

*Protecting Our Water Environment*



***Metropolitan Water Reclamation District of Greater Chicago***

***MONITORING AND RESEARCH  
DEPARTMENT***

***REPORT NO. 17-43***

***THORNTON COMPOSITE RESERVOIR***

***GROUNDWATER MONITORING REPORT***

***SECOND QUARTER 2017***

***September 2017***

## Protecting Our Water Environment

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September 26, 2017

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

Dear Mr. Cobb:

Subject: Transmittal of the Report "Thornton Composite Reservoir Groundwater Monitoring Report Second Quarter 2017"

Please find attached the report entitled "Thornton Composite Reservoir Groundwater Monitoring Report Second Quarter 2017" transmitted electronically. The report is prepared for transmittal to the Illinois Environmental Protection Agency (IEPA) in accordance with the Thornton Composite Reservoir Groundwater Monitoring Plan. Also attached are the Excel spreadsheets of the Thornton Composite Reservoir raw data from TestAmerica Laboratory as required by the IEPA.

If you have any questions or would like to have additional information, please contact Dr. Pauline Lindo at (708) 588-4109 or pauline.lindo@mwr.org.

Very truly yours,

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

AC:PL:cm

Attachments

cc: Mr. E. Podczerwinski

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**THORNTON COMPOSITE RESERVOIR GROUNDWATER  
MONITORING REPORT SECOND QUARTER 2017**

**By**

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## LIST OF ACRONYMS

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Acronym	Definition
CCD	Chicago City Datum
CSF	Combined Sewer Flow
FC	Fecal Coliform
GMP	Groundwater Monitoring Plan
GPS	Groundwater Protection System
IAC	Illinois Administrative Code
M&R	Monitoring and Research
TCR	Thornton Composite Reservoir
TDS	Total Dissolved Solids
TOC	Total Organic Carbon

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## **ACKNOWLEDGMENT**

This report for the Thornton Composite Reservoir Groundwater Monitoring was generated by the Monitoring and Research (M&R) Department. All samples were collected by Andrews Engineering, Inc. (contractor) under the Thornton Composite Reservoir contract 16-104-11. All analyses were performed by TestAmerica Analytical Laboratories, Inc. Special thanks are due to Ms. Coleen Maurovich for typing and formatting this report.

## **DISCLAIMER**

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

## INTRODUCTION

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

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

The locations of monitoring wells, quarry sump, TCR, and the GPS are presented in Figure 1. The Main Quarry Sump is located beyond the south boundary of the GPS and is not a component of the TCR but is an integral part of the Hanson Material Services mining quarry to the south of the TCR. This sump facilitates mining operations by minimizing the water level at the bottom of the quarry. It is possible that the bottom of this sump could extend beyond the lowest depth of the TCR (-297.5 CCD) ft. The sump contains mainly groundwater and small quantities of surface runoff, and it is sampled quarterly, 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 GPS, the Revised GMP (2016) presents the analysis of data for all samples collected during the background monitoring period and provides a baseline for comparison with routine monitoring data. Changes over time in groundwater calcium and magnesium concentrations would also be useful in tracking the occurrence of infiltration/exfiltration. Groundwater analytical data routinely generated for the monitoring wells, reservoir, and sump

