

Protecting Our Water Environment



Metropolitan Water Reclamation District of Greater Chicago

***MONITORING AND RESEARCH
DEPARTMENT***

REPORT NO. 20-20

TUNNEL AND RESERVOIR PLAN

GLORIA ALITTO MAJEWSKI

CHICAGO UNDERFLOW PLAN RESERVOIR

WATER QUALITY MONITORING WELLS

ANNUAL GROUNDWATER MONITORING REPORT

FOR 2019

July 2020

Protecting Our Water Environment

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Director of Monitoring and Research

July 14, 2020

Chief
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Illinois Environmental Protection Agency
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Springfield, IL 62794-9276

Dear Sir or Madam:

Subject: Tunnel and Reservoir Plan, Gloria Alitto Majewski Chicagoland
Underflow Plan Reservoir Water Quality Monitoring Wells, Annual
Groundwater Monitoring Report for 2019

Attached are three copies of "Tunnel and Reservoir Plan, Gloria Alitto Majewski
Chicagoland Underflow Plan Reservoir Water Quality Monitoring Wells, 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

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**TUNNEL AND RESERVOIR PLAN
GLORIA ALITTO MAJEWSKI
CHICAGO UNDERFLOW PLAN RESERVOIR
WATER QUALITY MONITORING WELLS
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
EC	electrical conductivity
FC	fecal coliform
ft	feet
hr	hour
IEPA	Illinois Environmental Protection Agency
L	liter
m	meter
mg	milligram
mL	milliliter
mS	millisiemens
NH ₃ -N	ammonia nitrogen
SO ₄ ²⁻	sulfate
TDS	total dissolved solids
Temp	temperature
TOC	total organic carbon

ANNUAL DATA FOR MONITORING WELLS

Introduction

Four monitoring wells, QK-1 through QK-4, are located on the perimeter of the Gloria Alitto Majewski Chicagoland Underflow Plan Reservoir (Reservoir). Well QK-1 is positioned at the northwest corner of the reservoir, with QK-2, -3, and -4 at the northeast, southeast, and southwest corners, respectively ([Figure 1](#)). In addition, there are nine privately owned water supply wells, W1X through W9X, which are located within 1,000 ft of the Reservoir. The four monitoring wells are sampled quarterly and for at least six consecutive weeks following each reservoir fill event in which the reservoir is used to store combined sewer flow from the Tunnel and Reservoir Plan system (Illinois Environmental Protection Agency memorandum dated October 14, 1997). Fill-event samples may substitute for quarterly samples, depending on the occurrence of fill events. Groundwater elevations are also measured during each sampling event. There are no observation wells associated with this site.

During the first quarter, there were no fill events, thus quarterly sampling was conducted. There were four fill events at this site with fill event 1 from 05/10/19 to 06/13/19, fill event 2 from 07/23/19 to 08/30/19, and fill events 3 & 4 consecutive from 09/19/19 to 12/4/19. There were no samples collected at wells QK-1 and QK-2 during the first quarter because of well malfunction. No samples were collected at well QK-2 during the first three weeks of fill event 1 because of well malfunction. Because of well malfunction at well QK-3, samples were not collected during fill events 1 and 2, and most weeks of fill event 3 & 4. For well QK-4, there were no samples collected during the first 3 weeks of fill event 1 due to well malfunction.

Summary of Data

Monitoring Wells. The analytical data for groundwater sampled during 2019 from monitoring wells QK-1 through -4, 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 pumpdown and sampling, are also included.

FIGURE 1: MAP OF FOUR WATER QUALITY MONITORING WELLS AND NINE PRIVATE WELLS SURROUNDING THE GLORIA ALITTO MAJEWSKI CHICAGOLAND UNDERFLOW PLAN RESERVOIR

