

Protecting Our Water Environment



Metropolitan Water Reclamation District of Greater Chicago

***MONITORING AND RESEARCH
DEPARTMENT***

REPORT NO. 12-27

TUNNEL AND RESERVOIR PLAN

THORNTON TRANSITIONAL FLOOD CONTROL RESERVOIR

MONITORING WELLS

2011 ANNUAL GROUNDWATER MONITORING REPORT

July 2012

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July 10, 2012

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

Dear Ms. Willhite:

Subject: Tunnel and Reservoir Plan, Thornton Transitional Flood Control Reservoir Monitoring Wells, 2011 Annual Groundwater Monitoring Report

Enclosed are three copies of "Tunnel and Reservoir Plan, Thornton Transitional Flood Control Reservoir Monitoring Wells, 2011 Annual Groundwater Monitoring Report."

Very truly yours,

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

TCG:DGM:lf

Enclosures

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TUNNEL AND RESERVOIR PLAN
THORNTON TRANSITIONAL FLOOD CONTROL RESERVOIR
MONITORING WELLS
2011 ANNUAL GROUNDWATER MONITORING REPORT

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INTRODUCTION

The purpose of this report is to meet the reporting requirements of the Illinois Environmental Protection Agency (IEPA) relative to annual flood control utilization of the Thornton Transitional Reservoir (Reservoir) for 2011. The specific informational requirements are described in the June 16, 2001, Scope of Work (SOW) for Groundwater Quality Monitoring of the Reservoir. The SOW was approved in a letter from the IEPA dated August 6, 2001.

The reporting requirements are found in Section 7 of the SOW and modified in a letter to the IEPA dated May 9, 2005. The requirements for the annual flood control utilization of the Reservoir shall include:

1. The year's monitoring well sample analysis results.
2. Reservoir content grab sample results.
3. Detailed review and comparison of the monitoring well sampling analysis results, utilizing the monitoring well statistical background determinations.

Objective

The objective of collecting groundwater quality data from the four monitoring wells QT-1, QT-2, QT-3, and QT-4 and Reservoir content grab samples is to assess any possible contamination of the monitoring wells which may result from seepage produced during a diversion event for any of the parameters indicated in Table 2 of the SOW ([Table 1](#)). Twenty-one-day biochemical oxygen demand analysis was discontinued on June 29, 2011, based on a memorandum sent to the IEPA on August 9, 2010 ([Appendix AI](#)).

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, as shown in [Figure 1](#). The Reservoir is the final structural measure 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, which has been expanded from the planned 3.1 BG due to additional rock mining and provides sufficient volume to capture a 100-year storm event from Thorn Creek at a point just south of the Tri-State Tollway.

The project provides flood control benefits for 21 businesses and 4,400 residences, for an average benefit 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 receive flood control benefits.

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 will be utilized for Reservoir dewatering purposes only.

FIELD SAMPLING

There were five diversion events at the Reservoir during the year 2011, April 22–23, 2011, April 26–28, 2011, May 26–27, 2011, May 29–30, 2011, and June 9–11, 2011. The volume collected, date of complete drainage, and number of weeks sampled for each diversion event of 2011 are summarized in Table 2.

During these events, in accordance with the SOW, groundwater samples were collected from the four monitoring wells surrounding the Reservoir, and grab samples were taken from the Reservoir. The parameters analyzed for in each monitoring well and Reservoir sample are found in Table 1.

ANALYTICAL DATA RESULTS

Tables 3 through 10 contain the results of the analyses of the four monitoring wells surrounding the Reservoir for the April 22–23, 2011, and April 26–28, 2011, diversion events. The upper 95 percent confidence limit for each analyte is also provided for comparison in these tables. The calculated upper 95 percent confidence limits were derived using ten samples from background monitoring between October 2002 and September 2004. These limits were updated from those using six samples collected from October 2002 and May 2003 which were reported in the Reservoir Pre-Operational Background Groundwater Quality Report (Research and Development Department Report No. 03-23). Tables 11 and 12 contain the results of the grab samples from the Reservoir for the April 22–23, 2011, and April 26–28, 2011, diversion events. Tables 13 through 20 contain the results of the analyses of the four monitoring wells surrounding the Reservoir as well as the calculated upper 95 percent confidence limits for the May 26–27, 2011, May 29–30, 2011, and June 9–11, 2011, diversion events. Tables 21 and 22 contain the results of the grab samples from the Reservoir for the May 26–27, 2011, May 29–30, 2011, and June 9–11, 2011, diversion events.

DISCUSSION OF RESULTS

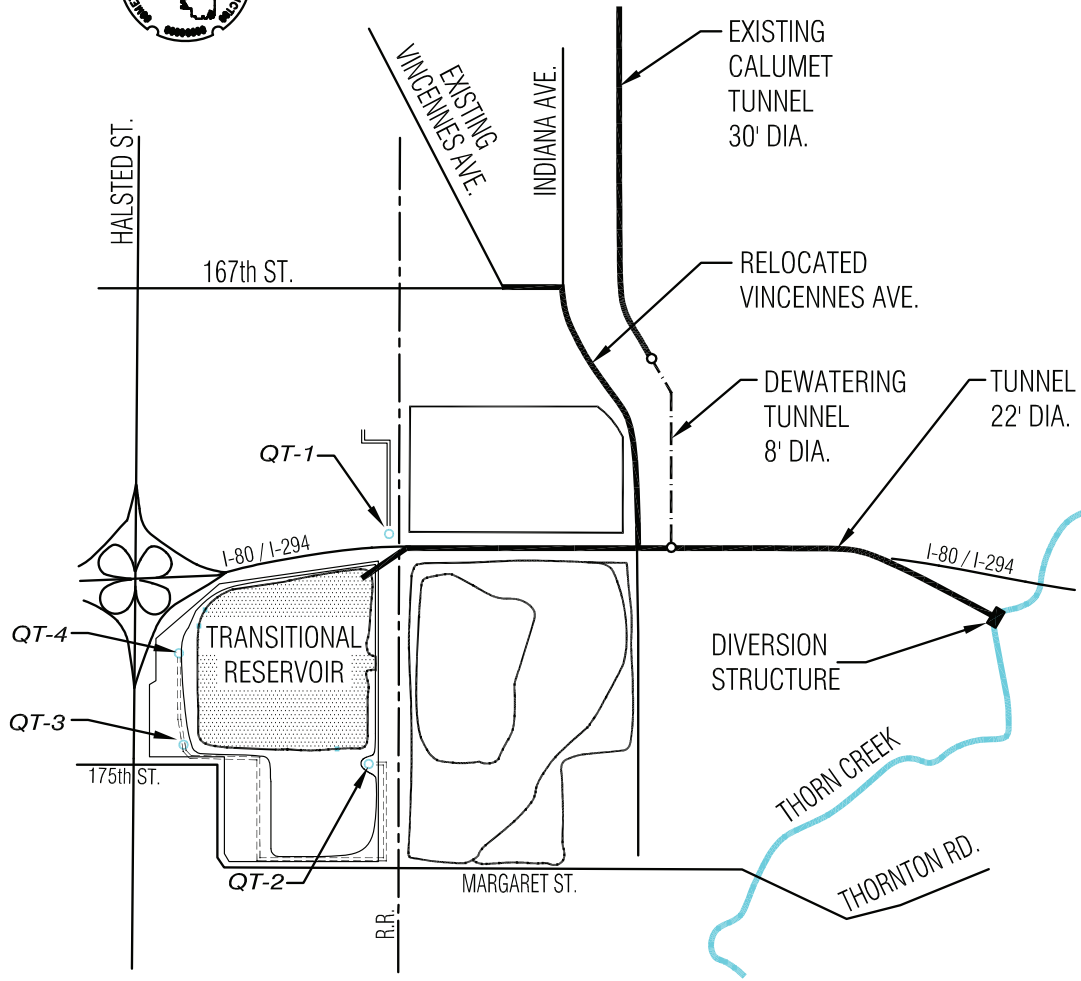
During all diversion events, samples of both the surrounding monitoring wells and the Reservoir itself were collected as long as there was water in the Reservoir per requirements of the SOW.

During the April 22–23, 2011, and April 26–28, 2011, diversion events, the 95 percent upper confidence limit from the background sampling was exceeded for the following parameters: QT-1 (Tables 3 and 4) chloride and silver; QT-2 (Tables 5 and 6) silver; QT-3 (Tables 7 and 8) chloride and sulfate, and QT-4 (Tables 9 and 10) silver. The Reservoir was dewatered by May 5, 2011, and the last sampling event took place on May 5, 2011. Although the number of parameters that exceeded the corresponding 95 percent upper confidence limit decreased, there were still some parameters that exceeded the upper 95 percent confidence limit from the background sampling after the Reservoir was dewatered. These parameters were chloride and silver from QT-1 and chloride, sulfate, and total dissolved solids from QT-3. Total dissolved solids could not be analyzed on May 5, 2011, for QT-1 and QT-4, because there was insufficient sample volume for analysis. It should be noted that the concentrations of these parameters in water samples from the Thornton Reservoir were below the upper 95th percentile confidence limits established for the surrounding groundwater.

During the May 26–27, 2011, May 29–30, 2011, and June 9–11, 2011, diversion events, the 95 percent upper confidence limit from the background sampling was exceeded for the following parameters: QT-1 (Tables 13 and 14) chloride, total dissolved solids, cadmium, manganese, silver, and nitrate nitrogen; QT-2 (Tables 15 and 16) iron, cyanide, and manganese; QT-3 (Tables 17 and 18) chloride, iron, sulfate, total dissolved solids, and manganese; QT-4 (Tables 19 and 20) iron, total dissolved solids, and manganese. It should be noted that the concentrations of these parameters in water samples from the Thornton Reservoir were below the upper 95th percentile confidence limits established for the surrounding groundwater. The Reservoir was dewatered by August 30, 2011. A last set of samples were collected from the monitoring wells on August 25, 2011, five days before the Reservoir was observed to have been dewatered. On June 9, 2011, and June 16, 2011, muddy conditions blocked access to monitoring well QT-4 and as a result samples could not be collected for these two dates. Total dissolved solids could not be analyzed on June 2, 2011, for monitoring wells QT-1 and QT-4, because there was insufficient sample volume from both monitoring wells for analysis. Five-day biochemical oxygen demand could not be analyzed on July 28, 2011, for monitoring well QT-1, because a sample was not submitted to the laboratory.