FIGURE 1: MONITORING WELL AND MAIN QUARRY SUMP LOCATIONS

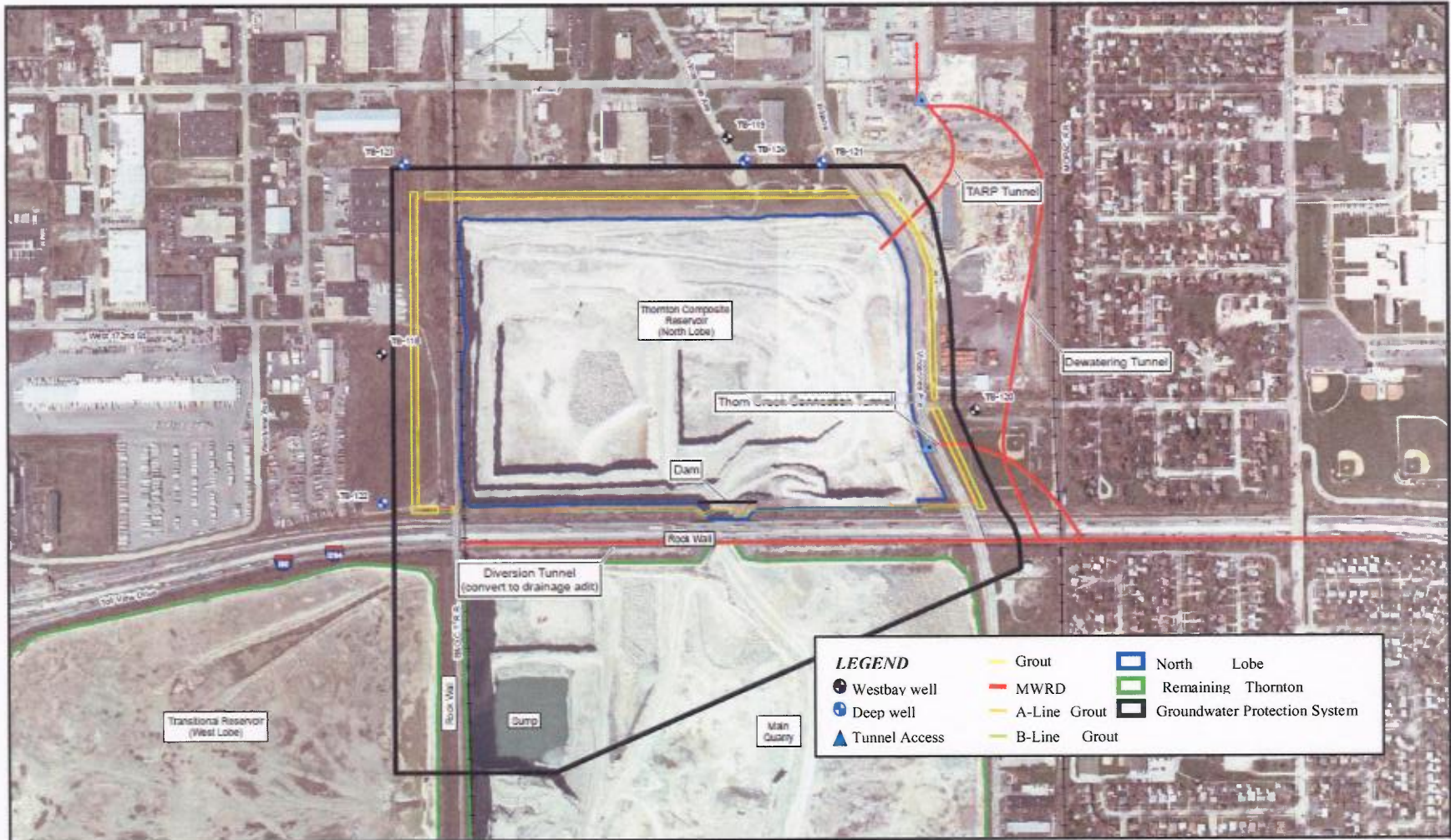


TABLE 1: CHARACTERISTICS OF MONITORING WELLS TB-118 THROUGH TB-124  
AT THE THORNTON COMPOSITE RESERVOIR SITE

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

<sup>1</sup>Illinois State Plane Coordinate System (NAD 1927).

<sup>2</sup>Chicago City Datum (CCD).

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

There were five fill events during the second quarter of 2017. This report presents field activities, observations, and analytical (inorganic) data for surface and groundwater monitoring samples taken at the Main Quarry Sump and at all monitoring wells during the second quarter/fill-event samplings of March 31 through June 30, 2017.

## FIELD ACTIVITIES

For this report period, five sets of fill-event monitoring samples were collected at the sump, the deep well, and sampling port intervals 2 and 3 of all multi-level wells. These fill-event samples also fulfilled the monitoring requirement for the second quarter of 2017. Samples were collected according to the schedule listed in Table 2.

Using a WTW Multi 3400i pH/conductivity/temperature meter, the pH, electrical conductivity (EC), and temperature of each sample were measured and recorded immediately after collection.

Prior to sampling the multi-level wells, hydrostatic pressure was measured to calculate the groundwater elevation at the port sampled. Table 3 lists the elevations at Port 2 or 3 of each well and the corresponding groundwater elevations during this sampling period.

All samples were packed in ice and shipped to IL State ELAP/NELAC-certified TestAmerica Laboratories, Inc. for the analysis of selected inorganic constituents listed in IAC Title 35 Part 620 Class I Groundwater Standards in accordance with the revised GMP for the fill-event samples. Additional aliquots were also prepared in the field and shipped in ice by Test America to Arro Laboratory, Inc. for fecal coliform analysis.

