Protecting Our Water Environment

Metropolitan Water Reclamation District of Greater Chicago

# MONITORING AND RESEARCH DEPARTMENT

***REPORT NO. 23-44***

## *THORNTON COMPOSITE RESERVOIR*

## *GROUNDWATER MONITORING REPORT*

## *THIRD QUARTER 2023*

***December 2023***

Protecting Our Water Environment

**Metropolitan Water Reclamation District of Greater Chicago**

100 EAST ERIE STREET CHICAGO, ILLINOIS 60611-3154 312.751.5190 f: 312.751.5194



**Edward W. Podczerwinski, P.E.**
Director of Monitoring and Research
podczerwinskie@mwrd.org

November 28, 2023

Mr. Michael Summers
Groundwater Section Manager
Bureau of Water/Public Water Supplies
Illinois Environmental Protection Agency
1021 North Grand Avenue East
Springfield, IL 62794

Dear Mr. Summers:

Subject: Transmittal of the Report "Thornton Composite Reservoir Groundwater Monitoring Report Third Quarter 2023"

Please find attached the report entitled "Thornton Composite Reservoir Groundwater Monitoring Report Third Quarter 2023" transmitted electronically. The report is prepared for transmittal to the Illinois Environmental Protection Agency (IEPA) in accordance with the Thornton Composite Reservoir (TCR) Groundwater Monitoring Plan. Also attached is the Excel® spreadsheet of the TCR 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@mwrd.org.

Very truly yours,

Albert Cox

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

AC:BM:lf
Attachments
cc: Mr. M. Brown, IEPA
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 THIRD QUARTER 2023

**By**

**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**

**Monitoring and Research Department**
**Edward W. Podczerwinski, Director** **December 2023**

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

# THORNTON COMPOSITE RESERVOIR GROUNDWATER MONITORING REPORT THIRD QUARTER 2023

**By**

**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**

**Monitoring and Research Department**
**Edward W. Podczerwinski, Director** **November 2023**

## TABLE OF CONTENTS

## LIST OF TABLES

## LIST OF FIGURES

## LIST OF ABBREVIATIONS

| Abbreviation | Definition |
|---|---|
| Ag | silver |
| B | boron |
| Be | beryllium |
| CCD | Chicago City Datum |
| CFU | colony forming units |
| Co | cobalt |
| Cr | chromium |
| CSF | combined sewer flow |
| Cu | copper |
| District | Metropolitan Water Reclamation District of Greater Chicago |
| EC | electrical conductivity |
| FC | fecal coliform |
| ft | feet |
| GMP | Groundwater Monitoring Plan |
| GPS | Groundwater Protection System |
| L | liter |
| m | meter |
| mg | milligram |
| Mn | manganese |
| mS | millisiemens |
| N | nitrogen |
| Se | selenium |
| TCR | Thornton Composite Reservoir |
| TDS | total dissolved solids |
| TOC | total organic carbon |
| USEPA | United States Environmental Protection Agency |
| Zn | zinc |
| mL | milliliter |

## ACKNOWLEDGMENTS

This report for the Thornton Composite Reservoir (TCR) Groundwater Monitoring was generated by the Monitoring and Research Department. All samples were collected by A3 Environmental Consultants (contractor) under TCR Contract 23-102-11. Analyses were performed by the Analytical Laboratories Division and the Analytical Microbiology Laboratory of the Metropolitan Water Reclamation District of Greater Chicago (District). Special thanks are due to Ms. Laura Franklin for typing and formatting this report.

## DISCLAIMER

Mention of proprietary equipment and chemicals in this report does not constitute endorsement by the District.

# 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 from the Main Quarry Sump, and one from each of the seven wells are collected annually and analyzed for the Illinois Administrative Code Title 35 Part 620 Class I (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, sampling is required every two weeks while the water in the reservoir remains above an elevation of -280 feet 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 multilevel monitoring wells is capable of monitoring four distinct 20-foot intervals in the Silurian dolomite aquifer.

