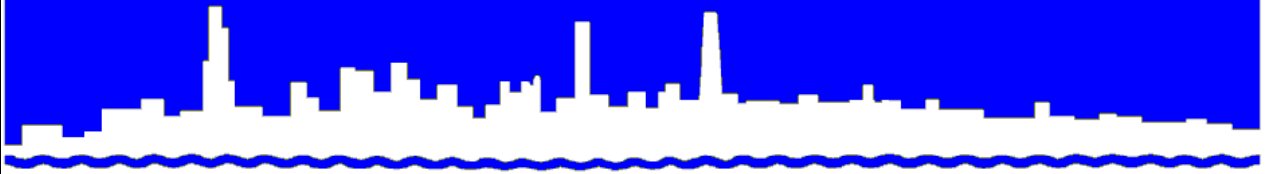


Protecting Our Water Environment



Metropolitan Water Reclamation District of Greater Chicago

***MONITORING AND RESEARCH
DEPARTMENT***

REPORT NO. 20-17

TUNNEL AND RESERVOIR PLAN

DES PLAINES TUNNEL SYSTEM

ANNUAL GROUNDWATER MONITORING REPORT

FOR 2019

July 2020

Protecting Our Water Environment



Metropolitan Water Reclamation District of Greater Chicago

CECIL LUE-HING RESEARCH AND DEVELOPMENT COMPLEX
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Edward W. Podczewinski, P.E.

Director of Monitoring and Research

July 16, 2020

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Springfield, IL 62794-9276

Dear Sir or Madam:

Subject: Tunnel and Reservoir Plan, Des Plaines Tunnel System, Annual
Groundwater Monitoring Report for 2019

Attached are three copies of "Tunnel and Reservoir Plan, Des Plaines Tunnel System,
Annual Groundwater Monitoring Report for 2019."

Very truly yours,

Albert E. Cox
Environmental Monitoring and Research Manager
Monitoring and Research Department

AC:EE:cm

Attachment

cc w/att: Mr. Ryan Bahr (USEPA Region 5 - WC15J) - (2)

Mr. E. Podczewinski

Dr. H. Zhang

cc w/o att: Mr. J. Murray

Mr. T. Conway

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

**TUNNEL AND RESERVOIR PLAN
DES PLAINES TUNNEL SYSTEM
ANNUAL GROUNDWATER MONITORING REPORT
FOR 2019**

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

July 2020

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LIST OF ABBREVIATIONS

°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
ft	feet
hr	hour
L	liter
m	meter
mg	milligram
mS	millisiemen
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) 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 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, -29, -30, -31, -33, -34, -36, -46, and -54), which had fecal coliform detected in 10 percent or more of samples during the period 1995 – 2013, will be sampled for four events of TARP tunnel fills, 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 ft Chicago City Datum (CCD). At each event, sampling is done weekly for three weeks. The samples collected during the first week of sampling were 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 fecal coliform. However, the samples from the second and third weeks are analyzed for only fecal coliform. Groundwater elevations in the monitoring wells are measured during each sampling event.

The other 31 wells associated with the Des Plaines Tunnel System are sampled once per year. These include six wells, QD-43, 47, 49, 53, 55, and 58, which were rehabilitated in 2017. These wells, including the six rehabilitated wells, had fecal coliform detected in less than 10 percent of samples during the period 1995 – 2013.

The monitoring well QD-25 was not sampled because of a well pump malfunction, and no annual sample was obtained for this report.

Summary of Data for Monitoring Wells

The analytical data for groundwater sampled during 2019 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, along with descriptive statistics, 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 fecal coliform data for groundwater sampled during 2019 from these monitoring wells, along with descriptive statistics, are presented in [Table 2](#). The analytical data for groundwater from 31 wells sampled once per year are presented in [Table 3](#).

