
# *MONITORING AND RESEARCH DEPARTMENT*

***REPORT NO. 20-19***

***TUNNEL AND RESERVOIR PLAN***

***THORNTON TRANSITIONAL FLOOD CONTROL***

***RESERVOIR AND WELLS***

***ANNUAL GROUNDWATER MONITORING REPORT***

***FOR 2019***

***July 2020***

Protecting Our Water Environment

Metropolitan Water Reclamation District of Greater Chicago

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July 16, 2020

Chief
Bureau of Water
Illinois Environmental Protection Agency
P. O. Box 19276
Springfield, IL 62794-9276

Dear Sir or Madam:

Subject: Tunnel and Reservoir Plan, Thornton Transitional Flood Control Reservoir and Wells, Annual Groundwater Monitoring Report for 2019

Attached are three copies of "Tunnel and Reservoir Plan, Thornton Transitional Flood Control Reservoir and 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)
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# TUNNEL AND RESERVOIR PLAN
# THORNTON TRANSITIONAL FLOOD CONTROL RESERVOIR AND WELLS
# ANNUAL GROUNDWATER MONITORING REPORT
# FOR 2019

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

**July 2020**

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| | |
|---|---|
| °C | degrees Celsius |
| Ag | silver |
| As | arsenic |
| B | boron |
| Ba | barium |
| BG | billion gallons |
| $BOD_5$ | five-day biochemical oxygen demand |
| Cd | cadmium |
| CFU | colony forming unit |
| $Cl^-$ | chloride |
| $CN^-$ | cyanide |
| Cr | chromium |
| Cu | copper |
| EC | electrical conductivity |
| $F^-$ | fluoride |
| FC | fecal coliform |
| Fe | iron |
| ft | feet |
| Hg | mercury |
| IEPA | Illinois Environmental Protection Agency |
| L | liter |
| m | meter |
| mg | milligram |
| mL | milliliter |
| Mn | manganese |
| mS | millisiemen |
| $NH_3$-N | ammonia nitrogen |
| Ni | nickel |
| Pb | lead |
| $SO_4^{2-}$ | sulfate |
| TCR | Thornton Composite Reservoir |
| TDS | total dissolved solids |
| Temp | temperature |
| TTR | Thornton Transitional Reservoir |

# ANNUAL DATA FOR MONITORING WELLS AND THORNTON TRANSITIONAL RESERVOIR

## Introduction

This report is submitted annually to fulfill the reporting requirements of the Illinois Environmental Protection Agency (IEPA) regarding the utilization of the Thornton Transitional Reservoir (TTR) for flood control. The reporting requirements for Groundwater Quality Monitoring of the Reservoir and adjacent wells were stated in Section 7 of the Scope of Work approved by the IEPA on August 6, 2001, modified on May 9, 2005, and last modified on March 14, 2019. The current monitoring program requires the four wells, QT-1, QT-2, QT-3 and QT-4, and the reservoir to be sampled one time at each fill event. In addition, the four wells, QT-1, QT-2, QT-3 and QT-4, need to be sampled once per quarter. The report includes:

1. Analytical data for the monitoring wells and transitional reservoir for 2019.

2. Review and comparison of analytical data for the monitoring wells with calculated statistical limits for previously analyzed background samples in order to evaluate exceedances in the concentrations of analytes.

## Project Description

The Reservoir is located in the West Lobe of the Thornton Quarry, southeast of the intersection of the Tri-State Tollway and Halsted Street in Thornton, Illinois (Figure 1). The Reservoir was the final structure to be implemented for the Little Calumet River Watershed under the Natural Resources Conservation Service Little Calumet Watershed Plan of November 1998. The Reservoir provides 3.7 billion gallons (BG) of floodwater storage, increased from the original volume of 3.1 BG due to additional rock mining. This provides sufficient volume to capture a 100-year storm event from Thorn Creek at a point just south of the Tri-State Tollway. This project provides flood control benefits for 21 businesses and 4,400 residences. Within the Little Calumet watershed are the Illinois communities of Blue Island, Calumet City, Dixmoor, Dolton, Glenwood, Harvey, Lansing, Phoenix, Riverdale, and South Holland, which all benefit from the implemented flood control measures.