The locations of the monitoring wells, the quarry sump, the 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 feet CCD). 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 will also be compared with the Class I Groundwater Standards (Illinois Pollution Control Board,

FIGURE 1: MONITORING WELL AND MAIN QUARRY SUMP LOCATIONS

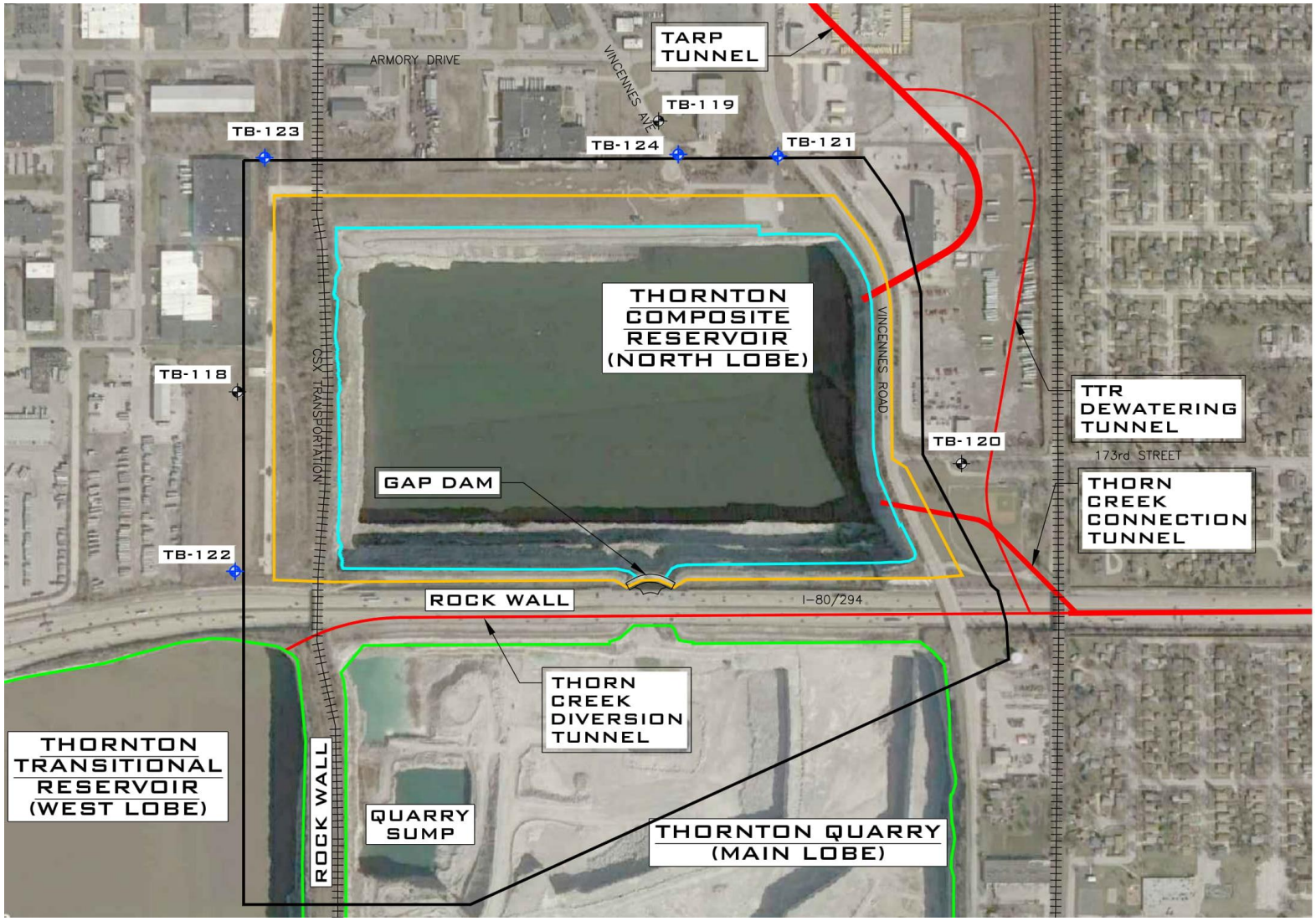

TABLE 1: CHARACTERISTICS OF MONITORING WELLS TB-118 THROUGH TB-124 AT THE THORNTON COMPOSITE RESERVOIR SITE

| Well ID | Coordinates[1] | | Ground Surface Elevation (ft, CCD[2]) | Top of Riser Elevation (ft, CCD) | 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[3] | 1,792,200.77 | 695,591.56 | 29.6 | 29.2 | 728 | -663 to -698 | | | |

[1]Illinois State Plane Coordinate System (NAD 1927).
[2]Chicago City Datum (CCD).
[3]TB-124 is a conventional well screened from -663 to -698 ft CCD. Samples are taken at approximately 650 ft below ground surface.