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

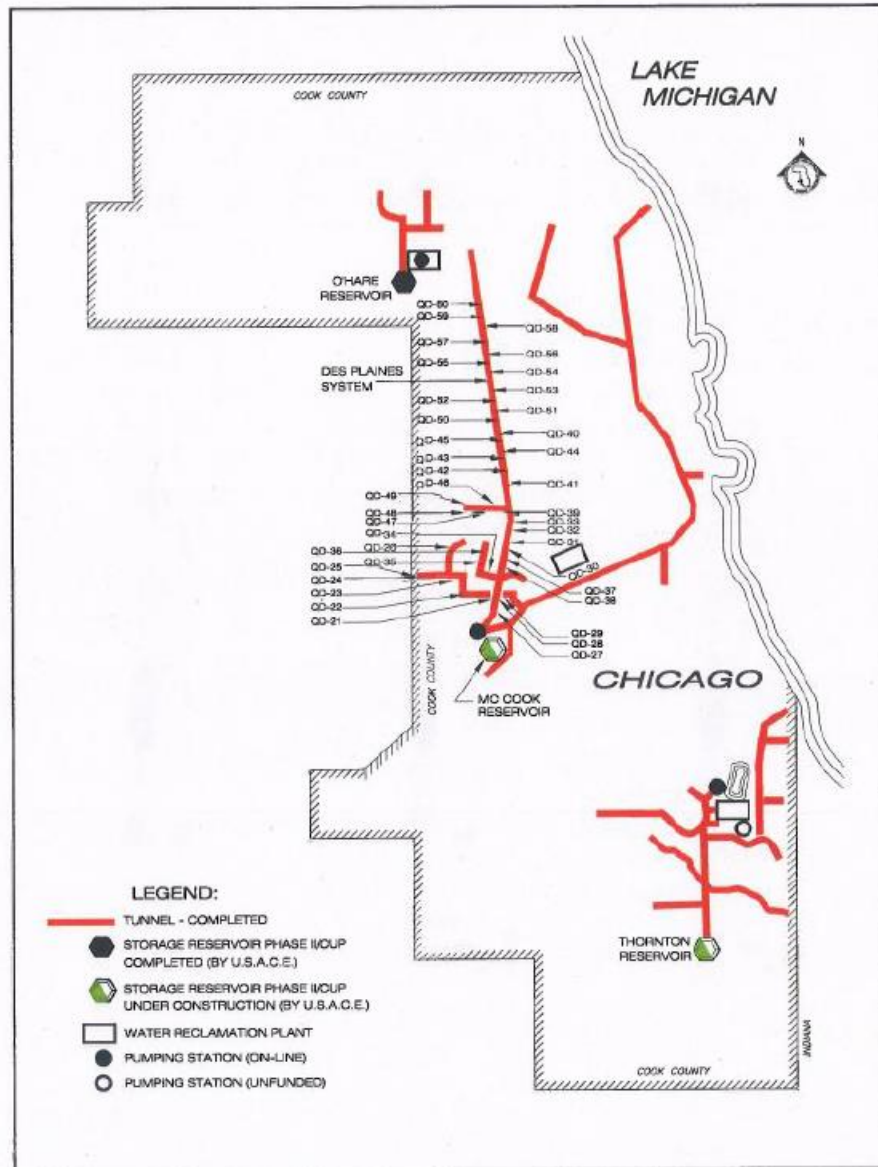


TABLE 1: ANALYSIS OF CHEMICAL AND PHYSICAL PARAMETERS IN GROUNDWATER FROM FILL EVENT MONITORING WELLS IN THE DES PLAINES TUNNEL SYSTEM OF THE TUNNEL AND RESERVOIR PLAN DURING 2019 AND DESCRIPTIVE STATISTICS OF EACH OF THE PARAMETERS¹