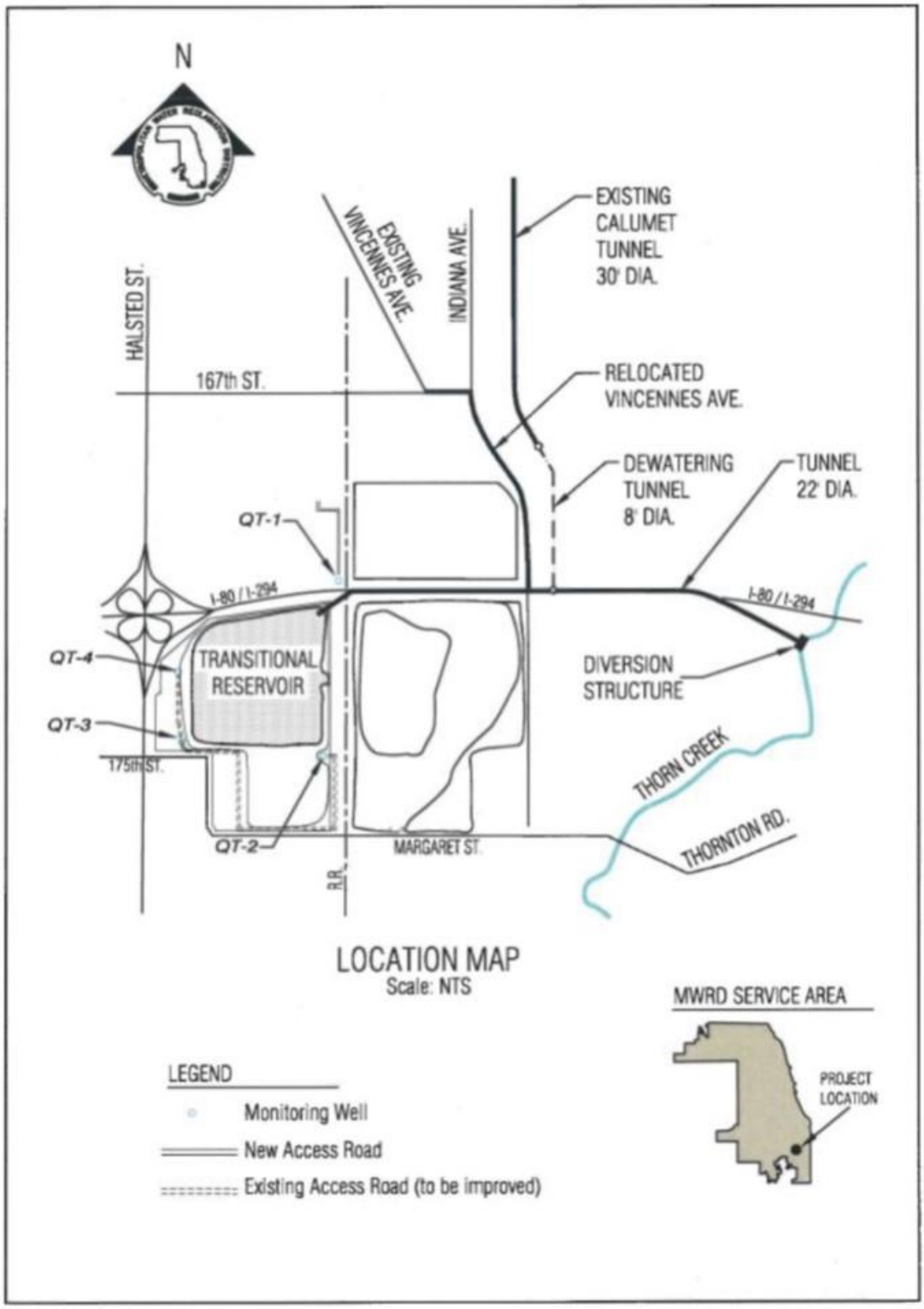
The Reservoir consists of a diversion structure at Thorn Creek, a 24-foot diameter dropshaft, and a 22-foot diameter conveyance tunnel to the Lower West Lobe of Thornton Quarry. The project also includes an 8-foot diameter tunnel connected to the Calumet Tunnel and Reservoir Plan System that is utilized for Reservoir dewatering purposes only.

The analytes measured in these samples include:

1. pH, electrical conductivity (EC), total dissolved solids (TDS), $BOD_5$, $CN^-$, $F^-$, $Cl^-$, $SO_4^{2-}$, $NH_3$-N, and phenol. Trace metals: Ag, As, B, Ba, Cd, Cr, Cu, Fe, Hg, Mn, Ni, and Pb.

2. Other parameters: fecal coliform (FC), groundwater temperature, and water elevation.

FIGURE 1: THORNTON TRANSITIONAL RESERVOIR MONITORING WELL LOCATIONS



There were four significant rain events in 2019, which resulted in the diversion of Thorn Creek water to the TTR (Table 1). Since the Thornton Composite Reservoir (TCR) was placed in service in October 2015, water accumulation in the TTR is generally used for flushing the TCR for odor control. As a result, water was impounded in the TTR between January and December 2019. According to the current monitoring plan approved in March 2019, the TTR should be sampled once at each fill event, and four monitoring wells sampled once at each fill event and quarterly. This required four sampling events for the reservoir and eight sampling events for TTR wells. Sampling was not conducted for wells at the fill event on June 27, 2019, due to a miscommunication. More frequent sampling during January and February of 2019 was related to the monitoring requirements prior to IEPA's approval of sampling reduction on March 14, 2019.

**Summary of Data for Monitoring Wells and Reservoir**

Analytical data for all sampling events are presented in Tables 2 through 6 for wells QT-1, -2, -3, -4, and the TTR, respectively.

The parameters in the wells that exceeded the upper 95 percent confidence limits established from the background samples of respective wells are presented in Table 7. Cyanide exceeded the established limit in all wells. Manganese exceeded the established limit in wells QT-1, QT-2, and QT-3. pH and Arsenic exceeded the limit in wells QT-1 and QT-2. Total dissolved solids and chloride exceeded the limits in two wells, QT-1 and QT-3. The sulfate, barium, copper, and lead exceeded the limits in one well, QT-3. Chromium and iron exceeded the limits in one well, QT-2. Detection limits exceeded the established upper 95 percent confidence limits for silver in wells QT-1 and QT-2 and for mercury in all QT wells. However, in nearly all cases where exceedances were observed in 2019 for any parameter in a well, the corresponding concentration of that parameter in the reservoir was much lower than that in the well, indicating that the reservoir is most likely not the source of the observed exceedances.