Illinois Environmental Protection Agency, 2013) to evaluate any exceedances in groundwater standards.

There were two fill events during the third quarter of 2023 (the third and fourth events of 2023). The first fill event of the quarter (the third event of 2023) began on July 3 and lasted until August 2, requiring three biweekly samplings. The second fill event of the quarter (the fourth event of 2023) began on September 18 and lasted until September 26, requiring a single sampling.

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 from July 5 – September 19, 2023.

## FIELD ACTIVITIES

For this report period, fill event samples were collected at the Main Quarry Sump, the deep well, and at sampling port interval 3 of all multilevel wells during the July 5–7, 2023, and July 19–21, 2023 samplings. Due to a malfunction, the sampling equipment was sent to the manufacturer for repairs in August 2023. Therefore, samples were collected only at the Main Quarry Sump and a partial set of multilevel wells at sampling port interval 3 during the August 2–3, 2023 sampling, and at the Main Quarry Sump and the deep well using a bailer at the September 19, 2023 sampling. Sample collection dates are shown in Table 2.

Using an Oakton PC450 pH/conductivity/temperature meter, the pH, electrical conductivity (EC), and temperature of each sample were measured and recorded immediately after collection.

Prior to sampling wells, hydrostatic pressure was measured at Port 3 of each multilevel well or at 650 feet below ground surface in the deep well to calculate the groundwater elevation. Table 3 lists the elevations at Port 3 of multilevel wells sampled during the fill event samplings in July and August prior to the equipment malfunction and the corresponding groundwater elevations.

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

TABLE 2: DEVICES AND CORRESPONDING DATES OF SAMPLING DURING FILL EVENT SAMPLING IN JULY, AUGUST, AND SEPTEMBER 2023

| Date of Sampling | Device/Structure Sampled |
|---|---|
| Fill Event #3, Sampling #1 | |
| 07/05/23 | TB-119, TB-120, TB-121 |
| 07/06/23 | TB-118, TB-122, TB-123 |
| 07/07/23 | TB-124, Main Quarry Sump, Main Quarry Sump Duplicate |
| Fill Event #3, Sampling #2 | |
| 07/19/23 | TB-119, TB-120, TB-121 |
| 07/20/23 | TB-118, TB-118 Duplicate, TB-122, TB-123 |
| 07/21/23 | TB-124, Main Quarry Sump |
| Fill Event #3, Sampling #3 | |
| 08/02/23 | TB-119, TB-120, TB-121 |
| 08/03/23 | TB-118, TB-122, Main Quarry Sump |
| Fill Event #4 | |
| 09/19/23 | TB-124, Main Quarry Sump, Main Quarry Sump Duplicate |

TABLE 3: SUMMARY OF ELEVATIONS AT SAMPLING PORT 3 OF EACH WELL AND CORRESPONDING GROUNDWATER ELEVATIONS DURING FILL EVENT SAMPLING IN JULY, AUGUST, AND SEPTEMBER 2023

