

Protecting Our Water Environment



Metropolitan Water Reclamation District of Greater Chicago

***MONITORING AND RESEARCH
DEPARTMENT***

REPORT NO. 20-26

THORNTON COMPOSITE RESERVOIR

GROUNDWATER MONITORING REPORT

SECOND QUARTER 2020

August 2020

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Metropolitan Water Reclamation District of Greater Chicago

CECIL LUE-HING RESEARCH AND DEVELOPMENT COMPLEX
6001 WEST PERSHING ROAD CICERO, ILLINOIS 60804-4112

Edward W. Podczerwinski, P.E.

Director of Monitoring and Research

August 7, 2020

Mr. Richard P. Cobb, P.G.
Division Manager
Division of Public Water Supplies
Illinois Environmental Protection Agency
1021 North Grand Avenue East
Springfield, IL 62794
RICK.COBB@Illinois.gov

Dear Mr. Cobb:

Subject: Transmittal of the Report "Thornton Composite Reservoir Groundwater Monitoring Report Second Quarter 2020"

Please find attached the report entitled "Thornton Composite Reservoir Groundwater Monitoring Report Second Quarter 2020" transmitted electronically. The report is prepared for transmittal to the Illinois Environmental Protection Agency (IEPA) in accordance with the Thornton Composite Reservoir Groundwater Monitoring Plan. Also attached is the Excel spreadsheet of the Thornton Composite Reservoir raw data as required by the IEPA.

If you have any questions or would like to have additional information, please contact Mr. Benjamin Morgan at (708) 588-3743 or morganb@mwr.org.

Very truly yours,



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

AC:BM:cm
Attachment
cc: Mr. E. Podczerwinski

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

Thornton Composite Reservoir Groundwater Monitoring Report
Second Quarter 2020

Benjamin Morgan
Environmental Soil Scientist

Guanglong Tian
Principal Environmental Scientist

Albert Cox
Environmental Monitoring and Research Manager

Heng Zhang
Assistant Director of Monitoring and Research
Environmental Monitoring and Research Division

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LIST OF ACRONYMS

Acronym	Definition
CCD	Chicago City Datum
CFU	Colony Forming Unit
CSF	Combined Sewer Flow
GMP	Groundwater Monitoring Plan
GPS	Groundwater Protection System
IAC	Illinois Administrative Code
TCR	Thornton Composite Reservoir
TOC	Total Organic Carbon

ACKNOWLEDGMENT

This report for the Thornton Composite Reservoir Groundwater Monitoring was generated by the Monitoring and Research Department. All samples were collected by A3 Environmental Consultants (contractor) under the Thornton Composite Reservoir Contract 20-100-11. Analyses were performed by the Analytical Laboratories Division and the Analytical Microbiology Section of the Metropolitan Water Reclamation District of Greater Chicago. Special thanks are due to Ms. Coleen Maurovich for typing and formatting this report.

DISCLAIMER

Mention of proprietary equipment and chemicals in this report does not constitute endorsement by the Metropolitan Water Reclamation District of Greater Chicago.

INTRODUCTION

A Groundwater Protection System (GPS) was constructed for the Thornton Composite Reservoir (TCR) to protect against the exfiltration of combined sewer flow (CSF) into the surrounding dolomite aquifers. The CSF and minimal amounts of stormwater are stored in the reservoir during and after large storm events. To monitor the performance of the GPS, a network of monitoring wells located outside the perimeter of the GPS is being monitored as discussed in the Revised Groundwater Monitoring Plan (GMP) (Black & Veatch, 2016). As explained in the Revised GMP, one sample of reservoir water, one of the Main Quarry Sump, and one from each of the seven wells are collected annually and analyzed for the Illinois Administrative Code (IAC) Title 35 Part 620 Class I groundwater constituents. In addition, following a reservoir fill event or during a routine quarterly event, groundwater is sampled from the seven wells and the Main Quarry Sump and tested for a targeted list of parameters that are more likely to be detected in CSF water.

The monitoring well system consists of one deep well, TB-124, which monitors the underlying Galena Aquifer, and six vertical Westbay multi-level monitoring wells: TB-118, TB-119, TB-120, TB-121, TB-122, and TB-123, which monitor the Silurian Dolomite aquifers. As discussed in the Revised GMP, following a reservoir fill event, bi-weekly sampling is required while the water in the reservoir remains above an elevation of -280 ft Chicago City Datum (CCD). Groundwater is sampled from each well at the first sample interval port immediately below the reservoir water elevation. Each of the multi-level monitoring wells is capable of monitoring four distinct 20-ft intervals in the Silurian Dolomite aquifer.