TABLE 2: DEVICES AND CORRESPONDING DATES OF SAMPLING  
DURING THE FILL EVENTS OF APRIL THROUGH JUNE 2017

Date of Sampling	Device/Structure Sampled
March 31-April 4 Event <sup>1</sup> :	
03/31/2017	TB-121, TB-124, TB-124 Dup
04/03/2017	TB-119, TB-120, Sump
04/04/2017	TB-118, TB-122, TB-123
April 18-20 Event:	
04/18/2017	TB-118, TB-123, TB-123 Dup
04/19/2017	TB-119, TB-121, TB-122
04/20/2017	TB-120, TB-124, Sump
May 2-5 Event:	
05/02/2017	TB-119, TB-120
05/03/2017	TB-118, TB-118 Dup, TB-122
05/04/2017	TB-121, Sump
05/05/2017	TB-123, TB-124
May 22-24 Event:	
05/22/2017	TB-119, TB-120
05/23/2017	TB-118, TB-122, TB-122 Dup, Sump
05/24/2017	TB-121, TB-123, TB-124
June 7-9 Event:	
06/07/2017	TB-119, TB-122
06/08/2017	TB--118, TB-121, TB-121 Dup, TB-123
06/09/2017	TB-120, TB-124, Sump

<sup>1</sup>Sampling started from the last day of the first quarter.

TABLE 3: SUMMARY OF ELEVATIONS AT PORT OF SAMPLING FOR EACH WELL AND CORRESPONDING GROUNDWATER ELEVATIONS DURING THE MONITORING OF APRIL THROUGH JUNE 2017

Well ID	Sampling Port 002 Elevation (ft CCD <sup>1</sup> )	Groundwater Elevation (ft CCD)	Groundwater Elevation (ft CCD)	Groundwater Elevation (ft CCD)	Groundwater Elevation (ft CCD)	Sampling Port 003 Elevation (ft CCD)	Groundwater Elevation (ft CCD)
		(March 31-April 4)	(April 18-20)	(May 2-5)	(May 22-24)		(June 7-9)
TB-118	-218	-92	-90	-90	-90	-289	-91
TB-119	-218	-178	-165	-182	-174	-289	-167
TB-120	-219	-154	-138	-133	-139	-290	-179
TB-121	-217	-188	-174	-173	-173	-288	-172
TB-122	-217	-165	-162	-163	-163	-288	-163
TB-123	-217	-52	-141	-51	-51	-288	-51
TB-124 <sup>2</sup>	NA	-445	-374	-446	-442	NA	-442

<sup>1</sup>Chicago City Datum.

<sup>2</sup>TB-124 is a conventional well screened from -663 to -698 ft below ground surface. During Quarter 2, samples were taken at approximately 650 ft below ground surface.

<sup>3</sup>NA = Not Applicable.



## ANALYTICAL RESULTS

Table 4 lists the analytical methods for parameters used by the laboratory. The analytical data for all well samples and the Main Quarry Sump samples collected during April through June 2017 are presented in Tables 5 through 9, respectively. Analytical results were reviewed to identify any analytes that exceeded the Illinois Class I Groundwater Standards (35 IAC Part 620).

During the April-June 2017 fill-event sampling, among the inorganic analytes, there were a few exceedances of the Part 620 groundwater standards, including total dissolved solids (TDS), chloride, sulfate, and boron, as indicated in bold font in Tables 5 through 9. These exceedances occurred in several wells and in the sump. However, none of these constituents showed concentrations exceeding the maximum background levels.

The fecal coliform (FC) populations of samples collected during the sampling events of this quarter at all monitoring wells were all undetectable (Tables 5 through 9). However, FC was detected at the Main Quarry sump (2-80 CFU/100 mL) (Tables 5 through 9).

TABLE 4: ANALYTICAL METHODS USED FOR REQUIRED PARAMETERS

Inorganic Chemical Parameters	Analytical Method <sup>1</sup>
Chloride	325.2
Alkalinity, Bicarbonate	2320B
Total Dissolved Solids	2540C
Sulfate	4500-SO4-2 C or D
TAL metals	6010B & 7470A
Ammonia (as N)	350.1R2.0
Hardness	2340B
TOC	5310C
Others:	
Phenols	SVOC/8270C
Fecal Coliform	SM 9221E

<sup>1</sup>All standard EPA methods used by NELAC-certified and other laboratories.