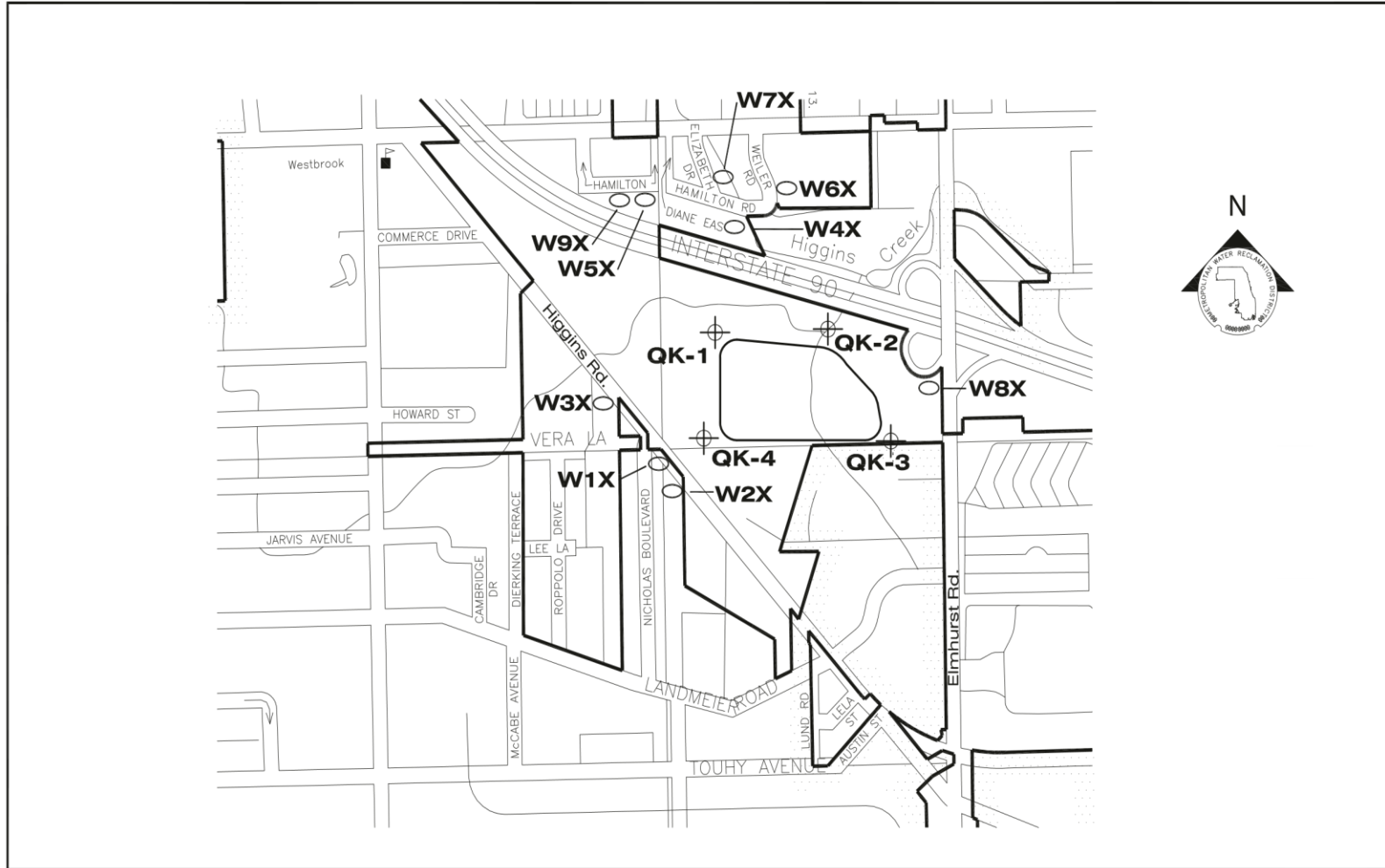


TABLE 1: ANALYSIS OF CHEMICAL AND PHYSICAL PARAMETERS AND FECAL COLIFORM IN GROUNDWATER FROM MONITORING WELLS IN THE GLORIA ALITTO MAJEWSKI CHICAGOLAND UNDERFLOW PLAN OF THE TUNNEL AND RESERVOIR PLAN DURING 2019