The locations of monitoring wells, quarry sump, TCR, and the GPS are presented in Figure 1. The Main Quarry Sump is located beyond the south boundary of the GPS and is not a component of the TCR but is an integral part of the Hanson Material Services mining quarry to the south of the TCR. This sump facilitates mining operations by minimizing the water level at the bottom of the quarry. It is possible that the bottom of this sump could extend beyond the lowest depth of the TCR (-297.5 CCD ft). The sump contains mainly groundwater and small quantities of surface runoff, and it is sampled quarterly and during fill events, along with the wells, to evaluate the potential migration of contaminants from the TCR to the sump.

Table 1 lists the characteristics of all wells at the TCR site (well location coordinates, elevations and depths, and the sampling port interval elevations).

Prior to the TCR becoming operational in November 2015, eight (8) sampling events were conducted on a quarterly basis for two years (May 2012 through March 2014) to provide background data on the existing groundwater quality. In order to evaluate the effectiveness of the grout curtain and the GPS, the Revised GMP (2016) presents the analysis of data for all samples collected during the background monitoring period and provides a baseline for comparison with routine monitoring data. Changes over time in groundwater calcium and magnesium concentrations would also be useful in tracking the occurrence of infiltration/exfiltration. Groundwater analytical data routinely generated for the monitoring wells, reservoir, and sump