TABLE 1: DIVERSION TO THE THORNTON TRANSITIONAL FLOOD CONTROL RESERVOIR DURING 2019

| Date of Diversion | Volume Collected in Thornton Transitional Reservoir | Rainfall (measured at Calumet WRP) | Date Reservoir Completely Drained | Number of Weeks Sampled |
|---|---|---|---|---|
| | Million Gallons | Inches | | |
| 04/29/19 | 2151 | 4.18 | NA[1] | 1 |
| 06/27/19 | 2283 | 0.30 | NA | 1 |
| 09/27/19 | 2283 | 3.59 | NA | 1 |
| 10/27/19 | 2460 | 2.51 | NA | 1 |
| Total | | 10.58 | | |

[1]Not Available, Reservoir contained water from January through December 2019. Recent protocol for the TTR to remain 5 percent full to allow make-up water to be fed into the TCR.

TABLE 2: ANALYSIS OF GROUNDWATER SAMPLED FROM MONITORING WELL QT-1 AT THE THORNTON TRANSITIONAL RESERVOIR SITE DURING 2019

| Event | Date Sampled[1] | pH | EC | TDS | BOD | $CN^-$ | $F^-$ | $Cl^-$ | $SO_4^{2-}$ | $NH_3$-N | Phenol | Ag | As | B | Ba |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | mS/m | mg/L | | | | | | | | | | | |
| Upper 95% Confidence Limit | | 7.6 | NL[2] | 2,408 | NL | 0.002 | 0.59 | 589 | 508 | NL | NL | <0.0008 | 0.001 | NL | 0.095 |
| 1st quarter | 03/13/19 | N/S[3] | N/S | 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 | 05/15/19 | 7.2 | 282 | 2,414 | <2.0 | <0.005 | 0.36 | 941 | 288 | 0.32 | <0.005 | <0.002 | <0.001 | 0.25 | 0.079 |
| 2nd quarter | 06/05/19 | 7.3 | 251 | 2,338 | ND[4] | <0.005 | 0.34 | 954 | 331 | 0.35 | <0.005 | <0.002 | <0.001 | 0.23 | 0.080 |
| 3rd quarter | 09/26/19 | 7.1 | 269 | 2,358 | <2.0 | <0.005 | 0.33 | 888 | 313 | 0.42 | 0.013 | <0.002 | 0.001 | 0.23 | 0.081 |
| Fill event | 10/01/19 | 7.0 | 211 | 2,374 | <2.0 | <0.005 | NRR[5] | 886 | 313 | 0.37 | 0.008 | <0.002 | 0.001 | 0.23 | 0.082 |
| Fill event | 11/07/19 | 7.7 | 218 | 2,344 | ND | <0.005 | 0.35 | 914 | 323 | 0.34 | 0.012 | <0.002 | <0.001 | 0.23 | 0.075 |
| 4th quarter | 12/11/19 | 7.0 | 205 | 2,242 | <2.0 | 0.005 | 0.36 | 888 | 323 | 0.52 | 0.005 | <0.002 | <0.001 | 0.23 | 0.075 |

TABLE 2 (Continued): ANALYSIS OF GROUNDWATER SAMPLED FROM MONITORING WELL QT-1 AT THE THORNTON TRANSITIONAL RESERVOIR SITE DURING 2019

| Event | Date Sampled[1] | Cd | Cr | Cu | Fe | Hg | Mn | Ni | Pb | Fecal Coliform | Temp | Water Elevation[6] | Recharge Time |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | mg/L | | | | | | | | CFU/100 mL | °C | ft | hr |
| Upper 95% Confidence Limit | | 0.002 | 0.005 | 0.022 | 49 | 0.00005 | 0.094 | 0.005 | 0.019 | NL[2] | NL | NL | NL |
| 1st quarter | 03/13/19 | N/S[3] | N/S | N/S | N/S | N/S | N/S | N/S | N/S | N/S | N/S | N/S | N/S |
| Fill event | 05/15/19 | <0.001 | <0.002 | <0.001 | 15 | <0.0005 | 0.070 | <0.001 | <0.001 | 1 | 12.5 | -64 | <48 |
| 2nd quarter | 06/05/19 | <0.001 | <0.002 | 0.002 | 15 | <0.0005 | 0.075 | 0.001 | <0.001 | 4 | 14.1 | -132 | <48 |
| 3rd quarter | 09/26/19 | <0.001 | 0.002 | 0.007 | 12 | NRR[5] | 0.135 | 0.002 | <0.001 | <1 | 12.7 | -183 | <48 |
| Fill event | 10/01/19 | <0.001 | <0.002 | 0.003 | 13 | <0.0005 | 0.072 | <0.001 | <0.001 | <1 | 14.4 | -183 | <48 |
| Fill event | 11/07/19 | <0.001 | <0.002 | 0.004 | 15 | <0.0005 | 0.074 | 0.001 | <0.001 | <1 | 12.1 | -183 | <48 |
| 4th quarter | 12/11/19 | <0.001 | <0.002 | 0.004 | 14 | <0.0005 | 0.081 | <0.001 | <0.001 | <1 | 12.1 | -112 | <48 |

[1]Sampling frequency reduced in March 2019 based on approval from IEPA
[2]NL: No limit.
[3]N/S: No samples were collected because the well was not accessible.
[4]ND: Not analyzed due to insufficient samples.
[5]NRR: No reportable result due to QA/QC failure during laboratory analysis.
[6]Relative to Chicago City Datum (579.48) ft above mean sea level at intersection of Madison and State Streets.