Event	Date Sampled	pH	EC ¹	TDS ¹	TOC ¹	Cl ⁻	SO ₄ ²⁻	NH ₃ -N	Hardness	Fecal Coliform ²	Temp	Water Elevation ³	Recharge Time
			mS/m	----- mg/L -----					CFU/100 mL	°C	ft	hr	
First Quarter													
QK-1	03/22/19	N/S ⁴	N/S	N/S	N/S	N/S	N/S	N/S	N/S	N/S	N/S	N/S	N/S
Fill Event 1													
QK-1	05/10/19	6.9	208	2,490	4.2	91	1,432	1.74	1,577	99,000	13.1	-66	<4
	05/16/19	6.9	195	2,090	2.4	100	1,140	1.36	1,325	NRR ⁵	14.5	-74	<4
	05/21/19	6.6	156	1,886	1.3	93	1,109	1.11	1,337	560	12.2	-78	<4
	05/29/19	7.1	181	2,190	1.9	116	1,426	1.54	1,632	100	14.0	-78	<4
	06/04/19	6.9	148	2,662	1.7	107	1,514	<0.30	1,734	28	12.6	-77	<4
	06/13/19	7.1	200	1,916	1.3	101	1,050	0.32	1,234	13	12.1	-75	<4
	Minimum	6.6	148	1,886	1.0	91	1,050	<0.30	1,234	13			
	Median	6.9	188	2,140	2.0	101	1,283	1.20	1,457	100			
	Mean	6.9	181	2,206	2.0	101	1,279	1.10	1,473	289			
	Maximum	7.1	208	2,662	4.0	116	1,514	1.70	1,734	99,000			
	Std. Dev.	0.2	25	313	1.0	9.0	200	0.60	201				
	Coeff. of Var. (%)	2.7	14	14	51	9.0	16	58	14				
Fill Event 2													
QK-1	07/23/19	7.1	131	2,056	<1.0	82	1,122	<0.30	1,224	<1	14.0	-77	<4
	07/31/19	7.1	152	1,860	<1.0	81	936	<0.30	1,066	<1	13.4	-78	<4
	08/06/19	6.9	154	2,204	1.0	84	1,154	<0.30	1,243	<1	13.5	-80	<4
	08/13/19	6.7	123	1,860	<1.0	85	953	<0.30	1,053	<1	13.5	-77	<4
	08/23/19	6.7	170	2,088	1.0	80	1,119	<0.30	1,254	<1	13.6	-74	<4
	08/30/19	7.1	167	2,066	1.2	81	1,060	<0.30	1,276	<1	13.1	-78	<4
	Minimum	6.7	123	1,860	<1.0	80	936	<0.30	1,053	<1			
	Median	7.0	153	2,061	1.0	82	1,090	0.30	1,234	1			
	Mean	6.9	149	2,022	1.0	82	1,057	0.30	1,186	1			

TABLE 1 (Continued): ANALYSIS OF CHEMICAL AND PHYSICAL PARAMETERS AND FECAL COLIFORM IN GROUNDWATER FROM MONITORING WELLS IN THE GLORIA ALITTO MAJEWSKI CHICAGOLAND UNDERFLOW PLAN OF THE TUNNEL AND RESERVOIR PLAN DURING 2019

