

Protecting Our Water Environment



Metropolitan Water Reclamation District of Greater Chicago

***MONITORING AND RESEARCH
DEPARTMENT***

REPORT NO. 25-25

TUNNEL AND RESERVOIR PLAN

MAINSTREAM TUNNEL SYSTEM

ANNUAL GROUNDWATER MONITORING REPORT

FOR 2024

July 2025

Protecting Our Water Environment



Metropolitan Water Reclamation District of Greater Chicago

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July 8, 2025

Ms. Joey Logan-Pugh
Chief
Bureau of Water
Illinois Environmental Protection Agency
2520 W. Iles Ave.
P. O. Box 19276
Springfield, IL 62794-9276

Dear Ms. Logan-Pugh:

Subject: Tunnel and Reservoir Plan Mainstream Tunnel System Annual Groundwater
Monitoring Report for 2024

The report entitled "Tunnel and Reservoir Plan Mainstream Tunnel System Annual Groundwater Monitoring Report for 2024" is attached.

Very truly yours,

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

AC:lf
Attachment
cc: Mr. Ryan Bahr (USEPA Region 5 - WC15J)
Mr. E. Podczerwinski
Dr. H. Zhang
cc w/o att: Mr. P. Desai
Mr. E. Staudacher

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**TUNNEL AND RESERVOIR PLAN
MAINSTREAM TUNNEL SYSTEM
ANNUAL GROUNDWATER MONITORING REPORT
FOR 2024**

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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
m	meter
mg	milligram
mL	milliliter
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 AND OBSERVATION WELLS

Introduction

The monitoring and observation wells are located along the length of the Mainstream Tunnel System between Morton Grove and Hodgkins, Illinois ([Figures 1](#) and [2](#)). Groundwater elevations of the observation wells were measured monthly during 2023. 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 of a three-year fill event-based groundwater monitoring study conducted by the District from 2017 to 2019 which were submitted to the IEPA in a report dated July 30, 2020.

Under the modified monitoring program, nine fill event-based monitoring wells in the Mainstream Tunnel System (QM-61, QM-62, QM-63, QM-64, QM-65, QM-67, QM-68, QM-75, and QM-77) 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. 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). Sampling is conducted during the second week following each 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 (NH₃-N), total organic carbon (TOC), chloride (Cl⁻), sulfate (SO₄²⁻), and FC. For the second fill event, samples are analyzed for FC only.

The other 13 monitoring wells associated with the Mainstream 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 1995–2013.

In 1994, the termination of monitoring of wells QM-51, QM-52, QM-54, QM-55, QM-57, and QM-60 was approved by the IEPA (memorandum dated May 4, 1994). Monitoring well QM-59 has been dry since February 1995 and is no longer monitored. Monitoring wells QM-56 and QM-58 were officially abandoned in the modified program. Monitoring of observation well OM-17 was also discontinued with the approval of the IEPA (letter dated December 16, 2011).