| Sample Date | Well ID | Sampling Port Elevation | Groundwater Elevation |
|---|---|---|---|
| | | (ft CCD[1]) | |
| | | Fill Event #3, Sampling #1 | |
| 07/06/23 | TB-118 | -289 | -84 |
| 07/05/23 | TB-119 | -289 | -164 |
| 07/05/23 | TB-120 | -290 | -217 |
| 07/05/23 | TB-121 | -288 | -169 |
| 07/06/23 | TB-122 | -288 | -163 |
| 07/06/23 | TB-123 | -288 | -49 |
| 07/07/23 | TB-124[2] | NA[3] | -474 |
| | | Fill Event #3, Sampling #2 | |
| 07/20/23 | TB-118 | -289 | -84 |
| 07/19/23 | TB-119 | -289 | -164 |
| 07/19/23 | TB-120 | -290 | -207 |
| 07/19/23 | TB-121 | -288 | -168 |
| 07/20/23 | TB-122 | -288 | -160 |
| 07/20/23 | TB-123 | -288 | -47 |
| 07/21/23 | TB-124[2] | NA | -421 |
| | | Fill Event #3, Sampling #3 | |
| 08/03/23 | TB-118 | -289 | -85 |
| 08/02/23 | TB-119 | -289 | -164 |
| 08/02/23 | TB-120 | -290 | -217 |
| 08/02/23 | TB-121 | -288 | -169 |
| 08/03/23 | TB-122 | -288 | -161 |
| | | Fill Event #4 | |
| 09/19/23 | TB-124[2] | NA | ND[4] |

[1]Chicago City Datum.
[2]TB-124 is a conventional well screened from -663 to -698 ft CCD. Samples were taken at approximately 650 ft below ground surface during the fill event samplings in July and September 2023.
[3]Not applicable.
[4]No data available. Pressure readings could not be made due to equipment malfunction.

## ANALYTICAL RESULTS

Table 4 lists the analytical methods used by the laboratory for measured parameters. Analytical results were reviewed to identify any analytes that exceeded the Class I groundwater standards.

The analytical data for all well samples and the Main Quarry Sump sample collected from July 5–7 for the first sampling of fill event monitoring in July are presented in Table 5. There were a few exceedances of the Class I groundwater standards, including pH, total dissolved solids (TDS), chloride, sulfate, and boron, as indicated in bold font in Table 5. Of these parameters, only pH exceeded the background maximum. Fecal coliform bacteria were detected in well TB-123, the Main Quarry Sump, and the Main Quarry Sump duplicate sample at 3, 35, and 40 CFU/100 mL, respectively (Table 5).

The analytical data for all well samples and the Main Quarry Sump sample collected from July 19–21 for the second sampling of fill event monitoring in July are presented in Table 6. There were a few exceedances of the Class I groundwater standards, including pH, TDS, chloride, sulfate, and boron, as indicated in bold font in Table 6. Of these parameters, only pH exceeded the background maximum. Fecal coliform bacteria were detected in wells TB-119, TB-121, TB-123, and the Main Quarry Sump at 7, 1, 35, and 2 CFU/100 mL, respectively (Table 6).

The analytical data for well samples and the Main Quarry Sump sample collected from August 2–3 for the fill event monitoring in August are presented in Table 7. There were a few exceedances of the Class I groundwater standards, including TDS, chloride, sulfate, and boron, as indicated in bold font in Table 7. Of these parameters, none exceeded the background maximum. Fecal coliform bacteria were detected in wells TB-118, TB-120, TB-121, TB-122 and the Main Quarry Sump at 12, 1, 5, 56, and 5 CFU/100 mL, respectively (Table 7).

The analytical data for the well and Main Quarry Sump samples collected on September 19 for the fill event monitoring in September are presented in Table 8. There were a few exceedances of the Class I groundwater standards, including pH, TDS, chloride, and sulfate, as indicated in bold font in Table 8. Of these parameters, only pH exceeded the background maximum. Fecal coliform bacteria were detected in the Main Quarry Sump and Main Quarry Sump duplicate samples at 56 and 65 CFU/100 mL, respectively (Table 8).

TABLE 4: ANALYTICAL METHODS USED FOR REQUIRED PARAMETERS

| Parameters | Analytical Method |
|---|---|
| Ammonia (as N) | USEPA 350.1 |
| Boron and Target Analyte List metals except calcium, magnesium, and mercury | USEPA 200.8 |
| Chloride, sulfate | USEPA 300.0 |
| Fecal coliform | SM 9222D |
| Hardness (as calcium and magnesium) | SM 3120B, SM 2340B |
| Mercury | SM 3112B |
| Phenols | USEPA 420.4 |
| Total dissolved solids | SM 2540C |
| Total organic carbon | SM 5310B |