TABLE 3: ANALYSIS OF GROUNDWATER SAMPLED FROM MONITORING WELL QT-2 AT THE THORNTON TRANSITIONAL RESERVOIR SITE DURING 2019

| Event | Date Sampled[1] | pH | EC | TDS | BOD | $CN^-$ | $F^-$ | $Cl^-$ | $SO_4^{2-}$ | $NH_3$-N | Phenol | Ag | As | B | Ba |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | mS/m | ----------mg/L---------- | | | | | | | | | | | |
| Upper 95% Confidence Limit | | 7.5 | NL[2] | 2,651 | NL | 0.002 | 0.38 | 478 | 757 | NL | NL | 0.0001 | 0.006 | NL | 0.069 |
| | 01/03/19 | 8.0 | 130 | 1,172 | ND[3] | <0.005 | NRR[4] | 208 | 445 | <0.50 | <0.005 | <0.003 | 0.049 | 0.224 | 0.041 |
| | 01/10/19 | 7.6 | 135 | 1,192 | <2.0 | <0.005 | 0.29 | 213 | 431 | <0.50 | 0.005 | <0.003 | 0.055 | 0.228 | 0.038 |
| | 01/16/19 | 7.7 | 130 | 1,138 | <2.0 | <0.005 | 0.30 | 211 | 434 | <0.50 | 0.005 | <0.003 | 0.053 | 0.241 | 0.039 |
| | 01/24/19 | 7.4 | 137 | 1,146 | ND | <0.005 | 0.30 | 189 | NRR | <0.50 | 0.007 | <0.003 | 0.051 | 0.226 | 0.040 |
| | 02/06/19 | 7.2 | 139 | 1,116 | <2.0 | <0.005 | 0.30 | 210 | 449 | <0.50 | <0.005 | <0.003 | 0.051 | 0.235 | 0.041 |
| | 02/13/19 | 6.6 | 129 | 1,060 | <2.0 | <0.005 | 0.30 | 215 | 462 | <0.50 | NRR | <0.003 | 0.056 | 0.235 | 0.043 |
| | 02/27/19 | 7.2 | 137 | 1,226 | <2.0 | 0.006 | 0.30 | 210 | 498 | <0.50 | <0.005 | <0.003 | 0.061 | 0.274 | 0.045 |
| 1st quarter | 03/13/19 | 6.9 | 129 | 1,182 | <2.0 | <0.005 | 0.29 | 212 | 454 | <0.50 | <0.005 | <0.003 | 0.043 | 0.219 | 0.040 |
| Fill event | 05/09/19 | 7.2 | 138 | 1,190 | <2.0 | <0.005 | 0.32 | 189 | 474 | 0.37 | <0.005 | <0.002 | 0.040 | 0.224 | 0.041 |
| 2nd quarter | 06/05/19 | 7.1 | 171 | 1,330 | ND | <0.005 | 0.29 | 169 | 532 | 0.34 | <0.005 | <0.002 | 0.048 | 0.207 | 0.042 |
| 3rd quarter | 09/26/19 | 7.1 | 130 | 1,332 | <2.0 | <0.005 | 0.25 | 127 | 585 | 0.31 | 0.005 | <0.002 | 0.036 | 0.191 | 0.034 |
| Fill event | 10/01/19 | 7.1 | 124 | 1,368 | <2.0 | <0.005 | NRR | 155 | 534 | <0.30 | 0.005 | <0.002 | 0.039 | 0.204 | 0.039 |
| Fill event | 11/07/19 | 7.6 | 108 | 1,162 | ND | <0.005 | 0.30 | 128 | 494 | <0.30 | <0.005 | <0.002 | 0.043 | 0.176 | 0.033 |
| 4th quarter | 12/11/19 | 6.9 | 114 | 1,106 | <2.0 | <0.005 | 0.31 | 123 | 533 | 0.37 | <0.005 | <0.002 | 0.037 | 0.172 | 0.033 |

TABLE 3 (Continued): ANALYSIS OF GROUNDWATER SAMPLED FROM MONITORING WELL QT-2 AT THE THORNTON TRANSITIONAL RESERVOIR SITE DURING 2019

| Event | Date Sampled[1] | Cd | Cr | Cu | Fe | Hg | Mn | Ni | Pb | Fecal Coliform | Temp | Water Elevation[5] | Recharge Time |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | mg/L | | | | | | | | CFU/100 ml | °C | ft | hr |
| Upper 95% Confidence Limit | | 0.002 | 0.007 | 0.033 | 5.0 | 0.0003 | 0.063 | NL[2] | 0.019 | NL | NL | NL | NL |
| | 01/03/19 | <0.001 | <0.002 | 0.002 | 3.4 | <0.0005 | 0.042 | 0.004 | <0.001 | <1 | 13.3 | -191 | <48 |
| | 01/10/19 | <0.001 | <0.002 | 0.002 | 2.1 | <0.0005 | 0.021 | 0.004 | <0.001 | <1 | 13.5 | -192 | <48 |
| | 01/16/19 | <0.001 | <0.002 | <0.001 | 3.1 | <0.0005 | 0.033 | 0.004 | <0.001 | <1 | 13.0 | -192 | <48 |
| | 01/24/19 | <0.001 | <0.002 | 0.001 | 3.6 | <0.0005 | 0.043 | 0.004 | <0.001 | <1 | 13.8 | -191 | <48 |
| | 02/06/19 | <0.001 | <0.002 | <0.001 | 3.7 | <0.0005 | 0.051 | 0.003 | <0.001 | <1 | 14.4 | -191 | <48 |
| | 02/13/19 | <0.001 | 0.003 | <0.001 | 3.9 | <0.0005 | 0.047 | 0.004 | <0.001 | <1 | 11.0 | -193 | <48 |
| | 02/27/19 | <0.001 | 0.010 | <0.001 | 3.7 | <0.0005 | 0.045 | 0.006 | <0.001 | <1 | 13.9 | -190 | <48 |
| 1st quarter | 03/13/19 | <0.001 | <0.002 | 0.001 | 2.5 | <0.0005 | 0.026 | 0.005 | <0.001 | <1 | 13.8 | -192 | <48 |
| Fill event | 05/09/19 | <0.001 | <0.002 | 0.002 | 4.1 | <0.0005 | 0.071 | 0.005 | <0.001 | <1 | 14.6 | -162 | <48 |
| 2nd quarter | 06/05/19 | <0.001 | <0.002 | <0.001 | 5.4 | <0.0005 | 0.040 | 0.008 | <0.001 | 1 | 14.9 | -157 | <48 |
| 3rd quarter | 09/26/19 | <0.001 | <0.002 | 0.002 | 4.2 | <0.0005 | 0.055 | 0.008 | <0.001 | <1 | 14.6 | -192 | <48 |
| Fill event | 10/01/19 | <0.001 | <0.002 | 0.001 | 2.5 | <0.0005 | 0.026 | 0.006 | <0.001 | 1 | 14.5 | -162 | <48 |
| Fill event | 11/07/19 | <0.001 | <0.002 | 0.001 | 3.2 | <0.0005 | 0.046 | 0.006 | <0.001 | <1 | 13.1 | -154 | <48 |
| 4th quarter | 12/11/19 | <0.001 | <0.002 | 0.002 | 3.5 | <0.0005 | 0.042 | 0.006 | <0.001 | <1 | 13.3 | -153 | <48 |