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 DURING THE MARCH 31-APRIL 4, 2017, MONITORING

Parameter	Unit	Part 620 Groundwater Standard	Maximum Background	Lab RL <sup>1</sup>	Well								Sump
					TB-118	TB-119	TB-120	TB-121	TB-122	TB-123	TB-124	TB-124-D <sup>2</sup>	
pH		6.5 - 9.0	8.4	NL <sup>3</sup>	7.2	8.3	8.0	8.1	7.9	7.8	8.0	8.0	8.2
EC	mS/m	NL	415	NL	251	140	173	102	409	57	118	118	129
TDS	mg/L	1,200	2,960	10	1,700	990	1,100	650	2,700	400	1,600	1,600	1,100
TOC	"	NL	1.0	1.0	2.8	2.5	2.8	1.7	2.5	1.4	1.0	1.0	1.9
Chloride	"	200	1,230	2	540	240	320	100	1,100	8	290	290	140
Sulfate	"	400	890	2	210	190	200	100	330	17	640	630	440
Ammonia as N	"	NL	NA <sup>4</sup>	0.20	0.54	0.43	0.25	0.58	0.41	0.59	0.96	0.97	0.20
Total Phenol	"	0.10	0.06	0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005
Fecal Coliform <sup>5</sup>	CFU/100 mL	NL	<1	10	<10	<10	<10	<10	<10	<10	<10	<10	80
Ag	mg/L	0.05	0.003	0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005
B	"	2	3.8	0.050	0.52	1.0	0.48	1.2	0.22	2.0	1.2	1.3	0.26
Be	"	0.004	0.002	0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001
Co	"	1	0.035	0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	0.019
Cr	"	0.1	86.4	0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005
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	0.0025	0.0110	0.0075	0.0030	0.0026	0.0140	<0.0025	<0.0034	0.0036	0.0052
Se	"	0.05	0.008	0.0025	<0.0025	<0.0025	<0.0025	<0.0025	<0.0025	<0.0025	<0.0025	<0.0025	<0.0025
V	"	0.049	NA	0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005
Zn	"	5	10	0.020	<0.020	0.045	<0.020	0.036	<0.020	0.034	1.2	1.1	<0.020
Ca	"	NL	276	0.20	210	120	130	97	190	38	69	68	120
Mg	"	NL	153	0.20	100	67	67	55	92	23	67	68	87

<sup>1</sup>Lab reporting limit.

<sup>2</sup>Duplicate sample.

<sup>3</sup>No existing limit.

<sup>4</sup>No analysis performed.

<sup>5</sup><10 CFU/100 mL is reported as no detection, since a 10-mL rather than 100 mL aliquot was used in the FC analysis of samples.

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 DURING THE APRIL 18-20, 2017, MONITORING

Parameter	Unit	Part 620 Groundwater Standard	Maximum Background	Lab RL <sup>1</sup>	Well								Sump
					TB-118	TB-119	TB-120	TB-121	TB-122	TB-123	TB-123 D <sup>2</sup>	TB-124	
pH		6.5 - 9.0	8.4	NL <sup>3</sup>	7.0	7.5	7.2	7.3	6.9	7.8	7.8	9.3	8.4
EC	mS/m	NL <sup>3</sup>	415	0.5	261	146	173	111	313	64	64	224	123
TDS	mg/L	1,200	2,960	10	1,800	900	1,100	670	2,100	480	360	1,500	950
TOC	"	NL	1.0	0.1	3.8	2.4	3.1	1.9	3.8	1.8	1.6	<1.0	2.6
Chloride	"	200	1,230	5	680	230	250	140	720	7	46	290	100
Sulfate	"	400	890	15	260	180	180	120	320	20	130	640	360
Ammonia as N	"	NL	NA <sup>4</sup>	0.10	0.45	0.48	0.20	0.58	0.34	0.58	0.60	1.0	<0.20
Total Phenol	"	0.10	0.06	0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005
Fecal Coliform <sup>5</sup>	CFU/100 mL	NL	<1	10	<10	<10	<10	<10	<10	<10	<10	<10	<10
Ag	mg/L	0.05	0.003	0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005
B	"	2	3.8	0.05	0.44	0.20	1.2	1.2	0.29	2.1	2.0	1.1	0.17
Be	"	0.004	0.002	0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001
Co	"	1	0.035	0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	0.001	<0.001	0.010
Cr	"	0.1	86.4	0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005
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	0.0025	0.0100	0.0072	0.0110	0.0030	0.0190	<0.0025	<0.0025	0.0058	0.0100
Se	"	0.05	0.008	0.0025	<0.0025	<0.0025	<0.0025	<0.0025	<0.0025	<0.0025	<0.0025	<0.0025	<0.0025
V	"	0.049	NA	0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005
Zn	"	5	10	0.020	0.024	0.029	0.024	<0.020	0.045	<0.020	<0.020	2.1	<0.020
Ca	"	NL	276	0.20	210	130	130	100	190	41	39	51	100
Mg	"	NL	153	0.20	100	69	62	57	95	24	23	83	70

