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*Metropolitan Water Reclamation District of Greater Chicago*

***MONITORING AND RESEARCH  
DEPARTMENT***

*REPORT NO. 18-18*

*TUNNEL AND RESERVOIR PLAN*

*THORNTON TRANSITIONAL FLOOD CONTROL*

*RESERVOIR AND WELLS*

*ANNUAL GROUNDWATER MONITORING REPORT*

*FOR 2017*

*August 2018*

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Director of Monitoring and Research

July 31, 2018

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 2017

Attached are three copies of "Tunnel and Reservoir Plan, Thornton Transitional Flood Control Reservoir and Wells, Annual Groundwater Monitoring Report for 2017."

Very truly yours,



Albert E. Cox  
Environmental Monitoring and Research Manager  
Monitoring and Research Department

AC:PS:cm

Attachment

cc/w att: Ms. Sally K. Swanson (USEPA Region 5 - WC15J) - (2)  
Mr. Podczerwinski  
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**TUNNEL AND RESERVOIR PLAN,  
THORNTON TRANSITIONAL FLOOD  
CONTROL RESERVOIR AND WELLS,  
ANNUAL GROUNDWATER MONITORING REPORT  
FOR 2017**

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

**July 2018**

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## LIST OF ABBREVIATIONS

|                               |  |
|-------------------------------|--|
| °C                            | degrees Celsius                          |
| Ag                            | silver                                   |
| As                            | arsenic                                  |
| B                             | boron                                    |
| Ba                            | barium                                   |
| BG                            | billion gallons                          |
| BOD <sub>5</sub>              | five-day biochemical oxygen demand       |
| Cd                            | cadmium                                  |
| CFU                           | colony forming unit                      |
| Cl <sup>-</sup>               | chloride                                 |
| CN <sup>-</sup>               | cyanide                                  |
| Cr                            | chromium                                 |
| CSF                           | combined sewer flow                      |
| Cu                            | copper                                   |
| EC                            | electrical conductivity                  |
| F <sup>-</sup>                | fluoride                                 |
| FC                            | fecal coliform                           |
| Fe                            | iron                                     |
| ft                            | feet                                     |
| Hg                            | mercury                                  |
| IEPA                          | Illinois Environmental Protection Agency |
| L                             | liter                                    |
| m                             | meter                                    |
| mg                            | milligram                                |
| MG                            | million gallons                          |
| mL                            | milliliter                               |
| Mn                            | manganese                                |
| mS                            | millisiemen                              |
| NH <sub>3</sub> -N            | ammonia nitrogen                         |
| Ni                            | nickel                                   |
| Pb                            | lead                                     |
| SO <sub>4</sub> <sup>2-</sup> | sulfate                                  |
| SOW                           | scope of work                            |
| 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, stated in Section 7 of the Scope of Work (SOW) approved by the IEPA on August 6, 2001, and modified May 9, 2005, for Groundwater Quality Monitoring of the Reservoir and adjacent wells include:

1. Analytical data for the monitoring wells and transitional reservoir for the previous year.
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.

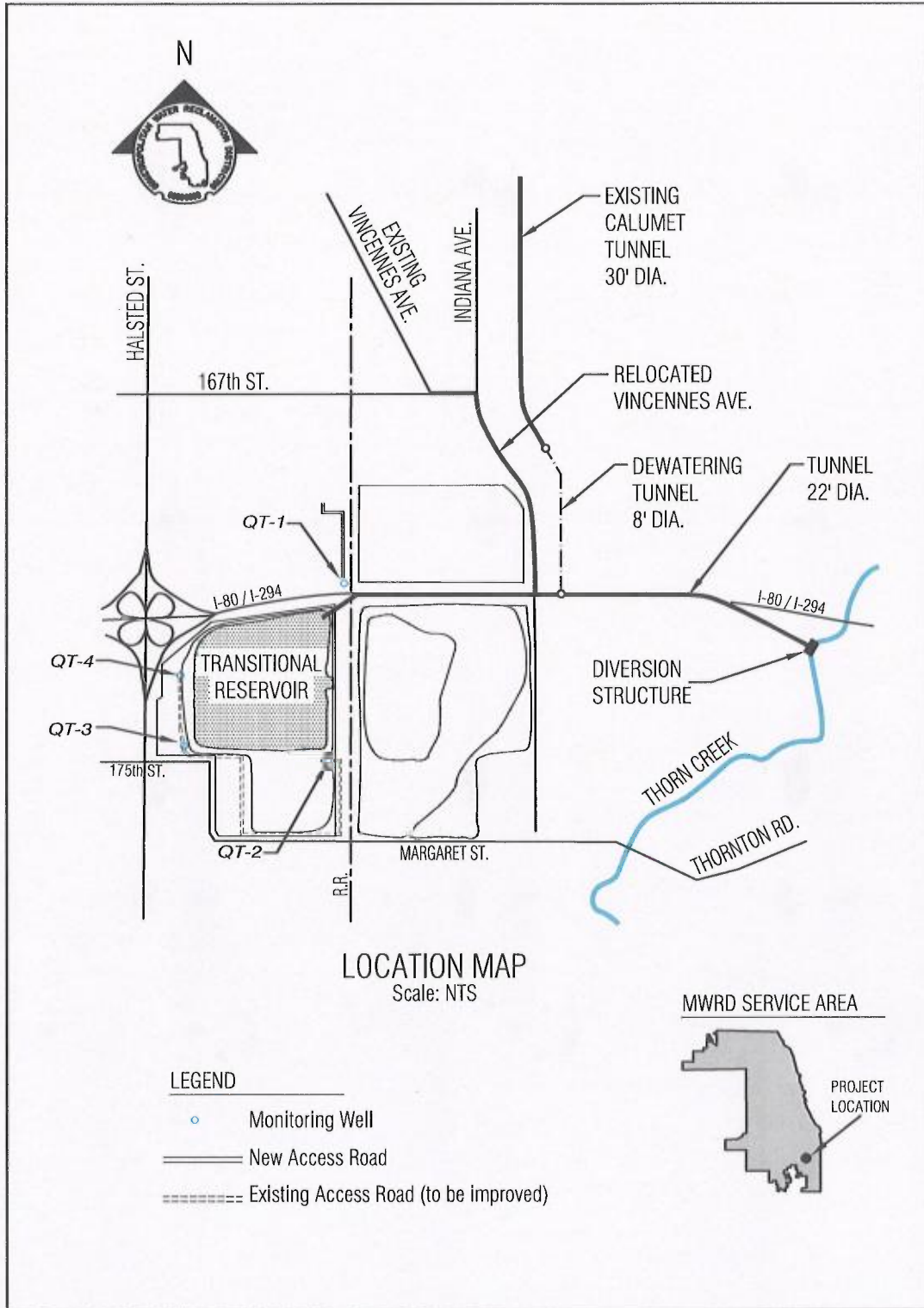
The Reservoir consists of a diversion structure at Thorn Creek, a 24-foot diameter dropshaft, and 22-foot diameter conveyance tunnel to the Lower West Lobe of Thornton Quarry. The project also includes an 8-foot diameter tunnel connected to the Calumet Tunnel and Reservoir Plan System that is utilized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