[1] Sampling frequency reduced in March 2019 based on approval from IEPA
[2]NL: No limit.
[3]ND: Not analyzed due to insufficient samples.
[4]NRR: No reportable data due to QA/QC failure during laboratory analysis.
[5]Relative to Chicago City Datum (579.48) ft above mean sea level) at intersection of Madison and State Streets.

TABLE 4: ANALYSIS OF GROUNDWATER SAMPLED FROM MONITORING WELL QT-3 AT THE THORNTON TRANSITIONAL RESERVOIR SITE DURING 2019

| Event | Date Sampled[1] | pH | EC | TDS | BOD | $CN^-$ | $F^-$ | $Cl^-$ | $SO_4^{2-}$ | $NH_3$-N | Phenol | Ag | As | B | Ba |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | mS/m | ---------- | | | | | mg/L | ---------- | | | | | |
| Upper 95% Confidence Limit | | 7.8 | NL[2] | 1,353 | NL | 0.002 | 0.36 | 190 | 238 | NL | NL | 0.0292 | <0.002 | NL | 0.082 |
| | 01/03/19 | 7.1 | 176 | 1,452 | ND[3] | <0.005 | 0.20 | 452 | 238 | <0.50 | 0.009 | <0.003 | <0.001 | 0.20 | 0.098 |
| | 01/10/19 | 7.2 | 171 | 1,362 | <2.0 | <0.005 | 0.21 | 436 | 230 | <0.50 | 0.007 | <0.003 | <0.001 | 0.20 | 0.088 |
| | 01/16/19 | 7.2 | 168 | 1,434 | <2.0 | <0.005 | 0.21 | 435 | 240 | NRR | 0.009 | <0.003 | <0.001 | 0.20 | 0.101 |
| | 01/24/19 | 7.0 | 174 | 1,432 | ND | <0.005 | 0.21 | 417 | NRR | <0.50 | 0.009 | <0.003 | <0.001 | 0.21 | 0.094 |
| | 02/06/19 | 7.3 | 174 | 1,512 | <2.0 | <0.005 | 0.21 | 450 | 241 | <0.50 | 0.005 | <0.003 | <0.001 | 0.22 | 0.100 |
| | 02/13/19 | 6.5 | 166 | 1,346 | <2.0 | <0.005 | 0.20 | 463 | 251 | <0.50 | 0.006 | <0.003 | <0.001 | 0.23 | 0.097 |
| | 02/27/19 | 6.9 | 169 | 1,418 | <2.0 | <0.005 | 0.16 | 437 | 231 | <0.50 | <0.005 | <0.003 | <0.001 | 0.26 | 0.105 |
| 1st quarter | 03/13/19 | 7.1 | 158 | 1,350 | <2.0 | <0.005 | 0.24 | 433 | 228 | <0.50 | <0.005 | <0.003 | <0.001 | 0.21 | 0.096 |
| Fill event | 05/09/19 | 6.8 | 192 | 1,478 | <2.0 | <0.005 | 0.18 | 445 | 254 | 0.36 | 0.010 | <0.002 | <0.001 | 0.21 | 0.108 |
| 2nd quarter | 06/05/19 | 7.0 | 158 | 1,496 | ND | 0.006 | 0.20 | 455 | 251 | <0.30 | <0.005 | <0.002 | <0.001 | 0.20 | 0.106 |
| 3rd quarter | 09/26/19 | 7.0 | 147 | 1,410 | 40 | <0.005 | 0.18 | 404 | 221 | 0.43 | 0.011 | <0.002 | <0.001 | 0.23 | 0.086 |
| Fill event | 10/01/19 | 6.8 | 147 | 1,552 | <2.0 | <0.005 | NRR[4] | 434 | 245 | 0.31 | 0.011 | <0.002 | <0.001 | 0.21 | 0.105 |
| Fill event | 11/07/19 | 7.2 | 138 | 1,464 | ND | <0.005 | 0.22 | 443 | 255 | <0.30 | 0.012 | <0.002 | <0.001 | 0.20 | 0.101 |
| 4th quarter | 12/11/19 | 6.8 | 138 | 1,412 | <2.0 | <0.005 | 0.20 | 439 | 252 | 0.35 | 0.005 | <0.002 | <0.001 | 0.21 | 0.093 |