FIGURE 1: MAP OF THE MONITORING WELLS IN THE MAINSTREAM TUNNEL SYSTEM

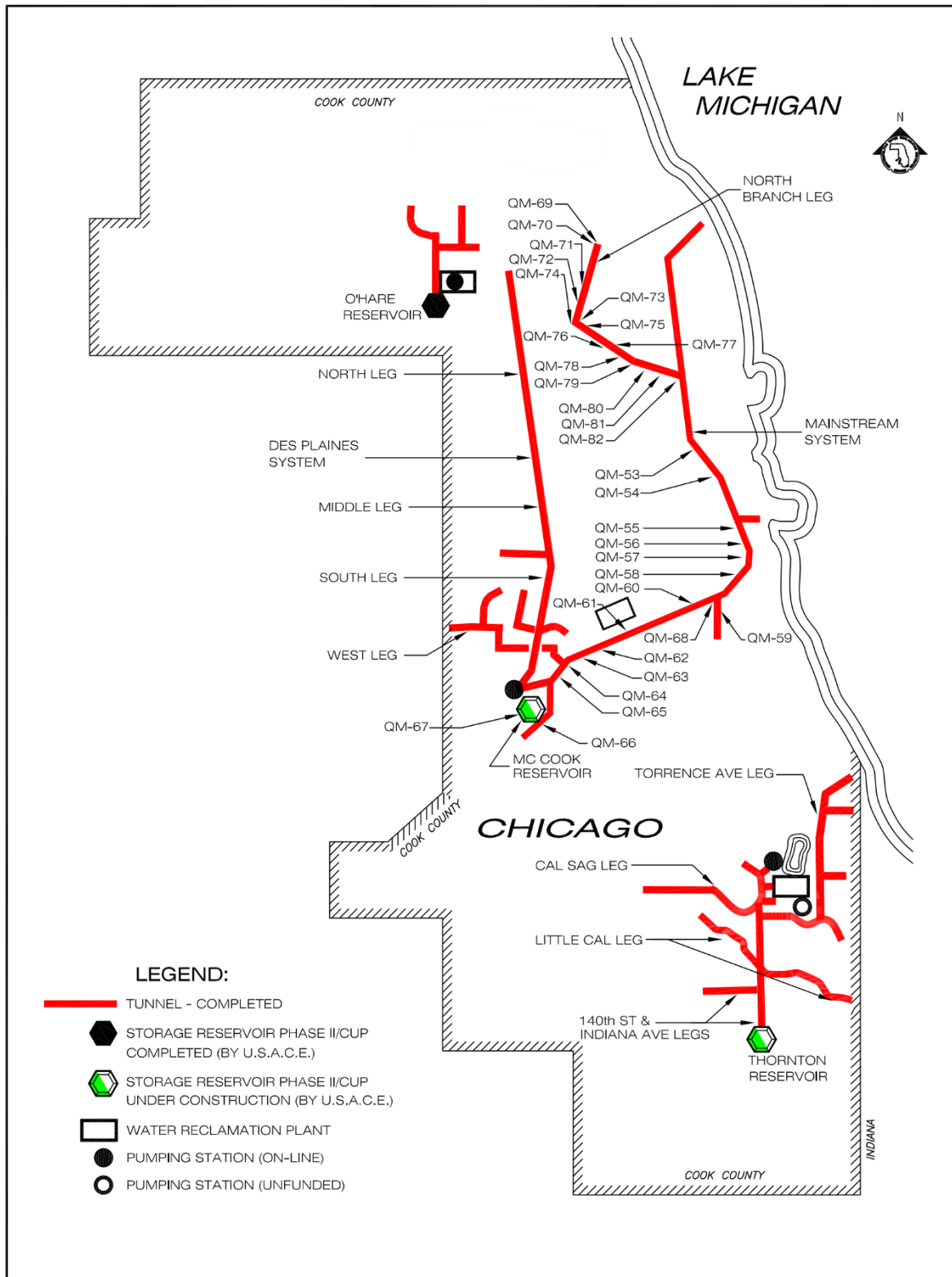
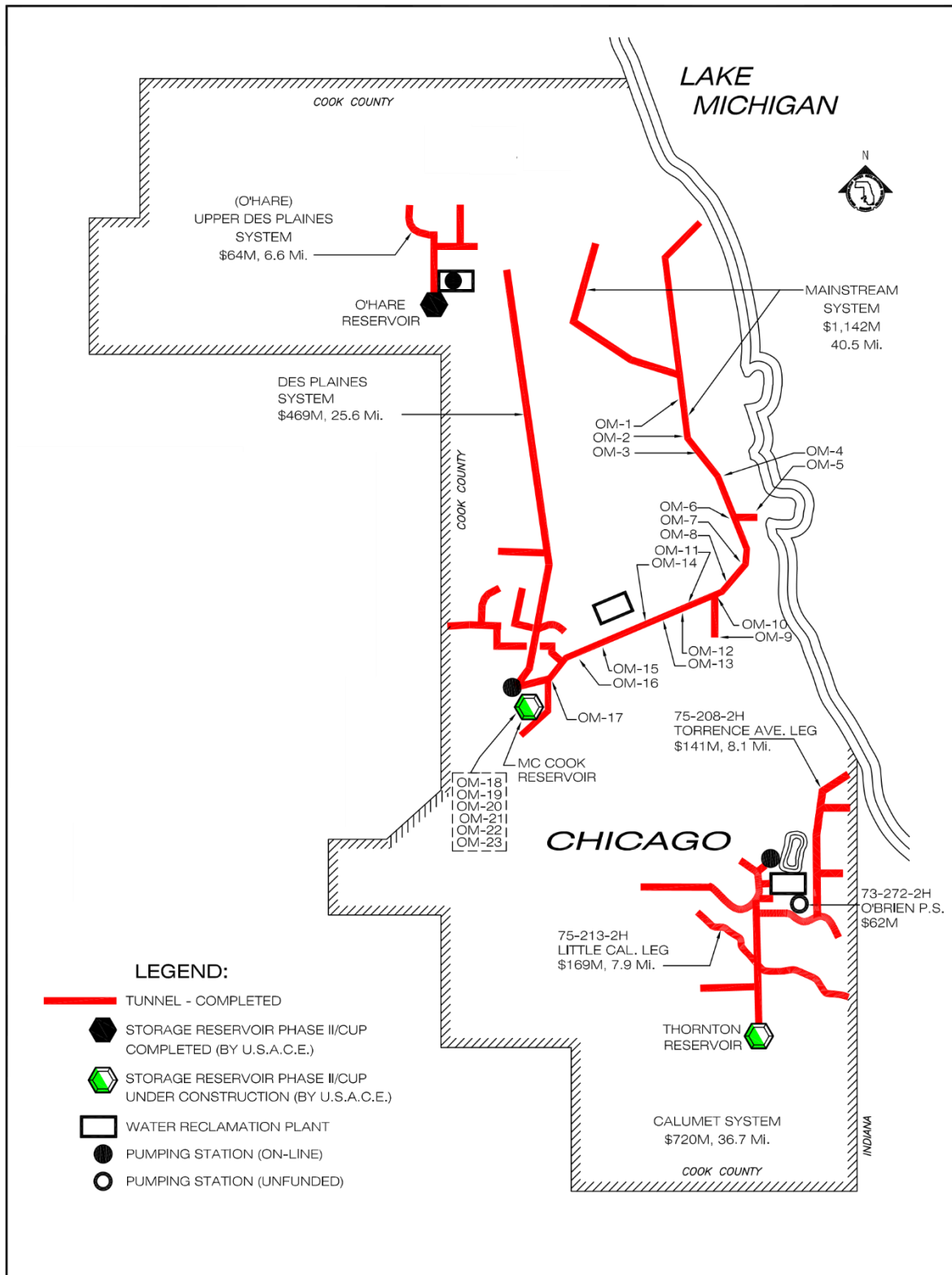