The analytes measured in these samples include:

1. pH, electrical conductivity (EC), total dissolved solids (TDS), BOD<sub>5</sub>, CN<sup>-</sup>, F<sup>-</sup>, Cl<sup>-</sup>, SO<sub>4</sub><sup>2-</sup>, NH<sub>3</sub>-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 three significant rain events in 2017 which resulted in the diversion of Thorn Creek water to the TTR, with an accumulation of 1,492 MG in the TTR (Table 1). For the rest of the four rain events, a subsequent diversion/fill event occurred but with no accumulation of water in the TTR. 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 July 2017 and October to November 2017. This triggered 24 sampling events for all TTR wells (groundwater) and the reservoir (water from Thorn Creek and combined sewer flow [CSF]) from January through July 2017 and October to November 2017. However, only 12 sampling events were conducted for the TTR wells due to personnel shortage because the highest priority of personnel allocation was placed on the Tunnel and Reservoir Plan fill event sampling.

### **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. Manganese, Cl<sup>-</sup>, and TDS exceeded the established limits in two wells. Arsenic and barium exceeded the limit each just one well only. In nearly all cases where exceedances were observed in 2017 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 contamination causing the observed exceedances.

TABLE 1: DIVERSION TO THE THORNTON TRANSITIONAL FLOOD CONTROL RESERVOIR DURING 2017

| 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                             |                                   |                         |
| 03/01/17          | NA  | 1.93                               | NA <sup>1</sup>                   | 24                      |
| 03/30/17          | NA  | 2.72                               |                                   |                         |
| 04/30/17          | NA  | 3.43                               |                                   |                         |
| Total             | 1,492   | 8.08                               |                                   |                         |

<sup>1</sup>Not available; reservoir contained water March through May 2017.

TABLE 2: ANALYSIS OF GROUNDWATER SAMPLED FROM MONITORING WELL QT-1 AT THE THORNTON TRANSITIONAL RESERVOIR SITE DURING 2017

| Date Sampled <sup>1</sup>  | pH  | EC <sup>2</sup> | TDS <sup>2</sup> | BOD <sub>5</sub> | CN <sup>-</sup> | F <sup>-</sup> | Cl <sup>-</sup> | SO <sub>4</sub> <sup>2-</sup> | NH <sub>3</sub> -N | Phenol | Ag     | As     | B    | Ba    |
|----------------------------|-----|-----------------|------------------|------------------|-----------------|----------------|-----------------|-------------------------------|--------------------|--------|--------|--------|------|-------|
|                            |     | mS/m            |                  |                  |                 |                |                 | mg/L                          |                    |        |        |        |      |       |
| Upper 95% Confidence Limit | 7.6 | NL <sup>3</sup> | 2,408            | NL               | 0.002           | 0.59           | 589             | 508                           | NL                 | NL     | 0      | 0.001  | NL   | 0.095 |
| 02/09/17                   | 6.3 | 406             | 2,418            | <2               | <0.005          | 0.38           | 958             | 296                           | 0.33               | <0.005 | <0.001 | <0.020 | 0.28 | 0.072 |
| 02/16/17                   | 7.1 | 404             | 2,438            | <2               | <0.005          | 0.37           | 968             | 301                           | 0.30               | <0.005 | <0.001 | <0.020 | 0.22 | 0.073 |
| 02/23/17                   | 7.1 | 304             | 2,392            | NRR <sup>4</sup> | <0.005          | 0.36           | 974             | 294                           | 0.37               | <0.005 | <0.001 | <0.020 | 0.23 | 0.077 |
| 03/22/17                   | 7.1 | 382             | 2,308            | <2               | <0.005          | 0.37           | 971             | 277                           | 0.39               | <0.005 | <0.001 | <0.020 | 0.21 | 0.066 |
| 03/29/17                   | 7.3 | 393             | 2,388            | <2               | <0.005          | 0.42           | 976             | 282                           | 0.30               | <0.005 | <0.001 | <0.020 | 0.20 | 0.070 |
| 04/27/17                   | 6.9 | 389             | 2,418            | <2               | <0.005          | 0.36           | 963             | 290                           | 0.33               | 0.005  | <0.001 | <0.020 | 0.21 | 0.072 |
| 05/25/17                   | 6.9 | 413             | 2,464            | <2               | <0.005          | 0.33           | 928             | 331                           | 0.36               | <0.005 | <0.001 | <0.020 | 0.21 | 0.075 |
| 06/01/17                   | 6.4 | 386             | 2,458            | <2               | <0.005          | 0.17           | 903             | 338                           | 0.33               | <0.005 | <0.001 | <0.020 | 0.21 | 0.070 |
| 06/08/17                   | 7.1 | 414             | 2,462            | 3                | <0.005          | 0.33           | 909             | 338                           | 0.35               | <0.005 | <0.001 | <0.020 | 0.21 | 0.070 |
| 06/15/17                   | 6.9 | 383             | 2,530            | <2               | <0.005          | 0.32           | 902             | 324                           | 0.24               | <0.005 | <0.001 | <0.020 | 0.22 | 0.073 |
| 06/22/17                   | 7.1 | 388             | 2,404            | <2               | <0.005          | 0.37           | 893             | 346                           | 0.25               | <0.005 | <0.001 | <0.020 | 0.20 | 0.071 |
| 11/02/17                   | 7.0 | 374             | 2,398            | <2               | <0.005          | 0.33           | 164             | 326                           | 0.33               | <0.005 | <0.001 | <0.020 | 0.22 | 0.073 |

