

Protecting Our Water Environment



Metropolitan Water Reclamation District of Greater Chicago

***MONITORING AND RESEARCH
DEPARTMENT***

REPORT NO. 14-34

TUNNEL AND RESERVOIR PLAN

THORNTON TRANSITIONAL FLOOD CONTROL

RESERVOIR AND WELLS

ANNUAL GROUNDWATER MONITORING REPORT

FOR 2013

September 2014

Protecting Our Water Environment

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September 26, 2014

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

Dear Ms. Willhite:

Subject: Thornton Transitional Flood Control Reservoir and Wells, Annual Groundwater Monitoring Report for 2013

Attached are three copies of "Tunnel and Reservoir Plan, Thornton Transitional Flood Control Reservoir and Wells, Annual Groundwater Monitoring Report for 2013."

Since there were several fill events in the Thornton Transitional Flood Control Reservoir during 2013, groundwater samples were collected and analyzed during the year.

Very truly yours,

Thomas C. Granato, Ph.D.
Director
Monitoring and Research

TCG:PL:cm

cc w/att. Ms. Sally K. Swanson (USEPA Region 5 - WC15J) - (2)
Dr. Zhang
Dr. Cox
Dr. Hundal
Dr. Lindo
cc w/o att: Mr. St. Pierre
Ms. Sharma
Mr. Cohen

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**TUNNEL AND RESERVOIR PLAN
THORNTON TRANSITIONAL FLOOD CONTROL
RESERVOIR AND WELLS
ANNUAL GROUNDWATER MONITORING REPORT
FOR 2013**

Monitoring and Research Department
Thomas C. Granato, Director

September 2014

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ANNUAL DATA FOR MONITORING WELLS AND 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 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 concentration limits of analytes.

Project Description

The Reservoir is 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, at an average cost of \$6.8 million per year. 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 rationale for collecting groundwater quality data for the four monitoring wells QT-1, QT-2, QT-3, and QT-4 and the Transitional Reservoir is to detect any potential contamination of groundwater in the monitoring wells and/or reservoir which may result from seepage during a fill or diversion event and to immediately implement measures to curtail and/or correct that contamination.

The analytes measured are:

1. pH, electrical conductivity (EC), total dissolved solids (TDS), BOD₅, CN⁻, F⁻, Cl⁻, SO₄²⁻, NH₃-N, NO₂+NO₃-N, and phenol.

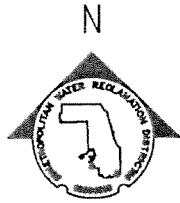
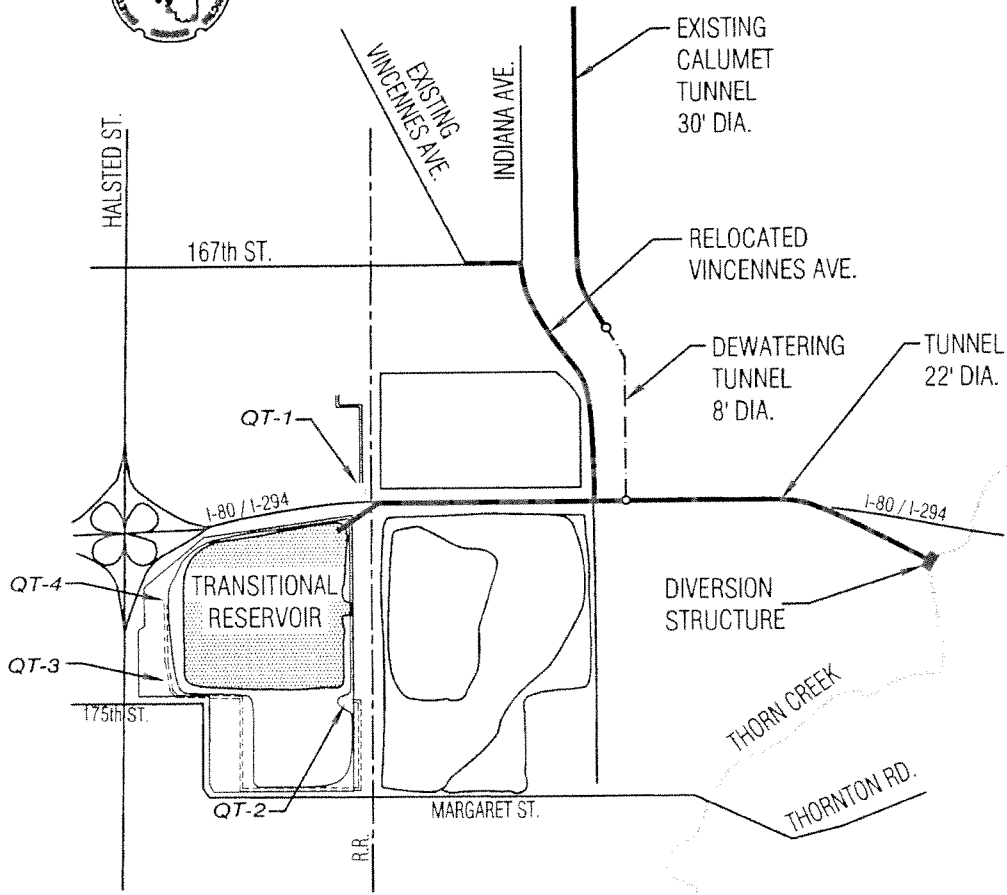


