

*Protecting Our Water Environment*



*Metropolitan Water Reclamation District of Greater Chicago*

***MONITORING AND RESEARCH  
DEPARTMENT***

***REPORT NO. 22-19***

***TUNNEL AND RESERVOIR PLAN***

***GLORIA ALITTO MAJEWSKI***

***CHICAGO UNDERFLOW PLAN RESERVOIR***

***WATER QUALITY MONITORING WELLS***

***ANNUAL GROUNDWATER MONITORING REPORT***

***FOR 2021***

***July 2022***

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July 22, 2022

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 Gloria Alitto Majewski Chicago Underflow Plan  
Reservoir Water Quality Monitoring Wells Annual Groundwater Monitoring  
Report for 2021

The report entitled "Tunnel and Reservoir Plan Gloria Alitto Majewski Chicago Underflow  
Plan Reservoir Water Quality Monitoring Wells Annual Groundwater Monitoring Report for 2021" is  
attached.

Very truly yours,



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) - (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  
GLORIA ALITTO MAJEWSKI  
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WATER QUALITY MONITORING WELLS  
ANNUAL GROUNDWATER MONITORING REPORT  
FOR 2021**

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## LIST OF ABBREVIATIONS

°C	degrees Celsius
CCD	Chicago City Datum
CFU	colony forming units
Cl-	chloride
Coeff. of Var.	coefficient of variation
EC	electrical conductivity
FC	fecal coliform
L	liter
m	meter
mg	milligram
mS	millisiemens
NH <sub>3</sub> -N	ammonia nitrogen
Std. Dev.	standard deviation
SO <sub>4</sub> <sup>2-</sup>	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, QK-3, and QK-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 feet 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 Metropolitan Water Reclamation District of Greater Chicago's 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.

Two fill events were observed during 2021. The first fill event occurred on June 25, 2021, and the second occurred on October 25, 2021. The monitoring wells (QK1, QK-2, QK-3, and QK-4) were sampled for six consecutive weeks following each fill event and quarterly on the following dates: March 3, 2021, May 26, 2021, and September 30, 2021.

## Summary of Data

**Monitoring Wells.** The analytical data for groundwater sampled during 2021 from monitoring wells QK-1 through QK-4 are presented in [Table 1](#). Physical characteristics, such as elevation, groundwater temperature, and estimated time of recharge for each well between initial pump-down and sampling, are also included.



