Metropolitan Water Reclamation District of Greater Chicago

MONITORING AND RESEARCH DEPARTMENT

REPORT NO. 21-25

TUNNEL AND RESERVOIR PLAN DES PLAINES TUNNEL SYSTEM

ANNUAL GROUNDWATER MONITORING REPORT FOR 2020

July 2021

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 19, 2021

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

Dear Sir or Madam:

Subject: Tunnel and Reservoir Plan Des Plaines Tunnel System Annual Groundwater Monitoring Report for 2020

Attached are three copies of "Tunnel and Reservoir Plan Des Plaines Tunnel System Annual Groundwater Monitoring Report for 2020."

Very truly yours,

Albert Cox

Albert Cox
Environmental Monitoring and Research Manager
Monitoring and Research Department

AC:EE:lf
Attachment
cc w/att: Mr. Ryan Bahr (USEPA Region 5 - WC15J) - (2)
Mr. E. Podczerwinski
Dr. H. Zhang
cc w/o att: Mr. J. Murray
Mr. S. Serafino

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TUNNEL AND RESERVOIR PLAN DES PLAINES TUNNEL SYSTEM ANNUAL GROUNDWATER MONITORING REPORT FOR 2020

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July 2021

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°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
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 July 13, 2017, the Illinois Environmental Protection Agency (IEPA) accepted the modifications for the District's TARP groundwater monitoring program effective in January 2017 for a period of three years (2017–2019). Under the revised monitoring plan, nine wells (QD-27, QD-29, QD-30, QD-31, QD-33, QD-34, QD-36, QD-46, and QD-54), which had fecal coliform (FC) detected in 10 percent or more of samples during the period 1995–2013, will be sampled for four TARP tunnel fill events, based on the water levels in the TARP following storm events (fill event-based). The criterion that triggers a fill event sampling is that the level of water in the TARP Mainstream tunnels reaches -150 feet Chicago City Datum (CCD). At each event, sampling is done weekly for three weeks. The samples collected during the first week of sampling are analyzed for all parameters in the original monitoring program, including pH, temperature, electrical conductivity, total dissolved solids, hardness, ammonia, total organic carbon, chloride, sulfate, and FC. However, the samples from the second and third weeks are analyzed for FC only. Groundwater elevations in the monitoring wells are measured during each sampling event. The modified program continued to operate in 2020 and beyond until a new program structure is approved by IEPA in 2021.

The other 31 wells associated with the Des Plaines Tunnel System are sampled once per year. These wells had FC detected in less than 10 percent of samples during the period 1995–2013.

Summary of Data for Monitoring Wells

During 2020, there were three tunnel fill events observed on the following dates: April 30, 2020, May 15, 2020, and October 22, 2020. Sampling was not conducted at the first two fill events due to the suspension of the TARP monitoring program, which was approved by the IEPA due to the COVID-19 pandemic. Groundwater sampling was conducted only during the fill event observed on October 22, 2020.

The analytical data for groundwater sampled during 2020 from fill event-based monitoring wells QD-27, QD-29, QD-30, QD-31, QD-33, QD-34, QD-36, QD-46, and QD-54 are presented in Table 1. Physical characteristics, such as elevation, groundwater temperature, and estimated time of recharge for each well between initial drawdown and sampling, are also included. The FC data for groundwater sampled during 2020 from these monitoring wells are presented in Table 2. The analytical data for groundwater from 31 wells sampled once per year are presented in Table 3. Fecal

coliform counts in all the annual sampling wells were undetectable (<1 CFU/100 mL) except for three wells, QD-49, QD-52, and QD-57.