FIGURE 1

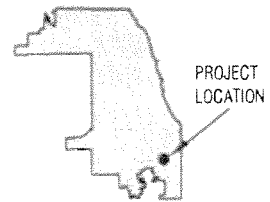


LOCATION MAP
Scale: NTS

LEGEND

- Monitoring Well
- ==== New Access Road
- Existing Access Road (to be improved)

MWRD SERVICE AREA



**THORNTON TRANSITIONAL RESERVOIR
MONITORING WELL LOCATIONS**

METROPOLITAN WATER RECLAMATION
DISTRICT OF GREATER CHICAGO
ENGINEERING DEPARTMENT
11-03 PLANNING JJK

2. Metals and trace elements: Ag, As, B, Ba, Cd, Cr, Cu, Fe, Hg, Mn, Ni, and Pb.
3. Other parameters: fecal coliform (FC), groundwater temperature, and water elevation.

There were four significant rain events and subsequent diversion/fill events during 2013 (Table 1) which required the sampling of both ground- and surface waters for analysis and evaluation. However, since the third and fourth events occurred close to each other, while there was still water in the reservoir from the third event, sampling for the third and fourth events were combined (listed as 'Event 3' in Tables 2 through 5).

Summary of Data for Monitoring Wells and Reservoir

Prior to all diversion/pumpdown events and based on the requirements of the SOW, the monitoring wells and the Reservoir were sampled weekly as long as there was water in the Reservoir. Analytical data generated during the March 13 – May 16 and June 5 – 19 fill events of 2013 are presented in Tables 2 through 6 for Wells QT-1, -2, -3, -4, and the Reservoir, respectively. During these events, several parameters exceeded the 95 percent upper confidence limits established for the background samples (Tables 2 through 6). There was no exceedance in Wells QT-1 through -4 for CN^- , $\text{NO}_2+\text{NO}_3\text{-N}$, FC, Ag, Cd, Cr, Hg, and Pb. However, there were exceedances in all the wells for EC, TDS, F^- , Cl^- , SO_4^{2-} , $\text{NH}_3\text{-N}$, B, Ba, Fe, and Mn. Exceedances for phenol, As, Cu, Ni, and BOD_5 were sporadic in the wells. The confidence limit for BOD_5 was exceeded only once in Well QT-3, and that occurred during the second rain event (E2) of 2013. For all other wells, there was no BOD_5 exceedance during all rain events.

The Reservoir samples experienced a higher incidence of exceedances than the well samples. There were exceedances for the following analytes: TDS, BOD_5 , F^- , Cl^- , SO_4^{2-} , $\text{NH}_3\text{-N}$, FC, and metals Ba, Cr, Cu, Fe, Mn, Ni, and Pb. The analytes that showed no exceedances were CN^- , phenol, Ag, As, B, Cd, and Hg (Table 6).