FIGURE 1

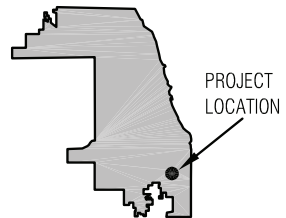


LOCATION MAP
Scale: NTS

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

TABLE 1: LIST OF PARAMETERS TO BE ANALYZED ACCORDING TO TABLE 2
FROM THE SCOPE OF WORK APPROVED BY THE ILLINOIS ENVIRONMENTAL
PROTECTION AGENCY

Column A	Column B
Arsenic	Barium
Boron	Cadmium
Chloride	Chromium
Copper	Cyanide
Fecal Coliform	Fluoride
Iron	Manganese
Lead	Nickel
Mercury	Silver
Phenols	Temperature
Sulfate	Nitrate
Total Dissolved Solids	5-Day Biochemical Oxygen Demand
Ammonia	21-Day Biochemical Oxygen Demand*

*Twenty-one day biochemical oxygen demand was discontinued on June 29, 2011, based on a memorandum sent to the Illinois Environmental Protection Agency on August 9, 2010.

TABLE 2: SUMMARY OF DIVERSIONS TO THE THORNTON TRANSITIONAL FLOOD CONTROL RESERVOIR FROM JANUARY 2011 THROUGH DECEMBER 2011

Date of Diversion	Volume Collected in Thornton Transitional Reservoir (million gallons)	Date Reservoir Observed Completely Drained	Number of Weeks of Sample Collection*
April 22–23, 2011	41	May 5, 2011	2
April 26–28, 2011	277	May 5, 2011	2
May 26–27, 2011	652	August 30, 2011	13
May 29–30, 2011	296	August 30, 2011	13
June 9–11, 2011	1,604	August 30, 2011	11

*Reflects sampling during diversion, fill, and upon complete drainage of the Reservoir.

TABLE 3: PARAMETERS FROM COLUMN A OF TABLE 1 FOR MONITORING WELL QT-1 DURING THE APRIL 22–23, 2011, AND APRIL 26–28, 2011, DIVERSION EVENTS

Date	Arsenic (mg/L)	Boron (mg/L)	Chloride (mg/L)	Copper (mg/L)	Fecal Coliform (CFU/100 mL)	Iron (mg/L)	Lead (mg/L)	Mercury (µg/L)	Phenols (µg/L)	Sulfate (mg/L)	Total Dissolved Solids (mg/L)	Ammonia Nitrogen (mg/L)
4/28/11	BLOQ	0.351	841	BLOQ	<1	20.90	BLOQ	BLOQ	BLOQ	339	2,264	0.43
5/5/11	BLOQ	0.318	911	BLOQ	<1	16.19	BLOQ	BLOQ	5	325	*	0.38
Limit of Quantification	0.05	0.070	10	0.020	DL	0.20	0.030	0.20	5	15	60	0.10
Upper 95% Confidence Limits	†	NA	552	†	NA	47.61	†	†	NA	489	2,279	NA
Excursion During Fill‡	No		Yes	No		No	No	No		No	No	
Excursion After Drained	No		Yes	No		No	No	No		No	No	

NA = Not applicable.

BLOQ = Below limit of quantification (LOQ).

DL = The detection limit for the FC analysis using the membrane filter method varies with actual sampling volume analyzed.

*Sample was not analyzed due to reasons provided in text.

†Upper 95% confidence limit calculated from background sampling is below current LOQ. Excursion identified if sample above current LOQ.

‡Fill event is defined as time during initial diversion and fill of the dry reservoir to when the reservoir is completely drained.

TABLE 4: PARAMETERS FROM COLUMN B OF TABLE 1 FOR MONITORING WELL QT-1 DURING THE APRIL 22–23, 2011, AND APRIL 26–28, 2011, DIVERSION EVENTS

Date	Barium (mg/L)	Cadmium (mg/L)	Chromium (mg/L)	Cyanide (mg/L)	Fluoride (mg/L)	Manganese (mg/L)	Nickel (mg/L)	Silver (mg/L)	Temperature °C	Nitrate Nitrogen (mg/L)	BOD ₅ (mg/L)	BOD ₂₁ (mg/L)
4/28/11	0.0908	BLOQ	BLOQ	BLOQ	0.39	0.1297	BLOQ	0.006	11.9	BLOQ	BLOQ	2
5/5/11	0.0919	BLOQ	BLOQ	BLOQ	0.36	0.0578	BLOQ	0.004	12.3	BLOQ	BLOQ	BLOQ
Limit of Quantification	0.0040	0.001	0.010	0.005	0.10	0.0030	0.008	0.004	NA	0.015	2	2
Upper 95% Confidence Limits	0.0963	*	*	*	0.57	0.1460	NA	*	NA	0.024	NA	NA
Excursion During Fill†	No	No	No	No	No	No		Yes		No		
Excursion After Drained	No	No	No	No	No	No		Yes		No		

NA = Not applicable.

BLOQ = Below limit of quantification (LOQ).

*Upper 95% confidence limit calculated from background sampling is below current LOQ. Excursion identified if sample above current LOQ.

†Fill event is defined as time during initial diversion and fill of the dry reservoir to when the reservoir is completely drained.

TABLE 5: PARAMETERS FROM COLUMN A OF TABLE 1 FOR MONITORING WELL QT-2 DURING THE APRIL 22–23, 2011, AND APRIL 26–28, 2011, DIVERSION EVENTS

Date	Arsenic (mg/L)	Boron (mg/L)	Chloride (mg/L)	Copper (mg/L)	Fecal Coliform (CFU/100 mL)	Iron (mg/L)	Lead (mg/L)	Mercury (µg/L)	Phenols (µg/L)	Sulfate (mg/L)	Total Dissolved Solids (mg/L)	Ammonia Nitrogen (mg/L)
4/28/11	BLOQ	0.273	222	BLOQ	<1	2.25	BLOQ	BLOQ	BLOQ	476	1,368	0.10
5/5/11	BLOQ	0.257	223	BLOQ	<1	3.46	BLOQ	BLOQ	BLOQ	481	1,514	BLOQ
Limit of Quantification	0.05	0.070	10	0.020	DL	0.20	0.030	0.20	5	15	60	0.10
Upper 95% Confidence Limits	*	NA	420	0.027	NA	4.50	*	0.230	NA	718	2,485	NA
Excursion During Fill†	No		No	No		No	No	No		No	No	
Excursion After Drained	No		No	No		No	No	No		No	No	

NA = Not applicable.

BLOQ = Below limit of quantification (LOQ).

DL = The detection limit for the FC analysis using the membrane filter method varies with actual sampling volume analyzed.

*Upper 95% confidence limit calculated from background sampling is below current LOQ. Excursion identified if sample above current LOQ.

†Fill event is defined as time during initial diversion and fill of the dry reservoir to when the reservoir is completely drained.

TABLE 6: PARAMETERS FROM COLUMN B OF TABLE 1 FOR MONITORING WELL QT-2 DURING THE APRIL 22–23, 2011, AND APRIL 26–28, 2011, DIVERSION EVENTS

Date	Barium (mg/L)	Cadmium (mg/L)	Chromium (mg/L)	Cyanide (mg/L)	Fluoride (mg/L)	Manganese (mg/L)	Nickel (mg/L)	Silver (mg/L)	Temperature °C	Nitrate Nitrogen (mg/L)	BOD ₅ (mg/L)	BOD ₂₁ (mg/L)
4/28/11	0.0423	BLOQ	BLOQ	BLOQ	0.32	0.0248	0.011	0.005	13.4	BLOQ	BLOQ	BLOQ
5/5/11	0.0412	BLOQ	BLOQ	BLOQ	0.31	0.0346	0.010	BLOQ	13.5	0.015	BLOQ	BLOQ
Limit of Quantification	0.0040	0.001	0.010	0.005	0.10	0.0030	0.008	0.004	NA	0.015	2	2
Upper 95% Confidence Limits	0.0742	*	*	*	0.35	0.0574	NA	*	NA	4.416	NA	NA
Excursion During Fill†	No	No	No	No	No	No		Yes		No		
Excursion After Drained	No	No	No	No	No	No		No		No		

NA = Not applicable.

BLOQ = Below limit of quantification (LOQ).

*Upper 95% confidence limit calculated from background sampling is below current LOQ. Excursion identified if sample above current LOQ.

†Fill event is defined as time during initial diversion and fill of the dry reservoir to when the reservoir is completely drained.

TABLE 7: PARAMETERS FROM COLUMN A OF TABLE 1 FOR MONITORING WELL QT-3 DURING THE APRIL 22–23, 2011, AND APRIL 26–28, 2011, DIVERSION EVENTS

Date	Arsenic (mg/L)	Boron (mg/L)	Chloride (mg/L)	Copper (mg/L)	Fecal Coliform (CFU/100 mL)	Iron (mg/L)	Lead (mg/L)	Mercury (µg/L)	Phenols (µg/L)	Sulfate (mg/L)	Total Dissolved Solids (mg/L)	Ammonia Nitrogen (mg/L)
4/28/11	BLOQ	0.152	244	BLOQ	<1	5.90	BLOQ	BLOQ	BLOQ	260	1,238	0.22
5/5/11	BLOQ	0.152	239	BLOQ	<1	8.88	BLOQ	BLOQ	5	275	1,352	0.20
Limit of Quantification	0.05	0.070	10	0.020	DL	0.20	0.030	0.20	5	15	60	0.10
Upper 95% Confidence Limits	*	NA	180	0.022	NA	30.59	*	*	NA	224	1,270	NA
Excursion During Fill†	No		Yes	No		No	No	No		Yes	No	
Excursion After Drained	No		Yes	No		No	No	No		Yes	Yes	

NA = Not applicable.

BLOQ = Below limit of quantification (LOQ).

DL = The detection limit for the FC analysis using the membrane filter method varies with actual sampling volume analyzed.

*Upper 95% confidence limit calculated from background sampling is below current LOQ. Excursion identified if sample above current LOQ.

†Fill event is defined as time during initial diversion and fill of the dry reservoir to when the reservoir is completely drained.