FIGURE 1: MONITORING WELL AND MAIN QUARRY SUMP LOCATIONS

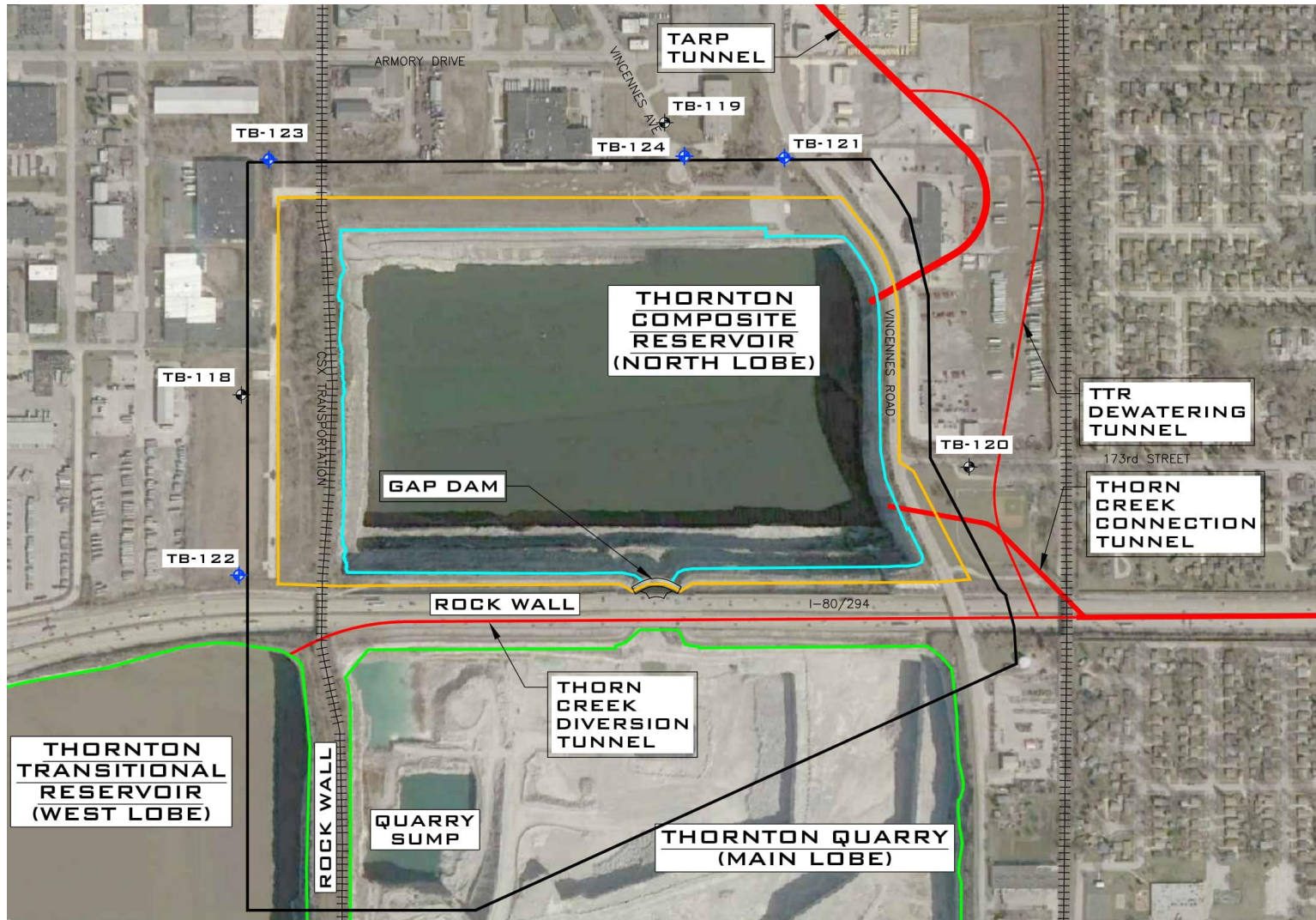


TABLE 1: CHARACTERISTICS OF MONITORING WELLS TB-118 THROUGH TB-124
AT THE THORNTON COMPOSITE RESERVOIR SITE

Well ID	Coordinates ¹		Ground Surface Elevation (ft, CCD ²)	Top of Riser Elevation (ft, CCD ²)	Depth of Well (ft)	Sampling Port Interval (ft, CCD)			
	Northing (ft)	Easting (ft)				Interval 1	Interval 2	Interval 3	Interval 4
TB-118	1,791,110.38	693,560.44	38.5	41.5	532	-85 to -105	-212 to -232	-283 to -303	-392 to -412
TB-119	1,792,316.63	695,509.39	27.9	29.5	529	-85 to -105	-212 to -232	-283 to -303	-392 to -412
TB-120	1,790,782.31	696,888.93	40.0	42.1	540	-86 to -106	-213 to -233	-284 to -304	-393 to -413
TB-121	1,792,193.10	696,044.98	29.4	30.4	461	-84 to -104	-211 to -231	-282 to -302	-391 to -411
TB-122	1,790,288.61	693,549.38	48.8	51.7	480	-85 to -105	-212 to -232	-283 to -303	-392 to -412
TB-123	1,792,185.60	693,685.69	28.9	31.8	460	-84 to -104	-211 to -231	-282 to -302	-391 to -411
TB-124	1,792,200.77	695,591.56	29.6	29.2	728	-663 to -698			

¹Illinois State Plane Coordinate System (NAD 1927).

²Chicago City Datum (CCD).

will also be compared with the IAC Title 35 Part 620 Class I Groundwater Standards (IPCB, IEPA, 2013) to evaluate any exceedances in groundwater standards.

There were three fill events during the second quarter of 2020. These were the first three fill events of 2020. The first fill event began April 30 and lasted until May 11, requiring a single sampling conducted on May 4 - May 7. One complete set of samples was collected at the Main Quarry Sump and all monitoring wells. The second fill event began on May 15 and lasted until June 25. Three bi-weekly fill event samplings were conducted on May 18 - 21, on June 2 - June 5, and on June 16, 17, and 19 at the Main Quarry Sump and all monitoring wells. The third fill event began on June 27 and lasted for two days. One complete set of samples was collected at the Main Quarry Sump and all monitoring wells on June 29 - July 1 immediately following this event.

This report presents field activities, observations, and analytical data for surface and groundwater monitoring samples taken at the Main Quarry Sump and at all monitoring wells during fill event sampling conducted from May 4 - July 1, 2020.

FIELD ACTIVITIES

For this report period, five complete sets of samples were collected at the Main Quarry Sump, the deep well, and at sampling port interval 3 of all multi-level wells. One set was collected as part of fill event monitoring for the first fill event of 2020 from May 4 - May 7. Three sets were collected for bi-weekly fill event monitoring of the second fill event of 2020 from May 18 - May 21, from June 2 - June 5, and on June 16, 17, and 19. The fifth set was collected from June 29 - July 1 for fill event monitoring during the third fill event of 2020. Samples were collected according to the schedule listed in Table 2.

Using a Myron L Ultrameter Model 6P pH/conductivity/temperature meter, the pH, electrical conductivity (EC), and temperature of each sample were measured and recorded immediately after collection.

Prior to sampling the multi-level wells, hydrostatic pressure was measured to calculate the groundwater elevation at Port 3 of each well. Table 3 lists the elevations at Port 3 of each well and the corresponding groundwater elevations during the fill event samplings from May 4 - July 1, 2020.