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 THE FIRST SAMPLING OF THE FILL EVENT IN JULY 2023

| Parameter | Unit | Part 620 Groundwater Standard | Background | Lab RL[1] | Well | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | TB-118 | TB-119 | TB-120 | TB-121 | TB-122 | TB-123 | TB-124 | Sump | Sump-Dup[2] |
| pH | | 6.5–9.0 | 8.4 | NL[3] | 7.6 | 7.2 | 7.4 | 7.4 | 7.5 | 7.4 | **11.7** | 7.5 | 7.5 |
| EC | mS/m | NL | 415 | NL | 163 | 154 | 132 | 148 | 124 | 84 | 179 | 132 | 132 |
| TDS | mg/L | 1,200 | 2,960 | 25 | **1,328** | 572 | 652 | 1,086 | 876 | 584 | **1,274** | 1,162 | **1,226** |
| TOC | " | NL | 1 | 1 | <5.0 | <5.0 | <5.0 | <5.0 | <5.0 | <5.0 | 12 | <5.0 | <5.0 |
| Chloride | " | 200 | 1,230 | 1 | **416** | 90 | 134 | **322** | **265** | 67 | **237** | 199 | 198 |
| Sulfate | " | 400 | 890 | 1 | 199 | 120 | 85 | 188 | 100 | 128 | **446** | **482** | **481** |
| Ammonia as N | " | NL | ND[4] | 0.30 | 0.62 | 0.59 | 0.42 | 0.65 | 0.64 | 0.72 | 1.77 | <0.30 | <0.30 |
| Total Phenol | " | 0.1 | 0.06 | 0.005 | <0.005 | <0.005 | <0.005 | <0.005 | <0.005 | <0.005 | 0.016 | <0.005 | <0.005 |
| Fecal Coliform | CFU/100 mL | NL | <1 | 1 | <1 | <1 | <1 | <1 | <1 | 3 | <1 | 35 | 40 |
| Ag | mg/L | 0.05 | 0.003 | 0.004 | <0.004 | <0.004 | <0.004 | <0.004 | <0.004 | <0.004 | <0.004 | <0.004 | <0.004 |
| B | " | 2 | 3.8 | 0.005 | 0.878 | 0.946 | 0.959 | 1.01 | **2.61** | 1.79 | 0.672 | 0.344 | 0.338 |
| Be | " | 0.004 | 0.002 | 0.002 | <0.002 | <0.002 | <0.002 | <0.002 | <0.002 | <0.002 | <0.002 | <0.002 | <0.002 |
| Co | " | 1 | 0.035 | 0.002 | <0.002 | <0.002 | <0.002 | <0.002 | <0.002 | <0.002 | <0.002 | 0.006 | 0.007 |
| Cr | " | 0.1 | 86.4 | 0.004 | 0.014 | 0.005 | 0.004 | <0.004 | 0.007 | <0.004 | 0.009 | <0.004 | <0.004 |
| Cu | " | 0.65 | 0.004 | 0.002 | <0.002 | <0.002 | <0.002 | <0.002 | <0.002 | <0.002 | <0.002 | <0.002 | <0.002 |
| Mn | " | 0.15 | 0.183 | 0.002 | 0.011 | 0.006 | 0.004 | 0.003 | 0.006 | 0.002 | 0.003 | 0.005 | 0.007 |
| Se | " | 0.05 | 0.008 | 0.004 | <0.004 | <0.004 | <0.004 | <0.004 | <0.004 | <0.004 | <0.004 | <0.004 | <0.004 |
| V | " | 0.049 | ND | 0.002 | <0.002 | <0.002 | <0.002 | <0.002 | <0.002 | <0.002 | <0.002 | <0.002 | <0.002 |
| Zn | " | 5 | 10 | 0.010 | 0.032 | 0.041 | 0.048 | 0.030 | 0.012 | <0.010 | 0.637 | <0.010 | <0.010 |
| Ca | " | NL | 276 | 0.5 | 168 | 93.7 | 89.3 | 136 | 75.5 | 79.7 | 62.5 | 119 | 121 |
| Mg | " | NL | 153 | 0.5 | 82.8 | 47.8 | 45.1 | 70.5 | 39.0 | 42.3 | 2.74 | 93.8 | 94.1 |