TABLE 8: PARAMETERS FROM COLUMN B OF TABLE 1 FOR MONITORING WELL QT-3 DURING THE APRIL 22–23, 2011, AND APRIL 26–28, 2011, DIVERSION EVENTS

Date	Barium (mg/L)	Cadmium (mg/L)	Chromium (mg/L)	Cyanide (mg/L)	Fluoride (mg/L)	Manganese (mg/L)	Nickel (mg/L)	Silver (mg/L)	Temperature °C	Nitrate Nitrogen (mg/L)	BOD ₅ (mg/L)	BOD ₂₁ (mg/L)
4/28/11	0.0767	BLOQ	BLOQ	BLOQ	0.19	0.1043	BLOQ	0.005	11.0	BLOQ	BLOQ	2
5/5/11	0.0771	BLOQ	BLOQ	BLOQ	0.18	0.0954	BLOQ	BLOQ	12.1	BLOQ	BLOQ	BLOQ
Limit of Quantification	0.0040	0.010	0.010	0.005	0.10	0.0030	0.008	0.004	NA	0.015	2	2
Upper 95% Confidence Limits	0.1000	*	*	*	0.38	0.1793	NA	0.0196	NA	0.331	NA	NA
Excursion During Fill†	No	No	No	No	No	No		No		No		
Excursion After Drained	No	No	No	No	No	No		No		No		

NA = Not applicable.

BLOQ = Below limit of quantification (LOQ).

*Upper 95% confidence limit calculated from background sampling is below current LOQ. Excursion identified if sample above current LOQ.

†Fill event is defined as time during initial diversion and fill of the dry reservoir to when the reservoir is completely drained.

TABLE 9: PARAMETERS FROM COLUMN A OF TABLE 1 FOR MONITORING WELL QT-4 DURING THE APRIL 22–23, 2011, AND APRIL 26–28, 2011, DIVERSION EVENTS

Date	Arsenic (mg/L)	Boron (mg/L)	Chloride (mg/L)	Copper (mg/L)	Fecal Coliform (CFU/100 mL)	Iron (mg/L)	Lead (mg/L)	Mercury (µg/L)	Phenols (µg/L)	Sulfate (mg/L)	Total Dissolved Solids (mg/L)	Ammonia Nitrogen (mg/L)
4/28/11	BLOQ	0.457	421	BLOQ	<1	18.44	BLOQ	BLOQ	BLOQ	240	1,486	0.44
5/5/11	BLOQ	0.433	396	BLOQ	<1	15.65	BLOQ	BLOQ	BLOQ	241	*	0.34
Limit of Quantification	0.05	0.070	10	0.020	DL	0.20	0.030	0.20	5	15	60	0.10
Upper 95% Confidence Limits	†	NA	611	0.073	NA	31.51	†	†	NA	300	1,873	NA
Excursion During Fill‡	No		No	No		No	No	No		No	No	
Excursion After Drained	No		No	No		No	No	No		No	No	

NA = Not applicable.

BLOQ = Below limit of quantification (LOQ).

DL = The detection limit for the FC analysis using the membrane filter method varies with actual sampling volume analyzed.

*Sample was not analyzed due to reasons provided in text.

†Upper 95% confidence limit calculated from background sampling is below current LOQ. Excursion identified if sample above current LOQ.

‡Fill event is defined as time during initial diversion and fill of the dry reservoir to when the reservoir is completely drained.

TABLE 10: PARAMETERS FROM COLUMN B OF TABLE 1 FOR MONITORING WELL QT-4 DURING THE APRIL 22–23, 2011, AND APRIL 26–28, 2011, DIVERSION EVENTS

Date	Barium (mg/L)	Cadmium (mg/L)	Chromium (mg/L)	Cyanide (mg/L)	Fluoride (mg/L)	Manganese (mg/L)	Nickel (mg/L)	Silver (mg/L)	Temperature °C	Nitrate Nitrogen (mg/L)	BOD ₅ (mg/L)	BOD ₂₁ (mg/L)
4/28/11	0.1003	BLOQ	BLOQ	BLOQ	0.25	0.1372	BLOQ	0.005	12.7	BLOQ	BLOQ	2
5/5/11	0.1015	BLOQ	BLOQ	BLOQ	0.26	0.1113	BLOQ	BLOQ	11.2	0.016	BLOQ	BLOQ
Limit of Quantification	0.0040	0.001	0.010	0.005	0.10	0.0030	0.008	0.004	NA	0.015	2	2
Upper 95% Confidence Limits	0.1576	*	0.074	*	0.37	0.2332	NA	0.004	NA	0.262	NA	NA
Excursion During Fill†	No	No	No	No	No	No		Yes		No		
Excursion After Drained	No	No	No	No	No	No		No		No		

NA = Not applicable.

BLOQ = Below limit of quantification (LOQ).

*Upper 95% confidence limit calculated from background sampling is below current LOQ. Excursion identified if sample above current LOQ.

†Fill event is defined as time during initial diversion and fill of the dry reservoir to when the reservoir is completely drained.

TABLE 11: PARAMETERS FROM COLUMN A OF TABLE 1 FOR THE THORNTON TRANSITIONAL RESERVOIR DURING THE APRIL 22–23, 2011, AND APRIL 26–28, 2011, DIVERSION EVENTS

Date	Arsenic (mg/L)	Boron (mg/L)	Chloride (mg/L)	Copper (mg/L)	Fecal Coliform (CFU/100 mL)	Iron (mg/L)	Lead (mg/L)	Mercury (µg/L)	Phenols (µg/L)	Sulfate (mg/L)	Total Dissolved Solids (mg/L)	Ammonia Nitrogen (mg/L)
4/29/11	BLOQ	0.107	68	BLOQ	880	3.41	BLOQ	BLOQ	BLOQ	55	394	0.27
Limit of Quantification	0.05	0.070	10	0.020	DL	0.20	0.030	0.20	5	15	60	0.10

BLOQ = Below limit of quantification.

DL = The detection limit for the FC analysis using the membrane filter method varies with actual sampling volume analyzed.

TABLE 12: PARAMETERS FROM COLUMN B OF TABLE 1 FOR THE THORNTON TRANSITIONAL RESERVOIR DURING THE APRIL 22–23, 2011, AND APRIL 26–28, 2011, DIVERSION EVENTS

Date	Barium (mg/L)	Cadmium (mg/L)	Chromium (mg/L)	Cyanide (mg/L)	Fluoride (mg/L)	Manganese (mg/L)	Nickel (mg/L)	Silver (mg/L)	Temperature °C	Nitrate Nitrogen (mg/L)	BOD ₅ (mg/L)	BOD ₂₁ (mg/L)
4/29/11	0.0374	BLOQ	BLOQ	BLOQ	0.24	0.0579	0.011	BLOQ	14.2	1.034	4	6
Limit of Quantification	0.0040	0.001	0.010	0.005	0.10	0.0030	0.008	0.004	NA	0.015	2	2

NA = Not applicable.

BLOQ = Below limit of quantification.

TABLE 13: PARAMETERS FROM COLUMN A OF TABLE 1 FOR MONITORING WELL QT-1 DURING THE MAY 26–27, 2011, MAY 29–30, 2011, AND JUNE 9–11, 2011, DIVERSION EVENTS

Date	Arsenic (mg/L)	Boron (mg/L)	Chloride (mg/L)	Copper (mg/L)	Fecal Coliform (CFU/100 mL)	Iron (mg/L)	Lead (mg/L)	Mercury (µg/L)	Phenols (µg/L)	Sulfate (mg/L)	Total Dissolved Solids (mg/L)	Ammonia Nitrogen (mg/L)
6/2/11	BLOQ	0.305	908	BLOQ	<1	23.37	BLOQ	BLOQ	BLOQ	332	*	0.40
6/9/11	BLOQ	0.302	878	BLOQ	<1	19.87	BLOQ	BLOQ	BLOQ	317	2,266	0.37
6/16/11	BLOQ	0.304	963	BLOQ	<1	21.99	BLOQ	BLOQ	BLOQ	297	2,746	0.39
6/23/11	BLOQ	0.284	940	BLOQ	<1	9.57	BLOQ	BLOQ	BLOQ	331	2,644	0.37
6/30/11	BLOQ	0.282	202	BLOQ	<1	15.44	BLOQ	BLOQ	BLOQ	322	2,404	0.34
7/8/11	BLOQ	0.279	884	BLOQ	<1	18.65	BLOQ	BLOQ	BLOQ	310	2,496	0.34
7/14/11	BLOQ	0.307	897	BLOQ	<1	21.64	BLOQ	BLOQ	BLOQ	322	2,612	0.40
7/21/11	BLOQ	0.262	877	BLOQ	<1	16.55	BLOQ	BLOQ	BLOQ	340	2,830	0.39
7/28/11	BLOQ	0.269	858	BLOQ	1	17.84	BLOQ	BLOQ	BLOQ	344	2,654	0.35
8/4/11	BLOQ	0.293	825	BLOQ	<1	20.27	BLOQ	BLOQ	BLOQ	391	2,492	0.57
8/11/11	BLOQ	0.285	800	BLOQ	<1	15.88	BLOQ	BLOQ	BLOQ	379	2,478	0.38
8/18/11	BLOQ	0.281	811	BLOQ	<1	16.77	BLOQ	BLOQ	10	376	2,388	0.34
8/25/11	BLOQ	0.266	803	BLOQ	<1	11.26	BLOQ	BLOQ	6	370	2,342	0.35
Limit of Quantification	0.05	0.070	10	0.020	DL	0.20	0.030	0.20	5	15	60	0.10
Upper 95% Confidence Limits	†	NA	552	†	NA	47.61	†	†	NA	489	2,279	NA

TABLE 13 (Continued): PARAMETERS FROM COLUMN A OF TABLE 1 FOR MONITORING WELL QT-1 DURING THE MAY 26–27, 2011, MAY 29–30, 2011, AND JUNE 9–11, 2011, DIVERSION EVENTS

Date	Arsenic (mg/L)	Boron (mg/L)	Chloride (mg/L)	Copper (mg/L)	Fecal Coliform (CFU/100 mL)	Iron (mg/L)	Lead (mg/L)	Mercury (µg/L)	Phenols (µg/L)	Sulfate (mg/L)	Total Dissolved Solids (mg/L)	Ammonia Nitrogen (mg/L)
Excursion During Fill‡	No		Yes	No		No	No	No		No	Yes	

NA = Not applicable.

BLOQ = Below limit of quantification (LOQ).

DL = The detection limit for the FC analysis using the membrane filter method varies with actual sampling volume analyzed.