TABLE 4 (Continued): ANALYSIS OF GROUNDWATER SAMPLED FROM MONITORING WELL QT-3 AT THE THORNTON TRANSITIONAL RESERVOIR SITE DURING 2019

| Event | Date Sampled[1] | Cd | Cr | Cu | Fe | Hg | Mn | Ni | Pb | Fecal Coliform | Temp | Water Elevation[5] | Recharge Time |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | mg/L | | | | | | | | CFU/100 ml | °C | ft | hr |
| | Upper 95% Confidence Level | 0.001 | 0.006 | 0.022 | 21 | 0.00005 | 0.158 | NL[1] | 0.014 | NL | NL | NL | NL |
| | 01/03/19 | <0.001 | <0.002 | 0.163 | 5.0 | <0.0005 | 0.089 | NRR[4] | 0.030 | <1 | 11.4 | -182 | <48 |
| | 01/10/19 | <0.001 | <0.002 | 0.003 | 17 | <0.0005 | 0.187 | 0.001 | <0.001 | <1 | 11.2 | -180 | <48 |
| | 01/16/19 | <0.001 | <0.002 | <0.001 | 5.0 | <0.0005 | 0.074 | 0.002 | <0.001 | <1 | 11.1 | -181 | <48 |
| | 01/24/19 | <0.001 | <0.002 | 0.002 | 18 | <0.0005 | 0.205 | <0.001 | <0.001 | <1 | 11.0 | -182 | <48 |
| | 02/06/19 | <0.001 | <0.002 | <0.001 | 15 | <0.0005 | 0.197 | 0.001 | <0.001 | <1 | 12.3 | -182 | <48 |
| | 02/13/19 | <0.001 | <0.002 | <0.001 | 18 | <0.0005 | 0.196 | 0.001 | <0.001 | <1 | 10.2 | -181 | <48 |
| | 02/27/19 | <0.001 | 0.004 | 0.001 | 18 | <0.0005 | 0.243 | 0.005 | <0.001 | <1 | 11.6 | -181 | <48 |
| 1st quarter | 03/13/19 | <0.001 | <0.002 | 0.001 | 6.0 | <0.0005 | 0.120 | 0.001 | <0.001 | <1 | 11.8 | -184 | <48 |
| Fill event | 05/09/19 | <0.001 | <0.002 | 0.006 | 8.0 | <0.0005 | 0.115 | 0.004 | <0.001 | 1 | 12.4 | -163 | <48 |
| 2nd quarter | 06/05/19 | <0.001 | <0.002 | 0.002 | 14 | <0.0005 | 0.148 | 0.002 | <0.001 | <1 | 13.8 | -153 | <48 |
| 3rd quarter | 09/26/19 | <0.001 | <0.002 | 0.004 | 7.0 | <0.0005 | 0.140 | 0.001 | <0.001 | <1 | 12.6 | -180 | <48 |
| Fill event | 10/01/19 | <0.001 | <0.002 | 0.003 | 7.0 | <0.0005 | 0.065 | <0.001 | <0.001 | <1 | 12.4 | -164 | <48 |
| Fill event | 11/07/19 | <0.001 | <0.002 | 0.002 | 14 | <0.0005 | 0.153 | 0.002 | <0.001 | <1 | 11.5 | -151 | <48 |
| 4th quarter | 12/11/19 | <0.001 | <0.002 | 0.002 | 14 | <0.0005 | 0.158 | 0.003 | <0.001 | <1 | 12.1 | -149 | <48 |

[1]Sampling frequency reduced in March 2019 based on approval from IEPA.
[2]No limit.
[3]ND: Not analyzed due to insufficient samples.
[4]NRR: No reportable data due to QA/QC failure during laboratory analysis.[4]NRR: No reportable data possibly due to sample contamination.
[5]Relative to Chicago City Datum (579.48 ft above mean sea level) at intersection of Madison and State Streets.

TABLE 5: ANALYSIS OF GROUNDWATER SAMPLES FROM MONITORING WELL QT-4 AT THE THORNTON TRANSITIONAL RESERVOIR SITE DURING 2019