All samples were packed in ice and transported to the Metropolitan Water Reclamation District of Greater Chicago's (District) Analytical Laboratories Division for the analysis of selected inorganic constituents (IAC Title 35 Part 620 Class I Groundwater Standards) in accordance with the revised GMP. Additional aliquots were also prepared in the field and transported in ice to the District's Analytical Microbiology Laboratory for fecal coliform analysis.

TABLE 2: DEVICES AND CORRESPONDING DATES OF SAMPLING DURING QUARTERLY MONITORING EVENT SAMPLING IN MAY AND JUNE 2020

Date of Sampling	Event	Device/Structure Sampled
05/04/2020	Fill Event #1	TB-118, TB-119, TB-122
05/05/2020	Fill Event #1	TB-123
05/06/2020	Fill Event #1	TB-124, Sump
05/07/2020	Fill Event #1	TB-120, TB-121, TB-121 Duplicate
05/18/2020	Fill Event #2, Sampling #1	TB-119, TB-120, TB-122
05/19/2020	Fill Event #2, Sampling #1	Sump, Sump Duplicate
05/20/2020	Fill Event #2, Sampling #1	TB-121
05/21/2020	Fill Event #2, Sampling #1	TB-118, TB-123, TB-124
06/02/2020	Fill Event #2, Sampling #2	TB-119, TB-120, TB-123
06/03/2020	Fill Event #2, Sampling #2	TB-121, Sump
06/04/2020	Fill Event #2, Sampling #2	TB-118
06/05/2020	Fill Event #2, Sampling #2	TB-122, TB-122 Duplicate, TB-124
06/16/2020	Fill Event #2, Sampling #3	TB-119, TB-119 Duplicate, TB-120, TB-121
06/17/2020	Fill Event #2, Sampling #3	TB-118, Sump
06/19/2020	Fill Event #2, Sampling #3	TB-122, TB-123, TB-124
06/29/2020	Fill Event #3	TB-119, Sump
06/30/2020	Fill Event #3	TB-118, TB-122, TB-122 Duplicate, TB-123
07/01/2020 ¹	Fill Event #3	TB-120, TB-121, TB-124

¹Part of sampling for the last monitoring event in June.

TABLE 3: SUMMARY OF GROUNDWATER ELEVATIONS AT SAMPLING PORT 3 OF EACH WELL AND CORRESPONDING GROUNDWATER ELEVATIONS DURING THE QUARTERLY MONITORING EVENT IN MAY AND JUNE 2020

Sample Date	Well ID	Sampling Port 003 Elevation	Groundwater Elevation
		----- (ft CCD ¹) -----	
05/04/2020	TB-118	-289	-87
05/04/2020	TB-119	-289	-163
05/07/2020	TB-120	-290	ND ²
05/07/2020	TB-121	-288	ND
05/04/2020	TB-122	-288	-158
05/05/2020	TB-123	-288	-46
05/06/2020	TB-124 ³	NA ⁴	-339
05/21/2020	TB-118	-289	-83
05/18/2020	TB-119	-289	-163
05/18/2020	TB-120	-290	-176
05/20/2020	TB-121	-288	-169
05/18/2020	TB-122	-288	-157
05/21/2020	TB-123	-288	-45
05/21/2020	TB-124	NA	-392
06/04/2020	TB-118	-289	-80
06/02/2020	TB-119	-289	-161
06/02/2020	TB-120	-290	-154
06/03/2020	TB-121	-288	-168
06/05/2020	TB-122	-288	-147
06/02/2020	TB-123	-288	-44
06/05/2020	TB-124	NA	-367

TABLE 3 (Continued): SUMMARY OF GROUNDWATER ELEVATIONS AT SAMPLING PORT 3 OF EACH WELL AND CORRESPONDING GROUNDWATER ELEVATIONS DURING THE QUARTERLY MONITORING EVENT IN MAY AND JUNE 2020

Sample Date	Well ID	Sampling Port 003 Elevation	Groundwater Elevation
		----- (ft CCD ¹) -----	
06/17/2020	TB-118	-289	-85
06/16/2020	TB-119	-289	-162
06/16/2020	TB-120	-290	-174
06/16/2020	TB-121	-288	-167
06/19/2020	TB-122	-288	-153
06/19/2020	TB-123	-288	-45
06/19/2020	TB-124	NA	-339
06/30/2020	TB-118	-289	-86
06/29/2020	TB-119	-289	-162
07/01/2020 ⁵	TB-120	-290	-186
07/01/2020	TB-121	-288	-168
06/30/2020	TB-122	-288	-153
06/30/2020	TB-123	-288	-46
07/01/2020	TB-124	NA	-339

¹Chicago City Datum.