*Sample was not analyzed due to reasons provided in text.

†Upper 95% confidence limit calculated from background sampling is below current LOQ. Excursion identified if sample above current LOQ.

‡Fill event is defined as time during initial diversion and fill of the dry reservoir to when the reservoir is completely drained.

TABLE 14: PARAMETERS FROM COLUMN B OF TABLE 1 FOR MONITORING WELL QT-1 DURING THE MAY 26–27, 2011, MAY 29–30, 2011, AND JUNE 9–11, 2011, DIVERSION EVENTS

Date	Barium (mg/L)	Cadmium (mg/L)	Chromium (mg/L)	Cyanide (mg/L)	Fluoride (mg/L)	Manganese (mg/L)	Nickel (mg/L)	Silver (mg/L)	Temperature °C	Nitrate Nitrogen (mg/L)	BOD ₅ (mg/L)	BOD ₂₁ (mg/L)
6/2/11	0.0922	BLOQ	BLOQ	BLOQ	0.30	0.1026	BLOQ	BLOQ	13.5	BLOQ	BLOQ	3
6/9/11	0.0962	BLOQ	BLOQ	BLOQ	0.28	0.0907	BLOQ	0.004	14.3	0.049	BLOQ	2
6/16/11	0.0917	BLOQ	BLOQ	BLOQ	0.37	0.1411	BLOQ	BLOQ	13.8	BLOQ	BLOQ	BLOQ
6/23/11	0.0899	0.007	BLOQ	BLOQ	0.34	0.1456	0.010	0.004	13.8	BLOQ	BLOQ	2
6/30/11	0.0867	BLOQ	BLOQ	BLOQ	0.39	0.1172	BLOQ	BLOQ	16.4	BLOQ	BLOQ	BLOQ
7/8/11	0.0893	BLOQ	BLOQ	BLOQ	0.36	0.1079	BLOQ	BLOQ	12.8	BLOQ	BLOQ	*
7/14/11	0.0908	BLOQ	BLOQ	BLOQ	0.35	0.1428	BLOQ	BLOQ	15.9	BLOQ	BLOQ	*
7/21/11	0.0895	BLOQ	BLOQ	BLOQ	0.37	0.0833	BLOQ	0.005	19.8	BLOQ	BLOQ	*
7/28/11	0.0913	BLOQ	BLOQ	BLOQ	0.32	0.1511	BLOQ	0.005	14.1	BLOQ	†	*
8/4/11	0.0868	BLOQ	BLOQ	BLOQ	0.26	0.1158	BLOQ	0.004	14.1	BLOQ	BLOQ	*
8/11/11	0.0878	BLOQ	BLOQ	BLOQ	0.36	0.1415	BLOQ	0.004	15.1	BLOQ	BLOQ	*
8/18/11	0.0842	BLOQ	BLOQ	BLOQ	0.35	0.1417	BLOQ	BLOQ	15.1	BLOQ	BLOQ	*
8/25/11	0.0830	BLOQ	BLOQ	BLOQ	0.33	0.1070	BLOQ	BLOQ	12.9	0.030	BLOQ	*
Limit of Quantification	0.0040	0.001	0.010	0.005	0.10	0.0030	0.008	0.004	NA	0.015	2	2
Upper 95% Confidence Limits	0.0963	‡	‡	‡	0.57	0.1460	NA	‡	NA	0.024	NA	NA

TABLE 14 (Continued): PARAMETERS FROM COLUMN B OF TABLE 1 FOR MONITORING WELL QT-1 DURING THE MAY 26–27, 2011, MAY 29–30, 2011, AND JUNE 9–11, 2011, DIVERSION EVENTS

Date	Barium (mg/L)	Cadmium (mg/L)	Chromium (mg/L)	Cyanide (mg/L)	Fluoride (mg/L)	Manganese (mg/L)	Nickel (mg/L)	Silver (mg/L)	Temperature °C	Nitrate Nitrogen (mg/L)	BOD ₅ (mg/L)	BOD ₂₁ (mg/L)
Excursion During Fill§	No	Yes	No	No	No	Yes		Yes		Yes		

NA = Not applicable.

BLOQ = Below limit of quantification (LOQ).

*Analysis discontinued on June 29, 2011, based on memorandum to IEPA dated August 9, 2010, to end the BOD₂₁ analysis.

†Sample was not analyzed due to reasons provided in text.

‡Upper 95% confidence limit calculated from background sampling is below current LOQ. Excursion identified if sample above current LOQ.

§Fill event is defined as time during initial diversion and fill of the dry reservoir to when the reservoir is completely drained.

TABLE 15: PARAMETERS FROM COLUMN A OF TABLE 1 FOR MONITORING WELL QT-2 DURING THE MAY 26–27, 2011, MAY 29–30, 2011, AND JUNE 9–11, 2011, DIVERSION EVENTS

Date	Arsenic (mg/L)	Boron (mg/L)	Chloride (mg/L)	Copper (mg/L)	Fecal Coliform (CFU/100 mL)	Iron (mg/L)	Lead (mg/L)	Mercury (µg/L)	Phenols (µg/L)	Sulfate (mg/L)	Total Dissolved Solids (mg/L)	Ammonia Nitrogen (mg/L)
6/2/11	BLOQ	0.249	226	BLOQ	<1	5.29	BLOQ	BLOQ	BLOQ	478	1,418	0.13
6/9/11	BLOQ	0.260	228	BLOQ	<1	13.80	BLOQ	BLOQ	BLOQ	579	1,528	BLOQ
6/16/11	BLOQ	0.189	138	BLOQ	2	11.27	BLOQ	BLOQ	BLOQ	403	1,400	0.12
6/23/11	BLOQ	0.145	86	BLOQ	<1	6.95	BLOQ	BLOQ	BLOQ	254	880	BLOQ
6/30/11	BLOQ	0.118	106	BLOQ	<1	5.34	BLOQ	BLOQ	BLOQ	273	956	BLOQ
7/8/11	BLOQ	0.106	82	BLOQ	<1	1.85	BLOQ	BLOQ	BLOQ	134	646	BLOQ
7/14/11	BLOQ	0.102	71	BLOQ	<1	2.25	BLOQ	BLOQ	BLOQ	102	654	BLOQ
7/21/11	BLOQ	0.100	60	BLOQ	<1	1.48	BLOQ	BLOQ	BLOQ	109	674	BLOQ
7/28/11	BLOQ	0.085	58	BLOQ	<1	1.28	BLOQ	BLOQ	BLOQ	75	752	BLOQ
8/4/11	BLOQ	0.101	40	BLOQ	<1	0.70	BLOQ	BLOQ	BLOQ	93	540	0.24
8/11/11	BLOQ	0.082	57	BLOQ	<1	2.01	BLOQ	BLOQ	BLOQ	73	464	BLOQ
8/18/11	BLOQ	0.090	44	BLOQ	<1	1.11	BLOQ	BLOQ	BLOQ	105	380	BLOQ
8/25/11	BLOQ	0.097	49	BLOQ	<1	0.88	BLOQ	BLOQ	BLOQ	139	462	BLOQ
Limit of Quantification	0.05	0.070	10	0.020	DL	0.20	0.030	0.20	5	15	60	0.10
Upper 95% Confidence Limits	*	NA	420	0.027	NA	4.50	*	0.23	NA	718	2,485	NA

TABLE 15 (Continued): PARAMETERS FROM COLUMN A OF TABLE 1 FOR MONITORING WELL QT-2 DURING THE MAY 26–27, 2011, MAY 29–30, 2011, AND JUNE 9–11, 2011, DIVERSION EVENTS

Date	Arsenic (mg/L)	Boron (mg/L)	Chloride (mg/L)	Copper (mg/L)	Fecal Coliform (CFU/100 mL)	Iron (mg/L)	Lead (mg/L)	Mercury (µg/L)	Phenols (µg/L)	Sulfate (mg/L)	Total Dissolved Solids (mg/L)	Ammonia Nitrogen (mg/L)
Excursion During Fill†	No		No	No		Yes	No	No		No	No	

NA = Not applicable.

BLOQ = Below limit of quantification (LOQ).

DL = The detection limit for the FC analysis using the membrane filter method varies with actual sampling volume analyzed.

*Upper 95% confidence limit calculated from background sampling is below current LOQ. Excursion identified if sample above current LOQ.

†Fill event is defined as time during initial diversion and fill of the dry reservoir to when the reservoir is completely drained.

TABLE 16: PARAMETERS FROM COLUMN B OF TABLE 1 FOR MONITORING WELL QT-2 DURING THE MAY 26–27, 2011, MAY 29–30, 2011, AND JUNE 9–11, 2011, DIVERSION EVENTS

Date	Barium (mg/L)	Cadmium (mg/L)	Chromium (mg/L)	Cyanide (mg/L)	Fluoride (mg/L)	Manganese (mg/L)	Nickel (mg/L)	Silver (mg/L)	Temperature °C	Nitrate Nitrogen (mg/L)	BOD ₅ (mg/L)	BOD ₂₁ (mg/L)
6/2/11	0.0421	BLOQ	BLOQ	BLOQ	0.29	0.0481	0.014	BLOQ	14.4	BLOQ	BLOQ	2
6/9/11	0.0470	BLOQ	BLOQ	BLOQ	0.30	0.0853	0.051	BLOQ	15.4	0.016	BLOQ	BLOQ
6/16/11	0.0323	BLOQ	BLOQ	BLOQ	0.27	0.3069	0.024	BLOQ	14.8	BLOQ	BLOQ	BLOQ
6/23/11	0.0235	BLOQ	BLOQ	BLOQ	0.27	0.1512	0.014	BLOQ	15.2	BLOQ	BLOQ	2
6/30/11	0.0196	BLOQ	BLOQ	BLOQ	0.28	0.1225	0.011	BLOQ	16.7	BLOQ	BLOQ	BLOQ
7/8/11	0.0215	BLOQ	BLOQ	BLOQ	0.28	0.0636	0.009	BLOQ	15.6	BLOQ	BLOQ	*
7/14/11	0.0176	BLOQ	BLOQ	0.005	0.27	0.0813	BLOQ	BLOQ	16.2	BLOQ	BLOQ	*
7/21/11	0.0245	BLOQ	BLOQ	BLOQ	0.28	0.0384	0.010	BLOQ	16.6	0.117	BLOQ	*
7/28/11	0.0199	BLOQ	BLOQ	BLOQ	0.28	0.0523	BLOQ	BLOQ	15.3	0.021	BLOQ	*
8/4/11	0.0262	BLOQ	BLOQ	BLOQ	0.24	0.0323	0.011	BLOQ	16.1	0.219	BLOQ	*
8/11/11	0.0206	BLOQ	BLOQ	BLOQ	0.25	0.0402	0.010	BLOQ	17.3	0.233	BLOQ	*
8/18/11	0.0223	BLOQ	BLOQ	BLOQ	0.24	0.0428	BLOQ	BLOQ	16.5	BLOQ	BLOQ	*
8/25/11	0.0295	BLOQ	BLOQ	BLOQ	0.27	0.0514	BLOQ	BLOQ	13.7	BLOQ	BLOQ	*
Limit of Quantification	0.0040	0.001	0.010	0.005	0.10	0.0030	0.008	0.004	NA	0.015	2	2
Upper 95% Confidence Limits	0.0742	†	†	†	0.35	0.0574	NA	†	NA	4.416	NA	NA

