608	13.4	-52	<1	<4
	09/14/22	7.29	173	—	—	—	—	—	—	14.5	-51	<1	<4
QD-30	04/06/22	7.30	79	604	<5.0	93	134	<0.3	352	12.8	-81	<1	<48
	09/14/22	7.22	91	—	—	—	—	—	—	13.1	-69	<1	<48
QD-31	04/13/22	7.55	117	936	<5.0	137	188	<0.3	224	12.8	-192	<1	<4
	09/22/22	7.48	117	—	—	—	—	—	—	12.8	-189	81	<4
QD-33	04/13/22	8.58	174	1,506	<5.0	360	210	<0.3	32	13.3	-197	6	<48
	09/22/22	8.18	194	—	—	—	—	—	—	12.9	-191	14	<48
QD-34	04/12/22	7.02	116	958	<5.0	149	242	0.4	630	13.8	-53	<1	<4
	09/22/22	6.78	119	—	—	—	—	—	—	13.6	-49	<1	<4
QD-36	04/12/22	7.04	116	1,028	<5.0	122	289	<0.3	684	12.9	-69	<1	<4
	09/22/22	6.72	120	—	—	—	—	—	—	14.7	-63	<1	<4
QD-46	04/12/22	8.16	67	550	<5.0	11	132	<0.3	84	12.9	-143	<1	<4
	09/22/22	7.72	75	—	—	—	—	—	—	12.8	-123	<1	<4

TABLE 1 (Continued): ANALYSIS OF CHEMICAL AND PHYSICAL PARAMETERS AND FECAL COLIFORM IN GROUNDWATER SAMPLED FROM FILL EVENT MONITORING WELLS IN THE DES PLAINES TUNNEL SYSTEM OF THE TUNNEL AND RESERVOIR PLAN DURING 2022

Well	Sampled Date	pH	EC mS/m	TDS	TOC	Cl^-	SO_4^{2-}	NH_3-N	Hardness	Temp. °C	Water Elevation[2] feet	Fecal Coliform CFU/100 mL	Recharge Time hours
				mg/L									
QD-54	04/06/22	8.78	54	430	<5.0	18	154	<0.3	29	15.5	53	<1	<48
	09/14/22	9.09	59	—	—	—	—	—	—	13.1	-44	<1	<48
QD-57	04/06/22	8.48	43	350	<5.0	13	48	<0.3	15	11.8	-121	<1	<48
	09/14/22	8.75	42	—	—	—	—	—	—	11.9	-120	<1	<48

[1]Chemistry parameters need to be analyzed for first fill event only.

[2]Relative to Chicago City Datum (579.48 feet above mean sea level) at intersection of State and Madison Streets.

Fecal coliform counts were nondetectable (<1 colony forming units (CFU)/100 mL) during the two monitored fill events at all Des Plaines fill event monitored wells expect at wells QD-31 and QD-33. Fecal coliforms were detected during the two monitored fill events at well QD-33 and only during the second fill event at well QD-31. The analytical data for groundwater from the 30 wells sampled once per year are presented in Table 2. Fecal coliform counts in all the annual sampling wells were nondetectable (<1 CFU/100 mL).

TABLE 2: ANALYSIS OF CHEMICAL AND PHYSICAL PARAMETERS AND FECAL COLIFORM IN GROUNDWATER SAMPLED FROM ANNUAL MONITORING WELLS IN THE DES PLAINES TUNNEL SYSTEM OF THE TUNNEL AND RESERVOIR PLAN DURING 2022