²No data. Pressure outside the well casing could not be reported due to a probe malfunction.

³TB-124 is a conventional well screened from -663 to -698 ft CCD. Sample from the well was taken at approximately 500 ft below ground surface on May 6, 2020, and approximately 650 ft below ground surface during other monitoring events.

⁴NA = Not Applicable.

⁵Samples collected on July 1, 2020 as part of sampling for the last monitoring event in June.

ANALYTICAL RESULTS

Table 4 lists the analytical methods used by the laboratory for various parameters. Analytical results were reviewed to identify any analytes that exceeded the Illinois Class I Groundwater Standards (35 IAC Part 620).

The analytical data for all well samples and the Main Quarry Sump sample collected during fill event #1 monitoring in May, from May 4 – 7, are presented in Table 5. There were a few exceedances of the Part 620 groundwater standards, including pH, TDS, chloride, sulfate, boron, and zinc as indicated in bold font in Table 5. Among these parameters, only pH showed a value higher than the background maximum.

The analytical data for all well samples and the Main Quarry Sump sample collected during sampling #1 of fill event #2 monitoring in May, from May 18 – 21, are presented in Table 6. There were a few exceedances of the Part 620 groundwater standards, including pH, TDS, chloride, boron, and zinc as indicated in bold font in Table 6. Among these parameters, only pH showed a value higher than the background maximum.

The analytical data for all well samples and the Main Quarry Sump sample collected during sampling #2 of fill event #2 monitoring in June, from June 2 – 5, are presented in Table 7. There were a few exceedances of the Part 620 groundwater standards, including pH, TDS, chloride, sulfate, and boron as indicated in bold font in Table 7. Among these parameters, only pH showed a value higher than the background maximum.

The analytical data for all well samples and the Main Quarry Sump sample collected during sampling #3 of fill event #2 monitoring in June, on June 16, 17, and 19, are presented in Table 8. There were a few exceedances of the Part 620 groundwater standards, including pH, TDS, chloride, boron, and zinc as indicated in bold font in Table 8. Among these parameters, only pH showed a value higher than the background maximum.

The analytical data for all well samples and the Main Quarry Sump sample collected during fill event #3 monitoring in June, from June 29 – July 1, are presented in Table 9. There were a few exceedances of the Part 620 groundwater standards, including pH, TDS, chloride, and boron as indicated in bold font in Table 9. Among these parameters, only pH showed a value higher than the background maximum.

Fecal coliform populations were detected at the Main Quarry Sump in every fill event sample at 2 – 110 CFU/100 mL, except sampling #3 of fill event #2 monitoring in June (Tables 5 – 9). Fecal coliform populations were detected at 9 CFU/100 mL in well TB-119 during fill event #1 monitoring in May (Table 5), at 2 CFU/100 mL in well TB-123 during sampling #1 of fill event #2 monitoring in May (Table 6), at 1 and 46 CFU/100 mL in wells TB-121 and TB-119, respectively, during sampling #3 of fill event #2 monitoring in June (Table 8), and at 3 CFU/100 mL in well TB-118 during fill event #3 monitoring in June (Table 9).

TABLE 4: ANALYTICAL METHODS USED FOR REQUIRED PARAMETERS

Analytical Parameters	Analytical Method
Chloride, Sulfate	EPA 300.0 Rev 2.1
Total Dissolved Solids	SM 2540-C
Metals except Calcium, Magnesium	EPA 200.8
Calcium, Magnesium	EPA 200.7
Ammonia (as N)	EPA 350.1
TOC	SM 5310-C
Phenols	EPA 420.4
Fecal Coliform	SM 9222D

TABLE 5: ANALYSIS OF GROUNDWATER SAMPLED FROM MONITORING WELLS TB-118 THROUGH TB-124 AND THE MAIN QUARRY SUMP AT THE THORNTON COMPOSITE RESERVOIR SITE FOR FILL EVENT #1 MONITORING IN MAY 2020