FIGURE 2: MAP OF THE OBSERVATION WELLS IN THE MAINSTREAM TUNNEL SYSTEM



Summary of Monitoring Well Data

Monitoring Wells. During the first half of 2024, there were no Mainstream tunnel fill events. As a substitution of the fill event sampling, the nine priority monitoring wells were sampled during the period from June 5–13, 2024. In the second half of the year, one tunnel fill event occurred on July 15, 2024, and lasted till July 27, 2024. The second fill event-based sampling was conducted in the second week of the fill event between July 24–26, 2024. Because the two samplings for the year (June and July) were so close, additional sampling for FC test only was conducted from October 2–14, 2024.

The groundwater analytical data and physical parameters for fill event-based monitoring wells QM-61 through QM-68 (except QM-66), QM-75, and QM-77 are presented in [Table 1](#). Fecal coliform was not detected, <1 CFU/100mL, in all monitoring wells during the first and third sampling event except well QM-67. For the second sampling event, FC was detected in all wells except wells QM-64 and QM-75. Although FC was found in most of the wells during July fill event sampling, FC detections were transient, and subsequently FC in all wells returned to undetectable levels at the third sampling event.

The analytical data for groundwater from the 13 Mainstream wells sampled once per year are presented in [Table 2](#). Fecal coliforms were undetectable (<1 CFU/100 mL) in all annual wells except well QM-82.

Observation Wells. Groundwater elevations were measured for observation wells OM-1 through OM-23 once per month. Groundwater elevations were calculated relative to the CCD (579.48 feet above mean sea level at the intersection of State and Madison Streets) and are presented in [Table 3](#). The minimum, mean, and maximum groundwater elevations for each well during the year are presented in [Figure 3](#).

TABLE 1: ANALYSIS OF CHEMICAL AND PHYSICAL PARAMETERS AND FECAL COLIFORM IN GROUNDWATER SAMPLED FROM FILL EVENT MONITORING WELLS IN THE MAINSTREAM TUNNEL SYSTEM OF THE TUNNEL AND RESERVOIR PLAN DURING 2024¹

Well	Sample 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-----									
QM-61	06/05/24	7.7	45	314	<5.0	55	11	<0.3	119	14.3	-143	<1	<4
	07/26/24	7.7	36	224	<5.0	41	10	1.2	100	14.5	-118	750	<4
	10/02/24	7.9	46	—	—	—	—	—	—	14.1	-124	<1	<4
QM-62	06/13/24	7.6	52	304	<5.0	46	22	0.9	143	14.8	-153	<1	<48
	07/25/24	7.5	54	284	<5.0	40	13	0.9	135	14.7	-101	960	<48
	10/03/24	7.7	48	—	—	—	—	—	—	14.5	-155	<1	<48
QM-63	06/13/24	7.5	154	1,596	<5.0	46	928	2.1	799	14.2	-171	<1	<48
	07/25/24	7.5	188	1,444	<5.0	42	830	2.2	817	14.6	-119	800	<48
	10/03/24	7.7	148	—	—	—	—	—	—	14.2	-166	<1	<48
QM-64	06/05/24	7.4	59	392	<5.0	50	33	1.2	202	14.9	-126	<1	<4
	07/26/24	7.4	58	386	<5.0	51	26	1.2	202	14.9	-102	<1	<4
	10/02/24	7.6	60	—	—	—	—	—	—	14.4	-124	<1	<4
QM-65	06/12/24	7.3	83	670	<5.0	81	114	3.2	301	14.5	-164	<1	<48
	07/24/24	7.3	86	676	<5.0	80	114	3.2	302	14.3	-131	27	<48
	10/03/24	7.2	97	—	—	—	—	—	—	14.3	-160	<1	<48
QM-67	06/12/24	7.3	104	648	<5.0	160	3.4	15.6	246	14.9	-161	270	<48
	07/24/24	7.4	101	740	<5.0	163	3.0	15.3	238	15.0	-161	680	<48
	10/03/24	7.3	97	—	—	—	—	—	—	14.8	-162	550	<48

TABLE 1 (Continued): ANALYSIS OF CHEMICAL AND PHYSICAL PARAMETERS AND FECAL COLIFORM IN GROUNDWATER SAMPLED FROM FILL EVENT MONITORING WELLS IN THE MAINSTREAM TUNNEL SYSTEM OF THE TUNNEL AND RESERVOIR PLAN DURING 2024¹