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

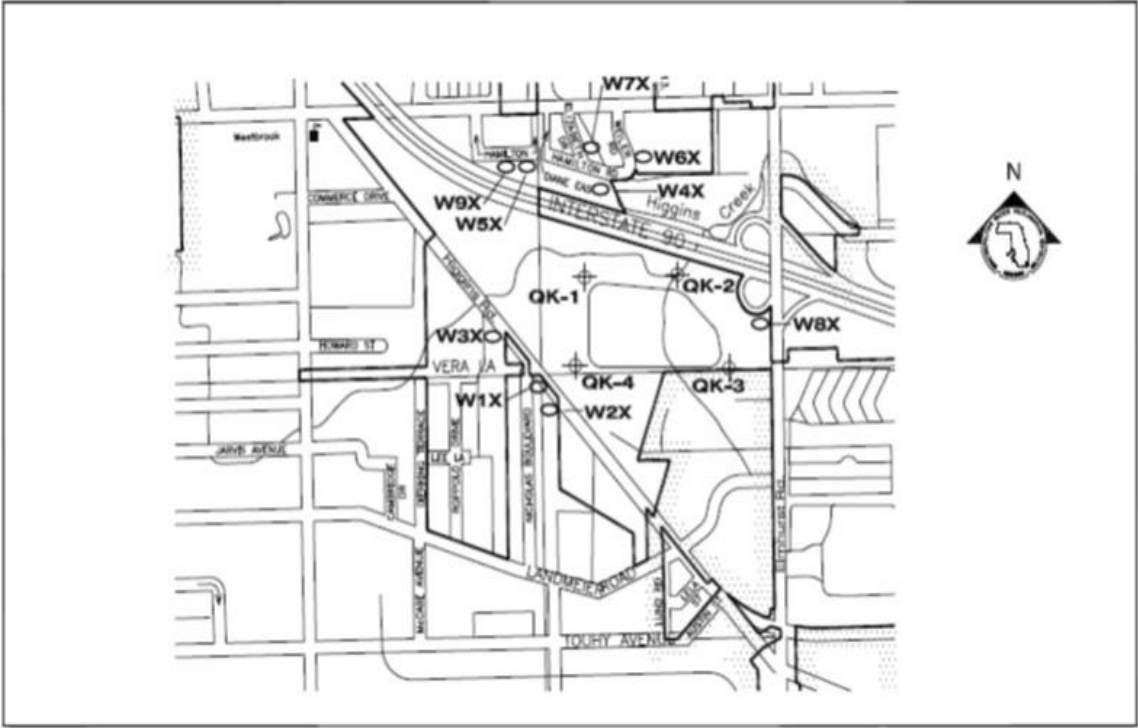


TABLE 1: ANALYSIS OF CHEMICAL AND PHYSICAL PARAMETERS AND FECAL COLIFORM IN GROUNDWATER FROM MONITORING WELLS ADJACENT TO THE GLORIA ALITTO MAJEWSKI CHICAGOLAND UNDERFLOW PLAN RESERVOIR OF THE TUNNEL AND RESERVOIR PLAN DURING 2021

Event	Sample Date	pH	EC <sup>1</sup> mS/m	TDS <sup>1</sup>	TOC <sup>1</sup>	Cl <sup>-</sup>	SO <sub>4</sub> <sup>2-</sup> mg/L	NH <sub>3</sub> -N	Hardness	Fecal Coliform CFU/100 mL	Temp. °C	Water Elevation <sup>2</sup> ft	Recharge Time hr
-----Well QK-1-----													
1 <sup>st</sup> Quarter	03/03/21	6.9	133	1,732	<5.0	74	912	<0.30	1,104	<1	12.3	-77	<4
2 <sup>nd</sup> Quarter	05/26/21	7.0	123	1,710	<5.0	69	872	<0.30	1,118	<1	13.6	-76	<4
1 <sup>st</sup> Fill	06/30/21	7.1	127	1,552	<5.0	69	744	0.41	983	32,000	20.2	-74	<4
	07/09/21	6.9	143	1,530	<5.0	69	845	0.60	1,060	12,000	14.7	-77	<4
	07/14/21	6.9	152	1,592	<5.0	66	792	<0.30	935	2,900	15.2	-77	<4
	07/23/21	6.1	127	1,688	<5.0	67	825	<0.30	1,066	350	15.6	-77	<4
	07/29/21	6.4	91	1,638	<5.0	68	826	<0.30	1,016	650	14.0	-77	<4
	08/05/21	5.9	100	1,780	6.93	65	783	<0.30	986	1,400	13.3	-77	<4
	Minimum	5.9	91	1,530	5.0	65	744	0.3	935	350			
	Median	6.7	127	1,615	5.0	68	809	0.3	1,001	2,150			
	Mean	6.7	124	1,653	5.3	69	825	0.4	1,034	8,217			
	Maximum	7.1	152	1,780	6.9	69	845	0.6	1,066	32,000			
Std. Dev.	0.5	24	93	0.8	2	37	0.1	50	12,441				
Coeff. of Var. %	7.6	19	6	14.8	2	4	33.2	5	151				
3 <sup>rd</sup> Quarter	09/30/21	7.1	75	1,568	<5.0	67	830	<0.30	963	<1	13.5	-76	<4
2 <sup>nd</sup> Fill	10/25/21	7.7	149	1,426	<5.0	66	796	<0.30	1,044	7	12.3	-74	<4
	11/04/21	6.9	153	1,484	<5.0	65	790	<0.30	1,047	43	12	-76	<4

TABLE 1 (Continued): ANALYSIS OF CHEMICAL AND PHYSICAL PARAMETERS AND FECAL COLIFORM IN GROUNDWATER FROM MONITORING WELLS ADJACENT TO THE GLORIA ALITTO MAJEWSKI CHICAGOLAND UNDERFLOW PLAN RESERVOIR OF THE TUNNEL AND RESERVOIR PLAN DURING 2021