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TABLE 2 (Continued): ANALYSIS OF GROUNDWATER SAMPLED FROM MONITORING WELL QT-1 AT THE THORNTON TRANSITIONAL RESERVOIR SITE DURING 2017

| Date Sampled <sup>1</sup>  | Cd               | Cr     | Cu     | Fe | Hg       | Mn    | Ni     | Pb    | Fecal Coliform | Temp | Water Elevation <sup>5</sup> | 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             | NL   | NL                           | NL            |
| 02/09/17                   | <0.001           | <0.003 | <0.004 | 7  | <0.00005 | 0.094 | <0.005 | <0.01 | <1             | 12.0 | -208                         | <48           |
| 02/16/17                   | <0.001           | <0.003 | <0.004 | 13 | <0.00005 | 0.068 | <0.005 | <0.01 | <1             | 12.0 | -198                         | <48           |
| 02/23/17                   | <0.001           | <0.003 | <0.004 | 12 | <0.00005 | 0.055 | <0.005 | <0.01 | <1             | 12.4 | -199                         | <48           |
| 03/22/17                   | <0.001           | 0.003  | 0.006  | 12 | <0.00005 | 0.065 | <0.005 | <0.01 | <1             | 11.6 | -198                         | <48           |
| 03/29/17                   | <0.001           | <0.003 | <0.004 | 11 | <0.00005 | 0.053 | <0.005 | <0.01 | <1             | 13.1 | -197                         | <48           |
| 04/27/17                   | <0.001           | <0.003 | <0.004 | 13 | <0.00005 | 0.092 | <0.005 | <0.01 | <1             | 12.8 | -194                         | <48           |
| 05/25/17                   | <0.001           | <0.003 | <0.004 | 13 | <0.00005 | 0.083 | <0.005 | <0.01 | <1             | 12.7 | -194                         | <48           |
| 06/01/17                   | <0.001           | 0.003  | <0.004 | 13 | <0.00005 | 0.069 | <0.005 | <0.01 | <1             | 12.9 | -195                         | <48           |
| 06/08/17                   | <0.001           | <0.003 | 0.007  | 12 | <0.00005 | 0.067 | <0.005 | <0.01 | <1             | 12.8 | -195                         | <48           |
| 06/15/17                   | <0.001           | <0.003 | 0.006  | 12 | <0.00005 | 0.058 | <0.005 | <0.01 | <1             | 14.7 | -195                         | <48           |
| 06/22/17                   | <0.001           | 0.003  | 0.006  | 11 | <0.00005 | 0.062 | <0.005 | <0.01 | <1             | 14.8 | -196                         | <48           |
| 11/02/17                   | <0.001           | <0.003 | 0.004  | 16 | <0.00005 | 0.317 | <0.005 | <0.01 | <1             | 12.9 | -230                         | <48           |

<sup>1</sup>Samples retrieved from QT-1 following rain events as well as prolonged storage of water in reservoir (for operational procedures).

<sup>2</sup>EC = electrical conductivity; TDS = total dissolved solids.

<sup>3</sup>No limit.

<sup>4</sup>No reportable result.

<sup>5</sup>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 2017

| Date Sampled <sup>1</sup>  | pH  | EC <sup>2</sup> | TDS <sup>2</sup> | BOD <sub>5</sub> | CN <sup>-</sup> | F <sup>-</sup> | Cl <sup>-</sup> | SO <sub>4</sub> <sup>2-</sup> | NH <sub>3</sub> -N <sub>x</sub> | Phenol | Ag     | As    | B    | Ba    |
|----------------------------|-----|-----------------|------------------|------------------|-----------------|----------------|-----------------|-------------------------------|---------------------------------|--------|--------|-------|------|-------|
|                            |     | mS/m            | ----- mg/L ----- |                  |                 |                |                 |                               |                                 |        |        |       |      |       |
| Upper 95% Confidence Limit | 7.5 | NL <sup>3</sup> | 2,651            | NL               | 0.002           | 0.38           | 478             | 757                           | NL                              | NL     | 0.0001 | 0.006 | NL   | 0.069 |
| 02/09/17                   | 7.4 | 191             | 1,274            | <2               | <0.005          | 0.29           | 241             | 477                           | 0.47                            | <0.005 | <0.001 | 0.058 | 0.33 | 0.047 |
| 02/16/17                   | 6.7 | 192             | 1,312            | <2               | <0.005          | 0.28           | 242             | 494                           | 0.47                            | <0.005 | <0.001 | 0.056 | 0.33 | 0.048 |
| 02/23/17                   | 7.3 | 193             | 1,296            | NRR <sup>4</sup> | <0.005          | 0.27           | 243             | 488                           | 0.59                            | <0.005 | <0.001 | 0.047 | 0.35 | 0.050 |
| 03/22/17                   | 7.2 | 201             | 1,302            | 6                | <0.005          | 0.34           | 248             | 482                           | 0.48                            | <0.005 | <0.001 | 0.050 | 0.28 | 0.046 |
| 03/29/17                   | 7.1 | 201             | 1,302            | <2               | <0.005          | 0.26           | 248             | 490                           | 0.45                            | <0.005 | <0.001 | 0.053 | 0.28 | 0.047 |
| 04/27/17                   | 7.2 | 204             | 1,536            | <2               | <0.005          | 0.30           | 242             | 531                           | 0.43                            | <0.005 | <0.001 | 0.035 | 0.26 | 0.047 |
| 05/25/17                   | 7.2 | 212             | 1,556            | <2               | <0.005          | 0.26           | 225             | 630                           | 0.42                            | <0.005 | <0.001 | 0.039 | 0.28 | 0.048 |
| 06/01/17                   | 6.9 | 205             | 1,700            | <2               | <0.005          | 0.23           | 203             | 692                           | 0.43                            | <0.005 | <0.001 | 0.038 | 0.28 | 0.045 |
| 06/08/17                   | 7.0 | 205             | 1,632            | <2               | <0.005          | 0.24           | 219             | 645                           | 0.67                            | <0.005 | <0.001 | 0.045 | 0.29 | 0.046 |
| 06/15/17                   | 7.2 | 217             | 1,652            | <2               | <0.005          | 0.24           | 233             | 580                           | 0.38                            | <0.005 | <0.001 | 0.037 | 0.31 | 0.046 |
| 06/22/17                   | 7.2 | 195             | 1,236            | <2               | <0.005          | 0.28           | 211             | 465                           | 0.32                            | <0.005 | <0.001 | 0.030 | 0.29 | 0.040 |
| 11/02/17                   | 7.3 | 156             | 1,002            | <2               | <0.005          | 0.26           | 171             | 362                           | 0.28                            | <0.005 | <0.001 | 0.031 | 0.25 | 0.037 |