[1]Laboratory reporting limit.
[2]Duplicate sample.
[3]No existing limit.
[4]Not 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 THE SECOND SAMPLING OF THE FILL EVENT IN JULY 2023

| Parameter | Unit | Part 620 Groundwater Standard | Background | Lab RL[1] | Well | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | TB-118 | TB-118-D[2] | TB-119 | TB-120 | TB-121 | TB-122 | TB-123 | TB-124 | Sump |
| pH | | 6.5−9.0 | 8.4 | NL[3] | 7.4 | 7.4 | 7.3 | 7.3 | 7.2 | 7.5 | 7.6 | **11.7** | 7.6 |
| EC | mS/m | NL | 415 | NL | 117 | 117 | 93 | 105 | 160 | 142 | 94 | 186 | 133 |
| TDS | mg/L | 1,200 | 2,960 | 25 | **1,532** | **1,546** | 626 | 694 | 1,138 | 976 | 632 | **1,256** | **1,254** |
| TOC | " | NL | 1 | 1 | <5.0 | <5.0 | <5.0 | <5.0 | <5.0 | <5.0 | <5.0 | 13 | <5.0 |
| Chloride | " | 200 | 1,230 | 1 | **516** | **521** | 87 | 131 | **313** | **271** | 66 | **229** | **229** |
| Sulfate | " | 400 | 890 | 1 | 206 | 207 | 114 | 82 | 180 | 100 | 124 | **420** | **431** |
| Ammonia as N | " | NL | ND[4] | 0.30 | 1.47 | 1.29 | 0.60 | 0.45 | 0.63 | 0.62 | 1.56 | 1.68 | <0.30 |
| Total Phenol | " | 0.1 | 0.06 | 0.005 | <0.005 | <0.005 | <0.005 | <0.005 | <0.005 | <0.005 | <0.005 | 0.015 | <0.005 |
| Fecal Coliform | CFU/100 mL | NL | <1 | 1 | <1 | <1 | 7 | <1 | 1 | <1 | 35 | <1 | 2 |
| Ag | mg/L | 0.05 | 0.003 | 0.004 | <0.004 | <0.004 | <0.004 | <0.004 | <0.004 | <0.004 | <0.004 | <0.004 | <0.004 |
| B | " | 2 | 3.8 | 0.005 | 0.746 | 0.712 | 0.992 | 1.12 | 1.03 | **2.50** | 1.89 | 0.708 | 0.262 |
| Be | " | 0.004 | 0.002 | 0.002 | <0.002 | <0.002 | <0.002 | <0.002 | <0.002 | <0.002 | <0.002 | <0.002 | <0.002 |
| Co | " | 1 | 0.035 | 0.002 | <0.002 | <0.002 | <0.002 | <0.002 | <0.002 | <0.002 | <0.002 | <0.002 | 0.003 |
| Cr | " | 0.1 | 86.4 | 0.004 | <0.004 | <0.004 | <0.004 | <0.004 | <0.004 | <0.004 | <0.004 | <0.004 | <0.004 |
| Cu | " | 0.65 | 0.004 | 0.002 | <0.002 | <0.002 | <0.002 | <0.002 | <0.002 | <0.002 | <0.002 | 0.003 | <0.002 |
| Mn | " | 0.15 | 0.183 | 0.002 | 0.004 | 0.005 | 0.009 | 0.004 | 0.003 | 0.003 | <0.002 | <0.002 | 0.007 |
| Se | " | 0.05 | 0.008 | 0.004 | <0.004 | <0.004 | <0.004 | <0.004 | <0.004 | <0.004 | <0.004 | <0.004 | <0.004 |
| V | " | 0.049 | ND | 0.002 | <0.002 | <0.002 | <0.002 | <0.002 | <0.002 | <0.002 | <0.002 | <0.002 | <0.002 |
| Zn | " | 5 | 10 | 0.010 | 0.016 | <0.010 | 0.021 | 0.025 | 0.015 | 0.018 | <0.010 | 1.280 | <0.010 |
| Ca | " | NL | 276 | 0.5 | 190 | 190 | 93.7 | 89.9 | 137 | 75.2 | 78.0 | 59.4 | 119 |
| Mg | " | NL | 153 | 0.5 | 90.2 | 89.7 | 48.2 | 45.7 | 71.1 | 39.4 | 42.4 | <0.50 | 90.4 |

[1]Laboratory reporting limit.
[2]Duplicate sample.
[3]No existing limit.
[4]Not determined.