TABLE 16 (Continued): PARAMETERS FROM COLUMN B OF TABLE 1 FOR MONITORING WELL QT-2 DURING THE MAY 26–27, 2011, MAY 29–30, 2011, AND JUNE 9–11, 2011, DIVERSION EVENTS

Date	Barium (mg/L)	Cadmium (mg/L)	Chromium (mg/L)	Cyanide (mg/L)	Fluoride (mg/L)	Manganese (mg/L)	Nickel (mg/L)	Silver (mg/L)	Temperature °C	Nitrate Nitrogen (mg/L)	BOD ₅ (mg/L)	BOD ₂₁ (mg/L)
Excursion During Fill‡	No	No	No	Yes	No	Yes		No		No		

NA = Not applicable.

BLOQ = Below limit of quantification (LOQ).

*Analysis discontinued on June 29, 2011, based on memorandum to IEPA dated August 9, 2010, to end the BOD₂₁ analysis.

†Upper 95% confidence limit calculated from background sampling is below current LOQ. Excursion identified if sample above current LOQ.

‡Fill event is defined as time during initial diversion and fill of the dry reservoir to when the reservoir is completely drained.

TABLE 17: PARAMETERS FROM COLUMN A OF TABLE 1 FOR MONITORING WELL QT-3 DURING THE MAY 26–27, 2011, MAY 29–30, 2011, AND JUNE 9–11, 2011, DIVERSION EVENTS

Date	Arsenic (mg/L)	Boron (mg/L)	Chloride (mg/L)	Copper (mg/L)	Fecal Coliform (CFU/100 mL)	Iron (mg/L)	Lead (mg/L)	Mercury (µg/L)	Phenols (µg/L)	Sulfate (mg/L)	Total Dissolved Solids (mg/L)	Ammonia Nitrogen (mg/L)
6/2/11	BLOQ	0.165	267	BLOQ	<1	13.54	BLOQ	BLOQ	BLOQ	228	1,268	0.27
6/9/11	BLOQ	0.170	250	BLOQ	<1	16.61	BLOQ	BLOQ	BLOQ	219	1,276	0.16
6/16/11	BLOQ	0.154	272	BLOQ	<1	21.72	BLOQ	BLOQ	5	228	1,480	0.22
6/23/11	BLOQ	0.171	267	BLOQ	<1	28.86	BLOQ	BLOQ	BLOQ	218	1,376	0.23
6/30/11	BLOQ	0.161	259	BLOQ	<1	17.68	BLOQ	BLOQ	BLOQ	218	1,308	0.22
7/8/11	BLOQ	0.173	275	BLOQ	<1	23.06	BLOQ	BLOQ	BLOQ	198	1,260	0.21
7/14/11	BLOQ	0.176	290	BLOQ	<1	34.34	BLOQ	BLOQ	BLOQ	198	1,452	0.26
7/21/11	BLOQ	0.162	294	BLOQ	<1	18.48	BLOQ	BLOQ	BLOQ	198	1,712	0.29
7/28/11	BLOQ	0.171	285	BLOQ	<1	34.49	BLOQ	BLOQ	BLOQ	193	1,766	0.19
8/4/11	BLOQ	0.188	286	BLOQ	<1	26.12	BLOQ	BLOQ	BLOQ	208	1,512	0.56
8/11/11	BLOQ	0.167	303	BLOQ	<1	30.90	BLOQ	BLOQ	BLOQ	209	1,358	0.24
8/18/11	BLOQ	0.172	297	BLOQ	<1	28.62	BLOQ	BLOQ	10	212	1,236	0.23
8/25/11	BLOQ	0.169	297	BLOQ	<1	27.12	BLOQ	BLOQ	8	200	1,316	0.21
Limit of Quantification	0.05	0.070	10	0.020	DL	0.20	0.030	0.20	5	15	60	0.10
Upper 95% Confidence Limits	*	NA	180	0.022	NA	30.59	*	*	NA	224	1,270	NA

TABLE 17 (Continued): PARAMETERS FROM COLUMN A OF TABLE 1 FOR MONITORING WELL QT-3 DURING THE MAY 26–27, 2011, MAY 29–30, 2011, AND JUNE 9–11, 2011, DIVERSION EVENTS

Date	Arsenic (mg/L)	Boron (mg/L)	Chloride (mg/L)	Copper (mg/L)	Fecal Coliform (CFU/100 mL)	Iron (mg/L)	Lead (mg/L)	Mercury (µg/L)	Phenols (µg/L)	Sulfate (mg/L)	Total Dissolved Solids (mg/L)	Ammonia Nitrogen (mg/L)
Excursion During Fill†	No		Yes	No		Yes	No	No		Yes	Yes	

NA = Not applicable.

BLOQ = Below limit of quantification (LOQ).

DL = The detection limit for the FC analysis using the membrane filter method varies with actual sampling volume analyzed.

*Upper 95% confidence limit calculated from background sampling is below current LOQ. Excursion identified if sample above current LOQ.

†Fill event is defined as time during initial diversion and fill of the dry reservoir to when the reservoir is completely drained.

TABLE 18: PARAMETERS FROM COLUMN B OF TABLE 1 FOR MONITORING WELL QT-3 DURING THE MAY 26–27, 2011, MAY 29–30, 2011, AND JUNE 9–11, 2011, DIVERSION EVENTS

Date	Barium (mg/L)	Cadmium (mg/L)	Chromium (mg/L)	Cyanide (mg/L)	Fluoride (mg/L)	Manganese (mg/L)	Nickel (mg/L)	Silver (mg/L)	Temperature °C	Nitrate Nitrogen (mg/L)	BOD ₅ (mg/L)	BOD ₂₁ (mg/L)
6/2/11	0.0765	BLOQ	BLOQ	BLOQ	0.20	0.1407	BLOQ	BLOQ	13.5	BLOQ	BLOQ	3
6/9/11	0.0754	BLOQ	BLOQ	BLOQ	0.18	0.2142	BLOQ	BLOQ	13.2	0.037	BLOQ	2
6/16/11	0.0818	BLOQ	BLOQ	BLOQ	0.20	0.2551	BLOQ	BLOQ	13.0	BLOQ	BLOQ	BLOQ
6/23/11	0.0790	BLOQ	BLOQ	BLOQ	0.22	0.4777	0.008	BLOQ	13.1	BLOQ	BLOQ	4
6/30/11	0.0785	BLOQ	BLOQ	BLOQ	0.20	0.3422	0.011	BLOQ	15.3	BLOQ	BLOQ	BLOQ
7/8/11	0.0827	BLOQ	BLOQ	BLOQ	0.17	0.2683	0.011	BLOQ	13.7	BLOQ	BLOQ	*
7/14/11	0.0765	BLOQ	BLOQ	BLOQ	0.20	0.4983	BLOQ	BLOQ	14.2	BLOQ	BLOQ	*
7/21/11	0.0787	BLOQ	BLOQ	BLOQ	0.27	0.2498	BLOQ	0.004	12.6	BLOQ	BLOQ	*
7/28/11	0.0846	BLOQ	BLOQ	BLOQ	0.19	0.4743	BLOQ	BLOQ	12.9	BLOQ	BLOQ	*
8/4/11	0.0857	BLOQ	BLOQ	BLOQ	0.20	0.3856	BLOQ	BLOQ	13.7	BLOQ	BLOQ	*
8/11/11	0.0780	BLOQ	BLOQ	BLOQ	0.19	0.4595	BLOQ	BLOQ	14.0	BLOQ	BLOQ	*
8/18/11	0.0763	BLOQ	BLOQ	BLOQ	0.19	0.4694	BLOQ	BLOQ	13.4	BLOQ	BLOQ	*
8/25/11	0.0751	BLOQ	BLOQ	BLOQ	0.19	0.4014	BLOQ	BLOQ	12.3	BLOQ	BLOQ	*
Limit of Quantification	0.0040	0.001	0.010	0.005	0.10	0.0030	0.008	0.004	NA	0.015	2	2
Upper 95% Confidence Limits	0.1000	†	†	†	0.38	0.1793	NA	0.0196	NA	0.331	NA	NA

TABLE 18 (Continued): PARAMETERS FROM COLUMN B OF TABLE 1 FOR MONITORING WELL QT-3 DURING THE MAY 26–27, 2011, MAY 29–30, 2011, AND JUNE 9–11, 2011, DIVERSION EVENTS

Date	Barium (mg/L)	Cadmium (mg/L)	Chromium (mg/L)	Cyanide (mg/L)	Fluoride (mg/L)	Manganese (mg/L)	Nickel (mg/L)	Silver (mg/L)	Temperature °C	Nitrate Nitrogen (mg/L)	BOD ₅ (mg/L)	BOD ₂₁ (mg/L)
Excursion During Fill‡	No	No	No	No	No	Yes		No		No		

NA = Not applicable.

BLOQ = Below limit of quantification (LOQ).

* Analysis discontinued on June 29, 2011, based on memorandum to IEPA dated August 9, 2010, to end the BOD₂₁ analysis.

†Upper 95% confidence limit calculated from background sampling is below current LOQ. Excursion identified if sample above current LOQ.

‡Fill event is defined as time during initial diversion and fill of the dry reservoir to when the reservoir is completely drained.