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TABLE 3 (Continued): ANALYSIS OF GROUNDWATER SAMPLED FROM MONITORING WELL QT-2 AT THE THORNTON TRANSITIONAL RESERVOIR SITE DURING 2017

| Date Sampled <sup>1</sup>  | Cd               | Cr     | Cu     | Fe | Hg       | Mn    | Ni     | Pb    | Fecal Coliform | Temp | Water Elevation <sup>4</sup> | Recharge Time |
|----------------------------|------------------|--------|--------|----|----------|-------|--------|-------|----------------|------|------------------------------|---------------|
|                            | ----- mg/L ----- |        |        |    |          |       |        |       | CFU/100 mL     | °C   | ft                           | hr            |
| Upper 95% Confidence Limit | 0.002            | 0.007  | 0.033  | 5  | 0.0003   | 0.063 | NL     | 0.019 | NL             | NL   | NL                           | NL            |
| 02/09/17                   | <0.001           | 0.003  | <0.004 | 3  | <0.00005 | 0.030 | 0.005  | <0.01 | <1             | 12.8 | -254                         | <48           |
| 02/16/17                   | <0.001           | <0.003 | <0.004 | 3  | <0.00005 | 0.024 | 0.005  | <0.01 | <1             | 13.5 | -249                         | <48           |
| 02/23/17                   | <0.001           | <0.003 | <0.004 | 3  | <0.00005 | 0.025 | 0.006  | <0.01 | <1             | 13.7 | -248                         | <48           |
| 03/22/17                   | <0.001           | 0.003  | <0.004 | 3  | <0.00005 | 0.034 | <0.005 | <0.01 | <1             | 13.6 | -248                         | <48           |
| 03/29/17                   | <0.001           | <0.003 | <0.004 | 3  | <0.00005 | 0.025 | <0.005 | <0.01 | <1             | 13.9 | -248                         | <48           |
| 04/27/17                   | <0.001           | 0.003  | <0.004 | 3  | <0.00005 | 0.036 | 0.006  | <0.01 | <1             | 13.6 | -236                         | <48           |
| 05/25/17                   | <0.001           | 0.003  | <0.004 | 4  | <0.00005 | 0.040 | 0.005  | <0.01 | <1             | 13.8 | -234                         | <48           |
| 06/01/17                   | <0.001           | 0.003  | <0.004 | 4  | <0.00005 | 0.039 | 0.009  | <0.01 | <1             | 14.3 | -235                         | <48           |
| 06/08/17                   | <0.001           | 0.004  | 0.008  | 5  | <0.00005 | 0.045 | 0.007  | <0.01 | <1             | 15.5 | -232                         | <48           |
| 06/15/17                   | <0.001           | 0.003  | <0.004 | 4  | <0.00005 | 0.032 | 0.006  | <0.01 | <1             | 15.0 | -233                         | <48           |
| 06/22/17                   | <0.001           | 0.003  | <0.004 | 2  | <0.00005 | 0.020 | 0.005  | <0.01 | <1             | 15.6 | -235                         | <48           |
| 11/02/17                   | <0.001           | <0.003 | <0.004 | 2  | <0.00005 | 0.021 | 0.005  | <0.01 | <1             | 13.6 | -255                         | <48           |

<sup>1</sup>Samples retrieved from QT-2 following rain events as well as prolonged storage of water in reservoir (for operational procedures).

<sup>2</sup>EC = electrical conductivity; TDS = total dissolved solids.

<sup>3</sup>No limit.

<sup>4</sup>No reportable limit.