Event	Date Sampled	pH	EC ¹	TDS1	TOC ¹	Cl ⁻	SO ₄ ²⁻	NH ₃ -N	Hardness	Fecal Coliform ²	Temp	Water Elevation ³	Recharge Time
			mS/m	-----	-----	mg/L	-----	-----	-----	CFU/100 mL	°C	ft	hr
	Maximum	7.1	170	2,204	1.20	85	1,154	0.30	1,276	1			
	Std. Dev.	0.2	18.9	136.4	0.10	1.9	92.7	0.0	99.5				
	Coeff. of Var. (%)	3.0	12.7	6.7	7.9	2.4	8.8	0.0	8.4				
	Fill Events 3 & 4												
	Consecutive												
	QK-1												
	09/19/19	6.6	136	1,990	1.0	75	1,116	<0.30	1,212	<1	13.8	-76	<4
	09/27/19	6.9	134	1,984	1.2	72	1,055	0.35	1,227	<1	13.0	-68	<4
	10/03/19	7.4	107	1,896	1.5	71	649	<0.30	862	42	12.5	-72	<4
	10/10/19	7.3	102	1,874	1.4	73	1,058	<0.30	1,260	1,800	12.9	-77	<4
	10/17/19	7.4	126	1,680	1.6	81	749	<0.30	1,131	740	13.1	-72	<4
	10/24/19	7.0	127	1,500	<1.0	72	974	<0.30	920	140	13.0	-77	<4
	10/28/19	6.8	120	1,798	1.1	68	979	<0.30	1,119	2,200	12.4	-76	<4
	11/08/19	6.9	131	1,482	1.2	76	790	<0.30	925	2,100	12.2	-77	<4
	11/13/19	6.5	122	1,788	1.5	71	1,044	<0.30	1,195	220	11.4	-77	<4
	11/21/19	7.2	111	1,920	<1.0	72	1,036	0.48	1,138	100	11.7	-72	<4
	11/26/19	6.7	132	1,868	1.2	71	1,023	<0.30	1,201	10	12.2	-73	<4
	12/04/19	6.6	101	1,854	1.1	68	1,012	<0.30	1,249	4	11.3	-77	<4
	Minimum	6.5	101	1,482	<1.0	68	649	0.40	862	<1			
	Median	6.9	124	1,861	1.2	72	1,018	0.30	1,167	120			
	Mean	6.9	120.7	1,803	1.2	73	957	0.30	1,120	75			
	Maximum	7.4	136	1,990	1.6	81	1,116	0.50	1,260	2,200			
	Std. Dev.	0.3	12.7	168.5	0.2	3.6	145.6	0.1	139				
	Coeff. of Var. (%)	4.8	10.5	9.3	17.4	4.9	15.2	16.8	12				

TABLE 1 (Continued): ANALYSIS OF CHEMICAL AND PHYSICAL PARAMETERS AND FECAL COLIFORM IN GROUNDWATER FROM MONITORING WELLS IN THE GLORIA ALITTO MAJEWSKI CHICAGOLAND UNDERFLOW PLAN OF THE TUNNEL AND RESERVOIR PLAN DURING 2019

Event	Date Sampled	pH	EC ¹	TDS ¹	TOC ¹	Cl ⁻	SO ₄ ²⁻	NH ₃ -N	Hardness	Fecal Coliform ²	Temp	Water Elevation ³	Recharge Time
			mS/m	----- mg/L -----						CFU/100 mL	°C	ft	hr
First Quarter													
QK-2	03/22/19	N/S	N/S	N/S	N/S	N/S	N/S	N/S	N/S	N/S	N/S	N/S	N/S
Fill Event 1													
QK-2	05/10/19	N/S	N/S	N/S	N/S	N/S	N/S	N/S	N/S	N/S	N/S	NS	<4
	05/16/19	N/S	N/S	N/S	N/S	N/S	N/S	N/S	N/S	N/S	N/S	NS	<4
	05/24/19	N/S	N/S	N/S	N/S	N/S	N/S	N/S	N/S	N/S	N/S	NS	<4
	05/29/19	7.5	105	1,106	1.2	5.0	612	<0.30	602	<1	14.2	-82	<4
	06/04/19	7.2	92	1,100	1.1	5.0	639	<0.30	604	<1	12.7	-87	<4
	06/13/19	7.3	98	1,042	1.0	5.0	560	<0.30	572	<1	12.8	-83	<4
	Minimum	7.2	92	1,042	1.0	5.0	560	<0.30	572	<1			
	Median	7.3	98	1,100	1.1	5.0	612	0.30	602	1			
	Mean	7.3	99	1,083	1.1	5.0	604	0.30	593	1			
	Maximum	7.5	105	1,106	1.2	5.0	639	0.30	604	1			
	Std. Dev.	0.1	6.4	35.3	0.1	0.0	40.2	0.0	17.9				
	Coeff. Of												
	Var. (%)	1.7	6.5	3.3	9.1	0.0	6.7	0.00	3.0				
Fill Event 2													
QK-2	07/23/19	7.7	83	1,036	<1.0	5.0	572	<0.30	530	<1	14.4	-81	<4
	07/31/19	7.3	94	1,028	1.0	5.0	560	<0.30	496	<1	14.8	-81	<4
	08/06/19	7.3	91	1,784	1.0	5.0	576	<0.30	523	<1	14.4	-84	<4
	08/13/19	7.6	93	860	<1.0	5.0	558	<0.30	484	<1	15.4	-83	<4
	08/23/19	7.3	92	1,000	<1.0	5.0	539	<0.30	471	<1	13.9	-84	<4
	08/30/19	7.3	91	1,006	<1.0	5.0	551	<0.30	499	<1	13.6	-84	<4