Event	Sample Date	pH	EC <sup>1</sup> mS/m	TDS <sup>1</sup>	TOC <sup>1</sup>	Cl <sup>-</sup>	SO <sub>4</sub> <sup>2-</sup> mg/L	NH <sub>3</sub> -N	Hardness	Fecal Coliform CFU/100 mL	Temp. °C	Water Elevation <sup>2</sup> ft	Recharge Time hr
	11/10/21	6.9	149	1,582	<5.0	65	797	<0.30	1,036	180	12.2	-75	<4
	11/16/21	7.0	148	1,640	<5.0	65	799	<0.30	992	290	12.3	-75	<4
	11/23/21	6.9	145	1,554	<5.0	68	808	<0.30	1,023	13	12	-76	<4
	11/30/21	6.9	142	1,606	<5.0	67	827	<0.30	1,102	22	12.2	-76	<4
	Minimum	6.9	142	1,426	5.0	65	790	<0.30	992	7			
	Median	6.9	149	1,568	5.0	66	798	<0.30	1,040	33			
	Mean	7.1	148	1,549	5.0	66	803	<0.30	1,041	93			
	Maximum	7.7	153	1,640	5.0	68	827	<0.30	1,102	290			
	Std. Dev.	0.3	3.7	80	0.0	1.3	13	0.0	36	116			
	Coeff. of Var. %	4.6	2.5	5.2	0.0	2.0	2.0	0.0	3.0	126			
-----Well QK-2-----													
1 <sup>st</sup> Quarter	03/03/21	7.7	81	884	<5.0	5	548	<0.30	493	<1	12.3	-83	<4
2 <sup>nd</sup> Quarter	05/26/21	7.3	82	1,104	<5.0	5	556	<0.30	501	<1	14.0	-85	<4
1 <sup>st</sup> Fill	06/30/21	NS <sup>3</sup>	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	<4
	07/09/21	7.6	93	1,054	<5.0	6	547	0.32	479	8	14.6	-82	<4
	07/14/21	7.6	94	982	<5.0	5	512	0.31	483	<1	14.4	-82	<4
	07/23/21	6.7	76	1,000	<5.0	5	537	0.34	507	<1	14.9	-82	<4

TABLE 1 (Continued): ANALYSIS OF CHEMICAL AND PHYSICAL PARAMETERS AND FECAL COLIFORM IN GROUNDWATER FROM MONITORING WELLS ADJACENT TO THE GLORIA ALITTO MAJEWSKI CHICAGOLAND UNDERFLOW PLAN RESERVOIR OF THE TUNNEL AND RESERVOIR PLAN DURING 2021

Event	Sample Date	pH	EC <sup>1</sup> mS/m	TDS <sup>1</sup>	TOC <sup>1</sup>	Cl <sup>-</sup>	SO <sub>4</sub> <sup>2-</sup> mg/L	NH <sub>3</sub> -N	Hardness	Fecal Coliform CFU/100 mL	Temp. °C	Water Elevation <sup>2</sup> ft	Recharge Time hr
	07/29/21	6.9	71	948	<5.0	5	543	0.33	483	2	15.6	-84	<4
	08/05/21	6.4	74	988	<5.0	5	514	<0.30	488	<1	14.5	-83	<4
	Minimum	6.4	71	948	<5.0	5.0	512	0.30	479	<1.0			
	Median	6.9	76	988	<5.0	5.2	537	0.32	483	1.0			
	Mean	7.0	82	994	<5.0	5.3	531	0.30	488	2.6			
	Maximum	7.6	94	1,054	<5.0	6.0	547	0.34	507	8.0			
	Std. Dev.	0.5	11	38.5	0.0	0.4	16.7	0.02	11.1	3.0			
	Coeff. of Var. %	7.5	13.5	3.9	0.0	7.6	3.1	4.91	2.3	117			
3 <sup>rd</sup> Quarter	09/30/21	7.9	56	840	<5.0	5	512	0.33	465	<1	13.8	-82	<4
2 <sup>nd</sup> Fill	10/25/21	7.7	89	780	<5.0	5	523	0.33	487	<1	12.6	-81	<4
	11/04/21	8.1	92	904	<5.0	5	524	<0.30	469	<1	12.0	-82	<4
	11/10/21	7.7	88	886	<5.0	5	536	0.32	473	<1	12.8	-83	<4
	11/16/21	7.8	88	900	<5.0	5	528	0.31	449	<1	12.6	-81	<4
	11/23/21	7.8	86	810	<5.0	5	525	0.35	480	<1	11.9	-82	<4
	11/30/21	7.4	87	772	<5.0	5	538	0.39	525	<1	12.6	-82	<4
	Minimum	7.4	86	772	<5.0	4.7	523	0.30	449	1			
	Median	7.7	88	848	<5.0	5.0	527	0.32	477	1			
	Mean	7.7	88	842	<5.0	5.0	529	0.33	481	1			
	Maximum	8.1	92	904	<5.0	5.1	538	0.39	525	1			

TABLE 1 (Continued): ANALYSIS OF CHEMICAL AND PHYSICAL PARAMETERS AND FECAL COLIFORM IN GROUNDWATER FROM MONITORING WELLS ADJACENT TO THE GLORIA ALITTO MAJEWSKI CHICAGOLAND UNDERFLOW PLAN RESERVOIR OF THE TUNNEL AND RESERVOIR PLAN DURING 2021