<sup>5</sup>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 2017

| Date Sampled <sup>1</sup>  | pH  | EC <sup>2</sup> | TDS <sup>2</sup> | BOD <sub>5</sub> | CN <sup>-</sup> | F <sup>-</sup> | Cl <sup>-</sup> | SO <sub>4</sub> <sup>2-</sup> | NH <sub>3</sub> -N | Phenol | Ag     | As    | B    | Ba    |
|----------------------------|-----|-----------------|------------------|------------------|-----------------|----------------|-----------------|-------------------------------|--------------------|--------|--------|-------|------|-------|
|                            |     | mS/m            | ----- mg/L ----- |                  |                 |                |                 |                               |                    |        |        |       |      |       |
| Upper 95% Confidence Limit | 7.8 | NL <sup>3</sup> | 1,353            | NL               | 0.002           | 0.36           | 190             | 238                           | NL                 | NL     | 0.0292 | 0     | NL   | 0.082 |
| 02/09/17                   | 7.4 | 142             | 1,240            | <2               | <0.005          | 0.25           | 356             | 193                           | 0.24               | <0.005 | <0.001 | <0.02 | 0.34 | 0.070 |
| 02/16/17                   | 6.8 | 226             | 1,352            | <2               | <0.005          | 0.22           | 388             | 205                           | 0.25               | <0.005 | <0.001 | <0.02 | 0.25 | 0.079 |
| 02/23/17                   | 7.0 | 226             | 1,360            | NRR <sup>4</sup> | <0.005          | 0.22           | 401             | 216                           | 0.28               | <0.005 | <0.001 | <0.02 | 0.24 | 0.085 |
| 03/22/17                   | 7.1 | 229             | 1,346            | <2               | <0.005          | 0.18           | 411             | 204                           | 0.25               | <0.005 | <0.001 | <0.02 | 0.18 | 0.083 |
| 03/29/17                   | 7.0 | 239             | 1,414            | <2               | <0.005          | 0.18           | 424             | 217                           | 0.20               | <0.005 | <0.001 | <0.02 | 0.17 | 0.080 |
| 04/27/17                   | 6.9 | 236             | 1,402            | <2               | <0.005          | 0.19           | 404             | 208                           | 0.22               | 0.005  | <0.001 | <0.02 | 0.16 | 0.083 |
| 05/25/17                   | 7.0 | 229             | 1,394            | <2               | <0.005          | 0.17           | 385             | 212                           | 0.25               | <0.005 | <0.001 | <0.02 | 0.17 | 0.080 |
| 06/01/17                   | 7.0 | 217             | 1,388            | <2               | <0.005          | 0.17           | 381             | 214                           | 0.30               | 0.005  | <0.001 | <0.02 | 0.18 | 0.080 |
| 06/08/17                   | 6.9 | 233             | 1,372            | <2               | <0.005          | 0.18           | 380             | 203                           | 0.47               | <0.005 | <0.001 | <0.02 | 0.19 | 0.078 |
| 06/15/17                   | 7.0 | 231             | 1,400            | <2               | <0.005          | 0.17           | 381             | 188                           | 0.17               | 0.006  | <0.001 | <0.02 | 0.18 | 0.078 |
| 06/22/17                   | 7.0 | 230             | 1,270            | <2               | <0.005          | 0.22           | 367             | 196                           | 0.20               | <0.005 | <0.001 | <0.02 | 0.19 | 0.075 |
| 11/02/17                   | 6.9 | 223             | 1,162            | <2               | <0.005          | 0.18           | 188             | 154                           | 0.28               | <0.005 | 0.001  | <0.02 | 0.32 | 0.059 |



TABLE 4 (Continued): ANALYSIS OF GROUNDWATER SAMPLED FROM MONITORING WELL QT-3 AT THE THORNTON TRANSITIONAL RESERVOIR SITE DURING 2017

| Date Sampled               | Cd               | Cr     | Cu     | Fe | Hg       | Mn    | Ni     | Pb    | Fecal Coliform | Temp | Water Elevation <sup>5</sup> | Recharge Time |
|----------------------------|------------------|--------|--------|----|----------|-------|--------|-------|----------------|------|------------------------------|---------------|
|                            | ----- mg/L ----- |        |        |    |          |       |        |       | CFU/100 mL     | °C   | ft                           | hr            |
| Upper 95% Confidence Limit | 0.001            | 0.006  | 0.022  | 21 | 0.00005  | 0.158 | N      | 0.014 | NL             | NL   | NL                           | NL            |
| 02/09/17                   | <0.001           | 0.003  | <0.004 | 4  | <0.00005 | 0.068 | <0.005 | <0.01 | <1             | 10.9 | -246                         | <48           |
| 02/16/17                   | <0.001           | <0.003 | <0.004 | 11 | <0.00005 | 0.086 | <0.005 | <0.01 | <1             | 11.8 | -239                         | <48           |
| 02/23/17                   | <0.001           | <0.003 | <0.004 | 13 | <0.00005 | 0.109 | <0.005 | <0.01 | <1             | 11.9 | -237                         | <48           |
| 03/22/17                   | <0.001           | <0.003 | <0.004 | 11 | <0.00005 | 0.138 | <0.005 | <0.01 | <1             | 11.6 | -236                         | <48           |
| 03/29/17                   | <0.001           | <0.003 | <0.004 | 13 | <0.00005 | 0.134 | <0.005 | <0.01 | <1             | 12.2 | -234                         | <48           |
| 04/27/17                   | <0.001           | <0.003 | 0.012  | 13 | <0.00005 | 0.209 | 0.147  | <0.01 | <1             | 12.1 | -225                         | <48           |
| 05/25/17                   | <0.001           | <0.003 | <0.004 | 14 | <0.00005 | 0.182 | <0.005 | <0.01 | <1             | 12.3 | -229                         | <48           |
| 06/01/17                   | <0.001           | <0.003 | <0.004 | 12 | <0.00005 | 0.152 | <0.005 | <0.01 | <1             | 12.5 | -236                         | <48           |
| 06/08/17                   | <0.001           | <0.003 | 0.006  | 12 | <0.00005 | 0.127 | <0.005 | <0.01 | <1             | 12.8 | -225                         | <48           |
| 06/15/17                   | <0.001           | <0.003 | <0.004 | 17 | <0.00005 | 0.213 | <0.005 | <0.01 | <1             | 13.4 | -229                         | <48           |
| 06/22/17                   | <0.001           | <0.003 | <0.004 | 14 | <0.00005 | 0.156 | <0.005 | <0.01 | <1             | 13.4 | -239                         | <48           |
| 11/02/17                   | <0.001           | <0.003 | <0.004 | 8  | <0.00005 | 0.248 | <0.005 | <0.01 | <1             | 12.0 | -267                         | <48           |

<sup>1</sup>Samples retrieved from QT-3 following rain events as well as prolonged storage of water in reservoir (for operational procedures).

<sup>2</sup>EC = electrical conductivity; TDS = total dissolved solids.

<sup>3</sup>No limit.

<sup>4</sup>No reportable result.

<sup>5</sup>Relative to Chicago City Datum (579.48 ft above mean sea level) at intersection of Madison and State Streets.