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 FILL EVENT SAMPLING IN AUGUST 2023

| Parameter | Unit | Part 620 Groundwater Standard | Maximum Background | Lab RL[2] | Well[1] | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | TB-118 | TB-119 | TB-120 | TB-121 | TB-122 | TB-123 | TB-124 | Sump |
| pH | | 6.5−9.0 | 8.4 | NL[3] | 7.2 | 7.2 | 7.6 | 7.0 | 7.1 | NC[4] | NC | 7.9 |
| EC | mS/m | NL | 415 | NL | 96 | 100 | 118 | 171 | 180 | NC | NC | 173 |
| TDS | mg/L | 1,200 | 2,960 | 25 | **1,572** | 632 | 664 | 1,116 | 944 | NC | NC | **1,344** |
| TOC | " | NL | 1 | 5 | <5.0 | <5.0 | <5.0 | <5.0 | <5.0 | NC | NC | <5.0 |
| Chloride | " | 200 | 1,230 | 1 | **543** | 88 | 135 | **317** | **274** | NC | NC | **232** |
| Sulfate | " | 400 | 890 | 1 | 217 | 116 | 86 | 188 | 102 | NC | NC | **463** |
| Ammonia as N | " | NL | ND[5] | 0.3 | 0.53 | 0.53 | 0.38 | 0.62 | 0.52 | NC | NC | <0.30 |
| Total Phenol | " | 0.1 | 0.06 | 0.005 | <0.005 | <0.005 | <0.005 | <0.005 | <0.005 | NC | NC | <0.005 |
| Fecal Coliform | CFU/100 mL | NL | <1 | 1 | 12 | <1 | 1 | 5 | 56 | NC | NC | 5 |
| | | | | | | | | | | NC | NC | |
| Ag | mg/L | 0.05 | 0.003 | 0.004 | <0.004 | <0.004 | <0.004 | <0.004 | <0.004 | NC | NC | <0.004 |
| B | " | 2 | 3.8 | 0.005 | 0.622 | 0.899 | 1.01 | 0.385 | **2.42** | NC | NC | 0.338 |
| Be | " | 0.004 | 0.002 | 0.002 | <0.002 | <0.002 | <0.002 | <0.002 | <0.002 | NC | NC | <0.002 |
| Co | " | 1 | 0.035 | 0.002 | <0.002 | <0.002 | <0.002 | <0.002 | <0.002 | NC | NC | 0.005 |
| Cr | " | 0.1 | 86.4 | 0.004 | <0.004 | <0.004 | <0.004 | <0.004 | <0.004 | NC | NC | <0.004 |
| Cu | " | 0.65 | 0.004 | 0.002 | <0.002 | <0.002 | <0.002 | <0.002 | <0.002 | NC | NC | <0.002 |
| Mn | " | 0.15 | 0.183 | 0.002 | 0.005 | 0.006 | 0.004 | 0.042 | 0.003 | NC | NC | 0.004 |
| Se | " | 0.05 | 0.008 | 0.004 | <0.004 | <0.004 | <0.004 | <0.004 | <0.004 | NC | NC | <0.004 |
| V | " | 0.049 | ND | 0.002 | <0.002 | <0.002 | <0.002 | <0.002 | <0.002 | NC | NC | <0.002 |
| Zn | " | 5 | 10 | 0.010 | 0.040 | <0.010 | <0.010 | 1.42 | <0.010 | NC | NC | <0.010 |
| Ca | " | NL | 276 | 0.5 | 172 | 93.9 | 89.8 | 78.7 | 72.7 | NC | NC | 126 |
| Mg | " | NL | 153 | 0.5 | 83.9 | 48.3 | 45.6 | 32.9 | 37.8 | NC | NC | 96.6 |