TABLE 19: PARAMETERS FROM COLUMN A OF TABLE 1 FOR MONITORING WELL QT-4 DURING THE MAY 26–27, 2011, MAY 29–30, 2011, AND JUNE 9–11, 2011, DIVERSION EVENTS

Date	Arsenic (mg/L)	Boron (mg/L)	Chloride (mg/L)	Copper (mg/L)	Fecal Coliform (CFU/100 mL)	Iron (mg/L)	Lead (mg/L)	Mercury (µg/L)	Phenols (µg/L)	Sulfate (mg/L)	Total Dissolved Solids (mg/L)	Ammonia Nitrogen (mg/L)
6/2/11	BLOQ	0.415	407	BLOQ	<1	14.95	BLOQ	BLOQ	BLOQ	229	*	0.52
6/9/11	*	*	*	*	*	*	*	*	*	*	*	*
6/16/11	*	*	*	*	*	*	*	*	*	*	*	*
6/23/11	BLOQ	0.411	367	BLOQ	<1	0.68	BLOQ	BLOQ	BLOQ	228	1,512	0.40
6/30/11	BLOQ	0.164	270	BLOQ	<1	33.66	BLOQ	BLOQ	BLOQ	211	1,258	0.25
7/8/11	BLOQ	0.401	362	BLOQ	<1	4.13	BLOQ	BLOQ	BLOQ	218	1,396	0.33
7/14/11	BLOQ	0.426	358	BLOQ	<1	20.76	BLOQ	BLOQ	BLOQ	215	1,554	0.41
7/21/11	BLOQ	0.381	339	BLOQ	<1	10.37	BLOQ	BLOQ	BLOQ	225	1,828	0.41
7/28/11	BLOQ	0.387	342	BLOQ	<1	1.86	BLOQ	BLOQ	BLOQ	232	1,940	0.31
8/4/11	BLOQ	0.434	342	BLOQ	<1	17.12	BLOQ	BLOQ	BLOQ	219	1,708	0.57
8/11/11	BLOQ	0.405	343	BLOQ	<1	14.29	BLOQ	BLOQ	BLOQ	236	1,460	0.36
8/18/11	BLOQ	0.402	338	BLOQ	<1	13.24	BLOQ	BLOQ	10	229	1,374	0.36
8/25/11	BLOQ	0.391	336	BLOQ	<1	12.73	BLOQ	BLOQ	7	224	1,394	0.36
Limit of Quantification	0.05	0.070	10	0.020	DL	0.20	0.030	0.20	5	15	60	0.10
Upper 95% Confidence Limits	†	NA	611	0.073	NA	31.51	†	†	NA	300	1,873	NA

TABLE 19 (Continued): PARAMETERS FROM COLUMN A OF TABLE 1 FOR MONITORING WELL QT-4 DURING THE MAY 26–27, 2011, MAY 29–30, 2011, AND JUNE 9–11, 2011, DIVERSION EVENTS

Date	Arsenic (mg/L)	Boron (mg/L)	Chloride (mg/L)	Copper (mg/L)	Fecal Coliform (CFU/100 mL)	Iron (mg/L)	Lead (mg/L)	Mercury (µg/L)	Phenols (µg/L)	Sulfate (mg/L)	Total Dissolved Solids (mg/L)	Ammonia Nitrogen (mg/L)
Excursion During Fill‡	No		No	No		Yes	No	No		No	Yes	

NA = Not applicable.

BLOQ = Below limit of quantification (LOQ).

DL = The detection limit for the FC analysis using the membrane filter method varies with actual sampling volume analyzed.

*Sample was not analyzed due to reasons provided in text.

†Upper 95% confidence limit calculated from background sampling is below current LOQ. Excursion identified if sample above current LOQ.

‡Fill event is defined as time during initial diversion and fill of the dry reservoir to when the reservoir is completely drained.

TABLE 20: PARAMETERS FROM COLUMN B OF TABLE 1 FOR MONITORING WELL QT-4 DURING THE MAY 26–27, 2011, MAY 29–30, 2011, AND JUNE 9–11, 2011, DIVERSION EVENTS

Date	Barium (mg/L)	Cadmium (mg/L)	Chromium (mg/L)	Cyanide (mg/L)	Fluoride (mg/L)	Manganese (mg/L)	Nickel (mg/L)	Silver (mg/L)	Temperature °C	Nitrate Nitrogen (mg/L)	BOD ₅ (mg/L)	BOD ₂₁ (mg/L)
6/2/11	0.0954	BLOQ	BLOQ	BLOQ	0.25	0.1640	BLOQ	BLOQ	13.4	BLOQ	BLOQ	3
6/9/11	*	*	*	*	*	*	*	*	*	*	*	*
6/16/11	*	*	*	*	*	*	*	*	*	*	*	*
6/23/11	0.0874	BLOQ	BLOQ	BLOQ	0.30	0.0640	BLOQ	BLOQ	13.2	BLOQ	BLOQ	2
6/30/11	0.0764	BLOQ	BLOQ	BLOQ	0.20	0.4595	BLOQ	BLOQ	15.8	BLOQ	BLOQ	BLOQ
7/8/11	0.0905	BLOQ	BLOQ	BLOQ	0.25	0.1098	BLOQ	BLOQ	14.1	BLOQ	BLOQ	†
7/14/11	0.0952	BLOQ	BLOQ	BLOQ	0.26	0.2721	BLOQ	BLOQ	14.4	BLOQ	BLOQ	†
7/21/11	0.0868	BLOQ	BLOQ	BLOQ	0.21	0.1116	BLOQ	0.004	14.0	BLOQ	BLOQ	†
7/28/11	0.0910	BLOQ	BLOQ	BLOQ	0.26	0.0407	BLOQ	0.004	13.5	BLOQ	BLOQ	†
8/4/11	0.0958	BLOQ	BLOQ	BLOQ	0.26	0.2582	BLOQ	BLOQ	13.4	BLOQ	BLOQ	†
8/11/11	0.0844	BLOQ	BLOQ	BLOQ	0.26	0.2579	BLOQ	BLOQ	15.1	0.020	BLOQ	†
8/18/11	0.0831	BLOQ	BLOQ	BLOQ	0.24	0.2550	BLOQ	BLOQ	16.0	BLOQ	BLOQ	†
8/25/11	0.0821	BLOQ	BLOQ	BLOQ	0.24	0.2400	BLOQ	BLOQ	13.3	BLOQ	BLOQ	†
Limit of Quantification	0.0040	0.001	0.010	0.005	0.10	0.0030	0.008	0.004	NA	0.015	2	2
Upper 95% Confidence Limits	0.1576	‡	0.074	‡	0.37	0.2332	NA	0.004	NA	0.262	NA	NA

TABLE 20 (Continued): PARAMETERS FROM COLUMN B OF TABLE 1 FOR MONITORING WELL QT-4 DURING THE MAY 26–27, 2011, MAY 29–30, 2011, AND JUNE 9–11, 2011, DIVERSION EVENTS

Date	Barium (mg/L)	Cadmium (mg/L)	Chromium (mg/L)	Cyanide (mg/L)	Fluoride (mg/L)	Manganese (mg/L)	Nickel (mg/L)	Silver (mg/L)	Temperature °C	Nitrate Nitrogen (mg/L)	BOD ₅ (mg/L)	BOD ₂₁ (mg/L)
Excursion During Fill§	No	No	No	No	No	Yes		No		No		

NA = Not applicable.

BLOQ = Below limit of quantification (LOQ).

*Sample was not analyzed due to reasons provided in text.

†Analysis discontinued on June 29, 2011, based on memorandum to IEPA dated August 9, 2010, to end the BOD₂₁ analysis.

‡Upper 95% confidence limit calculated from background sampling is below current LOQ. Excursion identified if sample above current LOQ.

§Fill event is defined as time during initial diversion and fill of the dry reservoir to when the reservoir is completely drained.

TABLE 21: PARAMETERS FROM COLUMN A OF TABLE 1 FOR THE THORNTON TRANSITIONAL RESERVOIR DURING THE MAY 26–27, 2011, MAY 29–30, 2011, AND JUNE 9–11, 2011, DIVERSION EVENTS

Date	Arsenic (mg/L)	Boron (mg/L)	Chloride (mg/L)	Copper (mg/L)	Fecal Coliform (CFU/100 mL)	Iron (mg/L)	Lead (mg/L)	Mercury (µg/L)	Phenols (µg/L)	Sulfate (mg/L)	Total Dissolved Solids (mg/L)	Ammonia Nitrogen (mg/L)
5/27/11	BLOQ	0.076	47	BLOQ	10,000	4.70	BLOQ	BLOQ	BLOQ	31	258	0.19
6/1/11	BLOQ	0.071	49	BLOQ	150	1.96	BLOQ	BLOQ	BLOQ	42	286	0.52
6/8/11	BLOQ	0.082	60	BLOQ	120	1.81	BLOQ	BLOQ	BLOQ	53	340	BLOQ
6/13/11	BLOQ	0.077	37	BLOQ	90	1.36	BLOQ	BLOQ	BLOQ	35	262	0.28
6/23/11	BLOQ	BLOQ	30	BLOQ	310	0.84	BLOQ	BLOQ	BLOQ	37	290	0.25
7/1/11	BLOQ	0.080	70	BLOQ	230	0.59	BLOQ	BLOQ	BLOQ	61	302	0.17
7/7/11	BLOQ	0.087	41	0.030	26,000	5.73	BLOQ	BLOQ	BLOQ	81	278	BLOQ
7/14/11	BLOQ	0.078	42	BLOQ	20	BLOQ	BLOQ	BLOQ	BLOQ	44	306	BLOQ
7/21/11	BLOQ	0.075	43	BLOQ	8,000	1.33	BLOQ	BLOQ	BLOQ	45	330	BLOQ
7/27/11	BLOQ	BLOQ	36	BLOQ	500	0.41	BLOQ	BLOQ	BLOQ	46	314	BLOQ
8/4/11	BLOQ	0.084	37	BLOQ	80	BLOQ	BLOQ	BLOQ	BLOQ	48	298	0.19
8/11/11	BLOQ	0.077	43	BLOQ	80	BLOQ	BLOQ	BLOQ	BLOQ	53	322	BLOQ
8/16/11	BLOQ	0.077	43	BLOQ	120	BLOQ	BLOQ	BLOQ	BLOQ	56	310	0.16
8/26/11	BLOQ	0.075	48	BLOQ	<10	0.48	BLOQ	BLOQ	BLOQ	61	324	0.11
Limit of Quantification	0.05	0.070	10	0.020	DL	0.20	0.030	0.20	5	15	60	0.10

BLOQ = Below limit of quantification.