<sup>1</sup>Lab reporting limit.

<sup>2</sup>Duplicate sample

<sup>3</sup>No existing limit.

<sup>4</sup>No analysis performed.

<sup>5</sup><10 CFU/100 mL is reported as no detection, since a 10-mL rather than 100 mL aliquot was used in the FC analysis of samples

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 DURING THE MAY 2-5, 2017, MONITORING

Parameter	Unit	Part 620 Groundwater Standard	Maximum Background	Lab RL <sup>1</sup>	Well								Sump
					TB-118	TB-118- D <sup>2</sup>	TB-119	TB-120	TB-121	TB-122	TB-123	TB-124	
pH		6.5 - 9.0	8.4	NL <sup>3</sup>	6.8	6.8	7.1	7.0	7.2	7.1	7.5	8.9	8.1
EC	mS/m	NL <sup>3</sup>	415	0.5	235	235	144	171	104	300	61	216	117
TDS	mg/L	1,200	2,960	10	1,700	1,700	1,000	1,100	700	2,000	360	1,600	870
TOC	"	NL	1.0	0.1	3.2	3.2	2.6	4.7	2.0	3.6	1.3	1.0	2.3
Chloride	"	200	1,230	5	150	150	260	300	69	190	9	150	110
Sulfate	"	400	890	15	55	52	180	180	52	81	26	310	360
Ammonia as N	"	NL	NA <sup>4</sup>	0.10	0.39	0.39	0.20	0.58	0.59	0.32	0.55	0.96	<0.20
Total Phenol	"	0.10	0.06	0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005
Fecal Coliform	CFU/100 mL	NL	<1	1	<1	<1	<1	<1	<1	<1	<1	<1	2
Ag	mg/L	0.05	0.003	0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005
B	"	2	3.8	0.05	0.43	0.42	0.90	0.22	1.2	0.25	1.8	1.2	0.16
Be	"	0.004	0.002	0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001
Co	"	1	0.035	0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	0.009
Cr	"	0.1	86.4	0.001	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005
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	0.0025	0.0099	0.0095	0.0062	0.0095	0.0033	0.0170	<0.0025	0.0050	0.0037
Se	"	0.05	0.008	0.0025	<0.0025	<0.0025	<0.0025	<0.0025	<0.0025	<0.0025	<0.0025	<0.0025	<0.0025
V	"	0.049	NA	0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005
Zn	"	5	10	0.020	<0.020	<0.020	0.038	<0.020	0.039	<0.020	0.023	2.2	<0.020
Ca	"	NL	276	0.20	190	190	120	130	110	180	37	67	100
Mg	"	NL	153	0.20	98	94	65	65	63	92	22	76	69

<sup>1</sup>Lab reporting limit.

<sup>2</sup>Duplicate sample.

<sup>3</sup>No existing limit.

<sup>4</sup>No analysis performed.

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 DURING THE MAY 22-24, 2017 MONITORING