TABLE 5: ANALYSIS OF GROUNDWATER SAMPLED FROM MONITORING WELL QT-4 AT THE THORNTON TRANSITIONAL RESERVOIR SITE DURING 2017

| Date Sampled <sup>1</sup>  | pH  | EC <sup>2</sup> | TDS <sup>2</sup> | BOD <sub>5</sub> | CN <sup>-</sup> | F <sup>-</sup> | Cl <sup>-</sup> | SO <sub>4</sub> <sup>2-</sup> | NH <sub>3</sub> -N | Phenol | Ag      | As     | B    | Ba    |
|----------------------------|-----|-----------------|------------------|------------------|-----------------|----------------|-----------------|-------------------------------|--------------------|--------|---------|--------|------|-------|
|                            |     | mS/m            | ----- mg/L ----- |                  |                 |                |                 |                               |                    |        |         |        |      |       |
| Upper 95% Confidence Limit | 7.7 | NL <sup>3</sup> | 2,034            | NL               | 0.002           | 0.39           | 590             | 314                           | NL                 | NL     | 0.0033  | NL     | NL   | 0.181 |
| 02/09/17                   | 7.2 | 195             | 1,234            | <2               | <0.005          | 0.24           | 286             | 234                           | 0.32               | <0.005 | <0.0010 | <0.020 | 0.44 | 0.065 |
| 02/16/17                   | 7.0 | 195             | 1,240            | <2               | <0.005          | 0.26           | 284             | 244                           | 0.33               | <0.005 | <0.0010 | <0.020 | 0.40 | 0.072 |
| 02/23/17                   | 7.1 | 197             | 1,236            | NRR <sup>4</sup> | <0.005          | 0.25           | 283             | 242                           | 0.35               | <0.005 | <0.0010 | <0.020 | 0.41 | 0.075 |
| 03/22/17                   | 7.0 | 194             | 1,174            | <2               | <0.005          | 0.26           | 267             | 230                           | 0.35               | <0.005 | <0.0010 | <0.020 | 0.38 | 0.069 |
| 03/29/17                   | 6.9 | 196             | 1,178            | <2               | <0.005          | 0.29           | 270             | 241                           | 0.28               | <0.005 | <0.0010 | <0.020 | 0.36 | 0.068 |
| 04/27/17                   | 7.1 | 186             | 1,166            | <2               | <0.005          | 0.25           | 234             | 234                           | 0.32               | <0.005 | <0.0010 | <0.020 | 0.34 | 0.067 |
| 05/25/17                   | 7.1 | 183             | 1,172            | <2               | <0.005          | 0.20           | 224             | 244                           | 0.31               | <0.005 | <0.0010 | <0.020 | 0.39 | 0.067 |
| 06/01/17                   | 6.9 | 185             | 1,206            | <2               | <0.005          | 0.24           | 234             | 250                           | 0.38               | 0.005  | <0.0010 | <0.020 | 0.39 | 0.067 |
| 06/08/17                   | 7.0 | 187             | 1,190            | <2               | <0.005          | 0.26           | 240             | 238                           | 0.52               | <0.005 | <0.0010 | <0.020 | 0.41 | 0.063 |
| 06/15/17                   | 7.1 | 187             | 1,242            | <2               | <0.005          | 0.23           | 237             | 224                           | 0.25               | 0.008  | <0.0010 | <0.020 | 0.40 | 0.063 |
| 06/22/17                   | 7.0 | 191             | 1,176            | <2               | <0.005          | 0.25           | 253             | 240                           | 0.31               | <0.005 | <0.0010 | <0.020 | 0.39 | 0.067 |
| 11/02/17                   | 7.0 | 197             | 1,238            | <2               | <0.005          | 0.21           | 145             | 243                           | 0.33               | <0.005 | <0.0010 | <0.020 | 0.38 | 0.078 |

TABLE 5 (Continued): ANALYSIS OF GROUNDWATER SAMPLED FROM MONITORING WELL QT-4 AT THE THORNTON TRANSITIONAL RESERVOIR SITE DURING 2017

| Date Sampled               | Cd               | Cr     | Cu     | Fe | Hg       | Mn    | Ni     | Pb    | Fecal Coliform | Temp | Water Elevation <sup>5</sup> | 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     | 0.018 | NL             | NL   | NL                           | NL            |
| 02/09/17                   | <0.001           | <0.003 | <0.004 | 4  | <0.00005 | 0.092 | <0.005 | <0.01 | <1             | 14.1 | -164                         | <48           |
| 02/16/17                   | <0.001           | <0.003 | <0.004 | 10 | <0.00005 | 0.071 | <0.005 | <0.01 | <1             | 13.8 | -143                         | <48           |
| 02/23/17                   | <0.001           | <0.003 | <0.004 | 11 | <0.00005 | 0.071 | <0.005 | <0.01 | <1             | 13.5 | -144                         | <48           |
| 03/22/17                   | <0.001           | <0.003 | <0.004 | 10 | <0.00005 | 0.086 | <0.005 | <0.01 | <1             | 12.8 | -143                         | <48           |
| 03/29/17                   | <0.001           | <0.003 | <0.004 | 8  | <0.00005 | 0.063 | <0.005 | <0.01 | <1             | 13.3 | -142                         | <48           |
| 04/27/17                   | <0.001           | 0.005  | <0.004 | 8  | <0.00005 | 0.103 | <0.005 | <0.01 | <1             | 13.3 | -133                         | <48           |
| 05/25/17                   | <0.001           | <0.003 | <0.004 | 9  | <0.00005 | 0.088 | <0.005 | <0.01 | <1             | 12.6 | -131                         | <48           |
| 06/01/17                   | <0.001           | <0.003 | <0.004 | 7  | <0.00005 | 0.070 | <0.005 | <0.01 | <1             | 13.7 | -133                         | <48           |
| 06/08/17                   | <0.001           | <0.003 | <0.004 | 9  | <0.00005 | 0.064 | <0.005 | <0.01 | <1             | 13.1 | -142                         | <48           |
| 06/15/17                   | <0.001           | <0.003 | <0.004 | 7  | <0.00005 | 0.078 | <0.005 | <0.01 | <1             | 13.5 | -144                         | <48           |
| 06/22/17                   | <0.001           | <0.003 | <0.004 | 10 | <0.00005 | 0.075 | <0.005 | <0.01 | <1             | 14.5 | -142                         | <48           |
| 11/02/17                   | <0.001           | <0.003 | <0.004 | 8  | <0.00005 | 0.094 | <0.005 | <0.01 | <1             | 13.8 | -183                         | <48           |

<sup>1</sup>Samples retrieved from QT-4 following rain events as well as prolonged storage of water in reservoir (for operational procedures).