Any event during which the concentrations of analytes exceed the upper limit of the 95 percent confidence interval is regarded as an excursion. An excursion may be defined as an elevated reading within a specific isolated location and indicates the potential for contamination. It may also be considered as the movement of constituents (as determined by analysis for control parameters) into a designated monitoring well. Overall, based on the number of exceedances in the well and reservoir samples collected at the Thornton site, there were numerous excursions at the Thornton site during the rain and fill events of 2013.

TABLE 1: DIVERSIONS TO THE THORNTON TRANSITIONAL
FLOOD CONTROL RESERVOIR DURING 2013

Date of Diversion	Volume Collected in Thornton Transitional Reservoir	Rainfall (measured at Calumet WRP)	Date Reservoir Completely Drained	Number of Weeks Sampled
	Million Gallons	Inch		
March 12, 2013	313	0.92	March 19, 2013	1
April 18-21, 2013	2,504	4.71	May 24, 2013	4
May 31, 2013	2,151	0.72	June 5, 2013	2
June 13, 2013	68	0.51	June 14, 2013	1

TABLE 2: ANALYSIS OF GROUNDWATER FROM MONITORING WELL QT-1 AT THE THORNTON RESERVOIR
SITE SAMPLED AFTER EACH SIGNIFICANT RAIN AND FILL EVENT DURING 2013

Well ¹	Sample Date	pH	EC ²	TDS ²	BOD ₅	CN ⁻	F ⁻	Cl ⁻	SO ₄ ²⁻
			mS/M	----- mg/L -----					
Upper 95% Confidence Limit		N ⁴	1	60	2	0.005	0.10	10	5
QT-1 (Event 1)	03/13/13	6.7	257	2,378	NRR ⁵	<0.005	0.39	921	315
Excursion		N	Yes	Yes	N	No	Yes	Yes	Yes
QT-1 (Event 2)	04/24/13	7.2	232	2,488	<2	<0.005	0.37	<10	301
QT-1	05/02/13	7.3	239	2,408	<2	<0.005	0.32	44	298
QT-1	05/09/13	7.3	225	2,474	<2	<0.005	0.36	152	324
QT-1	05/16/13	7.0	300	2,394	<2	<0.005	0.37	90	317
Excursion		N	Yes	Yes	No	No	Yes	Yes	Yes
QT-1 (Event 3)	06/05/13	6.9	290	2,476	<2	<0.005	0.34	874	300
QT-1	06/12/13	7.3	161	2,472	<2	<0.005	0.28	883	314
QT-1	06/19/13	7.0	282	2,512	<2	<0.005	0.38	906	222
Excursion		N	Yes	Yes	No	No	Yes	Yes	Yes

TABLE 2 (Continued): ANALYSIS OF GROUNDWATER FROM MONITORING WELL QT-1 AT THE THORNTON RESERVOIR SITE SAMPLED AFTER EACH SIGNIFICANT RAIN AND FILL EVENT DURING 2013

Well ¹	Sample Date	NH ₃ -N	NO ₂ +NO ₃ -N	Phenol	Ag	As	B	Ba	Cd
		----- mg/L -----							
Upper 95% Confidence Limit		0.10	0.15	5	0.001	0.050	0.05	0.004	0.001
QT-1 (Event 1)	03/13/13	0.52	<0.15	<5	<0.001	<0.050	0.32	0.076	<0.001
Excursion		Yes	No	No	No	No	Yes	Yes	No
QT-1 (Event 2)	04/24/13	0.55	<0.15	5	<0.001	<0.050	0.26	0.083	<0.001
QT-1	05/02/13	0.42	<0.15	<5	<0.001	<0.050	0.29	0.046	<0.001
QT-1	05/09/13	0.40	<0.15	<5	<0.001	0.054	0.27	0.078	<0.001
QT-1	05/16/13	0.40	<0.15	<5	<0.001	0.053	0.26	0.076	<0.001
Excursion		Yes	No	No	No	Yes	Yes	Yes	No
QT-1 (Event 3)	06/05/13	0.45	<0.15	9	<0.001	0.053	0.36	0.065	<0.001
QT-1	06/12/13	0.43	<0.15	<5	<0.001	0.070	0.33	0.050	<0.001
QT-1	06/19/13	0.31	<0.15	<5	<0.001	0.055	0.32	0.039	<0.001
Excursion		Yes	No	Yes	No	Yes	Yes	Yes	No