Event	Sample Date	pH	EC <sup>1</sup> mS/m	TDS <sup>1</sup>	TOC <sup>1</sup>	Cl <sup>-</sup>	SO <sub>4</sub> <sup>2-</sup> mg/L	NH <sub>3</sub> -N	Hardness	Fecal Coliform CFU/100 mL	Temp. °C	Water Elevation <sup>2</sup> ft	Recharge Time hr
	Std. Dev.	0.2	2.1	61.5	0.0	0.1	6.5	0.03	25.3	0.0			
	Coeff. of Var. %	2.8	2.3	7.3	0.0	2.7	1.2	9.9	5.3	0.0			
-----Well QK-3-----													
1 <sup>st</sup> Quarter	03/03/21	7.5	73	738	<5.0	66	297	0.51	450	<1	11.9	-91	<4
2 <sup>nd</sup> Quarter	05/26/21	7.5	78	840	<5.0	60	347	0.62	480	<1	12.8	-89	<4
1 <sup>st</sup> Fill	06/30/21	7.4	73	752	<5.0	66	282	0.5	430	6,700	14.0	-87	<4
	07/09/21	7.4	82	880	<5.0	65	307	0.6	463	1,100	13.6	-88	<4
	07/14/21	7.5	74	812	<5.0	66	276	0.61	428	300	14.2	-89	<4
	07/23/21	6.5	66	888	<5.0	66	275	0.67	449	320	13.9	-89	<4
	07/29/21	6.7	59	826	<5.0	68	315	0.64	464	110	13.2	-88	<4
	08/05/21	6.0	66	894	<5.0	66	279	0.61	436	100	13.5	-89	<4
	Minimum	6.0	59	752	5.0	65	275	0.50	428	100			
	Median	7.0	69	853	5.0	66	281	0.60	443	310			
	Mean	6.9	70	842	5.0	66	289	0.60	445	1,438			
	Maximum	7.5	82	894	5.0	68	315	0.70	464	6,700			
	Std. Dev.	0.6	8.1	55.7	0.0	0.9	17.5	0.1	16.1	2,604			
	Coeff. of Var. %	8.6	11.6	6.6	0.0	1.4	6.1	9.4	3.6	181			

TABLE 1 (Continued): ANALYSIS OF CHEMICAL AND PHYSICAL PARAMETERS AND FECAL COLIFORM IN GROUNDWATER FROM MONITORING WELLS ADJACENT TO THE GLORIA ALITTO MAJEWSKI CHICAGOLAND UNDERFLOW PLAN RESERVOIR OF THE TUNNEL AND RESERVOIR PLAN DURING 2021

Event	Sample Date	pH	EC <sup>1</sup> mS/m	TDS <sup>1</sup>	TOC <sup>1</sup>	Cl <sup>-</sup>	SO <sub>4</sub> <sup>2-</sup> mg/L	NH <sub>3</sub> -N	Hardness	Fecal Coliform CFU/100 mL	Temp. °C	Water Elevation <sup>2</sup> ft	Recharge Time hr	
3 <sup>rd</sup> Quarter	09/30/21	7.6	47	728	<5.0	62	293	0.61	439	<1	12.8	-90	<4	
2 <sup>nd</sup> Fill	10/25/21	7.4	82	708	<5.0	70	268	0.60	450	<1	12.1	-85	<4	
	11/04/21	7.5	89	738	<5.0	57	327	0.56	445	5,200	12.6	-87	<4	
	11/10/21	7.6	82	756	<5.0	69	289	0.63	458	690	12.2	-87	<4	
	11/16/21	7.6	82	740	<5.0	72	265	0.67	387	330	11.8	-88	<4	
	11/23/21	7.6	81	750	<5.0	69	270	0.65	447	120	11.8	-89	<4	
	11/30/21	7.1	80	714	<5.0	71	276	0.66	473	72	11.9	-89	<4	
	Minimum	7.1	80	708	<5.0	57	265	0.56	387	<1				
	Median	7.5	82	739	<5.0	69	273	0.64	449	225				
	Mean	7.4	83	734	<5.0	68	283	0.63	443	1,069				
	Maximum	7.6	89	756	<5.0	72	327	0.67	473	5,200				
Std. Dev.	0.2	3.3	19.3	0.0	5.5	23.4	0.04	29.4	2,039					
Coeff. of Var. %	2.5	4.0	2.6	0.0	8.0	8.3	6.20	6.6	191					
-----Well QK-4-----														
1 <sup>st</sup> Quarter	03/03/21	7.5	84	812	<5.0	122	284	0.78	489	<1	12.2	-67	<4	
2 <sup>nd</sup> Quarter	05/26/21	7.6	82	862	<5.0	131	283	0.77	486	<1	13.7	-64	<4	
1 <sup>st</sup> Fill	06/30/21	7.5	99	818	<5.0	86	316	0.67	454	170	27.2	-65	<4	
	07/09/21	7.4	84	896	<5.0	114	275	0.76	482	<1	13.0	-78	<4	