<sup>2</sup>EC = electrical conductivity; TDS = total dissolved solids.

<sup>3</sup>No limit.

<sup>4</sup>No reportable result.

<sup>5</sup>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 2017

| Date Sampled <sup>1</sup> | pH              | TDS <sup>2</sup> | BOD <sub>5</sub> | CN <sup>-</sup>  | F <sup>-</sup> | Cl <sup>-</sup> | SO <sub>4</sub> <sup>2-</sup> | NH <sub>3</sub> -N | Phenol | Ag     | As    | B     | Ba     |
|---------------------------|-----------------|------------------|------------------|------------------|----------------|-----------------|-------------------------------|--------------------|--------|--------|-------|-------|--------|
| ----- mg/L -----          |                 |                  |                  |                  |                |                 |                               |                    |        |        |       |       |        |
| 01/23/17                  | 6.0             | 500              | 3                | NRR <sup>4</sup> | 0.18           | 129             | 85                            | 0.23               | <0.005 | <0.001 | <0.02 | 0.058 | 0.0299 |
| 01/31/17                  | 6.4             | 460              | 4                | <0.005           | 0.18           | 127             | 89                            | <0.10              | <0.005 | <0.001 | <0.02 | 0.065 | 0.0291 |
| 02/08/17                  | 7.8             | 512              | 5                | <0.005           | 0.19           | 138             | 103                           | 0.28               | <0.005 | <0.001 | <0.02 | 0.123 | 0.025  |
| 02/16/17                  | 7.2             | 584              | <2               | <0.005           | 0.19           | 148             | 135                           | 0.18               | <0.005 | <0.001 | <0.02 | 0.136 | 0.0273 |
| 03/02/17                  | 7.0             | 424              | NA <sup>3</sup>  | <0.005           | 0.17           | 103             | 97                            | 0.25               | <0.005 | <0.001 | <0.02 | 0.100 | 0.035  |
| 03/07/17                  | 7.5             | 452              | 3                | <0.005           | 0.18           | 105             | 103                           | 0.23               | <0.005 | <0.001 | <0.02 | 0.087 | 0.0254 |
| 03/16/17                  | 7.9             | 498              | <2               | <0.005           | 0.18           | 109             | 113                           | 0.27               | <0.005 | <0.001 | <0.02 | 0.093 | 0.0227 |
| 03/23/17                  | 7.0             | 484              | 8                | <0.005           | 0.23           | 286             | 121                           | 0.27               | <0.005 | <0.001 | <0.02 | 0.098 | 0.0238 |
| 03/29/17                  | 6.2             | 502              | 3                | <0.005           | 0.16           | 114             | 127                           | <0.10              | <0.005 | <0.001 | <0.02 | 0.109 | 0.0214 |
| 04/03/17                  | 7.8             | 388              | 8                | <0.005           | 0.21           | 74              | 65                            | <0.10              | <0.005 | <0.001 | <0.02 | 0.062 | 0.0261 |
| 04/10/17                  | 7.7             | 306              | <2               | <0.005           | 0.22           | 69              | 63                            | 0.17               | <0.005 | <0.001 | <0.02 | 0.068 | 0.0238 |
| 04/25/17                  | 8.3             | 336              | <2               | <0.005           | 0.17           | 70              | 73                            | <0.10              | <0.005 | <0.001 | <0.02 | 0.101 | 0.0227 |
| 05/02/17                  | 8.0             | 380              | <2               | <0.005           | 0.18           | 71              | 90                            | 0.22               | <0.005 | <0.001 | <0.02 | 0.085 | 0.0198 |
| 05/09/17                  | NA <sup>3</sup> | 358              | 4                | <0.005           | <0.10          | 69              | 87                            | 0.18               | <0.005 | <0.001 | <0.02 | 0.117 | 0.0204 |
| 05/11/17                  | 6.3             | 364              | <2               | <0.005           | 0.16           | 67              | 81                            | 0.15               | <0.005 | <0.001 | <0.02 | 0.131 | 0.0198 |
| 05/17/17                  | 8.2             | 406              | <2               | <0.005           | 0.17           | 66              | 108                           | <0.10              | <0.005 | <0.001 | <0.02 | 0.097 | 0.0193 |
| 05/25/17                  | 8.6             | 424              | <2               | <0.005           | 0.14           | 79              | 96                            | 0.19               | <0.005 | <0.001 | <0.02 | 0.088 | 0.0191 |
| 06/01/17                  | 6.2             | 434              | 5                | <0.005           | 0.14           | 70              | 97                            | <0.10              | <0.005 | <0.001 | <0.02 | 0.093 | 0.0189 |
| 06/08/17                  | 8.1             | 438              | <2               | <0.005           | 0.20           | 74              | 100                           | 0.24               | <0.005 | <0.001 | <0.02 | 0.093 | 0.0184 |
| 06/15/17                  | 7.9             | 514              | 4                | <0.005           | 0.15           | 73              | 99                            | <0.10              | <0.005 | <0.001 | <0.02 | 0.083 | 0.0214 |
| 07/24/17                  | 7.9             | 596              | 3                | <0.005           | 0.20           | 81              | 129                           | 0.12               | <0.005 | <0.001 | <0.02 | 0.121 | 0.0254 |
| 10/16/17                  | 7.3             | 256              | 4                | 0.005            | 0.17           | 44              | 69                            | 0.26               | <0.005 | <0.001 | <0.02 | 0.083 | 0.0212 |
| 10/26/17                  | 6.4             | 406              | 5                | <0.005           | 0.18           | 62              | 69                            | <0.10              | <0.005 | <0.001 | <0.02 | 0.136 | 0.0175 |
| 11/02/17                  | 7.2             | 434              | 4                | <0.005           | 0.18           | 71              | 175                           | <0.10              | <0.005 | <0.001 | <0.02 | 0.153 | 0.019  |