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

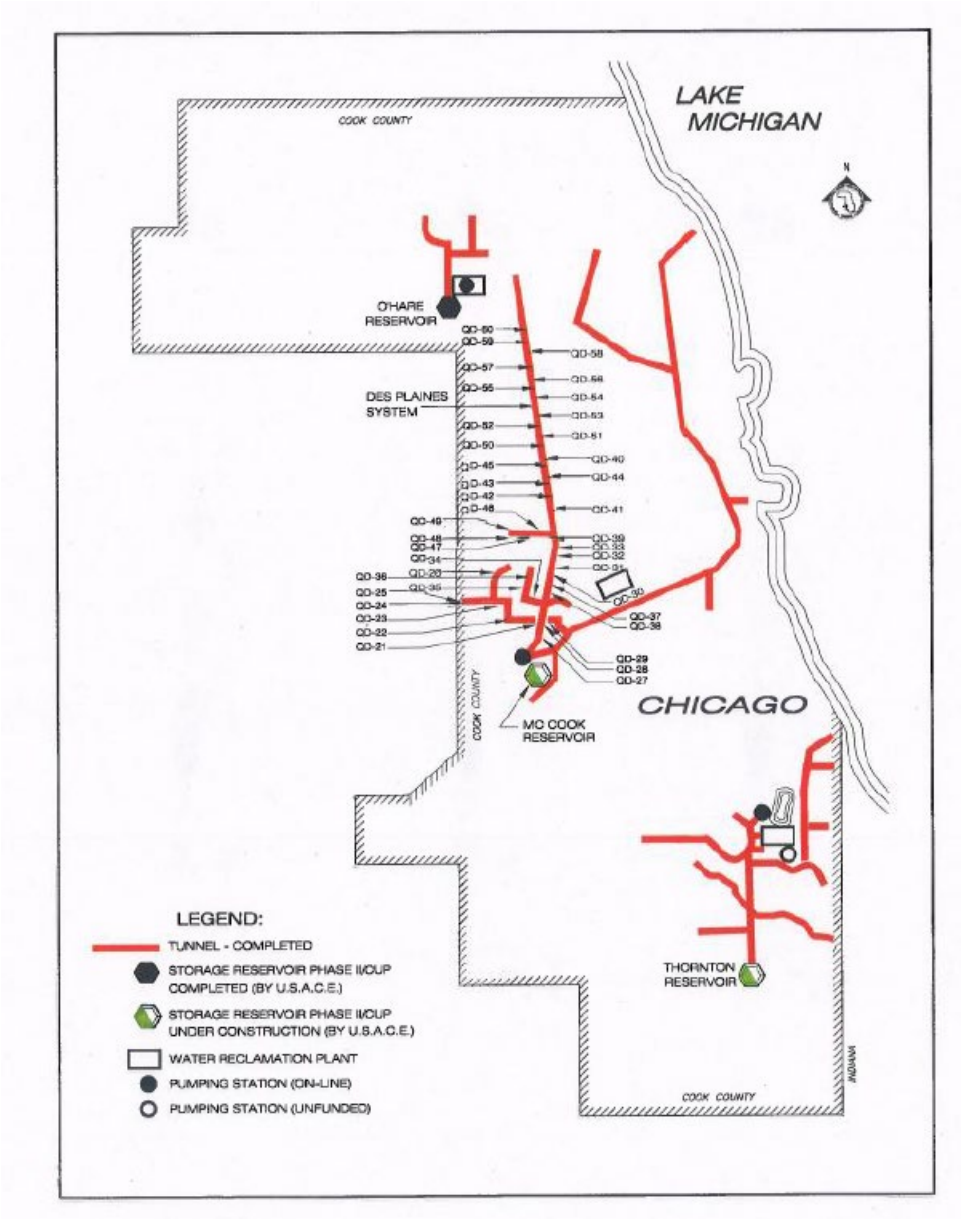

TABLE 1: ANALYSIS OF CHEMICAL AND PHYSICAL PARAMETERS IN GROUNDWATER FROM FILL EVENT MONITORING WELLS IN THE DES PLAINES TUNNEL SYSTEM OF THE TUNNEL AND RESERVOIR PLAN DURING 2020

Well	Fill Event[1]	Sample Date	pH	EC mS	TDS	TOC	Cl^-	SO_4^{2-}	NH_3-N	Hardness	Temp. °C	Water Elevation[2] feet	Recharge Time hours
								mg/L					
QD-27	F3	10/30/20	7.2	143	1,302	14.4	478	42	23.7	504	12.7	-147	<48
QD-29	F3	10/26/20	7.1	132	1,700	6.1	424	485	0.80	802	13.5	-58	<4
QD-30	F3	10/30/20	7.1	75	782	<5.0	106	203	<0.30	516	12.7	-85	<48
QD-31	F3	10/30/20	7.6	61	922	<5.0	138	201	<0.30	273	11.6	-181	<48
QD-33	F3	10/30/20	8.9	93	1,530	<5.0	360	212	<0.30	35	12.0	-180	<48
QD-34	F3	10/26/20	7.1	83	1,126	<5.0	135	178	0.7	530	13.9	-53	<4
QD-36	F3	10/26/20	6.9	79	1,032	<5.0	115	292	0.3	728	12.4	-63	<4
QD-46	F3	10/26/20	7.9	56	664	<5.0	13	123	<0.30	81	12.5	-110	<4
QD-54	F3	10/30/20	8.8	52	442	<5.0	20	151	0.4	40	12.4	-51	<48

[1]Fill events 1 and 2 were not sampled due to the COVID-19 pandemic.
[2]Relative to Chicago City Datum (579.48 feet above mean sea level) at intersection of State and State Streets.

TABLE 2: ANALYSIS OF FECAL COLIFORM IN GROUNDWATER FROM FILL EVENT MONITORING WELLS IN THE DES PLAINES TUNNEL SYSTEM OF THE TUNNEL AND RESERVOIR PLAN DURING 2020

Well	Fill Event[1]	Week 1 Sample Date[2]	Fecal Coliform, CFU/100 mL		
			Week 1	Week 2	Week 3
QD-27	F3	10/30/20	110	4	4
QD-29	F3	10/26/20	<1	NReq[3]	NReq
QD-30	F3	10/30/20	<1	NReq	NReq
QD-31	F3	10/30/20	7,100	790	150
QD-33	F3	10/30/20	46	9	3
QD-34	F3	10/26/20	>20,000	20	6
QD-36	F3	10/26/20	120	2	1
QD-46	F3	10/26/20	37	6	<1
QD-54	F3	10/30/20	<1	NReq	NReq

[1]Fill events 1 and 2 were not sampled due to the COVID-19 pandemic.
[2]Sampling date of the first week of the fill event.
[3]NReq: Sampling was not required because the fecal coliform level was below the detection limit in the previous week.