TABLE 1 (Continued): ANALYSIS OF CHEMICAL AND PHYSICAL PARAMETERS AND FECAL COLIFORM IN GROUNDWATER FROM MONITORING WELLS IN THE GLORIA ALITTO MAJEWSKI CHICAGOLAND UNDERFLOW PLAN OF THE TUNNEL AND RESERVOIR PLAN DURING 2019

Event	Date Sampled	pH	EC ¹	TDS ¹	TOC ¹	Cl ⁻	SO ₄ ²⁻	NH ₃ -N	Hardness	Fecal Coliform ²	Temp	Water Elevation ³	Recharge Time
			mS/m	----- mg/L -----						CFU/100 mL	°C	ft	hr
	Minimum	7.3	83	860	<1.0	5.0	539	<0.30	471	<1			
	Median	7.3	91	1,017	1.0	5.0	559	0.30	498	1			
	Mean	7.4	91	1,119	1.0	5.0	559	0.30	500.5	1			
	Maximum	7.7	94.4	1,784	1.0	5.0	576	0.30	530	1			
	Std. Dev.	0.2	3.9	332.1	0.0	0.0	13.6	0.0	22.5				
	Coeff. of Var. (%)	2.6	4.3	29.7	0.0	0.0	2.4	0.0	4.5				
9	Fill Events 3 & 4 Consecutive QK-2												
	09/19/19	7.5	83	918	<1.0	5.0	542	<0.30	518	<1	14.1	-84	<4
	09/27/19	7.4	81	884	<1.0	5.0	527	<0.30	483	<1	13.5	-84	<4
	10/03/19	7.9	69	908	<1.0	5.0	517	<0.30	458	1	13.1	-82	<4
	10/10/19	7.9	68	782	1.4	5.0	539	0.31	536	<1	13.1	-84	<4
	10/17/19	7.7	74	914	1.4	5.0	533	0.37	539	<1	12.7	-84	<4
	10/24/19	7.6	76	880	1.4	5.0	537	<0.30	475	<1	12.7	-81	<4
	10/28/19	7.2	74	874	<1.0	5.0	527	0.50	460	<1	12.4	-82	<4
	11/08/19	7.3	83	872	1.0	5.0	556	0.36	506	<1	11.6	-84	<4
	11/13/19	7.1	73	884	1.0	6.0	554	0.44	500	<1	10.9	-81	<4
	11/21/19	7.9	72	920	1.3	5.0	564	<0.30	469	<1	12.3	-82	<4
	11/26/19	7.4	77	910	1.1	6.0	535	<0.30	496	<1	12.2	-83	<4
	12/04/19	7.3	67	886	<1.0	6.0	526	<0.30	519	<1	12.1	-82	<4
	Minimum	7.1	67	782	1.0	5.0	517	<0.30	458	<1			
	Median	7.5	74	885	1.0	5.0	536	0.30	498	1			
	Mean	7.5	75	886	1.1	5.0	538	0.30	497	1			
	Maximum	7.9	83	920	1.4	6.0	564	0.50	539	1			
	Std. Dev.	0.3	5.4	37.2	0.2	0.4	13.9	0.1	28.0				

TABLE 1 (Continued): ANALYSIS OF CHEMICAL AND PHYSICAL PARAMETERS AND FECAL COLIFORM IN GROUNDWATER FROM MONITORING WELLS IN THE GLORIA ALITTO MAJEWSKI CHICAGOLAND UNDERFLOW PLAN OF THE TUNNEL AND RESERVOIR PLAN DURING 2019