Well	Sample Date	pH	EC mS/m	TDS	TOC[1]	Cl^-	SO_4^{2-}	NH_3-N	Hardness	Temp. °C	Water Elevation[1] feet	Fecal Coliform CFU/100 mL
				mg/L								
QD-21	11/16/22	7.0	162	1,204	<5.0	308	276	0.4	822	13.0	-37	<1
QD-22	11/16/22	7.0	106	768	<5.0	104	203	0.4	712	13.2	-16	<1
QD-23	11/16/22	6.9	142	1,074	<5.0	192	309	0.5	801	13.5	-25	<1
QD-24	06/23/22	7.2	101	932	<5.0	135	216	0.6	597	13.1	19	<1
QD-25	03/02/22	7.0	186	1,522	<5.0	467	270	0.6	697	11.5	29	<1
QD-26	10/20/22	7.4	68	524	<5.0	9	99	<0.3	407	12.7	-2	<1
QD-28	06/23/22	7.2	103	828	<5.0	187	142	1.3	449	14.0	-93	<1
QD-32	02/17/22	9.3	23	1,900	<5.0	569	228	<0.3	32	10.3	-221	<1
QD-35	10/20/22	7.0	111	1,052	<5.0	96	284	<0.3	658	13.1	-31	<1
QD-37	10/20/22	7.5	160	1,302	<5.0	223	301	<0.3	392	13.7	-194	<1
QD-38	10/20/22	7.7	105	796	<5.0	162	105	<0.3	253	12.6	-211	<1
QD-39	02/17/22	8.3	91	770	<5.0	28	98	<0.3	17	10.8	-149	<1
QD-40	02/17/22	9.2	87	742	<5.0	16	366	<0.3	18	12.1	-124	<1
QD-41	10/20/22	7.6	82	700	<5.0	13	323	<0.3	373	13.3	-135	<1
QD-42	01/27/22	7.8	73	668	<5.0	19	290	0.4	366	11.4	-102	<1
QD-43	11/17/22	7.2	83	624	<5.0	44	225	<0.3	433	11.8	-132	<1
QD-44	11/17/22	7.7	71	568	<5.0	21	210	<0.3	294	11.3	-12	<1
QD-45	10/20/22	8.8	69	554	<5.0	18	211	<0.3	103	12.3	6	<1
QD-47	11/17/22	7.6	66	422	<5.0	14	157	3.4	230	13.4	12	<1
QD-48	11/17/22	8.8	55	468	<5.0	7	253	<0.3	228	12.1	-179	<1
QD-49	12/07/22	8.3	68	524	<5.0	14	202	<0.3	277	10.6	-185	<1
QD-50	01/27/22	9.9	75	656	NRR[2]	15	283	<0.3	11	10.9	-149	<1
QD-51	11/17/22	9.4	68	492	<5.0	13	129	<0.3	4	11.7	-111	<1
QD-52	09/22/21	8.5	59	506	<5.0	16	148	<0.3	15	13.5	-125	<1

TABLE 2 (Continued): ANALYSIS OF CHEMICAL AND PHYSICAL PARAMETERS AND FECAL COLIFORM IN GROUNDWATER SAMPLED FROM ANNUAL MONITORING WELLS IN THE DES PLAINES TUNNEL SYSTEM OF THE TUNNEL AND RESERVOIR PLAN DURING 2022

Well	Sample Date	pH	EC mS/m	TDS	TOC[1]	Cl^-	SO_4^{2-}	NH_3-N	Hardness	Temp. °C	Water Elevation[1] feet	Fecal Coliform CFU/100 mL
				mg/L								
QD-52	11/17/22	8.8	63	470	<5.0	16	147	<0.3	14	13.1	-122	<1
QD-53	11/16/22	9.1	64	552	<5.0	18	169	<0.3	7	10.5	-152	<1
QD-55	11/16/22	8.2	59	432	<5.0	15	186	<0.3	178	11.5	-139	<1
QD-56	01/27/22	8.7	35	300	<5.0	11	9	<0.3	52	10.5	-78	<1
QD-58	02/17/22	7.9	32	250	<5.0	13	3	<0.3	115	10.8	-120	<1
QD-59	11/16/22	8.3	42	282	<5.0	64	12	<0.3	175	11.6	-42	<1
QD-60	01/27/22	7.9	46	360	<5.0	45	103	0.5	233	11.7	-92	<1

[1]Relative to Chicago City Datum (579.48 feet above mean sea level) at intersection of State and Madison Streets.
[2]No reportable result due to no proper preservation of the sample.