Well	Fill Event	Sample Date	pH	EC	TDS	TOC	Cl ⁻	SO ₄ ²⁻	NH ₃ -N ²	Hardness	Temp	Water Elevation ³	Recharge Time	
				mS/m	----- mg/L -----					°C	ft	hr		
QD-27	F1	02/13/19	7.2	217	1,094	10.7	449	48	26.1	513	12.6	-147	<48	
	F2	03/20/19	7.1	160	1,170	11.1	NRR ⁴	83	26.3	528	12.5	-172	<48	
	F3	04/24/19	6.9	200	1,312	8.5	480	52	29.4	532	12.6	-158	<48	
	F4	08/01/19	7.5	154	1,320	10.3	425	41	27.4	504	14.1	-173	<48	
	F5	10/04/19	7.3	186	1,448	9.5	509	40	26.5	532	13.3	-47	<48	
		Minimum		6.9	154	1,094	8.5	425	40	26.1	504	12.5	-173	
		Median		7.2	186	1,312	10.3	465	48	26.5	528	12.6	-158	
		Mean		7.2	184	1,269	10.0	466	53	27.1	522	13.0	-140	
		Maximum		7.5	217	1,448	11.1	509	83	29.4	532	14.1	-47	
		Standard deviation		0.2	26	139	1.0	36.6	18	1.4	12.7	0.7	53	
		Coefficient of variation (%)		3.0	14	11	10	8.0	33	5.0	2.0	5.0	38	
QD-29	F1	02/13/19	7.2	121	940	<1.0	158	243	<0.50	628	13.6	-80	<4	
	F2	03/19/19	7.1	118	918	1.3	144	248	<0.50	657	13.4	-85	<4	
	F3	04/23/19	7.1	116	936	<1.0	142	249	0.41	621	13.5	-88	<4	
	F4	08/01/19	7.2	104	1,012	1.1	141	223	0.34	596	13.7	-84	<4	
	F5	10/04/19	7.1	98	1,018	1.2	150	244	0.51	665	13.5	-66	<4	
		Minimum		7.1	98	918	<1.0	141	223	0.34	596	13.4	-88	
		Median		7.1	116	940	1.1	144	244	0.50	628	13.5	-84	
		Mean		7.1	111	965	1.1	147	241	0.45	633	13.5	-81	
		Maximum		7.2	121	1,018	1.3	158	249	0.51	665	13.7	-66	
		Standard deviation		0.1	10	47	0.1	7.1	11	0.08	28	0.1	8.6	
		Coefficient of variation (%)		1.0	9.0	5.0	12	5.0	4.0	17	4.0	1.0	11	

TABLE 1 (Continued): 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 2019 AND DESCRIPTIVE STATISTICS OF EACH OF THE PARAMETERS¹

Well	Fill Event	Sample Date	pH	EC	TDS	TOC	Cl ⁻	SO ₄ ²⁻	NH ₃ -N ²	Hardness	Temp	Water Elevation ³	Recharge Time	
				mS/m	----- mg/L -----					°C	ft	hr		
QD-30	F1	02/13/19	7.6	97	776	<1.0	101	196	<0.50	480	14.6	-96	<48	
	F2	03/20/19	7.2	96	872	<1.0	132	273	<0.50	603	12.3	-105	<48	
	F3	04/24/19	7.4	114	1,002	1.2	127	289	<0.30	646	12.2	-101	<48	
	F4	08/01/19	7.3	103	1,100	<1.0	120	298	<0.30	659	13.5	-100	<48	
	F5	10/04/19	7.1	97	1,060	1.2	116	313	0.33	726	13	-56	<48	
		Minimum		7.1	96	776	<1.0	101	196	<0.30	480	12.2	-105	
		Median		7.3	97	1,002	1.0	120	289	0.30	646	13.0	-100	
		Mean		7.3	101	962	1.1	119	274	0.40	623	13.1	-91	
		Maximum		7.6	114	1,100	1.2	132	313	0.50	726	14.6	-56	
		Standard deviation		0.2	8.0	135	0.1	12	46	0.10	91	1.0	20	
		Coefficient of variation (%)		3.0	8.0	14	10	10	17	27	15	7.0	22	
QD-31	F1	02/13/19	7.2	113	882	1.0	134	200	<0.50	275	12.7	-177	<48	
	F2	03/20/19	7.2	97	874	1.0	132	201	<0.50	293	11.7	-187	<48	
	F3	04/24/19	7.1	116	922	1.0	132	196	<0.30	270	12.5	-183	<48	
	F4	08/01/19	7.2	93	946	1.0	133	198	<0.30	281	12.6	-194	<48	
	F5	10/04/19	7.5	87	904	1.0	123	178	<0.30	309	12.4	18	<48	
		Minimum		7.1	87	874	<1.0	123	178	<0.30	270	11.7	-194	
		Median		7.2	97	904	1.0	132	198	0.30	281	12.5	-183	
		Mean		7.3	101	906	1.0	131	195	0.40	286	12.4	-145	
		Maximum		7.5	116	946	1.0	134	201	0.50	309	12.7	18	
		Standard deviation		0.1	12	29	0.0	4.4	9.5	0.10	16	0.4	91	
		Coefficient of variation (%)		2.0	12	3.0	0.0	3.0	5.0	29	5.0	3.0	63	