TABLE 6 (Continued): ANALYSIS OF FILL-EVENT WATER STORED IN THE THORNTON TRANSITIONAL RESERVOIR LOCATED AT THE THORNTON SITE AND SAMPLED DURING 2017

| Date Sampled <sup>1</sup> | Cd               | Cr     | Cu     | Fe    | Hg       | Mn   | Ni     | Pb    | Fecal Coliform | Temp | Depth of Water |
|---------------------------|------------------|--------|--------|-------|----------|------|--------|-------|----------------|------|----------------|
|                           | ----- mg/L ----- |        |        |       |          |      |        |       | CFU/100 mL     | °C   | ft             |
| 01/23/17                  | <0.001           | 0.003  | 0.004  | 2.20  | <0.00005 | 0.06 | 0.005  | <0.01 | 1,100          | 3.0  | 12             |
| 01/31/17                  | <0.001           | 0.005  | 0.004  | 2.45  | <0.00005 | 0.10 | 0.005  | <0.01 | 40             | 11.0 | 15             |
| 02/08/17                  | <0.001           | <0.003 | <0.004 | 0.70  | <0.00005 | 0.02 | <0.005 | <0.01 | <10            | 6.5  | 15             |
| 02/16/17                  | <0.001           | 0.003  | <0.004 | 1.21  | <0.00005 | 0.04 | 0.005  | <0.01 | <10            | NA   | 2              |
| 03/02/17                  | <0.001           | 0.005  | 0.005  | 3.41  | <0.00005 | 0.06 | 0.005  | <0.01 | 2,600          | 3.0  | 14             |
| 03/07/17                  | <0.001           | 0.003  | <0.004 | 1.42  | <0.00005 | 0.03 | 0.005  | <0.01 | 40             | 8.0  | 13             |
| 03/16/17                  | <0.001           | <0.003 | <0.004 | 0.59  | <0.00005 | 0.01 | <0.005 | <0.01 | <10            | 4.2  | 14             |
| 03/23/17                  | <0.001           | <0.003 | <0.004 | 0.79  | <0.00005 | 0.02 | 0.005  | <0.01 | <10            | 5.3  | 5              |
| 03/29/17                  | <0.001           | <0.003 | <0.004 | 0.35  | <0.00005 | 0.01 | 0.005  | <0.01 | 20             | 11.0 | 10             |
| 04/03/17                  | <0.001           | 0.003  | <0.004 | 1.68  | <0.00005 | 0.04 | <0.005 | <0.01 | 690            | 6.0  | 20             |
| 04/10/17                  | <0.001           | <0.003 | <0.004 | 1.30  | <0.00005 | 0.02 | <0.005 | <0.01 | 120            | 10.0 | 20             |
| 04/25/17                  | <0.001           | <0.003 | <0.004 | 0.83  | <0.00005 | 0.03 | 0.006  | <0.01 | 90             | 14.0 | 20             |
| 05/02/17                  | <0.001           | <0.003 | <0.004 | 0.65  | <0.00005 | 0.02 | 0.005  | <0.01 | 220            | 11.0 | 25             |
| 05/09/17                  | <0.001           | <0.003 | <0.004 | 0.44  | <0.00005 | 0.01 | <0.005 | <0.01 | NA             | NA   | NA             |
| 05/11/17                  | <0.001           | <0.003 | <0.004 | 0.36  | <0.00005 | 0.01 | <0.005 | <0.01 | 20             | 12.0 | >20            |
| 05/17/17                  | <0.001           | <0.003 | <0.004 | 0.25  | <0.00005 | 0.00 | 0.006  | <0.01 | <1             | 19.0 | 20             |
| 05/25/17                  | <0.001           | <0.003 | <0.004 | 0.10  | <0.00005 | 0.00 | <0.005 | <0.01 | 9              | 16.0 | 20             |
| 06/01/17                  | <0.001           | <0.003 | <0.004 | 0.06  | <0.00005 | 0.00 | 0.005  | <0.01 | <10            | 22.8 | >20            |
| 06/08/17                  | <0.001           | <0.003 | <0.004 | <0.05 | <0.00005 | 0.00 | <0.005 | <0.01 | <10            | 21.0 | 20             |
| 06/15/17                  | <0.001           | <0.003 | <0.004 | 0.79  | <0.00005 | 0.02 | 0.006  | <0.01 | 20             | 19.0 | 15             |
| 07/24/17                  | <0.001           | 0.003  | <0.004 | 0.80  | <0.00005 | 0.02 | <0.005 | <0.01 | 1,200          | 25.0 | NA             |
| 10/16/17                  | <0.001           | 0.003  | 0.005  | 1.67  | <0.00005 | 0.05 | <0.005 | <0.01 | 9,700          | 15.0 | >5             |
| 10/26/17                  | <0.001           | <0.003 | <0.004 | 0.47  | <0.00005 | 0.02 | 0.005  | <0.01 | 9              | 11.0 | <15            |
| 11/02/17                  | <0.001           | <0.003 | <0.004 | 0.09  | <0.00005 | 0.01 | 0.007  | <0.01 | <10            | 13.0 | <3             |

<sup>1</sup>Samples retrieved from the Transitional Reservoir following rain events during 2017, and also due to prolonged storage of water in reservoir at the frequency similar to monitoring wells.

<sup>2</sup>TDS = total dissolved solids.

<sup>3</sup>No available reading.

<sup>4</sup>No reportable result.

TABLE 7: EXCEEDANCES<sup>1</sup> DETECTED IN WELLS AT THE THORNTON TRANSITIONAL RESERVOIR SITE DURING 2017

| Well | Parameter Exceeding Limit <sup>1</sup> |
|------|--|
| 1    | TDS, Cl <sup>-</sup> , Mn              |
| 2    | As                                     |
| 3    | TDS, Cl <sup>-</sup> , Ba, Mn          |
| 4    | None                                   |

<sup>1</sup>Concentrations of analytes exceed upper limits of 95% confidence intervals for background samples.