Parameter	Unit	Part 620 Groundwater Standard	Maximum Background	Lab RL ¹	Well								Sump
					TB-118	TB-119	TB-120	TB-121	TB-121D ²	TB-122	TB-123	TB-124	
pH		6.5 - 9.0	8.4	NL ³	8.0	7.9	8.5	9.1	9.1	7.8	8.2	11.8	9.8
EC	mS/m	NL	415	NL	63	63	57	51	51	63	59	226	48
TDS	mg/L	1,200	2,960	25	1,306	518	322	284	280	766	566	1,092	1,102
TOC	"	NL	1	1	2.1	1.2	4.6	3.9	4.0	1.3	1.3	15.1	1.0
Chloride	"	200	1,230	1	344	47	51	36	36	240	61	180	175
Sulfate	"	400	890	1	199	45	48	44	44	95	129	342	419
Ammonia as N	"	NL	ND ⁴	0.30	0.52	0.49	0.47	0.78	0.80	0.53	0.67	1.48	<0.30
Total Phenol	"	0.1	0.06	0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	0.014	<0.005
Fecal Coliform	CFU/100 mL	NL	<1	1	<10	9	<1	<1	<1	<10	<1	<1	9
II Ag	mg/L	0.05	0.003	0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002
B	"	2	3.8	0.005	0.733	0.836	0.151	0.117	0.127	2.34	1.66	0.524	0.337
Be	"	0.004	0.002	0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001
Co	"	1	0.035	0.001	<0.001	0.002	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	0.010
Cr	"	0.1	86.4	0.002	<0.002	0.007	<0.002	0.006	0.005	0.002	0.020	0.010	<0.002
Cu	"	0.65	0.004	0.001	<0.001	0.002	0.001	0.004	0.003	<0.001	<0.001	0.002	<0.001
Mn	"	0.15	0.183	0.005	0.005	0.010	0.051	0.051	0.052	0.003	0.004	0.002	0.002
Se	"	0.05	0.008	0.002	0.002	<0.002	0.002	<0.002	<0.002	<0.002	<0.002	0.003	0.003
V	"	0.049	ND	0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001
Zn	"	5	10	0.005	0.018	0.122	7.1	6.5	5.5	0.027	0.029	3.4	0.005
Ca	"	NL	276	0.5	166	84.0	56.2	54.8	54.8	74.3	77.8	25.8	127
Mg	"	NL	153	0.5	80.7	42.4	17.3	16.1	16.2	38.0	41.2	<0.50	96.3

¹Lab reporting limit.

²Duplicate sample.

³No existing limit.

⁴Not determined.

TABLE 6: ANALYSIS OF GROUNDWATER SAMPLED FROM MONITORING WELLS TB-118 THROUGH TB-124 AND THE MAIN QUARRY SUMP AT THE THORNTON COMPOSITE RESERVOIR SITE FOR SAMPLING #1 OF FILL EVENT #2 MONITORING IN MAY 2020

Parameter	Unit	Part 620 Groundwater Standard	Maximum Background	Lab RL ¹	Well								
					TB-118	TB-119	TB-120	TB-121	TB-122	TB-123	TB-124	Sump	SumpD ²
pH		6.5 - 9.0	8.4	NL ³	8.4	8.2	7.9	8.2	7.6	8.1	11.9	9.9	9.9
EC	mS/m	NL	415	NL	89	35	46	57	44	58	49	48	48
TDS	mg/L	1,200	2,960	25	1,398	530	732	1,080	900	598	1,116	876	888
TOC	"	NL	1	1	1.6	1.2	1.3	1.0	1.3	1.2	16	1.2	1.2
Chloride	"	200	1,230	1	445	64	154	275	240	63	180	121	120
Sulfate	"	400	890	1	223	104	108	177	95	132	342	330	327
Ammonia as N	"	NL	ND ⁴	0.30	0.46	0.50	0.41	0.78	0.53	0.59	1.5	<0.30	<0.30
Total Phenol	"	0.1	0.06	0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	0.015	<0.005	<0.005
Fecal Coliform	CFU/100 mL	NL	<1	1	<1	<1	<1	<1	<1	2	<1	92	100
Ag	mg/L	0.05	0.003	0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002
B	"	2	3.8	0.005	0.691	0.858	0.944	0.996	2.36	1.70	0.528	0.247	0.252
Be	"	0.004	0.002	0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001
Co	"	1	0.035	0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	0.008	0.008
Cr	"	0.1	86.4	0.002	0.003	0.005	0.010	0.009	0.022	0.011	0.016	<0.002	<0.002
Cu	"	0.65	0.004	0.001	<0.001	<0.001	<0.001	<0.001	0.001	<0.001	0.004	<0.001	<0.001
Mn	"	0.15	0.183	0.005	0.005	0.005	0.005	0.004	0.005	0.004	0.004	0.002	0.002
Se	"	0.05	0.008	0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002
V	"	0.049	ND	0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001
Zn	"	5	10	0.005	0.039	0.099	0.105	0.108	0.173	0.141	6.71	<0.005	<0.005
Ca	"	NL	276	0.5	NA ⁵	NA	NA	NA	NA	NA	NA	NA	NA
Mg	"	NL	153	0.5	NA	NA	NA	NA	NA	NA	NA	NA	NA

¹Lab reporting limit.