TABLE 1 (Continued): 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 2019 AND DESCRIPTIVE STATISTICS OF EACH OF THE PARAMETERS¹

Well	Fill Event	Sample Date	pH	EC	TDS	TOC	Cl ⁻	SO ₄ ²⁻	NH ₃ -N ²	Hardness	Temp	Water Elevation ³	Recharge Time	
				mS/m	----- mg/L -----						°C	ft	hr	
QD-33	F1	02/13/19	8.0	190	1,436	1.0	359	212	<0.50	39	11.9	-185	<48	
	F2	03/20/19	7.7	176	466	1.0	362	213	<0.50	47	12.2	-192	<48	
	F3	04/24/19	7.8	202	1,602	1.0	346	196	<0.30	36	12.3	-185	<48	
	F4	08/01/19	8.1	200	1,510	1.0	363	210	<0.30	35	13.6	-196	<48	
	F5	10/04/19	8.5	83	990	1.2	131	82	<0.30	11	13.2	-88	<48	
		Minimum		7.7	83	466	1.0	131	82	<0.30	11	11.9	-196	
		Median		8.0	190	1,436	1.0	359	210	0.30	36	12.3	-185	
		Mean		8.0	170	1,201	1.0	312	183	0.40	34	12.6	-169	
		Maximum		8.5	202	1,602	1.2	363	213	0.50	47	13.6	-88	
		Standard deviation		0.3	50	473	0.1	102	57	0.10	14	0.7	46	
	Coefficient of variation (%)		4.0	29	39	9.0	33	31	29	40	6.0	27		
QD-34	F1	02/13/19	7.5	121	966	1.1	149	251	<0.50	625	14.8	-65	<4	
	F2	03/21/19	7.2	97	954	1.6	140	256	0.54	637	12.6	-67	<4	
	F3	04/25/19	7.2	116	934	1.6	138	252	0.41	685	13.2	-66	<4	
	F4	08/01/19	7.2	109	1,094	1.3	146	253	0.42	656	13.2	-63	<4	
	F5	10/02/19	7.0	90	814	1.7	101	188	1.10	521	13.7	-60	<4	
		Minimum		7.0	90	814	1.1	101	188	0.40	521	12.6	-67	
		Median		7.2	109	954	1.6	140	252	0.50	637	13.2	-65	
		Mean		7.2	107	952	1.5	135	240	0.60	625	13.5	-64	
		Maximum		7.5	121	1,094	1.7	149	256	1.10	685	14.8	-60	
		Standard deviation		0.2	13	100	0.3	19	29	0.30	62	0.8	2.8	
	Coefficient of variation (%)		2.0	12	10	17	14	12	48	10	6.0	4.0		

TABLE 1 (Continued): 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 2019 AND DESCRIPTIVE STATISTICS OF EACH OF THE PARAMETERS¹