| Event | Date Sampled[1] | pH | EC | TDS | BOD | $CN^-$ | $F^-$ | $Cl^-$ | $SO_4^{2-}$ | $NH_3$-N | Phenol | Ag | As | B | Ba |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | mS/m | mg/L | | | | | | | | | | | |
| Upper 95% Confidence Limit | | 7.7 | NL[2] | 2,034 | NL | 0.002 | 0.39 | 590 | 314 | NL | NL | 0.0033 | NL | NL | 0.181 |
| | 01/03/19 | 7.1 | 151 | 1,176 | ND[3] | <0.005 | 0.26 | 284 | 239 | <0.50 | 0.008 | <0.003 | <0.001 | 0.35 | 0.08 |
| | 01/10/19 | 7.2 | 153 | 1,162 | <2.0 | <0.005 | 0.25 | 287 | 234 | <0.50 | 0.008 | <0.003 | <0.001 | 0.34 | 0.07 |
| | 01/16/19 | 7.0 | 151 | 1,164 | <2.0 | <0.005 | 0.26 | 292 | 233 | <0.50 | 0.009 | <0.003 | <0.001 | 0.37 | 0.08 |
| | 01/24/19 | 7.1 | 154 | 1,150 | ND | <0.005 | 0.26 | 269 | NRR[4] | <0.50 | 0.008 | <0.003 | <0.001 | 0.37 | 0.07 |
| | 02/06/19 | 7.2 | 151 | 1,206 | <2.0 | <0.005 | 0.26 | 278 | 231 | <0.50 | 0.005 | <0.003 | <0.001 | 0.40 | 0.08 |
| | 02/13/19 | 6.8 | 147 | 966 | <2.0 | <0.005 | 0.26 | 278 | 232 | <0.50 | 0.006 | <0.003 | <0.001 | 0.41 | 0.07 |
| | 02/27/19 | 7.1 | 147 | 1,170 | <2.0 | 0.014 | 0.22 | 295 | 237 | <0.50 | <0.005 | <0.003 | <0.001 | 0.43 | 0.08 |
| 1st quarter | 03/13/19 | 7.1 | 143 | 1,196 | <2.0 | <0.005 | 0.28 | 287 | 225 | <0.50 | <0.005 | <0.003 | <0.001 | 0.35 | 0.08 |
| Fill event | 05/09/19 | 7.1 | 138 | 1,098 | <2.0 | <0.005 | 0.22 | 244 | 219 | 0.40 | 0.007 | <0.002 | <0.001 | 0.40 | 0.07 |
| 2nd quarter | 06/05/19 | 7.0 | 121 | 1,086 | ND | <0.005 | 0.25 | 246 | 229 | 0.35 | <0.005 | <0.002 | <0.001 | 0.37 | 0.07 |
| 3rd quarter | 09/26/19 | 7.1 | 121 | 1,122 | <2.0 | <0.005 | 0.23 | 224 | 221 | 0.46 | 0.008 | <0.002 | <0.001 | 0.40 | 0.07 |
| Fill event | 10/01/19 | 7.1 | 115 | 1,166 | <2.0 | <0.005 | NRR | 235 | 222 | 0.39 | 0.008 | <0.002 | <0.001 | 0.39 | 0.08 |
| Fill event | 11/07/19 | 7.3 | 107 | 1,060 | ND | <0.005 | 0.27 | 213 | 225 | 0.34 | 0.007 | <0.002 | <0.001 | 0.35 | 0.07 |
| 4th quarter | 12/11/19 | 6.8 | 107 | 1,060 | <2.0 | <0.005 | 0.272 | 215 | 227 | 0.42 | <0.005 | <0.002 | <0.001 | 0.35 | 0.06 |

TABLE 5 (Continued): ANALYSIS OF GROUNDWATER SAMPLED FROM MONITORING WELL QT-4 AT THE THORNTON TRANSITIONAL RESERVOIR SITE DURING 2019

| Event | Date Sampled[1] | Cd | Cr | Cu | Fe | Hg | Mn | Ni | Pb | Fecal Coliform | Temp | Water Elevation[5] | Recharge Time |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | mg/L | | | | | | | | CFU/100 mL | °C | ft | hr |
| Upper 95% confidence Limit | | 0.001 | 0.022 | 0.035 | 24 | 0.00004 | 0.203 | NL[2] | 0.018 | NL | NL | NL | NL |
| | 01/03/19 | <0.001 | <0.002 | 0.001 | 9.0 | <0.0005 | 0.10 | <0.001 | <0.001 | <1 | 14.2 | -95 | <48 |
| | 01/10/19 | <0.001 | <0.002 | <0.001 | 9.0 | <0.0005 | 0.10 | <0.001 | <0.001 | <1 | 14.2 | -94 | <48 |
| | 01/16/19 | <0.001 | <0.002 | <0.001 | 11 | <0.0005 | 0.10 | <0.001 | <0.001 | <1 | 13.8 | -94 | <48 |
| | 01/24/19 | <0.001 | <0.002 | 0.002 | 10 | <0.0005 | 0.11 | 0.001 | <0.001 | <1 | 13.9 | -95 | <48 |
| | 02/06/19 | <0.001 | <0.002 | <0.001 | 12 | <0.0005 | 0.13 | <0.001 | <0.001 | <1 | 14.0 | -90 | <48 |
| | 02/13/19 | <0.001 | <0.002 | <0.001 | 13 | <0.0005 | 0.11 | <0.001 | <0.001 | <1 | 13.4 | -94 | <48 |
| | 02/27/19 | <0.001 | 0.009 | <0.001 | 10 | <0.0005 | 0.13 | 0.004 | <0.001 | <1 | 13.7 | -93 | <48 |
| 1st quarter | 03/13/19 | <0.001 | <0.002 | <0.001 | 15 | <0.0005 | 0.15 | <0.001 | <0.001 | <1 | 13.1 | -94 | <48 |
| Fill event | 05/09/19 | <0.001 | <0.002 | <0.001 | 13 | <0.0005 | 0.10 | <0.001 | <0.001 | <1 | 13.1 | -91 | <48 |
| 2nd quarter | 06/05/19 | <0.001 | <0.002 | <0.001 | 11 | <0.0005 | 0.10 | <0.001 | <0.001 | <1 | 13.9 | -90 | <48 |
| 3rd quarter | 09/26/19 | <0.001 | <0.002 | 0.003 | 9.0 | <0.0005 | 0.06 | <0.001 | <0.001 | <1 | 13.9 | -92 | <48 |
| Fill event | 10/01/19 | <0.001 | <0.002 | 0.002 | 7.0 | <0.0005 | 0.05 | <0.001 | <0.001 | <1 | 14.0 | -91 | <48 |
| Fill event | 11/07/19 | <0.001 | <0.002 | <0.001 | 10 | <0.0005 | 0.08 | <0.001 | <0.001 | <1 | 13.5 | -89 | <48 |
| 4th quarter | 12/11/19 | <0.001 | <0.002 | 0.001 | 6.0 | <0.0005 | 0.07 | 0.001 | <0.001 | <1 | 12.8 | -89 | <48 |

[1]Sampling frequency reduced in March 2019 based on approval from IEPA
[2]NL: No limit.
[3]ND: Not analyzed due to insufficient samples.
[4]NRR: No reportable data due to QA/QC failure during laboratory analysis.
[5]Relative to Chicago City Datum (579.48 ft above mean sea level) at intersection of Madison and State Streets.