²Duplicate sample.

³No existing limit.

⁴Not determined.

⁵Not analyzed due to staffing limitations because of the coronavirus pandemic.

TABLE 7: ANALYSIS OF GROUNDWATER SAMPLED FROM MONITORING WELLS TB-118 THROUGH TB-124 AND THE MAIN QUARRY SUMP AT THE THORNTON COMPOSITE RESERVOIR SITE FOR SAMPLING #2 OF FILL EVENT #2 MONITORING IN JUNE 2020

Parameter	Unit	Part 620 Groundwater Standard	Maximum Background	Lab RL ¹	Well								Sump
					TB-118	TB-119	TB-120	TB-121	TB-122	TB-122D ²	TB-123	TB-124	
pH		6.5 - 9.0	8.4	NL ³	6.7	8.0	7.2	7.3	7.9	7.9	7.8	12.2	12.1
EC	mS/m	NL	415	NL	237	88	119	165	62	62	153	64	87
TDS	mg/L	1,200	2,960	25	1,394	502	228	1,010	860	882	552	1,078	726
TOC	"	NL	1	1	2.6	1.2	1.7	1.3	1.5	2.1	1.4	5.8	1.5
Chloride	"	200	1,230	1	472	64	130	286	221	247	63	214	101
Sulfate	"	400	890	1	225	104	94	190	89	97	129	401	294
Ammonia as N	"	NL	ND ⁴	0.30	0.51	0.51	0.42	0.59	0.56	0.52	0.66	1.9	<0.30
Total Phenol	"	0.1	0.06	0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	0.016	<0.005
Fecal Coliform	CFU/100 mL	NL	<1	1	<1	<1	<1	<1	<1	<1	<1	<1	110
Ag	mg/L	0.05	0.003	0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002
B	"	2	3.8	0.005	0.661	0.855	0.992	0.932	2.27	2.18	1.66	0.597	0.216
Be	"	0.004	0.002	0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001
Co	"	1	0.035	0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	0.006
Cr	"	0.1	86.4	0.002	0.002	0.006	0.004	0.004	0.002	<0.002	0.005	0.007	<0.002
Cu	"	0.65	0.004	0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	0.001	<0.001
Mn	"	0.15	0.183	0.005	0.006	0.006	0.004	0.003	0.003	0.003	0.003	0.002	0.003
Se	"	0.05	0.008	0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	0.002	<0.002
V	"	0.049	ND	0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001
Zn	"	5	10	0.005	0.045	0.064	0.068	0.077	0.013	0.066	0.062	1.22	<0.005
Ca	"	NL	276	0.5	178	83.8	96.1	135	72.3	72.1	80.8	46.4	89.5
Mg	"	NL	153	0.5	86.4	41.6	47.8	68.6	37.1	36.4	41.9	1.4	59.9

¹Lab reporting limit.

²Duplicate sample.

³No existing limit.

⁴Not determined.

TABLE 8: ANALYSIS OF GROUNDWATER SAMPLED FROM MONITORING WELLS TB-118 THROUGH TB-124 AND THE MAIN QUARRY SUMP AT THE THORNTON COMPOSITE RESERVOIR SITE FOR SAMPLING #3 OF FILL EVENT #2 MONITORING IN JUNE 2020