Event	Date Sampled	pH	EC ¹	TDS ¹	TOC ¹	Cl ⁻	SO ₄ ²⁻	NH ₃ -N	Hardness	Fecal Coliform ²	Temp	Water Elevation ³	Recharge Time
			mS/m	----- mg/L -----						CFU/100 mL	°C	ft	hr
	Coeff. of Var. (%)	3.7	7.3	4.2	16.1	7.7	2.6	19.7	5.6				
First Quarter													
QK-3	03/22/19	7.8	789	678	1.0	50	310	<0.50	391	<1	11.7	-90	<4
Fill Event 1													
QK-3	05/10/19	N/S	N/S	N/S	N/S	N/S	N/S	N/S	N/S	N/S	N/S	N/S	<4
	05/16/19	N/S	N/S	N/S	N/S	N/S	N/S	N/S	N/S	N/S	N/S	N/S	<4
	05/24/19	N/S	N/S	N/S	N/S	N/S	N/S	N/S	N/S	N/S	N/S	N/S	<4
	05/29/19	N/S	N/S	N/S	N/S	N/S	N/S	N/S	N/S	N/S	N/S	N/S	<4
	06/04/19	N/S	N/S	N/S	N/S	N/S	N/S	N/S	N/S	N/S	N/S	N/S	<4
	06/11/19	N/S	N/S	N/S	N/S	N/S	N/S	N/S	N/S	N/S	N/S	N/S	<4
	06/13/19	N/S	N/S	N/S	N/S	N/S	N/S	N/S	N/S	N/S	N/S	N/S	<4
	Minimum	NA ⁶	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	
	Median	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	
	Mean	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	
	Maximum	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	
	Std. Dev.	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	
	Coeff. of Var. (%)	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	
Fill Event 2													
QK-3	07/23/19	N/S	N/S	N/S	N/S	N/S	N/S	N/S	N/S	N/S	N/S	N/S	<4
	07/31/19	N/S	N/S	N/S	N/S	N/S	N/S	N/S	N/S	N/S	N/S	N/S	<4
	08/06/19	N/S	N/S	N/S	N/S	N/S	N/S	N/S	N/S	N/S	N/S	N/S	<4
	08/13/19	N/S	N/S	N/S	N/S	N/S	N/S	N/S	N/S	N/S	N/S	N/S	<4

TABLE 1 (Continued): ANALYSIS OF CHEMICAL AND PHYSICAL PARAMETERS AND FECAL COLIFORM IN GROUNDWATER FROM MONITORING WELLS IN THE GLORIA ALITTO MAJEWSKI CHICAGOLAND UNDERFLOW PLAN OF THE TUNNEL AND RESERVOIR PLAN DURING 2019

Event	Date Sampled	pH	EC ¹	TDS ¹	TOC ¹	Cl ⁻	SO ₄ ²⁻	NH ₃ -N	Hardness	Fecal Coliform ²	Temp	Water Elevation ³	Recharge Time
			mS/m	----- mg/L -----						CFU/100 mL	°C	ft	hr
	08/23/19	N/S	N/S	N/S	N/S	N/S	N/S	N/S	N/S	N/S	N/S	N/S	<4
	08/30/19	N/S	N/S	N/S	N/S	N/S	N/S	N/S	N/S	N/S	N/S	N/S	<4
	Minimum	NA	NA	NA	NA	NA	NA	NA	NA	NA			
	Median	NA	NA	NA	NA	NA	NA	NA	NA	NA			
	Mean	NA	NA	NA	NA	NA	NA	NA	NA	NA			
	Maximum	NA	NA	NA	NA	NA	NA	NA	NA	NA			
	Std. Dev.	NA	NA	NA	NA	NA	NA	NA	NA	NA			
	Coeff. of Var. (%)	NA	NA	NA	NA	NA	NA	NA	NA	NA			
Fill Events 3 & 4													
Consecutive													
QK-3	09/19/19	N/S	N/S	N/S	N/S	N/S	N/S	N/S	N/S	N/S	N/S	N/S	<4
	09/27/19	N/S	N/S	N/S	N/S	N/S	N/S	N/S	N/S	N/S	N/S	N/S	<4
	10/03/19	N/S	N/S	N/S	N/S	N/S	N/S	N/S	N/S	N/S	N/S	N/S	<4
	10/10/19	N/S	N/S	N/S	N/S	N/S	N/S	N/S	N/S	N/S	N/S	N/S	<4
	10/17/19	N/S	N/S	N/S	N/S	N/S	N/S	N/S	N/S	N/S	N/S	N/S	<4
	10/24/19	N/S	N/S	N/S	N/S	N/S	N/S	N/S	N/S	N/S	N/S	N/S	<4
	10/28/19	N/S	N/S	N/S	N/S	N/S	N/S	N/S	N/S	N/S	N/S	N/S	<4
	11/08/19	N/S	N/S	N/S	N/S	N/S	N/S	N/S	N/S	N/S	N/S	N/S	<4
	11/13/19	N/S	N/S	N/S	N/S	N/S	N/S	N/S	N/S	N/S	N/S	N/S	<4
	11/21/19	7.7	76	720	1.6	66	278	0.64	403	290	12.0	-88	<4
	11/26/19	7.3	76	682	<1.0	65	266	0.62	461	26	11.9	-88	<4
	12/04/19	7.1	72	774	<1.0	57	351	0.54	519	75	12.5	-87	<4