Well	Sample 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-----									
QM-68	06/12/24	7.1	76	516	<5.0	110	50	0.9	344	14.3	-111	<1	<48
	07/24/24	7.1	72	578	<5.0	104	53	0.8	307	14.1	-98	4	<48
	10/03/24	7.3	72	—	—	—	—	—	—	13.7	-111	<1	<48
QM-75	06/13/24	7.8	38	204	<5.0	13	12	<0.3	58	14.4	-68	<1	<48
	07/24/24	7.9	28	252	<5.0	13	10	<0.3	58	12.8	-62	<1	<48
	10/14/24	7.8	27	—	—	—	—	—	—	12.2	-67	<1	<48
QM-77	06/12/24	7.8	20	136	<5.0	11	2.0	<0.3	43	13.1	-177	<1	<48
	07/24/24	8.2	20	172	<5.0	11	2.0	0.50	43	12.9	-135	150	<48
	10/02/24	8.2	20	—	—	—	—	—	—	12.8	-170	<1	<48

¹Chemistry parameters were analyzed for the first two sampling events.

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

TABLE 2: ANALYSIS OF CHEMICAL AND PHYSICAL PARAMETERS AND FECAL COLIFORM IN GROUNDWATER SAMPLED FROM ANNUAL MONITORING WELLS IN THE MAINSTREAM TUNNEL SYSTEM OF THE TUNNEL AND RESERVOIR PLAN DURING 2024

Well	Sample Date	pH	EC mS/m	TDS	TOC	Cl ⁻	SO ₄ ²⁻ mg/L	NH ₃ -N	Hardness	Temp. °C	Water Elevation ¹ feet	Fecal Coliform CFU/100 mL
QM-53	02/22/24	8.2	26	188	<5.0	17	37	<0.3	136	11.4	-43	<1
QM-69	03/07/24	8.0	37	278	<5.0	38	35	0.8	141	11.6	-18	<1
QM-70	03/07/24	8.0	41	266	<5.0	47	53	0.4	143	12.0	-61	<1
QM-71	03/07/24	8.1	59	396	<5.0	127	65	0.4	170	11.7	-63	<1
QM-72	03/07/24	7.9	49	320	<5.0	126	2	0.3	218	12.0	-68	<1
QM-73	06/28/24	7.8	53	292	<5.0	38	3	0.3	152	13.1	-159	<1
QM-74	06/28/24	7.9	49	266	<5.0	61	1	<0.3	110	12.9	6	<1
QM-76	06/28/24	8.4	52	310	<5.0	12	36	0.7	42	12.9	-182	<1
QM-78	08/01/24	9.1	48	300	<5.0	10	44	<0.3	10	13.0	-170	<1
QM-79	08/01/24	8.7	35	286	<5.0	13	24	<0.3	15	12.5	-133	<1
QM-80	08/01/24	8.5	25	200	<5.0	13	2	<0.3	22	13.3	-140	<1
QM-81	10/24/24	8.3	30	232	<5.0	23	10	<0.3	30	13.1	-126	<1
QM-82	10/24/24	8.5	36	276	<5.0	30	9	<0.3	14	13.3	-183	1

¹Relative to Chicago City Datum (579.48 feet above sea level) at intersection of State and Madison Streets.

TABLE 3: GROUNDWATER ELEVATIONS FOR OBSERVATION WELLS OM-1 THROUGH OM-23 IN THE MAINSTREAM TUNNEL SYSTEM OF THE TUNNEL AND RESERVOIR PLAN MEASURED DURING 2024