DL = The detection limit for the FC analysis using the membrane filter method varies with actual sampling volume analyzed.

TABLE 22: PARAMETERS FROM COLUMN B OF TABLE 1 FOR THE THORNTON TRANSITIONAL RESERVOIR DURING THE MAY 26–27, 2011, MAY 29–30, 2011, AND JUNE 9–11, 2011, DIVERSION EVENTS

Date	Barium (mg/L)	Cadmium (mg/L)	Chromium (mg/L)	Cyanide (mg/L)	Fluoride (mg/L)	Manganese (mg/L)	Nickel (mg/L)	Silver (mg/L)	Temperature °C	Nitrate		
										Nitrogen (mg/L)	BOD ₅ (mg/L)	BOD ₂₁ (mg/L)
5/27/11	0.0398	BLOQ	BLOQ	BLOQ	0.21	0.0924	BLOQ	BLOQ	16.6	1.432	4	10
6/1/11	0.0286	BLOQ	BLOQ	BLOQ	0.22	0.0295	BLOQ	BLOQ	27.3	1.589	5	12
6/8/11	0.0281	BLOQ	BLOQ	BLOQ	0.22	0.0450	BLOQ	BLOQ	32.1	1.000	4	10
6/13/11	0.0265	BLOQ	BLOQ	BLOQ	0.19	0.0215	BLOQ	BLOQ	19.0	0.983	3	9
6/23/11	0.0208	BLOQ	BLOQ	BLOQ	0.22	0.0081	BLOQ	BLOQ	21.1	0.976	BLOQ	3
7/1/11	0.0200	BLOQ	BLOQ	BLOQ	0.21	0.0074	BLOQ	BLOQ	22.9	0.968	BLOQ	*
7/7/11	0.0679	BLOQ	BLOQ	0.008	0.20	0.2377	0.031	BLOQ	20.5	0.407	45	*
7/14/11	0.0193	BLOQ	BLOQ	BLOQ	0.19	BLOQ	BLOQ	BLOQ	24.4	0.311	6	*
7/21/11	0.0215	BLOQ	BLOQ	BLOQ	0.20	0.0439	BLOQ	BLOQ	32.6	0.037	7	*
7/27/11	0.0184	BLOQ	BLOQ	BLOQ	0.20	0.0195	BLOQ	BLOQ	28.5	BLOQ	12	*
8/4/11	0.0182	BLOQ	BLOQ	BLOQ	0.20	BLOQ	BLOQ	BLOQ	25.7	BLOQ	4	*
8/11/11	0.0185	BLOQ	BLOQ	BLOQ	0.20	0.0071	BLOQ	BLOQ	25.2	BLOQ	3	*
8/16/11	0.0185	BLOQ	BLOQ	BLOQ	0.20	0.0039	BLOQ	BLOQ	28.4	0.019	BLOQ	*
8/26/11	0.0203	BLOQ	BLOQ	BLOQ	0.19	0.0119	BLOQ	BLOQ	26.1	BLOQ	3	*
Limit of Quantification	0.0040	0.001	0.010	0.005	0.10	0.0030	0.008	0.004	NA	0.015	2	2

NA = Not applicable.

BLOQ = Below limit of quantification.

*Analysis discontinued on June 29, 2011, based on memorandum to IEPA dated August 9, 2010, to end the BOD₂₁ analysis.

APPENDIX AI

REQUEST FOR EXEMPTION OF 21-DAY BIOCHEMICAL OXYGEN DEMAND
ANALYSIS FOR THE GROUNDWATER MONITORING WELLS AND THE DIVERSIONS
TO THE THORNTON TRANSITIONAL FLOOD CONTROL RESERVOIR

Protecting Our Water Environment

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Director of Monitoring and Research
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August 9, 2010

Mr. Sanjay Sofat
Division of Water Pollution Control
Bureau of Water
Illinois Environmental Protection Agency
P.O. Box 19276
Springfield, IL 62794-9276

Dear Mr. Sofat,

Subject: Request for Exemption of 21-Day Biochemical Oxygen Demand Analysis for the Groundwater Monitoring Wells and the Diversions to the Thornton Transitional Flood Control Reservoir

The Scope of Work (SOW) for the Thornton Transitional Flood Control Reservoir (Reservoir) Groundwater Monitoring Program issued by the Illinois Environmental Protection Agency on June 26, 2001 requires the Metropolitan Water Reclamation District of Greater Chicago (District) to analyze five-day biochemical oxygen demand (BOD₅) and 21-day biochemical oxygen demand (BOD₂₁) for the samples collected from the four groundwater monitoring wells (QT-1 through QT-4) and the Reservoir. From 2004 to 2009, a total of 70 or more samples have been collected from each of the four groundwater monitoring wells and the Reservoir for BOD₅ and BOD₂₁ analyses. The analytical results for BOD₅ and BOD₂₁ from 2004 to 2009 are presented in Tables 1 and 2 for the four groundwater monitoring wells and the Reservoir, respectively. The method detection limit (MDL) for both BOD₅ and BOD₂₁ analyses is 2 mg/L. Any value less than the MDL was reported as <2 mg/L in the tables.

Statistical analyses were conducted for both BOD₅ and BOD₂₁ for each of the four groundwater monitoring wells and the Reservoir. For the purpose of calculation, the MDL value of 2 mg/L was assigned to any value reported as <2 mg/L. Complete data is used for basic statistics, such as arithmetic averages and standard deviations, and Analysis of Variance (ANOVA). Paired data, i.e. both BOD₅ and BOD₂₁ are present, was used for the regression analysis. The results of the statistical analyses are presented in Tables 3 and 4.

Complete ANOVA results are shown in Table 3, which shows the population variances (σ_1 , σ_2) for BOD₅ and BOD₂₁ are equivalent. These results also indicate that at 5 percent level of significance there are statistically significant differences between the average BOD₅ and BOD₂₁

Subject: Request for Exemption of 21-Day Biochemical Oxygen Demand Analysis for the Groundwater Monitoring Wells and the Diversions to the Thornton Transitional Flood Control Reservoir

values (μ_1 , μ_2) for the groundwater monitoring wells and the Reservoir except for monitoring well QT-2.

The results of a regression analysis are presented in Table 4. The results show that at each monitoring site BOD_{21} has a very close non-linear relationship in the form of BOD_5 power and the R^2 of fit between BOD_{21} and BOD_5 for the relationships is all greater than 0.87 indicating that BOD_5 can be a good predictor of the BOD_{21} for each of the monitoring sites. Judging from the data presented in Table 4, the District could safely eliminate future monitoring of BOD_{21} without compromising the quality of monitoring.

Given that a BOD_5 value can be a good predictor of BOD_{21} value, little information will be lost and the extra time and expense to the taxpayer can be saved by not analyzing for BOD_{21} . Therefore, the District is requesting an exemption from the BOD_{21} analysis for the four groundwater monitoring wells and the Reservoir for the Thornton Transition Reservoir.

We will assume your approval of this request and will stop analyzing BOD_{21} for the groundwater monitoring wells and the reservoir in 2011, if we do not hear from you regarding this request by December 31, 2010. Please contact Heng Zhang of my staff at 708-588-4068 if you have any question with respect to information presented in this request.

Very truly yours,

Signature on file

Louis Kollias
Director
Monitoring and Research

LK:DM:lf
Attachments
cc: O'Connor

TABLE 1: SUMMARY OF 5-DAY BIOCHEMICAL OXYGEN DEMAND AND 21-DAY BIOCHEMICAL OXYGEN DEMAND FOR GROUNDWATER QUALITY MONITORING WELLS QT-1 THROUGH QT-4 FROM 2004 THROUGH 2009

Collection Date	QT-1		QT-2		QT-3		QT-4	
	BOD ₅ mg/L	BOD ₂₁ mg/L	BOD ₅ mg/L	BOD ₂₁ mg/L	BOD ₅ mg/L	BOD ₂₁ mg/L	BOD ₅ mg/L	BOD ₂₁ mg/L
2/4/04	5	2	<2	2	3	4	<2	4
3/4/04	<2	3	<2	<2	<2	3	<2	3
3/17/04	<2	2	<2	2	<2	2	<2	2
4/29/04	N/A ²	N/A ²	N/A ²	N/A ²	N/A ²	N/A ²	N/A ²	N/A ²
5/13/04	<2	<2	<2	<2	<2	2	<2	<2
6/3/04	<2	<2	<2	<2	<2	2	<2	2
6/10/04	<2	2	<2	<2	<2	3	<2	2
6/17/04	<2	<2	<2	<2	<2	2	<2	2
6/24/04	<2	N/A ²	<2	N/A ²	<2	N/A ²	<2	N/A ²
7/1/04	<2	2	<2	2	<2	2	<2	2
9/16/04	<2	<2	<2	2	<2	<2	<2	<2
1/20/05	<2	<2	<2	3	<2	<2	<2	4
1/26/05	<2	<2	N/A ²	N/A ²	N/A ²	N/A ²	N/A ²	N/A ²
2/2/05	<2	4	<2	4	<2	4	<2	2
2/10/05	<2	<2	<2	<2	<2	<2	<2	3
2/17/05	N/A ²	N/A ²	<2	<2	<2	2	<2	<2
2/25/05	N/A ²	3	<2	2	N/A ²	3	N/A ²	2
3/3/05	N/A ²	N/A ²	<2	2	<2	3	<2	3
4/27/06	<2	3	<2	5	<2	4	<2	5
5/4/06	<2	3	<2	5	<2	4	<2	4
5/11/06	N/A ²	N/A ²	<2	4	<2	4	<2	4
6/15/06	<2	3	<2	5	<2	3	<2	2
7/13/06	<2	4	<2	4	<2	3	<2	3
8/31/06	<2	3	N/A ²	N/A ²	<2	3	<2	5
9/8/06	<2	2	N/A ²	N/A ²	<2	3	<2	2
9/13/06	<2	3	<2	2	3	4	<2	3
9/20/06	<2	<2	<2	<2	<2	2	<2	2
9/28/06	3	4	<2	2	<2	3	<2	4
10/5/06	<2	4	11	4	3	4	<2	5
10/12/06	3	3	<2	3	<2	4	<2	3
12/7/06	8	8	N/A ²	N/A ²	5	7	8	8
12/14/06	<2	2	<2	3	<2	2	<2	2
1/11/07	N/A ²	2	N/A ²	6	N/A ²	3	N/A ²	3
1/18/07	4	2	4	4	<2	2	<2	2
4/19/07	<2	2	<2	3	<2	2	<2	3
5/3/07	<2	2	<2	2	<2	3	<2	3