Well	Fill Event	Sample Date	pH	EC	TDS	TOC	Cl ⁻	SO ₄ ²⁻	NH ₃ -N ²	Hardness	Temp	Water Elevation ³	Recharge Time	
				mS/m	----- mg/L -----					°C	ft	hr		
QD-36	F1	02/13/19	7.2	116	968	<1.0	125	317	<0.50	718	11.5	-80	<4	
	F2	03/21/19	6.9	102	1,028	1.2	125	317	<0.50	706	11.9	-83	<4	
	F3	04/25/19	7.1	114	988	1.3	125	303	0.31	733	12.2	-83	<4	
	F4	08/01/19	7.1	107	1,098	1.0	120	286	0.30	709	12.3	-78	<4	
	F5	10/02/19	7.1	87	814	1.6	89	217	0.31	573	12.4	-73	<4	
		Minimum		6.9	87	814	1.0	89	217	0.30	573	11.5	-83	
		Median		7.1	107	988	1.3	125	303	0.30	709	12.2	-80	
		Mean		7.1	105	979	1.3	117	288	0.40	688	12.1	-79	
		Maximum		7.2	116	1,098	1.6	125	317	0.50	733	12.4	-73	
		Standard deviation		0.1	12	105	0.3	16	42	0.10	65	0.4	4.0	
	Coefficient of variation (%)		2.0	11	11	20	13	14	28	9.0	3.0	5.0		
QD-46	F1	02/13/19	8.2	69	538	<1.0	12	126	<0.50	76	12.6	-165	<4	
	F2	03/21/19	8.0	68	524	<1.0	12	112	<0.50	65	12.4	-164	<4	
	F3	04/25/19	7.8	70	552	2.1	11	133	<0.30	100	13.2	-160	<4	
	F4	07/31/19	7.8	65	604	<1.0	12	128	<0.30	72	12.8	-153	<4	
	F5	10/04/19	8.0	56	532	<1.0	20	113	0.32	66	12.5	-89	<4	
		Minimum		7.8	56	524	<1.0	11	112	<0.30	65	12.4	-165	
		Median		8.0	67.5	538	1.0	12	126	0.30	72	12.6	-160	
		Mean		8.0	65.5	550	1.2	13.4	122	0.40	76	12.7	-146	
		Maximum		8.2	70	604	2.1	20	133	0.50	100	13.2	-89	
		Standard deviation		0.2	5.6	32	0.5	3.7	9.4	0.1	14	0.3	32	
	Coefficient of variation (%)		2.0	9.0	6.0	40	28	8.0	28	19	2.0	22		

TABLE 1 (Continued): 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 2019 AND DESCRIPTIVE STATISTICS OF EACH OF THE PARAMETERS¹

Well	Fill Event	Sample Date	pH	EC	TDS	TOC	Cl ⁻	SO ₄ ²⁻⁻	NH ₃ -N ²	Hardness	Temp	Water Elevation ³	Recharge Time	
				mS/m	----- mg/L -----					°C	ft	hr		
QD-54	F1	02/15/19	8.7	54	440	<1.0	19	149	<0.50	32	9.7	-70	<48	
	F2	03/21/19	8.6	59	420	<1.0	21	166	<0.50	38	12.1	-50	<48	
	F3	04/25/19	8.5	61	394	1.5	21	151	<0.30	31	13.2	-48	<48	
	F4	08/02/19	8.9	46	458	<1.0	20	156	0.52	66	13.6	-50	<48	
	F5	10/04/19	8.8	45	468	<1.0	20	158	<0.30	31	12.4	-21	<48	
		Minimum		8.5	45	394	<1.0	19	149	<0.30	31	9.7	-70	
		Median		8.7	54	440	1.0	20	156	0.50	32	12.4	-50	
		Mean		8.7	53	436	1.1	20	156	0.40	40	12.2	-47	
		Maximum		8.9	61	468	1.5	21	166	0.50	66	13.6	-21	
		Standard deviation		0.2	7.0	30	0.2	0.8	6.7	0.1	15	1.5	17	
	Coefficient of variation (%)		2.0	13	7.0	20	4.0	4.0	27	38	12	37		

¹For values less than reporting limits, the reporting limits were used in calculation of descriptive statistics.

²Detection limit changed to <0.3 starting on April 8, 2019.

³Relative to Chicago City Datum (579.48 ft above mean sea level) at intersection of Madison and State Streets.

⁴NRR: No reportable result due to failure of QA/QC checks during lab analysis.