Parameter	Unit	Part 620 Groundwater Standard	Maximum Background	Lab RL <sup>1</sup>	Well								Sump
					TB-118	TB-119	TB-120	TB-121	TB-122	TB-122 D <sup>2</sup>	TB-123	TB-124	
pH		6.5 - 9.0	8.4	NL <sup>3</sup>	6.9	7.2	6.9	7.6	6.8	6.8	7.7	8.7	8.1
EC	mS/m	NL <sup>3</sup>	415	0.5	254	159	180	111	393	393	61	231	116
TDS	mg/L	1,200	2,960	10	1,600	1,000	1,100	670	2,700	2,600	350	1,500	890
TOC	"	NL	1.0	0.1	3.1	2.1	3.0	1.7	3.1	3.1	1.1	<1.0	2.6
Chloride	"	200	1,230	5	640	240	290	160	1,200	1,200	8	350	120
Sulfate	"	400	890	15	220	160	180	110	350	360	19	690	330
Ammonia as N	"	NL	NA <sup>4</sup>	0.10	0.42	0.49	0.20	0.47	0.39	0.37	0.41	0.87	<0.20
Total Phenol	"	0.10	0.06	0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005
Fecal Coliform	CFU/100 mL	NL	<1	1	<1	<1	<1	<1	<1	<1	<1	<1	8
Ag	mg/L	0.05	0.003	0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005
B	"	2	3.8	0.05	0.42	1.0	0.24	1.1	0.20	0.19	0.31	1.2	0.15
Be	"	0.004	0.002	0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001
Co	"	1	0.035	0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	0.001	<0.001	0.006
Cr	"	0.1	86.4	0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005
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	0.0025	0.0089	0.0066	0.0091	0.0031	0.0150	0.0140	0.0180	0.0041	0.0033
Se	"	0.05	0.008	0.0025	<0.0025	<0.0025	<0.0025	<0.0025	<0.0025	<0.0025	<0.0025	<0.0025	<0.0025
V	"	0.049	NA	0.005	<0.005	<0.005	0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005
Zn	"	5	10	0.020	<0.020	0.040	0.059	0.020	<0.020	<0.020	6.7	1.5	<0.020
Ca	"	NL	276	0.20	170	120	130	110	180	180	49	51	96
Mg	"	NL	153	0.20	93	70	64	61	95	93	22	83	68

<sup>1</sup>Lab reporting limit.

<sup>2</sup>Duplicate sample.

<sup>3</sup>No existing limit.

<sup>4</sup>No analysis performed.

TABLE 9: ANALYSIS OF GROUNDWATER SAMPLED FROM MONITORING WELLS TB-118 THROUGH TB-124 AND THE MAIN QUARRY SUMP AT THE THORNTON COMPOSITE RESERVOIR SITE DURING THE JUNE 7-9, 2017 MONITORING

Parameter	Unit	Part 620 Groundwater Standard	Maximum Background	Lab RL <sup>1</sup>	Well								Sump
					TB-118	TB-119	TB-120	TB-121	TB-121 D <sup>2</sup>	TB-122	TB-123	TB-124	
pH		6.5 - 9.0	8.4	NL <sup>3</sup>	6.8	7.4	7.1	7.1	7.1	7.1	7.4	9.1	8.2
EC	mS/m	NL <sup>3</sup>	415	0.5	182	84	118	152	152	148	94	222	121
TDS	mg/L	1,200	2,960	10	1,100	560	740	990	1,000	930	620	1,500	860
TOC	"	NL	1.0	0.1	3.8	2.2	4.3	2.2	2.1	2.9	2.2	1.9	3.9
Chloride	"	200	1,230	5	330	66	170	280	280	250	61	340	130
Sulfate	"	400	890	15	210	93	100	210	200	88	130	590	310
Ammonia as N	"	NL	NA <sup>4</sup>	0.10	0.53	0.50	0.45	0.57	0.59	0.54	0.67	1.0	<0.20
Total Phenol	"	0.10	0.06	0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005
Fecal Coliform	CFU/100 mL	NL	<1	1	<1	<1	<1	<1	<1	<1	<1	<1	<1
Ag	mg/L	0.05	0.003	0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005
B	"	2	3.8	0.05	0.89	1.7	1.0	1.1	1.0	2.5	1.9	1.1	0.19
Be	"	0.004	0.002	0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001
Co	"	1	0.035	0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	0.004
Cr	"	0.1	86.4	0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005
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	0.0025	0.0054	0.0063	0.0042	0.0028	0.0025	0.0032	0.0026	0.0035	0.0033
Se	"	0.05	0.008	0.0025	<0.0025	<0.0025	<0.0025	<0.0025	<0.0025	<0.0025	<0.0025	<0.0025	<0.0025
V	"	0.049	NA	0.005	<0.005	<0.005	0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005
Zn	"	5	10	0.020	0.036	<0.020	<0.020	<0.020	<0.020	<0.020	<0.020	1.9	<0.020
Ca	"	NL	276	0.20	160	76	93	130	130	68	81	44	100
Mg	"	NL	153	0.20	79	40	48	73	71	36	46	77	67

<sup>1</sup>Lab reporting limit.

<sup>2</sup>Duplicate sample.

<sup>3</sup>No existing limit.

<sup>4</sup>No analysis performed.

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