Date	Observation Well No.										
	OM-1	OM-2	OM-3	OM-4	OM-5	OM-6	OM-7	OM-8	OM-9	OM-10	OM-11
	Elevation (feet) ¹										
01/10/24	-36.9	-30.2	-32.8	-67.4	-43.7	-34.2	-49.7	-39.3	-28.1	-20.4	-46.2
02/23/24	-36.9	-30.3	-32.9	-67.6	-53.7	-50.7	-49.6	-39.3	-28.4	-20.6	-46.4
03/11/24	-36.2	-30.3	-32.6	-66.4	-53.9	-34.2	-50.3	-39.5	-28.5	-19.9	-45.3
04/17/24	-36.6	-30.0	-32.6	-67.2	-53.5	-41.0	-49.8	-39.0	-28.2	-20.5	-45.9
05/15/24	-36.3	-30.1	-32.6	-67.2	-53.8	-34.5	-49.9	-39.1	-28.3	-20.4	-46.0
06/20/24	-36.6	-30.4	-26.6	-67.8	-54.4	-34.0	-48.5	-39.6	-28.5	-20.9	-46.7
07/15/24	-34.5	-26.7	-30.5	-63.9	-53.8	-34.1	-49.7	-38.9	-44.7	-18.9	-21.0
08/13/24	-36.8	-29.1	-32.8	-67.7	-53.8	-34.7	-49.9	-39.0	-27.3	-20.3	-45.4
09/12/24	-36.5	-30.3	-33.1	-68.1	-53.8	-35.3	-49.9	-39.1	-27.9	-20.8	-44.9
10/08/24	-36.3	-29.5	-32.5	-67.4	-52.3	-34.7	-47.6	-37.2	-27.3	-20.5	-44.2
11/13/24	-36.1	-30.2	-33.2	-68.1	-53.8	-34.9	-49.9	-39.0	-27.8	-20.8	-43.2
12/03/24	-36.3	-30.2	-33.0	-68.4	-53.8	-34.9	-50.1	-43.0	-28.1	-21.0	-43.4

TABLE 3 (Continued): GROUNDWATER ELEVATIONS FOR OBSERVATION WELLS OM-1 THROUGH OM-23 IN THE MAINSTREAM TUNNEL SYSTEM OF THE TUNNEL AND RESERVOIR PLAN MEASURED DURING 2024

Date	Observation Well No.										
	OM-12	OM-13	OM-14	OM-15	OM-16	OM-18	OM-19	OM-20	OM-21	OM-22	OM-23
	Elevation (feet) ¹										
01/12/24	-7.6	41.6	-82.7	-139.9	-87.2	-205.3	-83.3	-85.8	-69.8	-72.6	-166.3
02/24/24	-7.5	41.6	-59.3	-142.9	-86.9	-194.5	-83.5	-84.4	-61.1	-64.1	-197.8
03/11/24	-7.6	41.6	-52.6	-132.7	-86.6	-195.9	-83.5	-83.3	-65.5	-69.1	-145.4
04/17/24	-14.0	41.7	-58.4	-142.4	-85.8	-202.9	-81.0	-78.7	-60.8	-62.7	-173.4
05/17/24	-7.0	41.5	-56.6	-139.6	-84.9	-140.5	-80.2	-78.4	-61.2	-65.1	-166.2
06/18/24	-7.6	41.5	-58.3	-141.7	-84.4	-189.7	-148.3	-81.0	-55.5	-63.8	-184.8
07/10/24	-14.0	42.1	-56.7	-137.9	-81.6	-196.2	-70.9	-83.0	-65.1	-62.8	-160.0
08/14/24	-7.7	41.8	-58.4	-137.3	-82.5	-194.9	-81.5	-82.7	-43.7	-62.5	-174.9
09/13/24	-7.7	41.5	-58.0	-143.0	-84.6	-202.1	-82.9	-83.0	-66.9	-63.2	-178.5
10/16/24	-8.2	42.4	-58.6	-143.8	-84.0	-217.5	-78.5	-87.2	-52.4	-65.8	-189.5
11/14/24	-7.5	41.7	-58.3	-142.3	-83.5	-214.3	-83.3	-89.7	-71.9	-70.6	-177.7
12/04/24	-7.2	41.4	-57.6	-144.3	-83.2	-216.8	-83.0	-88.7	-74.7	-71.6	-182.2

¹Relative to Chicago city datum (579.48' above mean sea level) at intersection of State and Madison Streets.

FIGURE 3: MINIMUM, MEAN, AND MAXIMUM WATER ELEVATION FOR OBSERVATION WELLS OM-1 THROUGH OM-23 IN THE MAINSTREAM TUNNEL SYSTEM OF THE TUNNEL AND RESERVOIR PLAN MEASURED DURING 2024

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