TABLE 6 : ANALYSIS OF FILL EVENT WATER STORED IN THE THORNTON TRANSITIONAL RESERVOIR LOCATED AT THE THORNTON SITE AND SAMPLED DURING 2019

| Event | Date Sampled[1] | pH | TDS | BOD | $CN^-$ | $F^-$ | $Cl^-$ | $SO_4^{2-}$ | $NH^3$-N | Phenol | Ag | As | B | Ba |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | mg/L | | | | | | | | | | | | |
| | 01/03/19 | 7.0 | 834 | NRR[2] | <0.005 | 0.32 | 159 | 276 | <0.50 | <0.005 | <0.003 | 0.001 | 0.205 | 0.029 |
| | 01/10/19 | 7.0 | 836 | 3.0 | <0.005 | 0.29 | 168 | 296 | <0.50 | <0.005 | <0.003 | 0.001 | 0.229 | 0.027 |
| | 01/16/19 | 7.0 | 784 | <2.0 | <0.005 | 0.27 | 161 | 282 | <0.50 | <0.005 | <0.003 | 0.001 | 0.215 | 0.027 |
| | 02/07/19 | 7.8 | 386 | NRR | <0.005 | 0.16 | 78 | 133 | <0.50 | <0.005 | <0.003 | <0.001 | 0.115 | 0.015 |
| 1st Fill event | 05/06/19 | 7.7 | 306 | 3.0 | 0.009 | 0.18 | 53 | 49 | <0.30 | <0.005 | <0.002 | 0.002 | 0.063 | 0.023 |
| 2nd Fill event | 07/01/19 | 8.0 | 392 | 186 | <0.005 | 0.16 | 58 | 77 | <0.30 | <0.005 | <0.002 | 0.002 | 0.077 | 0.019 |
| 3rd Fill event | 10/01/19 | 7.3 | 234 | <2.0 | <0.005 | 0.17 | 26 | 38 | <0.30 | <0.005 | <0.002 | 0.002 | 0.064 | 0.021 |
| 4th Fill event | 10/28/19 | 7.0 | 296 | <2.0 | <0.005 | NRR | 31 | 51 | <0.30 | <0.005 | <0.002 | 0.002 | 0.061 | 0.018 |

TABLE 6 (Continued): ANALYSIS OF FILL EVENT WATER STORED IN THE THORNTON TRANSITIONAL RESERVOIR LOCATED AT THE THORNTON SITE AND SAMPLED DURING 2019

| Event | Date Sampled[1] | Cd | Cr | Cu | Fe | Hg | Mn | Ni | Pb | Fecal Coliform | Temp | Depth of Water |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | mg/L | | | | | | | | | | |
| | | | | | | - | | | | CFU/100 mL | °C | ft |
| | 01/03/19 | <0.001 | <0.002 | <0.001 | 0.12 | <0.0005 | 0.014 | 0.008 | <0.001 | <10 | 2.3 | 7.0 |
| | 01/10/19 | <0.001 | 0.003 | <0.001 | 0.17 | <0.0005 | 0.015 | 0.009 | <0.001 | <10 | 2.0 | 8.0 |
| | 01/16/19 | <0.001 | <0.002 | <0.001 | 0.04 | <0.0005 | 0.009 | 0.008 | <0.001 | <10 | 1.0 | 10 |
| | 02/07/19 | <0.001 | <0.002 | <0.001 | 0.08 | <0.0005 | 0.006 | 0.004 | <0.001 | <10 | 4.0 | 5.0 |
| 1st Fill event | 05/06/19 | <0.001 | <0.002 | 0.006 | 0.81 | <0.0005 | 0.029 | 0.003 | 0.002 | 30 | 15 | 55 |
| 2nd Fill event | 07/01/19 | <0.001 | <0.002 | 0.004 | 0.44 | <0.0005 | 0.019 | 0.011 | <0.001 | 350 | 26 | 60 |
| 3rd Fill event | 10/01/19 | <0.001 | <0.002 | 0.004 | 1.25 | <0.0005 | 0.023 | 0.003 | 0.002 | 840 | 22 | 35 |
| 4th Fill event | 10/28/19 | <0.001 | <0.002 | 0.002 | 0.66 | NRR | 0.019 | 0.003 | 0.001 | 51 | 14 | 25 |

[1]Sampling frequency reduced in March 2019 based on approval from IEPA.
[2]NRR: No reportable data due to QA/QC failure during laboratory analysis.

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TABLE 7: EXCEEDANCES[1] DETECTED IN WELLS AT THE THORNTON TRANSITIONAL RESERVOIR SITE DURING 2019

| Well | Parameter Exceeding Limit[1] |
|---|---|
| 1 | pH, TDS, $CN^-$, $Cl^-$, As, Mn, |
| 2 | pH, $CN^-$, As, Cr, Fe, Mn, |
| 3 | TDS, $CN^-$, $Cl^-$, $SO_4^{2-}$, Ba, Cu, Mn, Pb, |
| 4 | $CN^-$ |

[1]Concentrations of analytes exceed upper limits of 95 percent confidence intervals for background samples.