Parameter	Unit	Part 620 Groundwater Standard	Maximum Background	Lab RL ¹	Well								Sump
					TB-118	TB-119	TB-119D ²	TB-120	TB-121	TB-122	TB-123	TB-124	
pH		6.5 - 9.0	8.4	NL ³	7.8	6.7	6.7	7.3	7.5	7.7	8.2	12.0	8.3
EC	mS/m	NL	415	NL	59	93	93	118	51	154	97	221	113
TDS	mg/L	1,200	2,960	25	1,436	516	518	696	1,044	868	592	1,584	788
TOC	"	NL	1	1	3.4	1.2	4.4	1.7	2.8	1.7	1.4	15.2	1.7
Chloride	"	200	1,230	1	42	66	49	154	38	246	63	181	118
Sulfate	"	400	890	1	45	109	47	110	43	96	131	345	289
Ammonia as N	"	NL	ND ⁴	0.30	0.87	0.84	0.50	0.47	0.82	0.51	0.60	1.6	<0.30
Total Phenol	"	0.1	0.06	0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	0.014	<0.005
Fecal Coliform	CFU/100 mL	NL	<1	1	<1	46	3	<1	1	<1	<1	<1	<1
Ag	mg/L	0.05	0.003	0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002
B	"	2	3.8	0.005	0.167	0.265	0.906	0.923	0.732	2.57	1.75	0.751	0.252
Be	"	0.004	0.002	0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001
Co	"	1	0.035	0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	0.005
Cr	"	0.1	86.4	0.002	0.007	0.011	0.007	0.012	0.002	0.010	<0.002	0.002	<0.002
Cu	"	0.65	0.004	0.001	0.001	0.002	<0.001	0.001	0.001	<0.001	0.001	0.002	<0.001
Mn	"	0.15	0.183	0.005	0.034	0.034	0.005	0.005	0.018	0.004	0.003	0.002	0.003
Se	"	0.05	0.008	0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	0.003	<0.002
V	"	0.049	ND	0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001
Zn	"	5	10	0.005	6.45	4.91	0.094	0.179	1.99	0.246	1.29	2.55	0.005
Ca	"	NL	276	0.5	61.7	56.7	86.7	93.7	113	72.0	79.4	54.4	90.9
Mg	"	NL	153	0.5	22.4	19.8	43.3	47.0	53.9	36.9	41.7	28.2	65.8

¹Lab reporting limit.

²Duplicate sample.

³No existing limit.

⁴Not determined.

TABLE 9: ANALYSIS OF GROUNDWATER SAMPLED FROM MONITORING WELLS TB-118 THROUGH TB-124 AND THE MAIN QUARRY SUMP AT THE THORNTON COMPOSITE RESERVOIR SITE FOR FILL EVENT #3 MONITORING IN JUNE 2020

Parameter	Unit	Part 620 Groundwater Standard	Maximum Background	Lab RL ¹	Well								Sump
					TB-118	TB-119	TB-120	TB-121	TB-122	TB-122D ²	TB-123	TB-124	
pH		6.5 - 9.0	8.4	NL ³	7.2	8.1	8.0	7.9	9.3	9.3	7.6	12.0	8.3
EC	mS/m	NL	415	NL	222	134	118	165	154	154	95	223	114
TDS	mg/L	1,200	2,960	25	1,454	576	722	1,072	980	998	586	1,632	858
TOC	"	NL	1	1	1.8	1.0	2.1	1.3	1.5	1.4	1.1	15	1.3
Chloride	"	200	1,230	1	450	64	278	150	246	254	63	179	128
Sulfate	"	400	890	1	220	103	187	107	96	99	129	340	298
Ammonia as N	"	NL	ND ⁴	0.30	0.52	0.52	0.46	0.73	0.58	0.58	0.73	1.6	<0.30
Total Phenol	"	0.1	0.06	0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	0.016	<0.005
Fecal Coliform	CFU/100 mL	NL	<1	1	3	<1	NA ⁵	<1	<1	<1	<1	NA	2
15 Ag	mg/L	0.05	0.003	0.002	<0.004	<0.004	<0.004	<0.004	<0.004	<0.004	<0.004	<0.004	<0.004
B	"	2	3.8	0.005	0.653	0.262	0.932	0.921	2.50	2.37	1.55	0.707	0.829
Be	"	0.004	0.002	0.001	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002
Co	"	1	0.035	0.001	<0.002	0.005	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002
Cr	"	0.1	86.4	0.002	<0.004	<0.004	<0.004	<0.004	0.008	0.005	0.006	<0.004	<0.004
Cu	"	0.65	0.004	0.001	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002
Mn	"	0.15	0.183	0.005	0.005	0.004	0.004	0.003	0.004	0.003	0.003	0.002	0.006
Se	"	0.05	0.008	0.002	<0.004	<0.004	<0.004	<0.004	<0.004	<0.004	<0.004	<0.004	<0.004
V	"	0.049	ND	0.001	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002
Zn	"	5	10	0.005	0.047	<0.010	0.054	0.028	0.019	0.060	0.063	2.66	0.084
Ca	"	NL	276	0.5	184	92.7	94.6	140	70.5	72.4	77.8	54.3	83.5
Mg	"	NL	153	0.5	89.5	69.2	47.6	72.0	36.8	37.5	41.2	23.5	41.9

¹Lab reporting limit.

²Duplicate sample.

³No existing limit.

⁴Not determined.

⁵Not analyzed due to loss of labels from sample bottles during transport.

REFERENCES

Black & Veatch, 2014, “Background Groundwater Quality Report for Thornton Composite Reservoir,” prepared for the Metropolitan Water Reclamation District of Greater Chicago, July 2014.

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