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 2019 AND ITS DESCRIPTIVE STATISTICS¹

Well	Fill Event	Week 1 Sample Date	Week 1	Week 2	Week 3	
QD-27	F1	02/13/19	1	4	14	
	F2	03/19/19	4	2	1	
	F3	04/23/19	1	2,700	1,200	
	F4	08/01/19	1	1	NReq ²	
	F5	10/04/19	17,000	9,700	990	
		Minimum		1	1	1
		Median		1	4	502
		Mean ³		9	46	64
		Maximum		17,000	9,700	1,200
	QD-29	F1	02/13/19	<1	<1	NReq
F2		03/19/19	<1	<1	NReq	
F3		04/23/19	<1	12	<1	
F4		08/01/19	<1	<1	NReq	
F5		10/04/19	31	11	3	
		Minimum		<1	<1	<1
		Median		1	1	2
		Mean		2	3	2
		Maximum		31	12	3
QD-30		F1	02/13/19	<1	<1	NReq
	F2	03/20/19	2	<1	<1	
	F3	04/24/19	<1	15	<1	
	F4	08/01/19	<1	1	<1	
	F5	10/04/19	210	13	3	
		Minimum		<1	<1	<1
		Median		1	1	1
		Mean		3	3	1
		Maximum		210	15	3
	QD-31	F1	02/13/19	42	14	2,200
F2		03/20/19	4	3	1	
F3		04/24/19	2	>20,000	7,500	
F4		08/01/19	1	<1	<1	
F5		10/04/19	>20,000	330	410	

TABLE 2 (Continued): ANALYSIS OF FECAL COLIFORM IN GROUNDWATER FROM
 FILL EVENT MONITORING WELLS IN THE DES PLAINES TUNNEL SYSTEM OF
 THE TUNNEL AND RESERVOIR PLAN DURING 2019 AND ITS DESCRIPTIVE
 STATISTICS¹

Well	Fill Event	Week 1 Sample Date	Week 1	Week 2	Week 3
		Minimum	1	<1	<1
		Median	4	14	410
		Mean	23	49	92
		Maximum	20,000	20,000	7,500
QD-33	F1	02/13/19	150	1	780
	F2	03/20/19	1	1	<1
	F3	04/24/19	<1	>20,000	7,000
	F4	08/01/19	1	<1	<1
	F5	10/04/19	>20,000	42	35
		Minimum	<1	<1	<1
		Median	1	1	35
		Mean	20	15	45
		Maximum	20,000	20,000	7,000
QD-34	F1	02/13/19	<1	<1	NReq
	F2	03/21/19	2	3	<1
	F3	04/25/19	<1	>20,000	1,200
	F4	08/01/19	<1	<1	NReq
	F5	10/02/19	4,900	4,000	43
		Minimum	<1	<1	<1
		Median	1	3	43
		Mean	6	47	37
		Maximum	4,900	20,000	1,200
QD-36	F1	02/13/19	<1	1	50
	F2	03/21/19	5	<1	1
	F3	04/25/19	<1	4,600	78
	F4	08/01/19	<1	<1	NReq
	F5	10/02/19	1,300	550	21
		Minimum	<1	<1	1
		Median	1	1	36
		Mean	6	19	17
		Maximum	1,300	4,600	78

TABLE 2 (Continued): ANALYSIS OF FECAL COLIFORM IN GROUNDWATER FROM FILL EVENT MONITORING WELLS IN THE DES PLAINES TUNNEL SYSTEM OF THE TUNNEL AND RESERVOIR PLAN DURING 2019 AND ITS DESCRIPTIVE STATISTICS¹

Well	Fill Event	Week 1 Sample Date	Week 1	Week 2	Week 3
QD-46	F1	02/13/19	<1	<1	NReq
	F2	03/21/19	10	1	2
	F3	04/25/19	<1	9,400	210
	F4	07/31/19	<1	<1	NReq
	F5	10/04/19	2,600	52	14
		Minimum	<1	<1	2
		Median	1	1	14
		Mean	8	14	18
	Maximum	2,600	9,400	210	
QD-54	F1	02/15/19	<1	<1	NReq
	F2	03/21/19	<1	<1	NReq
	F3	04/25/19	<1	21	1
	F4	08/02/19	<1	<1	NReq
	F5	10/04/19	<1	<1	NReq
		Minimum	<1	<1	1
		Median	1	1	1
		Mean	1	2	1
	Maximum	1	21	1	

¹For values less than reporting limits, the reporting limits were used in calculation of descriptive statistics.

²NReq: Sampling is not required because the Fecal Coliform level was below detection limit in the previous week.

³Geometric mean is calculated.