[1]A well duplicate sample was inadvertently not collected.
[2]Laboratory reporting limit.
[3]No existing limit.
[4]Not collected due to equipment malfunction.
[5]Not 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 FILL EVENT SAMPLING IN SEPTEMBER 2023

| Parameter | Unit | Part 620 Groundwater Standard | Background | Lab RL[1] | Well | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | TB-118 | TB-119 | TB-120 | TB-121 | TB-122 | TB-123 | TB-124 | Sump | Sump-Dup[2] |
| pH | | 6.5−9.0 | 8.4 | NL[3] | NC[4] | NC | NC | NC | NC | NC | **11.6** | 7.2 | 7.2 |
| EC | mS/m | NL | 415 | NL | NC | NC | NC | NC | NC | NC | 141 | 152 | 152 |
| TDS | mg/L | 1,200 | 2,960 | 25 | NC | NC | NC | NC | NC | NC | **1,234** | 1,180 | 1,196 |
| TOC | " | NL | 1 | 1 | NC | NC | NC | NC | NC | NC | 19 | <5.0 | <5.0 |
| Chloride | " | 200 | 1,230 | 1 | NC | NC | NC | NC | NC | NC | **233** | **201** | 198 |
| Sulfate | " | 400 | 890 | 1 | NC | NC | NC | NC | NC | NC | **429** | **470** | **462** |
| Ammonia as N | " | NL | ND[5] | 0.30 | NC | NC | NC | NC | NC | NC | 1.78 | <0.30 | <0.30 |
| Total Phenol | " | 0.1 | 0.06 | 0.005 | NC | NC | NC | NC | NC | NC | 0.018 | <0.005 | <0.005 |
| Fecal Coliform | CFU/100 mL | NL | <1 | 1 | NC | NC | NC | NC | NC | NC | <1 | 56 | 65 |
| | | | | | NC | NC | NC | NC | NC | NC | | | |
| Ag | mg/L | 0.05 | 0.003 | 0.004 | NC | NC | NC | NC | NC | NC | <0.004 | <0.004 | <0.004 |
| B | " | 2 | 3.8 | 0.005 | NC | NC | NC | NC | NC | NC | 0.657 | 0.384 | 0.379 |
| Be | " | 0.004 | 0.002 | 0.002 | NC | NC | NC | NC | NC | NC | <0.002 | <0.002 | <0.002 |
| Co | " | 1 | 0.035 | 0.002 | NC | NC | NC | NC | NC | NC | <0.002 | 0.008 | 0.008 |
| Cr | " | 0.1 | 86.4 | 0.004 | NC | NC | NC | NC | NC | NC | <0.004 | <0.004 | <0.004 |
| Cu | " | 0.65 | 0.004 | 0.002 | NC | NC | NC | NC | NC | NC | <0.002 | <0.002 | <0.002 |
| Mn | " | 0.15 | 0.183 | 0.002 | NC | NC | NC | NC | NC | NC | <0.002 | 0.002 | 0.002 |
| Se | " | 0.05 | 0.008 | 0.004 | NC | NC | NC | NC | NC | NC | <0.004 | <0.004 | <0.004 |
| V | " | 0.049 | ND | 0.002 | NC | NC | NC | NC | NC | NC | <0.002 | <0.002 | <0.002 |
| Zn | " | 5 | 10 | 0.010 | NC | NC | NC | NC | NC | NC | 0.565 | <0.010 | <0.010 |
| Ca | " | NL | 276 | 0.5 | NC | NC | NC | NC | NC | NC | 62.2 | 119 | 112 |
| Mg | " | NL | 153 | 0.5 | NC | NC | NC | NC | NC | NC | <0.50 | 99.8 | 95.2 |

[1]Laboratory reporting limit.
[2]Duplicate sample.
[3]No existing limit.
[4]Not collected due to equipment malfunction.
[5]Not determined.

## REFERENCES

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

Black & Veatch, 2016, "Revised Groundwater Monitoring Plan, Groundwater Protection System for Thornton Composite Reservoir," prepared for the Metropolitan Water Reclamation District of Greater Chicago, May 2016.

Illinois Environmental Protection Agency, 2012, 35 Illinois Administrative Code Part 620 Class I Groundwater Standards, 2012.

Illinois Pollution Control Board, 2013, Illinois Administrative Code Title 35: Environmental Protection, Subtitle F: Potable Water Supplies, Chapter I: Pollution Control Board, Part 620 – Groundwater Quality, October 7, 2013.