TABLE 1 (Continued): ANALYSIS OF CHEMICAL AND PHYSICAL PARAMETERS AND FECAL COLIFORM IN GROUNDWATER FROM MONITORING WELLS IN THE GLORIA ALITTO MAJEWSKI CHICAGOLAND UNDERFLOW PLAN OF THE TUNNEL AND RESERVOIR PLAN DURING 2019

Event	Date Sampled	pH	EC ¹	TDS ¹	TOC ¹	Cl ⁻	SO ₄ ²⁻	NH ₃ -N	Hardness	Fecal Coliform ²	Temp	Water Elevation ³	Recharge Time	
			mS/m	----- mg/L -----						CFU/100 mL	°C	ft	hr	
	Minimum	7.1	72	682	<1.0	57.0	266	0.54	403	26				
	Median	7.3	76	720	1.0	65.0	278	0.62	461	75				
	Mean	7.3	75	725	1.2	62.7	298	0.60	461	82.7				
	Maximum	7.7	76	774	1.6	66.0	351	0.64	519	290				
	Std. Dev.	0.3	2.1	46.2	0.3	4.9	46.0	0.05	58.0					
	Coeff. of Var. (%)	4.1	2.7	6.4	28.9	7.9	15.4	8.7	12.6					
6	First Quarter QK-4	03/22/19	7.8	83	712	6.3	72	335	0.703	443	<1	10.7	-77	<4
	Fill Event 1 QK-4	05/10/19	N/S	N/S	N/S	N/S	N/S	N/S	N/S	N/S	N/S	N/S	N/S	<4
		05/16/19	N/S	N/S	N/S	N/S	N/S	N/S	N/S	N/S	N/S	N/S	N/S	<4
		05/24/19	N/S	N/S	N/S	N/S	N/S	N/S	N/S	N/S	N/S	N/S	N/S	<4
		05/29/19	7.2	89	810	1.5	85	316	0.67	508	300	15.4	-77	<4
		06/04/19	7.3	77	832	1.3	92	287	0.71	455	230	12.4	-77	<4
		06/13/19	7.7	88	834	1.3	104	316	0.74	457	70	12.3	-65	<4
	Minimum	7.2	77	810	1.3	85	287	0.67	455	70				
	Median	7.3	88	832	1.3	92	316	0.70	457	230				
	Mean	7.4	85	825	1.4	94	306	0.70	473	169				
	Maximum	7.7	89	834	1.5	104	316	0.74	508	300				
	Std. Dev.	0.3	6.2	13.3	0.1	9.6	16.7	0.0	30.0					
	Coeff. of Var. (%)	3.5	7.4	1.6	8.4	10.3	5.5	5.3	6.3					

TABLE 1 (Continued): ANALYSIS OF CHEMICAL AND PHYSICAL PARAMETERS AND FECAL COLIFORM IN GROUNDWATER FROM MONITORING WELLS IN THE GLORIA ALITTO MAJEWSKI CHICAGOLAND UNDERFLOW PLAN OF THE TUNNEL AND RESERVOIR PLAN DURING 2019