TABLE 3: ANALYSIS OF CHEMICAL AND PHYSICAL PARAMETERS AND FECAL COLIFORM IN GROUNDWATER FROM ANNUAL SAMPLING WELLS IN THE DES PLAINES TUNNEL SYSTEM OF THE TUNNEL AND RESERVOIR PLAN DURING 2020

Well	Sample Date	pH	EC mS/m	TDS	TOC[1]	Cl^-	SO_4^{2-}	NH_3-N	Hardness	Temp. °C	Water Elevation[2] feet	Fecal Coliform CFU/100 mL
							mg/L					
QD-21	11/24/20	6.9	118	1,292	<5.0	286	299	0.30	753	13.4	-42	<1
QD-22	01/30/20	6.6	100	942	1.8	147	255	0.4	704	13.3	-19	<1
QD-23	01/30/20	6.9	122	1,258	1.4	236	374	0.6	868	13.2	-26	<1
QD-24	01/30/20	6.8	88	876	2.6	141	232	0.7	596	11.7	22	<1
QD-25	09/17/20	7.0	149	1,682	<5.0	569	299	0.7	801	12.7	30	<1
QD-26	06/26/20	7.4	57	514	<1.0	11	103	0.3	400	12.8	-1	<1
QD-28	06/24/20	7.2	101	864	1.1	209	170	1.2	465	14.3	-92	<1
QD-32	06/26/20	9.0	231	1,868	<1.0	537	237	<0.30	21	12.3	-220	<1
QD-35	08/11/20	6.9	70	890	<5.0	89	277	0.4	622	13.9	-71	<1
QD-37	02/06/20	7.8	109	1,268	<1.0	254	332	0.5	399	11.6	-207	<1
QD-38	02/06/20	7.4	72	754	1.1	162	103	0.4	238	11.4	-214	<1
QD-39	02/06/20	7.8	76	788	1.3	28	92	<0.30	20	11.4	-143	<1
QD-40	02/06/20	8.9	68	746	1.3	17	355	<0.30	15	12.1	-130	<1
QD-41	02/06/20	6.9	58	712	2.1	16	315	0.3	330	12.3	-143	<1
QD-42	02/06/20	7.0	57	740	1.3	19	288	0.4	357	11.1	-106	<1
QD-43	02/06/20	7.1	47	658	1.9	45	217	0.4	435	11.0	-139	<1
QD-44	02/06/20	7.0	46	592	1.8	22	210	0.4	296	10.3	-10	<1
QD-45	06/26/20	8.5	61	558	<1.0	18	213	0.4	104	12.3	7	<1
QD-47	06/26/20	7.9	58	492	<1.0	15	150	<0.30	235	14.2	10	<1
QD-48	08/13/20	8.6	41	402	<5.0	8	226	<0.30	170	13.7	-178	<1
QD-49	08/13/20	8.8	43	406	<5.0	12	205	<0.30	161	17.1	-185	2
QD-50	08/20/20	9.5	76	672	<5.0	13	282	<0.30	7	12.6	-112	<1
QD-51	07/09/20	9.4	66	526	1.1	14	130	<0.30	5	12.6	-110	<1
QD-52	07/09/20	8.8	60	482	1.0	18	151	<0.30	16	14.3	-124	1
QD-53	07/09/20	9.3	76	580	1.1	20	166	<0.30	9	15.4	-152	<1

TABLE 3 (Continued): ANALYSIS OF CHEMICAL AND PHYSICAL PARAMETERS AND FECAL COLIFORM IN GROUNDWATER FROM ANNUAL SAMPLING WELLS IN THE DES PLAINES TUNNEL SYSTEM OF THE TUNNEL AND RESERVOIR PLAN DURING 2020

Well	Sample Date	pH	EC mS/m	TDS	TOC[1]	Cl^-	SO_4^{2-}	NH_3-N	Hardness	Temp. °C	Water Elevation[2] feet	Fecal Coliform CFU/100 mL
				mg/L								
QD-55	07/09/20	8.1	55	454	<1.0	16	194	<0.30	165	14.4	-144	<1
QD-56	06/25/20	8.3	34	300	<1.0	11	10	<0.30	64	12.0	-79	<1
QD-57	06/26/20	8.4	38	370	<1.0	14	64	<0.30	39	11.4	-108	1
QD-58	06/26/20	8.1	31	264	<1.0	12	3	<0.30	110	11.4	-126	<1
QD-59	07/09/20	8.4	39	326	<1.0	72	17	<0.30	211	12.0	-50	<1
QD-60	07/09/20	7.7	44	390	<1.0	46	104	0.4	244	12.5	-92	<1

[1]Detection limit changed to <5.0 starting 08/1/20 due to new equipment.
[2]Relative to Chicago City Datum (579.48 feet above mean sea level) at intersection of State and Madison Streets.