TABLE 1 (Continued): SUMMARY OF 5-DAY BIOCHEMICAL OXYGEN DEMAND AND 21-DAY BIOCHEMICAL OXYGEN DEMAND FOR GROUNDWATER QUALITY MONITORING WELLS QT-1 THROUGH QT-4 FROM 2004 THROUGH 2009

Collection Date	QT-1		QT-2		QT-3		QT-4	
	BOD ₅ mg/L	BOD ₂₁ mg/L	BOD ₅ mg/L	BOD ₂₁ mg/L	BOD ₅ mg/L	BOD ₂₁ mg/L	BOD ₅ mg/L	BOD ₂₁ mg/L
5/10/07	<2	2	<2	2	<2	<2	<2	<2
8/30/07	<2	2	<2	2	<2	3	<2	3
9/13/07	7	3	<2	3	3	3	3	3
9/20/07	<2	2	<2	2	<2	3	<2	3
9/27/07	<2	3	<2	2	<2	3	<2	3
10/4/07	<2	3	<2	2	<2	3	<2	3
10/11/07	<2	2	<2	2	<2	2	<2	2
10/18/07	<2	4	<2	3	<2	3	<2	3
10/25/07	<2	4	<2	4	<2	3	<2	4
1/10/08	3	3	<2	2	<2	4	<2	3
1/17/08	<2	2	<2	<2	<2	3	<2	3
1/24/08	<2	3	<2	2	<2	3	<2	3
1/31/08	<2	2	2	2	<2	3	<2	3
2/22/08	<2	N/A ²	N/A ²	N/A ²	N/A ²	N/A ²	N/A ²	N/A ²
2/28/08	<2	4	N/A ²	N/A ²	N/A ²	N/A ²	N/A ²	N/A ²
3/6/08	7	7	N/A ²	N/A ²	N/A ²	N/A ²	N/A ²	N/A ²
3/13/08	4	6	N/A ²	N/A ²	N/A ²	N/A ²	N/A ²	N/A ²
3/20/08	<2	3	N/A ²	N/A ²	N/A ²	N/A ²	N/A ²	N/A ²
3/27/08	<2	<2	N/A ²	N/A ²	N/A ²	N/A ²	N/A ²	N/A ²
4/3/08	2	2	N/A ²	N/A ²	N/A ²	N/A ²	N/A ²	N/A ²
4/10/08	2	2	<2	2	<2	3	<2	4
4/17/08	2	2	<2	<2	<2	3	<2	2
4/24/08	2	3	<2	2	<2	4	12	4
5/1/08	2	3	<2	2	<2	2	<2	3
5/15/08	2	2	<2	2	<2	3	<2	2
5/22/08	2	3	<2	2	<2	3	<2	3
6/5/08	2	2	<2	2	<2	2	<2	2
6/12/08	2	<2	<2	<2	<2	2	<2	2
6/26/08	2	2	<2	3	<2	3	<2	3
09/18/08	7	8	6	7	8	5	N/A ²	N/A ²
09/25/08	2	2	<2	2	<2	3	<2	2
10/02/08	2	3	<2	2	<2	3	<2	3
10/09/08	2	2	<2	<2	<2	2	<2	2
10/16/08	2	2	<2	2	<2	3	<2	3
10/23/08	2	3	<2	2	<2	3	<2	3
10/30/08	2	2	<2	<2	<2	2	<2	2

TABLE 1 (Continued): SUMMARY OF 5-DAY BIOCHEMICAL OXYGEN DEMAND AND 21-DAY BIOCHEMICAL OXYGEN DEMAND FOR GROUNDWATER QUALITY MONITORING WELLS QT-1 THROUGH QT-4 FROM 2004 THROUGH 2009

Collection Date	QT-1		QT-2		QT-3		QT-4	
	BOD ₅ mg/L	BOD ₂₁ mg/L	BOD ₅ mg/L	BOD ₂₁ mg/L	BOD ₅ mg/L	BOD ₂₁ mg/L	BOD ₅ mg/L	BOD ₂₁ mg/L
12/31/08	2	4	<2	3	<2	4	<2	4
1/8/09	2	2	<2	2	<2	3	<2	3
3/4/09	2	<2	<2	<2	<2	2	<2	2
3/12/09	2	3	<2	2	<2	2	<2	2
3/19/09	2	2	<2	<2	<2	2	<2	2
3/26/09	2	3	<2	2	<2	3	<2	3
4/2/09	2	3	<2	2	<2	2	<2	2
4/9/09	<2	3	<2	<2	<2	2	<2	2
4/16/09	4	4	<2	2	4	3	3	3
5/1/09	N/A ²	N/A ²	4	2	N/A ²	N/A ²	N/A ²	N/A ²
5/21/09	<2	3	<2	3	<2	3	<2	4
10/26/09	<2	2	<2	2	<2	3	<2	2
11/5/09	<2	2	<2	2	<2	3	<2	2
11/12/09	<2	3	<2	2	<2	3	<2	3

¹The Method Detection Limit (MDL) value for both BOD₅ and BOD₂₁ is 2 mg/L. All values less than 2 mg/L have been reported as <2 mg/L.

²Data was missing or well could not be sampled because not enough sample volume could be collected.

TABLE 2: SUMMARY OF FIVE-DAY BIOCHEMICAL OXYGEN DEMAND AND 21-DAY BIOCHEMICAL OXYGEN DEMAND FOR THE THORNTON TRANSITIONAL RESERVOIR FROM 2004 THROUGH 2009¹

Collection Date	BOD ₅ mg/L	BOD ₂₁ mg/L	Collection Date	BOD ₅ mg/L	BOD ₂₁ mg/L
3/11/04	7	N/A ²	1/11/08	3	6
6/1/04	4	6	1/16/08	8	7
6/8/04	5	6	3/14/08	N/A ²	5
6/14/04	23	6	3/20/08	4	7
6/21/04	6	7	3/26/08	4	5
6/28/04	3	5	4/2/08	3	6
1/15/05	<2	7	4/11/08	3	6
1/20/05	5	7	4/16/08	3	5
1/26/05	3	5	4/23/08	10	7
2/10/05	4	7	5/2/08	3	6
2/15/05	18	N/A ²	5/8/08	10	4
2/23/05	3	5	5/12/08	<2	4
4/19/06	N/A ²	8	5/22/08	<2	4
4/27/06	4	7	5/28/08	3	3
5/3/06	7	14	6/5/08	4	6
8/30/06	3	7	6/11/08	<2	2
9/6/06	4	5	6/19/08	<2	2
9/15/06	5	5	9/16/08	<2	3
9/21/06	4	7	9/23/08	<2	3
9/28/06	3	5	10/1/08	5	6
10/4/06	3	7	10/9/08	<2	2
12/4/06	6	10	10/15/08	4	6
1/6/07	4	8	10/23/08	3	5
1/11/07	4	7	10/30/08	<2	3
4/28/07	5	11	12/30/08	5	4
5/3/07	7	20	3/12/09	5	7
8/27/07	<2	5	3/19/09	4	6
9/4/07	<2	4	3/27/09	<2	5
9/10/07	<2	8	4/2/09	4	7
9/17/07	<2	5	4/9/09	3	5
9/24/07	12	7	4/29/09	4	3
10/2/07	6	<2	5/18/09	4	6
10/9/07	<2	8	10/26/09	3	7
10/17/07	3	9	11/3/09	4	11
10/23/07	<2	9	11/10/09	3	6

¹The Method Detection Limit (MDL) value for both BOD₅ and BOD₂₁ is 2 mg/L. All values less than 2 mg/L are reported as <2 mg/L.

²The analysis was not performed due to various reasons.

TABLE 3: BASIC STATISTICS FOR FIVE-DAY BIOCHEMICAL OXYGEN DEMAND AND 21-DAY BIOCHEMICAL OXYGEN DEMAND
SIGNIFICANCE TEST ON THE AVERAGES OF 5-DAY BIOCHEMICAL OXYGEN DEMAND AND 21-DAY BIOCHEMICAL OXYGEN DEMAND

Sampling Point	Observations		Average		Standard Deviation		Significance Prob ¹ Testing Hypothesis	
	BOD ₅	BOD ₂₁	BOD ₅	BOD ₂₁	BOD ₅	BOD ₂₁	$\sigma_1 = \sigma_2$	$\mu_1 = \mu_2$
DT-1	78	78	2.385	2.821	1.219	1.256	0.397	0.028
DT-2	72	72	2.236	2.542	1.193	1.061	0.311	0.104
DT-3	73	74	2.192	2.878	0.828	0.859	0.378	0.000
DT-4	72	73	2.250	2.849	1.371	1.023	0.109	0.003
Reservoir	68	68	4.441	6.162	3.504	2.778	0.172	0.002

¹Significance Probability <0.05 indicates that the hypothesis is rejected.

TABLE 4: BASIC STATISTICS FOR FIVE-DAY BIOCHEMICAL OXYGEN DEMAND AND 21-DAY BIOCHEMICAL OXYGEN DEMAND REGRESSION ANALYSIS AND TEST ON REGRESSION COEFFICIENTS

Sampling Point	Relationship	Regression		Variance	Stat (T)	Sig Prob ¹ H ₀ : B=1
		R ²	Coefficient (b)	b		
DT-1	$BOD_{21} = BOD_5^{1.1373}$	0.911	1.1373	0.00169	81.08	0.000
DT-2	$BOD_{21} = BOD_5^{1.0721}$	0.878	1.0721	0.00229	31.50	0.000
DT-3	$BOD_{21} = BOD_5^{1.2924}$	0.924	1.2924	0.00194	150.96	0.000
DT-4	$BOD_{21} = BOD_5^{1.2289}$	0.878	1.2289	0.00300	76.25	0.000
Reservoir	$BOD_{21} = BOD_5^{1.2095}$	0.877	1.2095	0.00316	66.30	0.000

¹Significance Probability <0.05 indicates that the hypothesis is rejected.