Event	Date Sampled	pH	EC ¹	TDS ¹	TOC ¹	Cl ⁻	SO ₄ ²⁻	NH ₃ -N	Hardness	Fecal Coliform ²	Temp	Water Elevation ³	Recharge Time
			mS/m	-----	-----	mg/L	-----	-----	-----	CFU/100 mL	°C	ft	hr
Fill Event 2													
QK-4	07/23/19	7.6	75	834	<1.0	85	337	0.75	443	4	14.5	-76	<4
	07/31/19	7.4	81	864	1.2	93	311	0.62	443	5	12.8	-77	<4
	08/06/19	7.5	85	910	1.2	69	362	0.73	463	1	13.0	-79	<4
	08/13/19	6.9	71	994	<1.0	107	290	0.66	448	2	13.1	-70	<4
	08/23/19	7.0	87	868	1.0	102	295	0.69	445	2	13.9	-71	<4
	08/30/19	7.6	86	868	1.2	76	346	0.65	475	<1	13.4	-78	<4
	Minimum	6.9	71	834	1.0	69	290	0.62	443	<1			
	Median	7.5	83	868	1.2	89	324	0.68	447	2			
	Mean	7.3	81	890	1.4	89	324	0.68	453	2			
	Maximum	7.6	87	994	1.2	107	362	0.75	475	5			
	Std. Dev.	0.3	7.0	57	0.1	15	29	0.05	13				
	Coeff. of Var. (%)	4.2	8.0	6.0	15.3	17	9.0	7.4	3.0				
Fill Events 3 & 4													
Consecutive													
QK-4	09/19/19	6.7	79	792	1.2	64	349	0.65	456	<1	12.9	-76	<4
	09/27/19	7.1	80	768	1.2	71	327	0.67	438	<1	12.2	-75	<4
	10/03/19	7.7	71	834	1.1	98	286	0.68	450	<1	12.0	-71	<4
	10/10/19	8.0	68	754	1.6	87	315	0.68	483	<1	12.1	-77	<4
	10/17/19	7.7	76	800	1.3	121	256	0.78	499	<1	11.9	-75	<4
	10/24/19	7.1	75	792	1.4	120	260	0.67	452	<1	11.9	-76	<4
	10/28/19	7.1	77	830	<1.0	100	291	0.70	462	<1	11.7	-75	<4
	11/08/19	6.9	79	776	1.5	94	317	0.77	443	<1	9.8	-75	<4
	11/13/19	6.6	80	764	1.2	90	321	0.78	463	<1	11.1	-76	<4
	11/21/19	7.4	70	824	<1.0	128	272	0.67	464	<1	11.6	-75	<4

TABLE 1 (Continued): ANALYSIS OF CHEMICAL AND PHYSICAL PARAMETERS AND FECAL COLIFORM IN GROUNDWATER FROM MONITORING WELLS IN THE GLORIA ALITTO MAJEWSKI CHICAGOLAND UNDERFLOW PLAN OF THE TUNNEL AND RESERVOIR PLAN DURING 2019

Event	Date Sampled	pH	EC ¹	TDS ¹	TOC ¹	Cl ⁻	SO ₄ ²⁻	NH ₃ -N	Hardness	Fecal Coliform ²	Temp	Water Elevation ³	Recharge Time
			mS/m	----- mg/L -----						CFU/100 mL	°C	ft	hr
	11/26/19	7.2	77	798	1.1	115	279	0.64	492	<1	11.6	-75	<4
	12/04/19	7.1	73	808	<1.0	127	263	0.62	507	<1	11.9	-63	<4
	Minimum	6.6	68	754	<1.0	64	256	0.62	438	<1			
	Median	7.1	76	795	1.2	99	289	0.70	463	1			
	Mean	7.2	76	795	1.2	101	295	0.70	467	1			
	Maximum	8.0	80	834	1.6	128	349	0.78	507	1			
	Std. Dev.	0.4	4.0	26.2	0.2	21.3	30.4	0.1	22.6				
	Coeff. of Var. (%)	5.5	5.3	3.3	16.4	21.1	10.3	8.1	4.8				

¹EC = electrical conductivity; TDS = total dissolved solids; TOC = total organic carbon.

²Geomean.

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

⁴N/S: No samples collected, well malfunction.

⁵NRR: No reportable result.

⁶NA: Not applicable.