TABLE 1 (Continued): ANALYSIS OF CHEMICAL AND PHYSICAL PARAMETERS AND FECAL COLIFORM IN GROUNDWATER FROM MONITORING WELLS ADJACENT TO THE GLORIA ALITTO MAJEWSKI CHICAGOLAND UNDERFLOW PLAN RESERVOIR OF THE TUNNEL AND RESERVOIR PLAN DURING 2021

Event	Sample Date	pH	EC <sup>1</sup> mS/m	TDS <sup>1</sup>	TOC <sup>1</sup>	Cl <sup>-</sup>	SO <sub>4</sub> <sup>2-</sup> mg/L	NH <sub>3</sub> -N	Hardness	Fecal Coliform CFU/100 mL	Temp. °C	Water Elevation <sup>2</sup> ft	Recharge Time hr
	07/14/21	7.5	91	854	<5.0	119	276	0.67	450	<1	14.5	-78	<4
	07/23/21	7.4	74	906	<5.0	102	291	0.76	464	<1	15.2	-74	<4
	07/29/21	6.8	72	856	<5.0	108	311	0.70	483	<1	13.4	-66	<4
	08/05/21	6.0	74	974	<5.0	127	266	0.69	468	<1	14.4	-67	<4
	Minimum	6.0	72	818	<5.0	86	266	0.67	450	<1			
	Median	7.4	79	876	<5.0	111	283	0.70	466	1			
	Mean	7.1	82	884	<5.0	110	289	0.71	467	29			
	Maximum	7.5	99	974	<5.0	127	316	0.76	483	170			
	Std. Dev.	0.6	11	54.3	0.0	14	20.5	0.04	13.8	69			
	Coeff. of Var. %	8.1	13.3	6.1	0.0	13	7.1	6.0	3.0	237			
3 <sup>rd</sup> Quarter	09/30/21	7.6	53	732	<5.0	85	316	0.71	429	<1	12.5	-65	<4
2 <sup>nd</sup> Fill	10/25/21	7.4	89	792	<5.0	122	274	0.67	490	<1	12.0	-65	<4
	11/04/21	7.3	97	812	<5.0	125	273	0.63	476	7	11.4	-65	<4
	11/10/21	7.5	85	846	<5.0	108	294	0.70	470	<1	11.8	-64	<4
	11/16/21	7.5	85	804	<5.0	85	325	0.68	427	1	11.5	-64	<4
	11/23/21	7.5	83	758	<5.0	97	299	0.70	463	<1	11.6	-73	<4
	11/30/21	7.2	84	726	<5.0	82	329	0.67	467	<1	11.6	-78	<4
	Minimum	7.2	83	726	<5.0	82	273	0.63	427	<1			
	Median	7.4	85	798	<5.0	102	297	0.68	469	1			
	Mean	7.4	87	790	<5.0	103	299	0.67	466	2			

TABLE 1 (Continued): ANALYSIS OF CHEMICAL AND PHYSICAL PARAMETERS AND FECAL COLIFORM IN GROUNDWATER FROM MONITORING WELLS ADJACENT TO THE GLORIA ALITTO MAJEWSKI CHICAGOLAND UNDERFLOW PLAN RESERVOIR OF THE TUNNEL AND RESERVOIR PLAN DURING 2021

Event	Sample Date	pH	EC <sup>1</sup> mS/m	TDS <sup>1</sup> -----mg/L-----	TOC <sup>1</sup>	Cl <sup>-</sup>	SO <sub>4</sub> <sup>2-</sup>	NH <sub>3</sub> -N	Hardness	Fecal Coliform CFU/100 mL	Temp. °C	Water Elevation <sup>2</sup> ft	Recharge Time hr
	Maximum	7.6	97	846	<5.0	125	329	0.70	490	7			
	Std. Dev.	0.1	5.3	42.3	<0.0	18	24	0.03	21.1	2.4			
	Coeff. of Var. %	1.4	6.1	5.4	0.0	18	8.0	4.03	4.5	123			

<sup>1</sup>EC = electrical conductivity; TDS = total dissolved solids; TOC = total organic carbon.

<sup>2</sup>Relative to Chicago City Datum (579.48 feet above mean sea level) at the intersection of State and Madison Streets.

<sup>3</sup>NS: No sample was collected due to access restriction to the well during maintenance operation on the site.