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 2019

Well	Sample Date	pH	EC	TDS	TOC	Cl ⁻	SO ₄ ²⁻	NH ₃ -N ¹	Hardness	Temp	Water Elevation ²	Fecal Coliform
			mS/m	----- mg/L -----					°C		ft	CFU/100 mL
QD-21	09/17/19	6.9	167	1,366	<1.0	304	328	<0.30	855	13.2	-46	<1
QD-22	09/17/19	6.8	113	964	1.1	134	241	0.40	737	13.5	-20	<1
QD-23	09/17/19	6.7	151	1,300	1.2	219	364	0.60	866	13.9	-19	<1
QD-24	09/17/19	6.7	79	670	2.0	105	152	0.50	480	12.5	19	<1
QD-25	N/S ³	N/S	N/S	N/S	N/S	N/S	N/S	N/S	N/S	N/S	N/S	N/S
QD-26	09/10/19	7.7	59	500	<1.0	10	95	0.40	356	12.6	-123	<1
QD-28	09/05/19	6.7	109	968	<1.0	235	170	1.30	506	13.8	-103	<1
QD-32	09/10/19	8.1	234	1,940	<1.0	510	227	<0.30	25	13.6	-225	<1
QD-35	09/17/19	6.7	138	930	1.6	108	253	0.30	643	13.0	-77	<1
QD-37	08/28/19	7.8	143	1,328	<1.0	257	369	0.30	459	13.8	-198	<1
QD-38	08/28/19	8.3	86	726	<1.0	167	109	0.40	210	14.5	-211	<1
QD-39	09/10/19	8.0	87	822	<1.0	28	95	<0.30	36	12.5	-174	<1
QD-40	09/10/19	8.6	89	734	<1.0	16	351	<0.30	17	15.4	-136	<1
QD-41	07/10/19	7.7	78	738	1.7	17	324	0.30	410	13.8	-138	<1
QD-42	07/10/19	7.4	78	718	1.2	19	288	0.30	368	12.8	-108	<1
QD-43	07/10/19	7.3	73	670	1.5	45	213	0.30	424	13.2	-140	<1
QD-44	07/10/19	7.8	62	574	1.3	21	206	0.40	297	12.1	-12	<1
QD-45	07/10/19	8.3	64	542	1.4	18	210	0.40	101	12.3	6.0	<1
QD-47	06/19/19	8.0	61	486	1.3	15	148	0.30	231	14.7	8.0	1
QD-48	06/19/19	8.6	48	300	1.1	8.0	228	<0.30	193	14.9	-180	2
QD-49	06/19/19	9.1	39	408	1.1	13	129	0.50	66	15.2	-185	12
QD-50	02/07/19	9.6	79	682	<1.0	12	286	<0.50	8.0	11.6	-147	<1
QD-51	02/07/19	9.3	66	524	<1.0	13	128	<0.50	4.0	12.1	-117	<1
QD-52	02/07/19	9.2	56	488	<1.0	18	159	<0.50	13	12.4	-128	<1
QD-53	02/07/19	9.2	70	550	<1.0	26	158	<0.50	5.0	12.2	-154	<1
QD-55	02/07/19	8.5	56	464	<1.0	16	191	<0.50	153	11.0	-142	<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 2019

Well	Sample Date	pH	EC	TDS	TOC	Cl ⁻	SO ₄ ²⁻	NH ₃ -N ¹	Hardness	Temp	Water Elevation ²	Fecal Coliform
			mS/m			----- mg/L -----				°C	ft	CFU/100 mL
QD-56	04/11/19	8.1	34	324	<1.0	12	12	<0.30	53	11.6	-77	<1
QD-57	04/11/19	8.5	35	370	<1.0	13	79	0.30	58	10.5	-101	8
QD-58	04/11/19	7.7	29	250	<1.0	13	3	0.30	113	10.6	-128	<1
QD-59	04/11/19	8.8	28	354	<1.0	72	18	0.40	220	11.7	-50	<1
QD-60	04/11/19	7.7	39	396	<1.0	45	100	0.40	243	11.5	-95	<1

¹Reporting limits changed to 0.3 mg/L on April 8, 2019, due to change in laboratory equipment.

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

³N/S: No samples obtained because well pump malfunction.